Robinson
Land Development

1319 Johnston Road Site Plan
Light Industrial Development
Servicing and Stormwater Management Report

Prepared For:

2079 Artistic Place GP Inc.

Prepared By:

Robinson Land Development

Project No. 23034
July 2024

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LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **2079 Artistic Place GP Inc.**

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

1.0 INTRODUCTION

Robinson Land Development has been retained by 2079 Artistic Place Inc. to prepare a servicing and stormwater management design for a proposed commercial development located at 1319 Johnston Road, located in the corner of Johnston Road and Bank Street (and Artistic Place). The subject site is proposed to be developed into eight separate light industrial buildings. The extent of the development is bounded by Sawmill Creek on the west and tributary ditches to Sawmill Creek on the north and east side of the property. Refer to architectural site plan provided in **Appendix A** for reference.

This report will detail the proposed means of servicing the site and provide details on how to meet the stormwater management requirements. Pre-consultation notes from the City of Ottawa have been provided in **Appendix A** for reference.

2.0 EXISTING CONDITIONS

The 4.89 ha subject site is zoned Light Industrial (IL) and is currently partially developed for concreting/landscaping yardworks. These existing works will be demolished for the proposed development. The only municipal ROW access the site has is a 15.25 m wide strip at the southeast corner of the site that connects to Johnston Road.

The following infrastructure exists adjacent to the site:

- 300 mm dia. cast iron watermain along Johnston Road.
- 750 mm dia. concrete sanitary sewer along Johnston Road.
    - 250 mm dia. concrete sanitary sewer along Johnston Road that crosses in front of the site entrance ties and discharges into the 750 mm dia. sanitary.
- 450 to 1050 mm dia. concrete storm sewer along Johnston Road.
    - The storm sewer along Johnston Road collects to an 1800 mm dia. sewer and travels north adjacent to the site, crosses the property from the east edge to the northwest corner in a 9 m wide easement. This storm sewer discharges to Sawmill Creek shortly downstream.

Refer to GeoOttawa screen captures of the existing watermain, sanitary, and storm infrastructure provided in **Appendix A** for more details.

3.0 DEVELOPMENT PROPOSAL

The Owner is proposing to develop the subject site into eight separate light industrial buildings and associated parking lots. Only 3.70 ha of the site are proposed for development, allowing a 30 m setback from the west property line and a 15 m setback from the north property line for the Sawmill Creek tributaries. The eight commercial buildings are sized as follows, following clockwise around the site beginning at Building G:

- Building G: 2,439 m^2
- Building H: 2,439 m^2
- Building F: 2,019 m^2
- Building E: 1,464 m^2
- Building C: 1,859 m^2
- Building B: 1,098 m^2
- Building D: 1,588 m^2
- Building A: 2,453 m^2

Refer to the Site Plan, prepared by Allan Stone Architect, in **Appendix A** for more details.

The proposed development will be provided with new water, sanitary and storm services per City requirements. The proposed civil design drawings are provided in **Appendix B** including:

- Servicing Plan
- Grading Plan
- Notes & Details Plan
- Erosion & Sediment Control Plan
- Existing Conditions & Removals Plan
- Storm Drainage Area Plan

3.1 Phasing

The architectural site plan in **Appendix A** indicates five phases of development. Phase 1 will involve most of the civil servicing infrastructure, including the storm pond, storm tank, and all hydrants. Only CB 215 (Phase 2/3), and CB 211 and CB 213 (Phase 4) and will be constructed during the respective phases. As the full storm quantity and quality control infrastructure will be constructed during phase 1 and the future phases will be left as softscaping in the interim, there are no concerns about stormwater management during the interim conditions. The main watermain loop and all hydrants will be constructed during Phase 1, therefore there are no concerns about fire servicing during the interim conditions. Likewise, the full sanitary sewer will be constructed during Phase 1.

4.0 WATER SERVICING

The subject site will receive water supply via a twinned 200 mm watermain connected to the existing 300 mm watermain on Johnston Road, looped within the site for supply redundancy. The watermain system has been designed according to the following standards and guidelines:

- Ottawa Design Guidelines – Water Distribution (2010) periodically amended as part of Technical Bulletins
- Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection (2020)
- MOECC Design Guidelines for Drinking-Water Systems (2008)

Accordingly, the following watermain design criteria have been utilized for the subject site:

- Light Industrial Flow: 35,000 L/ha/d
- Max Day Demand Factor: 1.5
- Peak Hour Demand Factor: 1.8
- Minimum Pressure During Peak Hour 276 kPa (40 psi)
- Minimum Pressure During Maximum Day Plus Fire 140 kPa (20 psi)
- Maximum Pressure in Unoccupied Areas 689 kPa (100 psi)
- Maximum Pressure in Occupied Areas 552 kPa (80 psi)

4.1 Boundary Conditions

The City of Ottawa provided boundary conditions for the subject site at the proposed connections to the existing 300 mm watermain on Johnston Road. Refer to **Appendix C** for proposed domestic and fire demand calculations and received boundary conditions. The boundary conditions have been summarized in **Table 1** below:

Table 1 – Boundary Conditions

Demand Scenario	Head (m)	Pressure (psi)
Maximum HGL (Average Day)	131.3	73.8
Minimum HGL (Peak Hour)	123.9	63.3

Max Day + Fire	123.7	63.0

4.2 Fire Protection

The nearest existing municipal hydrant to the site is located approximately 45 m from the site entrance on Johnston Road. Fire protection for the subject site will be provided by proposed on-site private hydrants fed from the same 200 mm private watermain loop. The proposed hydrants will be located to provide coverage of all buildings based on their calculated fire demand, with a maximum spacing of 90 m. Buildings G, H, C, and A will be sprinklered, and Buildings F, E, B, and D will be unsprinklered. A hydrant is within 45 m of each building's respective fire department connection (HYD-8 for Building G and A, HYD-4 for Building H, and HYD-5 for Building C), located on the outside wall of the mechanical room.

The required fire flow for the subject site was calculated using the Fire Underwriter's Survey (FUS) long form for each building (refer to **Appendix C**). Based on the building construction, occupancy and ground floor area for each building, the maximum required fire flow is 14,000 L/min (233.3 L/s) at Building E and F.

4.3 Hydraulic Model Results

The hydraulic model results for Maximum HGL, Peak Hour and Maximum Day + FF have been calculated and summarized in **Table 2** below. The fire demand scenario was rendered for the set of three hydrants nearest an unsprinklered building and its associated fire demand, and the set of two hydrants nearest a sprinklered building and its associated fire demand.

Table 2 – Hydraulic Model Results

Criteria	Fire Demand (L/min)	Min. Pressure (psi)	Max. Pressure (psi)	Allowable Pressure Range
Avg Day	-	67.9	72.8	40 – 80 psi
Peak Hour	-	57.3	62.3	40 – 80 psi
Max Day + Fire (Hyd 8,1 - Bldg G or A - sprinklered)	7,000	52.4	-	>20 psi
Max Day + Fire (Hyd 3,4 Bldg H - sprinklered)	8,000	43.9	-	>20 psi
Max Day + Fire (Hyd 2,3,4 - Bldg F)	14,000	26.0	-	>20 psi
Max Day + Fire (Hyd 3,4,5 - Bldg E)	14,000	22.2	-	>20 psi
Max Day + Fire (Hyd 5,6 - Bldg C - sprinklered)	9,000	37.6	-	>20 psi
Max Day + Fire (Hyd 5,6,7 - Bldg D or B)	12,000	28.2	-	>20 psi

As indicated in **Table 3** above, the subject site can be adequately serviced for both domestic and fire demands. Refer to the hydraulic model outputs provided in **Appendix C** for details.

5.0 SANITARY SERVICING

5.1 Design Criteria

Sanitary flows from the site will discharge to the 750 mm sanitary sewer on Johnston Road. The sanitary sewer system has been designed according to the following standards and guidelines:

- Ottawa Sewer Design Guidelines (2012) periodically amended as part of Technical Bulletins
- MOECC Design Guidelines for Sewage Works (2008)

Accordingly, the following design parameters have been implemented for the subject site:

- Light Industrial Flow: 35,000 L/ha/d
- Peaking Factor: 7.0
- Infiltration Allowance: 0.33 L/s/ha
- Minimum Velocity: 0.60 m/s
- Maximum Velocity: 3.0 m/s

5.2 Proposed Design

All proposed sanitary sewers have been designed to have capacities to convey the peak design flows and meet minimum full flow velocities. Refer to the sanitary sewer design sheet in **Appendix D** for more details. Confirmation from the City of Ottawa that the existing 750 mm sanitary on Johnston Rd. has sufficient capacity for the proposed development is provided in **Appendix D**.

A monitoring maintenance hole is located at the site entrance near the property line immediately prior to discharge to the existing 750 mm municipal sewer.

6.0 STORM SERVICING

6.1 Design Criteria

Stormwater runoff collected on the subject site will be discharged to the existing 1800 mm storm sewer that runs in an easement through the site and ultimately discharges to the Sawmill Creek shortly downstream. Existing stormwater runoff is directed to the boundaries of the property. Ditches/streams that are tributary to Sawmill Creek run along the property lines to collect the sites current stormwater runoff.

The storm sewer system has been designed according to the following standards and guidelines:

- Ottawa Sewer Design Guidelines (2012) periodically amended as part of Technical Bulletins
- MOECC Stormwater Management Planning and Design Manual (2003)
- Sawmill Creek Subwatershed Study Update (2003) by CH2M Hill
- Site Plan Application pre-consultation meeting minutes

Accordingly, the following design parameters have been implemented for the subject site:

- Quantity Control: 100-year post-development to 2-year pre-development
- Quality Control: Enhanced (80% TSS reduction)
- Infiltration: Provide infiltration for 40% of hard surfaces
- Ponding: No ponding during 2-year, max. 300mm ponding
- Minimum Velocity: 0.80 m/s
- Maximum Velocity: 3.0 m/s

Additionally, the storage system must remain above the 100-year hydraulic grade line of the 1800 mm storm sewer as confirmed by the City. These criteria were confirmed with the City and provided in **Appendix E** for reference.

The allowable controlled flow rate was calculated based on the 2-year pre-development flow rate, accounting for the uncontrolled area. Refer to **Appendix E** for details of the calculations. The summary of the calculations are as follows:

- 2-year Pre-Development Flow Rate: 127 L/s
- 100-year Controlled Area Allowable Discharge Rate: 100 L/s

6.2 Minor System

Because the 1800mm storm sewer and its easement crosses the site the drainage system is effectively split into two sections: the Main Site and Building A. Stormwater runoff from the Main Site will be captured and discharge to a new MH installed on the 1800 mm storm sewer. Stormwater runoff from the Building A side will be captured and discharge to the existing MH on the 1800 mm storm sewer. Based on the site plan the two drainage system sections cannot effectively be discharged to the same location on the 1800 mm storm sewer, thus two connection points are required. A portion of the entrance driveway cannot be captured by the storm system and will be captured by the existing catch basins on Johnston Rd. immediately outside the site entrance (which is also conveyed through the 1800 mm storm sewer). The buildings are assumed to have no roof storage capacity (sloped roofs) with roof drainage discharging at-grade at downspouts identified on the plan. Refer to the 2-year storm sewer design sheet in **Appendix E** for details of the calculations and the Storm Drainage Area Plan in **Appendix B** for reference. Accordingly, under the 2-year storm no ponding will occur.

6.3 Major System/Quantity Control

The major system flows of the site involve ponding in the respective drainage areas. Quantity storage is provided by surface ponding at catch basins, an underground storage tank in the centre of the site, and a dry pond at the north end of the site. No spillover will occur during the 5-year storm. During the 100-year storm some spillover will occur between the individual drainage areas (from Drainage Areas 4, 5, and 7) though no emergency spillover off-site up to and including the 100-year storm. Surface ponding depths are limited to maximum 300mm measured from the catch basin T/G, with all local overflow elevations minimum 300mm below building entrance elevations. Emergency overflow flow routes are directed towards:

- Johnston Road (Drainage Areas 10,13 and 14);
- Existing Sawmill Creek along the west property line (Drainage Areas 1-5,7-9,15,17, and 18);
- Existing tributary ditch along the east property line (Drainage Area 16)

Refer to the 5-year and 100-year storm sewer design sheets in **Appendix E** for details of the calculations and the Storm Drainage Area Plan in **Appendix B** for reference.

While individual drainage areas were generally designed to operate independently during the 2-year and 5-year storms, due to the flow restrictions the Main Site and Building A systems will each operate as a whole (though still independent of one another). Flow restrictions were calculated for the site with the use of inlet control devices at the end of the respective sewer trains, but before the oil-grit separators. The details of the calculations are provided in **Appendix E** and summarized in **Table 3** below.

Table 3 – 100-Year Post-Development Discharge Rates

Drainage Area	Max Discharge Rate (L/s)
Main Site (1-14)	91.1
Building G (15-18)	8.7
Uncontrolled Entranceway	26.8
Total	**126.6**

Based on these flow restrictions the total storm storage was calculated for the 100-yr design storm for the Main Site and Building A portions. Since ICD flow rate is a function of head pressure, for total storage calculations the discharge rate was assumed at 50% of the maximum rate. On the Main Site side there is sufficient storage for the 100-yr design storm up to the spillover elevation of 82.80 m. On the Building A side all storage is contained within the dry pond up to the 100-yr design storm at an elevation of 82.50 m, but there remains additional storage in the site up to the spillover elevation of 82.83 m (spilling over from Drainage Area 18 to the Main Site side at Drainage Area 6 and ultimately to the emergency spillover at the west end of the site). The details of the calculations are provided in **Appendix E** and summarized in **Table 4** below.

Table 4 – 100-Year Post-Development Storage Volumes

Drainage Area	Required Storage (m^3)	Available Storage (m^3)	Elevation (m)
Main Site (1-14)	1,573	1,577	82.80
Building A (15-18)	527	541	82.50
Total		**2,118**	

The underground storage tank is proposed as a GreenStorm ST underground storage module or equivalent which provides high volume efficiency storage capacity, highway-rated vehicle loading, and infiltration capacity with exposed bottom construction. Typical details of the GreenStorm system are provided in **Appendix E** for reference. The tank ICD will be secured in a dedicated maintenance hole immediately downstream of the tank but before the oil-grit separator. The ICD for the Main Site drainage portion is proposed as a Tempest HF Model E or equivalent to provide high flow-rate control along with additional level of control against the discharge of floatable contaminants prior to the OGS. Typical details of the Tempest ICDs are provided in **Appendix E** for reference. The dry pond will be a simple grassed open area with 3:1 side walls and concrete headwalls for the inlet and outlet pipes. The pond ICD orifice plate will be secured at the outlet headwall, with the oil-grit separator immediately downstream.

6.4 Hydraulic Grade Line

As confirmed by the City of Ottawa the hydraulic grade line of the 1800mm storm sewer will be above the obvert of the pipe during the 100-year storm. Accordingly, the connecting storm storage system will be above the hydraulic grade line at the connection point to avoid backflow of the system and negating storage capacity. The hydraulic grade line provided by email is shown in **Appendix E** and summarized as follows:

- Main Site (underground tank) connection: Minimum elevation at ex. MHST33692 of 80.77 m (HGL downstream of MHST33692 at connection point will be lower)
- Building A (dry pond) connection: Minimum elevation at ex. MHST33693 of 80.56 m

The bottom of the underground storage tank is set to 80.77 m and the bottom of the dry pond is set to 80.60 m, above the 100-yr HGL of the 1800mm storm sewer.

6.5 Infiltration

In line with the Sawmill Creek Subwatershed Study, infiltration of minimum 40% of the impervious area is desired for maintaining overall creek baseflow volumes and water table recharging. This equates to 9,433 m^3 per year based on Environment Canada monitoring station rainfall data at the Ottawa MacDonald-Cartier International Airport years 1993-2023 (available from the Government of Canada website for historical weather, climate and hazard data). This is the same monitoring station the City of Ottawa based their rainfall IDF curves upon from years 1967-1997. Infiltration capacity of a site is impacted by soil type, and bedrock and groundwater level, with a minimum difference between bottom of infiltration and top of either bedrock or groundwater around 1 m. Per the geotechnical investigation for 1319 Johnston Road prepared by Gemtec dated July 24, 2023, bedrock elevations (or auger refusal) ranged from 73.9-78.9 m and groundwater levels ranged from 79.6-80.5 m. The bedrock elevations are well below the underground storage tank and dry pond, however the measured groundwater level is less than the typical 1 m desired difference (though still below the minimum system elevations). This does not mean that infiltration will not occur, but that the system has a reduced infiltration capacity.

Beneath the storm storage tank is a 150 mm layer of gravel for infiltration that will be filled during a typical storm event. This equals a minimum infiltration volume of 111 m^3 within the gravel bed (any volume above the gravel bed will most likely be discharged before it can be infiltrated). For the silty-clayey sand layer that the storm storage tank will be within or just above per the geotechnical investigation, a percolation rate of 35 min/cm was chosen (average of 20-50 min/cm per MMAH SB-6) with a factor of safety of 2.0 for the proximity of the groundwater table. At this infiltration rate the gravel bed is expected to infiltrate its volume within 10.5 hr, typically infiltration from a storm event is expected within 24-48 hrs. With these parameters it was calculated that the required yearly infiltration target can be achieved over the course of 84 rainfall events across the year (an average year was found to have 118 rainfall events). Or to put in another way, during the average rainfall year the storage tank will infiltrate approximately 13,200 m^3. The details of the calculations are provided in **Appendix E** and summarized in **Table 5** below.

Table 5 – Infiltration at the Storm Storage Tank

Required Infiltration per Year (m^3)	Minimum Infiltration per Event (m^3)	Number of Typical Events Required per Year	Total Infiltration per Year (m^3)
9,433	111	85	13,209

This above calculation does not take into account the infiltration capacity of the dry pond itself which will further contribute to the site's total infiltration. Therefore, it is concluded that the infiltration requirements are met.

For additional consideration, from the geotechnical investigation, the locations of infiltration will be within or just above areas of silty-clayey sand but below a layer of stiff silty clay that was found through most of the site with thicknesses between 0.21-1.25 m. This layer of stiff silty clay would significantly impact the site's existing infiltration capacity from surface runoff.

6.6 Quality Control

Quality control will be provided by oil-grit separators prior to discharge to the 1800 mm storm sewer sized for 60% TSS reduction at ETV particle size distribution based on the restricted flow rates of the Main Site and Building G drainage portions. Refer to OGS sizing cutsheets in **Appendix E** for more details. This is the approximate maximum reduction rate a typical OGS unit can achieve using ETV particle size distribution, equivalent to approximately 90% TSS reduction using typical "Fine" particle size distribution. In order to achieve the required 80% TSS reduction, additional settlement exists in the underground tank and dry pond systems where inflow velocity is significantly reduced.

7.0 EROSION AND SEDIMENT CONTROL

Prior to construction and until vegetation has been re-established in disturbed areas, erosion and sediment control measures must be implemented to mitigate the impact on receiving watercourses and existing infrastructure. The following erosion and sediment control (ESC) measures have been proposed for the subject site:

- Limiting the extent of exposed soils at any given time.
- Erosion and sediment control measures shall be maintained until vegetation has been re-established in all disturbed areas. Re-vegetate disturbed areas in accordance with approved Landscape Plan as soon as possible.
- Stockpile soil away (15 metres or greater) from watercourses, drainage features and top of steep slopes.
- Installation of silt sacks between frame and cover on all proposed and existing catch basins and open cover storm manholes until construction is completed.
- Silt fence to be installed and maintained along the property boundaries.
- Install mud mats at all construction entrances.
- During active construction periods, visual inspections shall be undertaken on a weekly basis and after major storm events (>25mm of rain in 24 hour period) on ESC and any damage repaired immediately.
- ESC shall also be assessed (and repaired as required) following significant snowmelt events.
- Visual inspections shall also be undertaken in anticipation of large storm events (or a series of rainfall and/or snowmelt days) that could potentially yield significant runoff volumes.
- Care shall be taken to prevent damage to ESC during construction operations.
- In some cases, barriers may be removed temporarily to accommodate construction operations. The affected barriers shall be reinstated immediately after construction operations are completed.
- ESC should be adjusted during construction to adapt to site features as the site becomes developed.
- ESC shall be cleaned of accumulated sedimentation as required and replaced as necessary.

- During the course of construction, if the Engineer believes that additional prevention methods are required to control erosion and sedimentation, the Contractor shall implement additional measures, as required, to the satisfaction of the Engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

Refer to the Erosion and Sediment Control Plan provided in **Appendix B** for more details.

8.0 APPROVALS

The proposed development is subject to City of Ottawa site plan approval with criteria from the Rideau Valley Conservation Authority. Since stormwater quantity and quality control is being provided for an industrial-use site an Environmental Compliance Approval from the Ontario Ministry of Environment, Conservation and Park will also be required.

9.0 CONCLUSIONS

This servicing and stormwater management report has been prepared to support the Site Plan Application for the development of the property located at 1319 Johnston Road. The report has detailed the proposed means of servicing the site for potable water and sanitary sewer and provided details on how to meet the stormwater management requirements in accordance with City of Ottawa standards and the Sawmill Creek Subwatershed Study. The proposed servicing and stormwater management designs will be achieved by implementing the following key features:

- Domestic water supply will be provided by a 200 mm diameter watermain connection to the existing 300 mm diameter watermain on Johnston Road.
- Fire protection will be provided by proposed on-site hydrants.
- Sanitary flows will be conveyed to the existing 750 mm diameter sanitary sewer on Johnston Road via a proposed 250 mm diameter sanitary sewer.
- Stormwater runoff (minor system) will be conveyed by the proposed storm sewer system to the existing 1800 mm storm sewer that runs through the site at two locations: a new MH on the 1800 mm and at an existing MH immediately downstream.
- Stormwater runoff for all storm events up to and including the 100-year design storm will be controlled on-site at maximum the 2-year pre-development flow rate.
- On-site storage will be provided for all storm events up to and including the 100-year design storm event through surface ponding, underground storage, and a dry pond.
- Emergency overland flows will be conveyed to Sawmill Creek and its tributary ditches along the property boundaries as well as Johnston Road.
- Infiltration equivalent to 40% of the impervious areas is provided at the underground storage tank, as well as the dry pond.
- Quality control will be provided by oil-grit separators immediately downstream of the ICD flow restrictions and immediately prior to discharge to the existing 1800 mm system.
- Erosion and sediment control measures will be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas.

Report Prepared By:

Stephen McCaughey, P.Eng.
Project Engineer

Report Reviewed By:

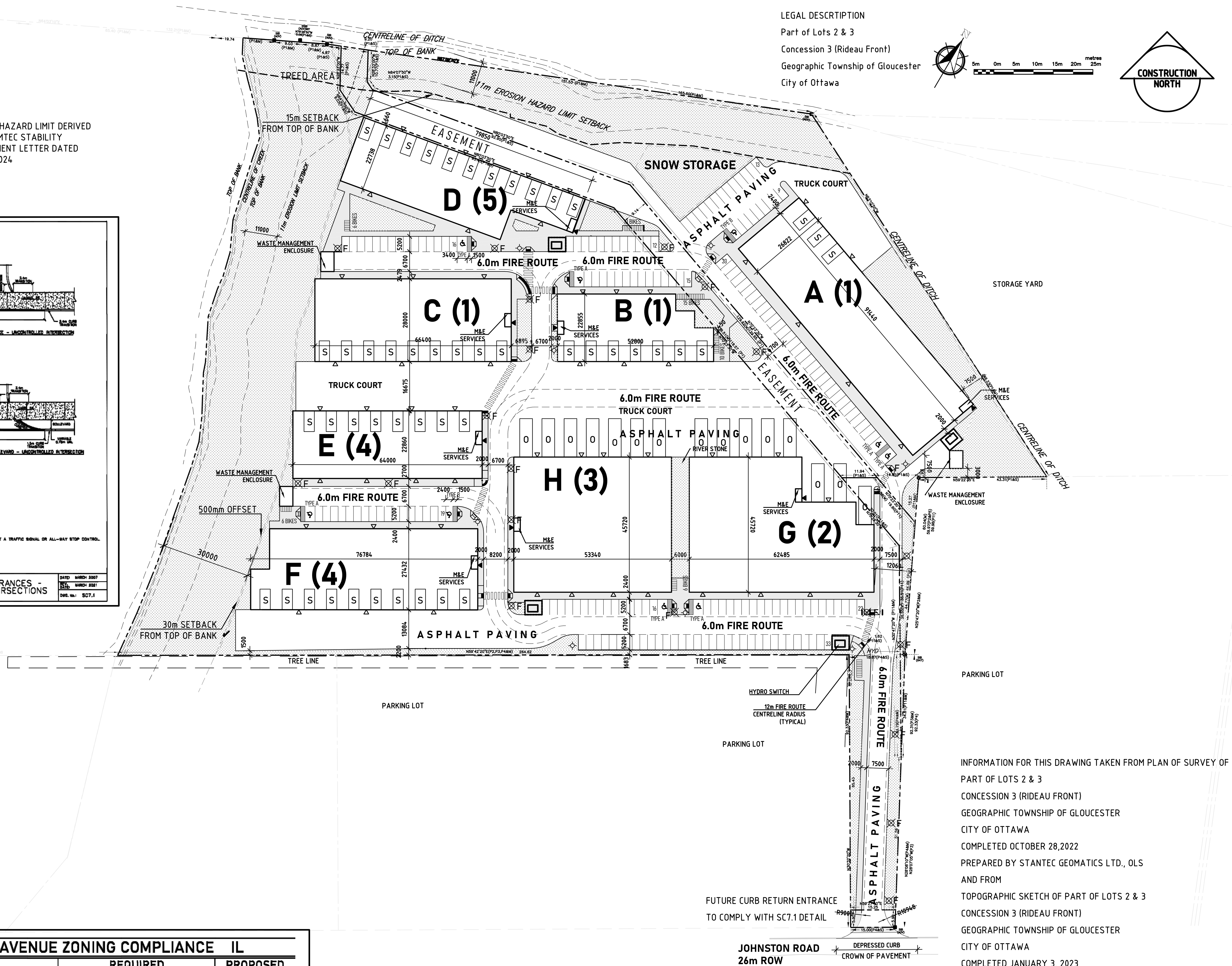
Chris Collins
Manager, Land Development

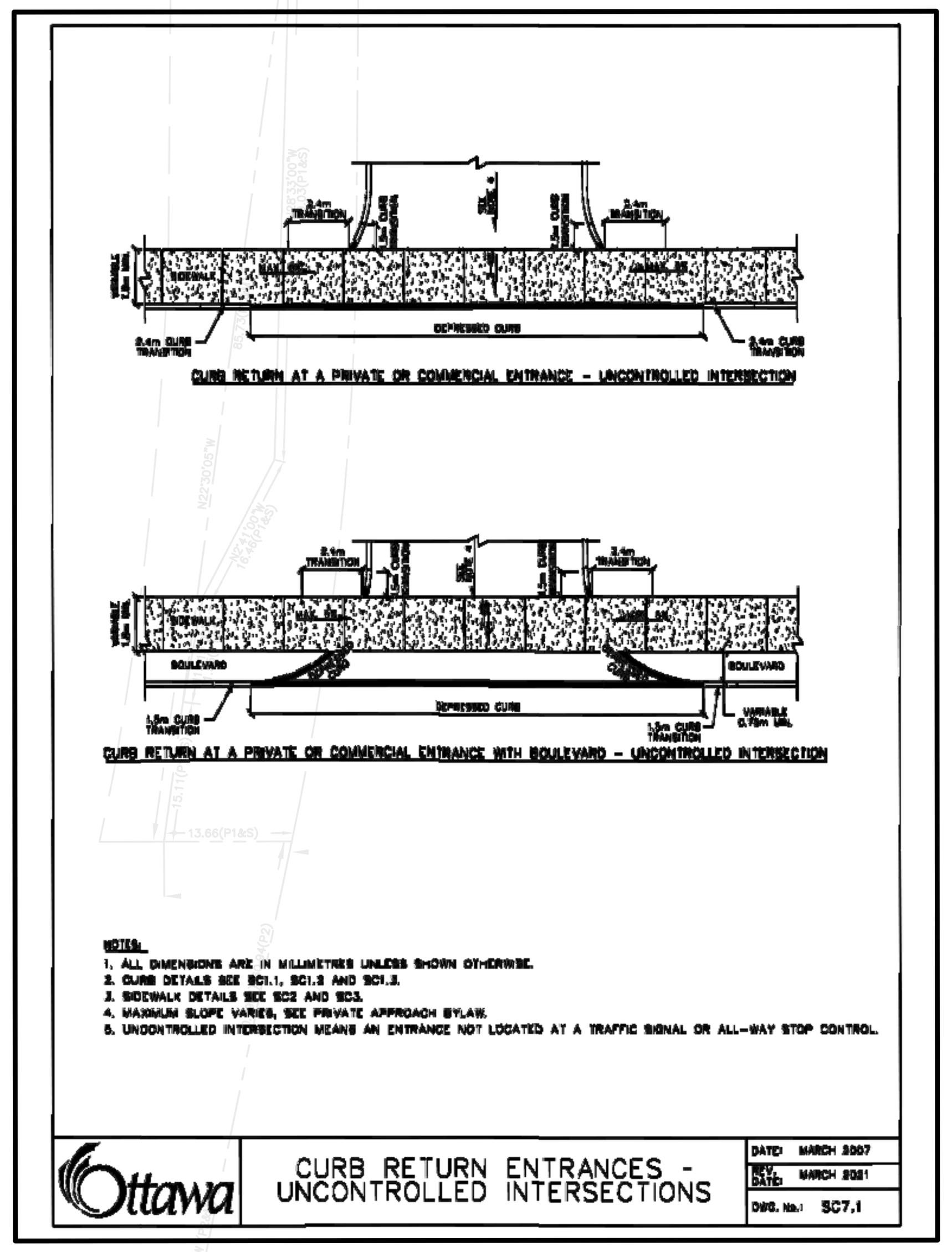
Appendix A

Architectural Site Plan

Pre-Consultation Notes

GeoOttawa existing watermain, sanitary and storm





INFORMATION FOR THIS DRAWING TAKEN FROM PLAN OF SURVEY OF
PART OF LOTS 2 & 3
CONCESSION 3 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA
COMPLETED OCTOBER 28,2022
PREPARED BY STANTEC GEOMATICS LTD., OLS
AND FROM
TOPOGRAPHIC SKETCH OF PART OF LOTS 2 & 3
CONCESSION 3 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA
COMPLETED JANUARY 3, 2023
PREPARED BY STANTEC GEOMATICS LTD., OLS

1319 JOHNSTON AVENUE ZONING COMPLIANCE IL

MECHANISM	REQUIRED	PROPOSED
Minimum Lot Area	2,000 m2	48,997 m2
Minimum Lot Width	No Minimum	15.3 m
Maximum Lot Coverage	65%	31%
Minimum Interior Side Yard Setback	7.5 m	7.5 m
Minimum Front Yard Setback	7.5 m	113.4 m
Minimum Rear Yard Setback	3.5 m	22.7 m
Maximum Building Height	18 m	17.8 m
Maximum Floor Space Index	2	0.3
Minimum Width of Landscape Area	Abutting a Street: 3 m Other Cases: No Minimum	3 m 1.5 m
Parking Spaces	121	188
Bicycle Parking Spaces	19	63
Loading Spaces	8	63
Standard		48
Oversize		15

STATISTICS

	GROSS FLOOR AREA		BUILDING HEIGHT
BUILDING A	2,320.12	m2	17.8 m
BUILDING B	1,006.28	m2	9.1 m
BUILDING C	1,756.39	m2	9.1 m
BUILDING D	1,498.76	m2	9.1 m
BUILDING E	1,380.04	m2	9.1 m
BUILDING F	1,908.49	m2	9.1 m
BUILDING G	2,306.92	m2	9.1 m
BUILDING H	2,307.03	m2	9.1 m
TOTAL	14,484.03		

OWNER/DEVELOPER
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APPLICANT
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Attn: Mr. Tim Eisner

REVISIONS AND DISTRIBUTION LOG

No.	Date	Note
01	16 AUG 2023	ISSUED FOR PRECONSULTATION STAGE 3
02	11 MAR 2024	GENERAL REVISION
03	19 MAR 2024	ELECTRICAL SERVICE REVISION
04	26 MAR 2024	FIRE HYDRANTS ADDED
05	04 MAY 2024	EROSION HAZARD INFO ADDED, PARKING UPDATED
06	23 JUL 2024	LANDCACAPE STRIP REVISED @ BLDG F, STATS FOR BLDG A REVISED

THE CONTRACTOR SHALL CHECK ALL DIMENSIONS AND REPORT DISCREPANCIES TO THE ARCHITECT.

ALL DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS OTHERWISE INDICATED.

DO NOT SCALE DRAWINGS.

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBø	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
M/MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
P1	"	REGISTERED PLAN 4M-1566
HYD	"	FIRE HYDRANT
F		FIRE ROUTE SIGN
		CONCRETE SIDEWALK
		SOFT LANDSCAPING
▲		CONFIRMED DOOR LOCATION
△		CONCEPTUAL DOOR LOCATION
O		POTENTIAL OVERSIZED LOADING SPACE 4.3m X 13m
S		POTENTIAL STANDARD LOADING SPACE 3.5m X 7m

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Project:
INDUSTRIAL DEVELOPMENT
1319 Johnston Road
Ottawa Ontario

Drawing Title:
SITE PLAN

Drawn By:	Checked By:	Date Checked:	Project No.
			1319J.2023

Date Plotted: Jul 24, 2024 - 12:02pm
Scale: 1:750
Drawing No.: A101
Revision No.: 06

ISO A1

2059 Artistic Place

Meeting Summary Notes

June 17th, 2022. Online Teams Meeting

Attendees:

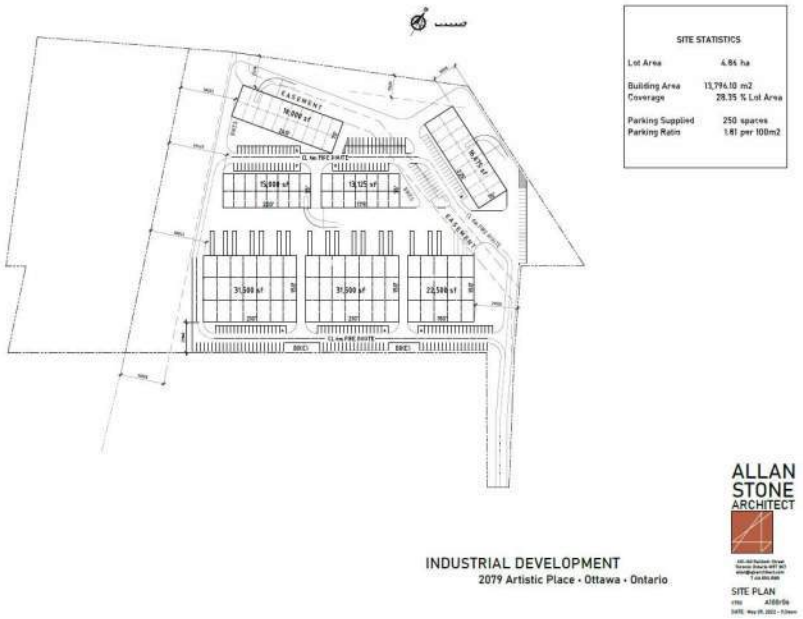
- Jocelyn Chandler (Applicant, JFSA)
- Barry Godfrey (Applicant, Quaestus)
- David Meikle (DBM Consulting)
- Tim Eisner (JFSA)
- Allan Stone (CMV Arch)
- Alex Meacoe (Gemtec)
- Andrew Harte (CGH)
- Michelle Chen (CGH)
- Chris Collins (EXP)
- Morphet, Katie (File Lead, Planner, City of Ottawa)
- Cassidy, Tyler (Project Manager, City of Ottawa)
- Charie, Kelsey (EIT, City of Ottawa)
- Richardson, Mark (Forestry, City of Ottawa)
- Elliott, Mark (Environmental Planner, City of Ottawa)
- Jamie Batchelor (RVCA)

Not in Attendance:

- Christopher Moise (Urban Design, City of Ottawa)
- Neetu Paudel (Transportation Project Manager, City of Ottawa)
- Phil Castro (Parks, City of Ottawa)

Issue of Discussion:

- Site Plan Control for 7 new 1-storey light industrial buildings.



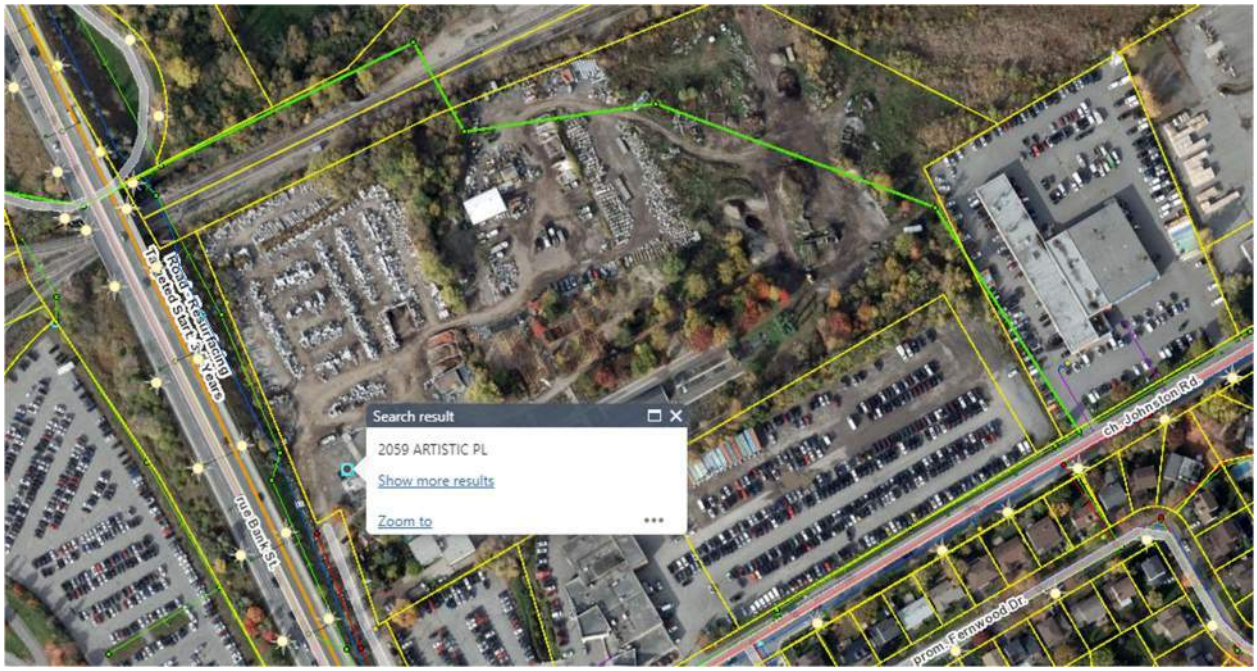
1. Infrastructure/Servicing – Tyler Cassidy

Please note the following information regarding the engineering design submissions for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/how-develop-property/development-application-review-process-2/guide-preparing-studies-and-plans
2. Servicing and site works shall be in accordance with the following documents:
   - Ottawa Sewer Design Guidelines (October 2012) and all the Technical Bulletins including, Technical Bulletin PIEDTB-2016-01 and ISTB-2018-01
   - Ottawa Design Guidelines – Water Distribution (2010) and Technical Bulletins ISD-2010-2, ISDTB-2014-02 and ISTB-2018-02
   - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
   - City of Ottawa Environmental Noise Control Guidelines (January, 2016)
   - City of Ottawa Park and Pathway Development Manual (2012)
   - City of Ottawa Accessibility Design Standards (2012)
   - Ottawa Standard Tender Documents (latest version)
   - Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x 44455
4. The Stormwater Management Criteria, for the subject site, is to be based on the following (as established in the "**Sawmill Creek Subwatershed Study – Final Report**" dated May 2003:
    - The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).
    - Flows to the storm sewer in excess of the 2-year storm release rate, up to and including the 100-year storm event, must be detained on site.
    - Ensure no overland flow for all storms up to and including the 100-year event.
    - Use of Low Impact Development (LIDs) are considered Best Management Practices (BMP) for this site.
    - The 2-yr storm or 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.
    - A calculated time of concentration (Cannot be less than 10 minutes).
    - Quality control requirements to be provided by Rideau Valley Conservation Authority (RVCA). **(As determined in the sawmill creek subwatershed).
    - This property is located within the **Sawmill Creek** subwatershed. Please verify any subwatershed specific SWM criteria with the RVCA.

5. Deep Services:



i. A plan view of the approximate services may be seen above. Services should ideally be grouped in a common trench to minimize the number of road cuts. The sizing of available future services is:

a. Connections (Johnson Road):

i. Existing 450 mm dia. STM (Conc.)
ii. Existing 305 mm dia. Watermain (CI)
iii. Existing 250 mm dia. SAN (Conc.)

b. Connections (Sawmill Creek Storm Trunk Sewer):

i. Existing 1800 mm dia. STM (Conc.) * Note that the connection must be to a maintenance hole, and drop pipes will most likely be required.

ii. Direct discharge to the Sawmill Creek is not permitted as there are available storm connections fronting the property.

*Note that only one (1) san, stm, or water connection to the right of way is permitted per site.

ii. Provide existing servicing information and the recommended location for the proposed connections. Services should ideally be grouped in a common trench to minimize the number of road cuts.

iii. Provide information on the monitoring manhole requirements – should be located in an accessible location on private property near the property line (ie. Not in a parking area).

iv. Provide information on the type of connection permitted

Sewer connections to be made above the springline of the sewermain as per:

a. Std Dwg S11.1 for flexible main sewers – *connections made using approved tee or wye fittings.*

b. Std Dwg S11 (For rigid main sewers) – *lateral must be less that 50% the diameter of the sewermain,*

c. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – *for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,*

d. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

e. No submerged outlet connections.

6. Civil consultant must request boundary conditions from the City's assigned Project Manager prior to first submission. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

i. Location of service(s)
ii. Type of development and the amount of fire flow required (as per FUS, 1999).
iii. Average daily demand: ___ l/s.
iv. Maximum daily demand: ___l/s.
v. Maximum hourly daily demand: ___ l/s.
vi. Hydrant location and spacing to meet City's Water Design guidelines.

vii. Water supply redundancy will be required for more than 50 m3/day water demand.

7. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.
8. MECP ECA Requirements (Standard) –

   All development applications should be considered for an Environmental Compliance Approval (ECA) by the Ministry of the Environment, Conservation, and Parks (MECP);

   a. Consultant determines if an approval for sewage works under Section 53 of OWRA is required. Consultant then determines what type of application is required and the City's project manager confirms. (If the consultant is not clear if an ECA is required, they will work with the City to determine what is required. If the consultant it is still unclear or there is a difference of opinion only then will the City PM approach the MECP.
   b. The project will be either transfer of review (standard), transfer of review (additional), direct submission, or exempt as per O. Reg. 525/98.
   c. Standard Works ToR Draft ECA's are sent to the local MECP office (moeccottawasewage@ontario.ca) for information only
   d. Additional ToR draft ECAs require a project summary/design brief and require a response from the local MECP (10 business day window)
   e. Site plan Approval, or Draft Approval, is required before an application is sent to the MECP
9. General/ additional comments:

   i. Only one watermain connection per site. However, looping would be required if proposed demand is 50m3/day or greater.
   ii. A pre and post construction CCTV inspection is required for re-using any existing servicing connections.

2. Initial Planning Comments

- Please include a table on the Site Plan drawing which identifies all required Zoning By-law required provisions and how they are being achieved onsite.

- Please ensure that the required planning rationale includes policy analysis for the current Official Plan and the City's new Official Plan.

- If possible, we would like to see additional landscaping added onsite.

- Please delineate any intended employee pedestrian connections using alternative materials or line painting.

- I was able to confirm that a Future land Use Study will not be required for this site if no Zoning By-law Amendment is being sought.

3. Urban Design Comments – Christopher Moise

- This proposal does not run along or does not meet the threshold in one of the City's Design Priority Areas and need not attend the City's UDRP. Staff will be responsible for evaluating the proposal and providing design direction;
- We appreciate the material presented and have the following comments/questions about the proposal:
    - **Parking**: Minimize quantity of vehicular parking as much as use will allow, provide in discreet locations and screened with landscaping. We recommend using minimum parking requirements to reduce the surface area of asphalt to mitigate heat island effects;
    - **Landscaping**: Improve the landscaping treatment around the site and with enhanced plantings and trees;
    - **Pedestrian connectivity**: Consider safe and convenient access to buildings from parking locations using sidewalks, clear painted lines and interspersed with landscaping;
- A scoped Design Brief is a required submittal for all Site Plan/Re-zoning applications and can be combined with the Planning Rationale. Please see the Design Brief Terms of Reference provided.

Note. The Design Brief submittal should have a section which addresses these pre-consultation comments;

This is an exciting project in an area full of potential. We look forward to helping you achieve its goals with the highest level of design resolution. We are happy to assist and answer any questions regarding the above. Good luck.

4. Parks – Phil Castro

Comments expected July 4th. It is expected that Parks will be requiring 2% parkland dedication for this area.

5. Trees - Mark Richardson

<u>TCR requirements:</u>

1. a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
    b. The TCR may be combined with the EIS provided all information is supplied
2. Any removal of privately-owned trees 10cm or larger in diameter, or city-owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
4. the TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition
5. Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
6. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained
7. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
    a. the location of tree protection fencing must be shown on the plan
8. the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.
9. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on City of Ottawa

LP tree planting requirements:

For additional information on the following please contact tracy.smith@Ottawa.ca

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track or water service laterals.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas. Adhere to Ottawa Hydro's planting guidelines

(species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume

- Please document on the LP that adequate soil volumes can be met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

Sensitive Marine Clay

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

<u>Tree Canopy Cover</u>

- The landscape plan shall show how the proposed tree planting will replace and increase canopy cover on the site over time, to support the City's 40% urban forest canopy cover target.
- At a site level, efforts shall be made to provide as much canopy cover as possible, through tree planting and tree retention, with an aim of 40% canopy cover at 40 years, as appropriate.
- Indicate on the plan the projected future canopy cover at 40 years for the site.

6. Environment – Mark Elliot

Endangered Species: Nothing of concern. There are some birds (Peregrine Falcon, Chimney Swift, Barn Swallow, Black Crowned Night Heron) that have been spotted in the woods across Bank Street, and a Snapping Turtle upstream in Sawmill Creek. However, none of the proposed changes would negatively impact these species. Indeed, the applicant's proposal to plant more trees in the area is likely to improve habitat, rather than degrade it.

Watercourse: Any development within the 30m setback (4.9.3 in the New OP, 4.7.3 in the Old OP) will require an EIS to determine ecological function and that no negative impact will come from it. The CA covered issues with flood plains in detail so I won't comment on them except to say that I agree with what was said.

Unevaluated Wetlands: The applicant noted during the preconsultation that the unevaluated wetlands in the Northeastern corner are likely a mapping artifact and do not exist on the ground. However, this would need to be confirmed by ground truthing because it would otherwise be considered a surface water feature (per definition in New OP p.266) and be protected under 4.9.3 in the New OP.

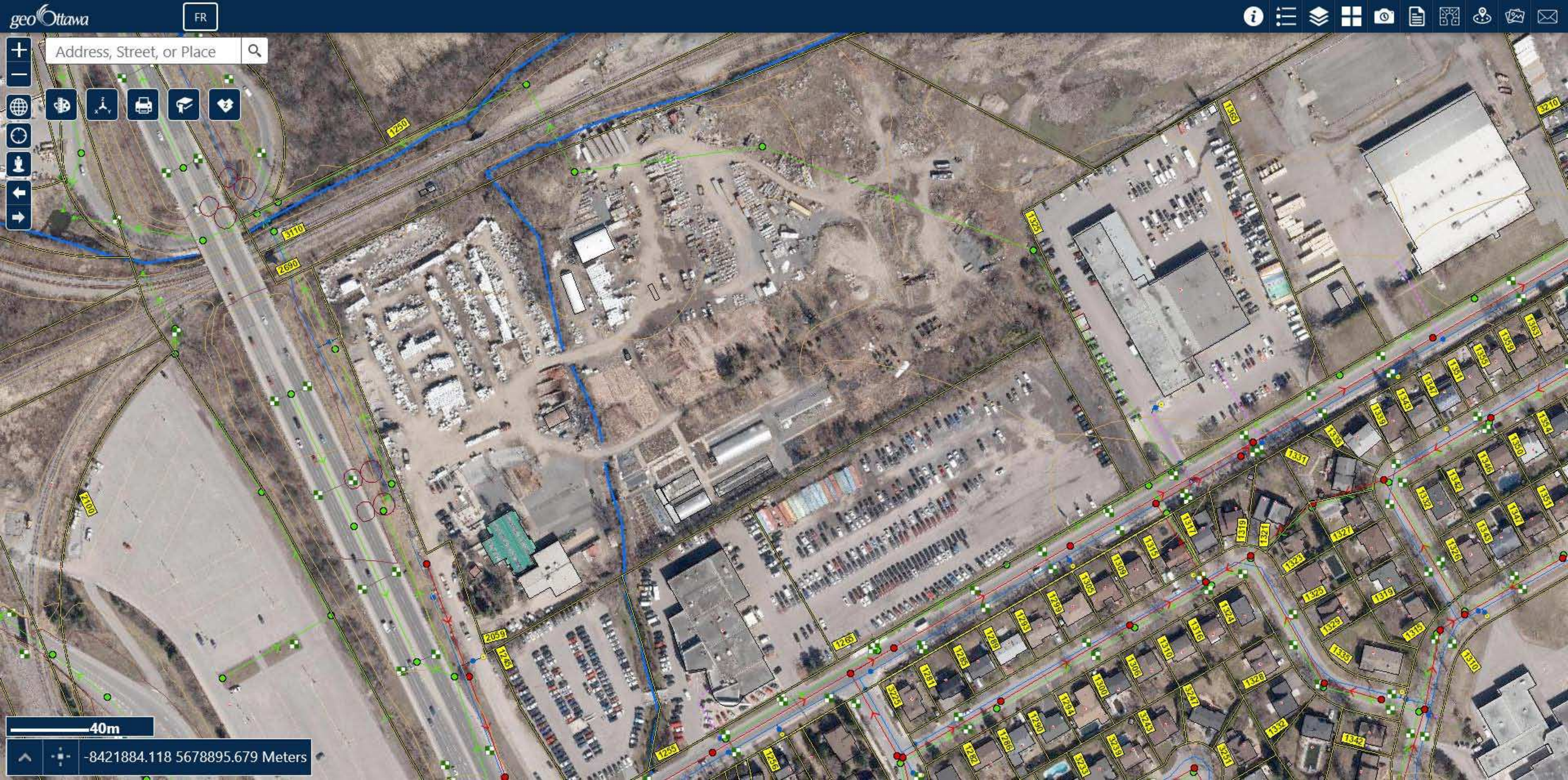
7. Transportation – Mike Giampa

- Follow Transportation Impact Assessment Guidelines:
    - A TIA is required.
    - Start this process asap. The application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable).
- As the proposed site is for the general public use, AODA legislation applies.
    - Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).
    - Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements. https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards
- On site plan:
    - Parking stalls at the end of dead-end parking aisles require adequate turning around space
    -
    - Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible

    - Show lane/aisle widths.
    - Incorporate pedestrian circulation into the site layout by providing sidewalks/ walkways.
    - Ensure the access is 3m away from the property line.
- Noise Impact Studies required for the following:
    - Rail (if the proposed development is considered noise sensitive)

8. General Information

a. Ensure that all plans and studies are prepared as per City guidelines – as available online…
   https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans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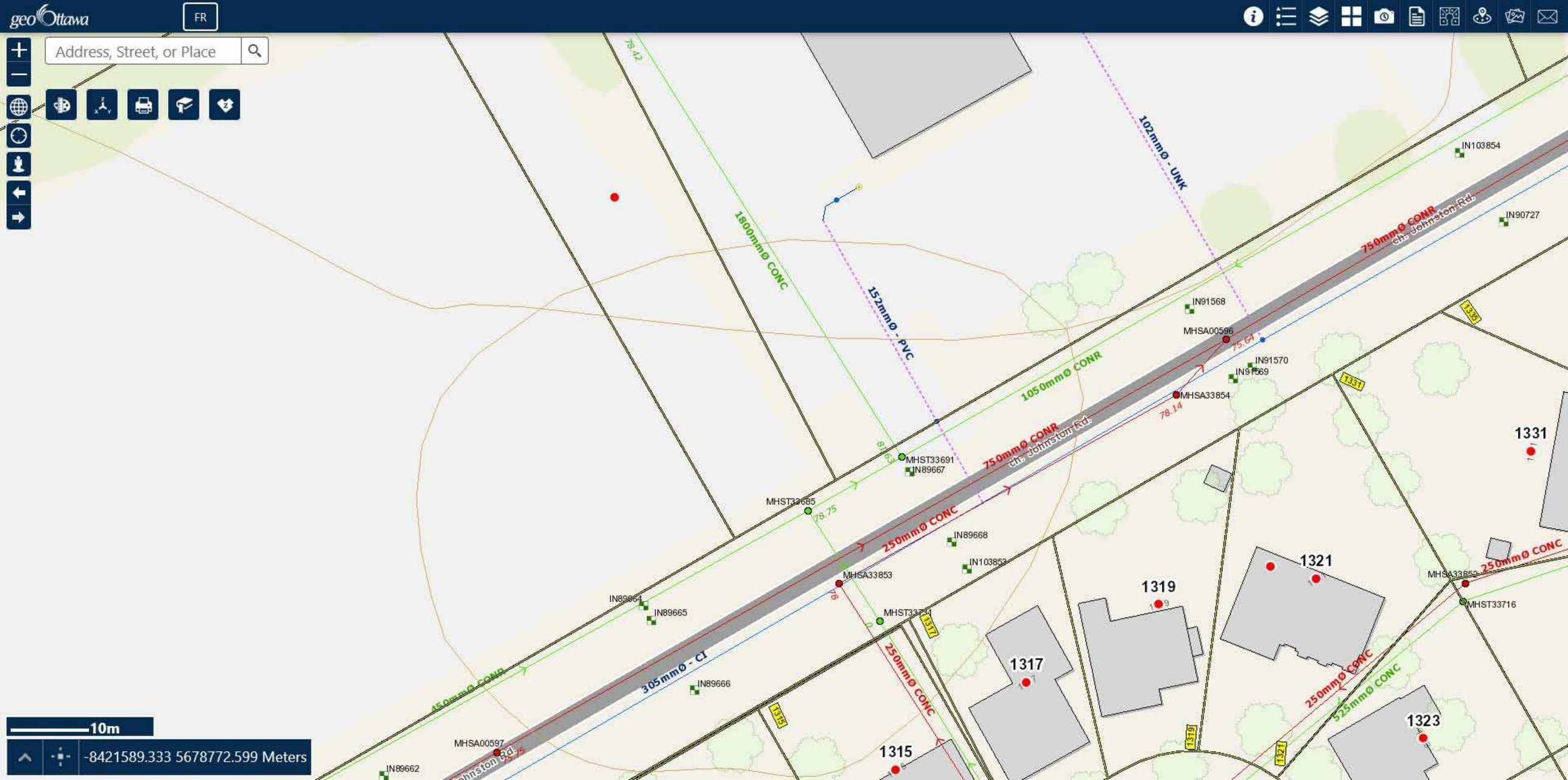
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102mmØ - UNK
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IN91570
IN91569
1050mmØ CONR
MHSA33854
78.14
1331
MHST33691
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78.63
750mmØ CONR
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78.75
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IN103853
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IN89665
305mmØ - CI
MHST33716
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1319
1317
1315
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MHSA00597
IN89662
1323
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Appendix B

Servicing Plan
(DWG. 23034-S1)

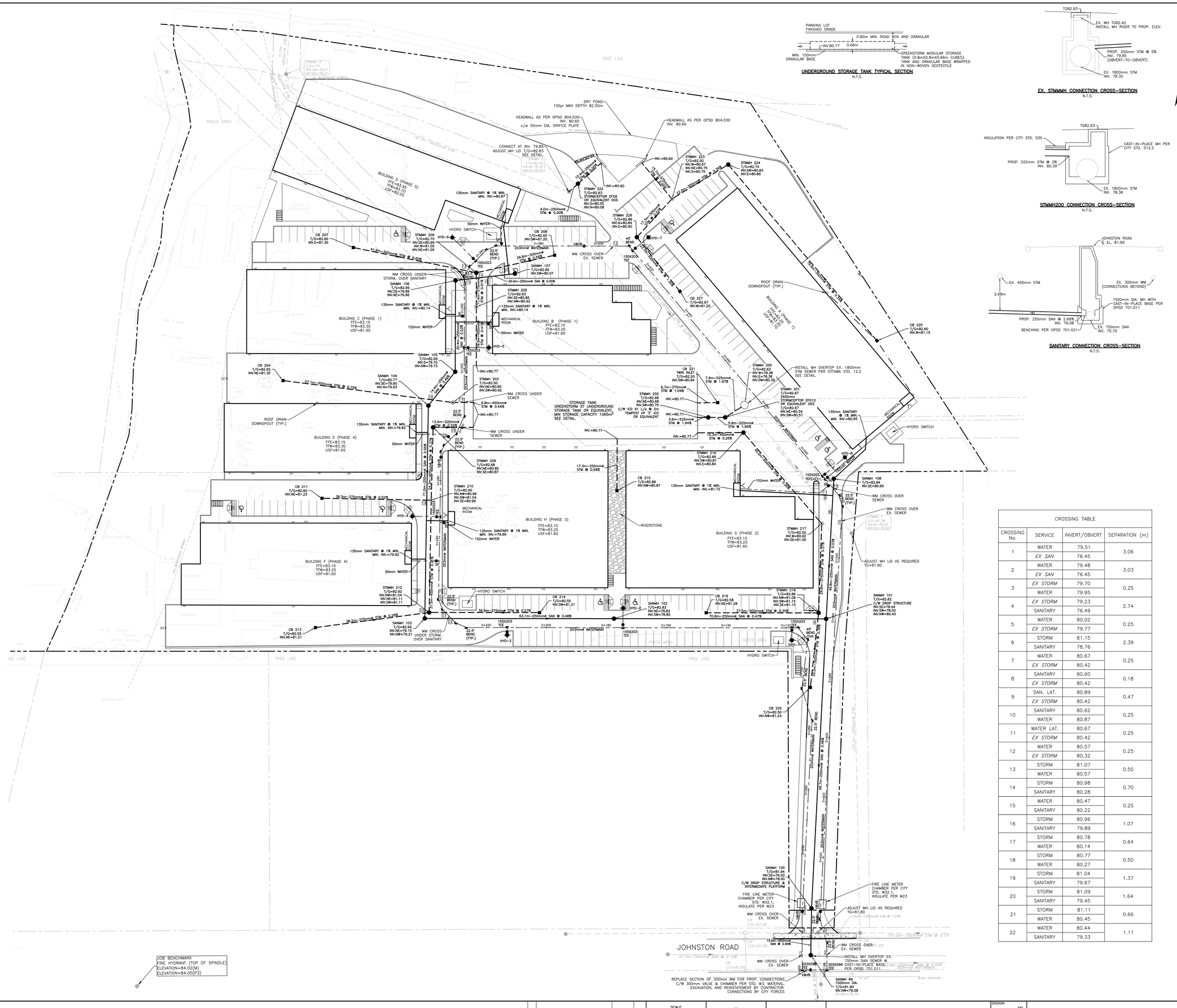
Grading Plan
(DWG. 23034-GR1)

Notes & Details
(DWG. 23034-N1)

Erosion and Sediment Control Plan
(DWG. 23034-ESC1)

Existing Conditions and Removals Plan
(DWG. 23034-R1)

Storm Drainage Area Plan
(DWG. 23034-STM1)



CROSSING TABLE			
CROSSING No.	SERVICE	INVERT/OBVERT	SEPARATION (m)
1	WATER	79.51	3.06
	EX SAN	76.45	
2	WATER	79.48	3.03
	EX SAN	76.45	
3	*EX STORM*	79.70	0.25
	WATER	79.95	
4	*EX STORM*	79.23	2.74
	SANITARY	76.49	
5	WATER	80.02	0.25
	EX STORM	79.77	
6	STORM	81.15	2.39
	SANITARY	78.76	
7	WATER	80.67	0.25
	EX STORM	80.42	
8	SANITARY	80.60	0.18
	EX STORM	80.42	
9	SAN. LAT.	80.89	0.47
	EX STORM	80.42	
10	SANITARY	80.62	0.25
	WATER	80.87	
11	WATER LAT.	80.67	0.25
	EX STORM	80.42	
12	WATER	80.57	0.25
	EX STORM	80.32	
13	STORM	81.07	0.50
	WATER	80.57	
14	STORM	80.98	0.70
	SANITARY	80.28	
15	WATER	80.47	0.25
	SANITARY	80.22	
16	STORM	80.96	1.07
	SANITARY	79.89	
17	STORM	80.78	0.64
	WATER	80.14	
18	STORM	80.77	0.50
	WATER	80.27	
19	STORM	81.04	1.37
	SANITARY	79.67	
20	STORM	81.09	1.64
	SANITARY	79.45	
21	STORM	81.11	0.66
	WATER	80.45	
22	WATER	80.44	1.11
	SANITARY	79.33	

203mm# WATERMAIN GRADE TABLE				
STATION	FINISHED GRADE (m)	TOP OF WATER (m)	COVER DEPTH (m)	COMMENTS
0+000	81.76	79.37	2.40	203X296mm TEE TO EXISTING
0+019.5	82.02	79.62	2.40	VALVE & VALVE BOX
0+020.8–0+023.8	81.98–82.11	79.58–79.71	2.40	VALVE CHAMBER
0+083.2	82.63	80.23	2.40	22.5° HORIZONTAL BEND
0+94.5	82.82	80.42	2.40	22.5° HORIZONTAL BEND
0+110.9	82.71	80.31	2.40	45° HORIZONTAL BEND
0+115.9	82.78	80.38	2.40	45° HORIZONTAL BEND
0+118.0	82.79	80.39	2.40	155X203mm HYDRANT TEE
0+174.4	82.87	80.47	2.40	155X203mm HYDRANT TEE
0+213.0	82.76	80.36	2.40	155X203mm HYDRANT TEE
0+226.7	82.86	80.46	2.40	22.5° HORIZONTAL BEND
0+230.5	82.88	80.48	2.40	22.5° HORIZONTAL BEND
0+236.8	82.88	80.48	2.40	22.5° HORIZONTAL BEND
0+240.4	82.89	80.49	2.40	22.5° HORIZONTAL BEND
0+253.2	82.80	80.40	2.40	52X203mm SERVICE TEE
0+266.0	82.75	80.35	2.40	52X203mm SERVICE TEE
0+267.9	82.74	80.34	2.40	155X203mm HYDRANT TEE
0+287.8	82.88	80.48	2.40	VALVE & VALVE BOX
0+289.7	82.91	80.51	2.40	22.5° HORIZONTAL BEND
0+292.0	82.88	80.48	2.40	22.5° HORIZONTAL BEND
0+295.0	82.85	80.45	2.40	52X203mm SERVICE TEE
0+297.6	82.82	80.27	2.60	22.5° HORIZONTAL BEND
0+304.0	82.67	80.27	2.40	22.5° HORIZONTAL BEND
0+326.9	82.95	80.40	2.55	155X203mm HYDRANT TEE
0+334.9	82.93	80.53	2.40	52X203mm SERVICE TEE
0+337.4	82.91	80.51	2.40	52X203mm SERVICE TEE
0+350.8	82.75	80.57	2.18	22.5° HORIZONTAL BEND
0+354.5	82.84	80.57	2.27	22.5° HORIZONTAL BEND
0+357.1	82.91	80.51	2.40	155X203mm HYDRANT TEE
0+362.3	83.00	80.60	2.40	22.5° HORIZONTAL BEND
0+365.7	82.98	80.58	2.40	22.5° HORIZONTAL BEND
0+367.6	82.95	80.55	2.40	52X203mm SERVICE TEE
0+395.1	82.96	80.56	2.40	VALVE & VALVE BOX
0+410.2	82.98	80.58	2.40	45° HORIZONTAL BEND
0+412.1	82.93	80.53	2.40	155X203mm HYDRANT TEE
0+510.4	82.82	80.42	2.40	155X203mm HYDRANT TEE
0+511.8	82.83	80.43	2.40	155X203mm SERVICE TEE
0+514.1	82.81	80.41	2.40	52X203mm SERVICE TEE
0+519.0	82.77	80.37	2.40	22.5° HORIZONTAL BEND
0+522.8	82.88	80.48	2.40	22.5° HORIZONTAL BEND
0+654.0–0+657.0	82.10–82.01	79.70–79.61	2.40	VALVE CHAMBER
0+658.1	82.02	79.62	2.40	VALVE & VALVE BOX
0+660.6	81.98	79.58	2.40	22.5° HORIZONTAL BEND
0+668.8	81.78	79.38	2.40	22.5° HORIZONTAL BEND
0+677.9	81.74	79.34	2.40	203X296mm TEE TO EXISTING

NOT FOR CONSTRUCTION

NOTES

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.

PROPERTY BOUNDARIES AND TOPOGRAPHIC SURVEY ARE FROM "TOPOGRAPHIC SKETCH OF PART OF LOS 2 & 3 CONCESSION 3 (RIDEAU FRONT)" STANTEC GEOMATICS LTD., ONTARIO LAND SURVEYORS. DATED MAY 17, 2023

NO.	REVISION DESCRIPTION	DATE	BY
5	REISSUED FOR SPA	30/07/24	SM
5	REVISED PER SITE PLAN	16/07/24	BM
4	REISSUED FOR SPA	11/06/24	SM
3	REISSUED FOR SPA	27/03/24	SM
2	ISSUED FOR SPA	23/11/23	CC
1	ISSUED FOR SPA	21/08/23	CC

SCALE
0m 40m 80m 160m
HORIZONTAL 1:400

LICENSED PROFESSIONAL ENGINEER
JUL 30/24
S.A.G.MCCAUGHEY
100171133
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

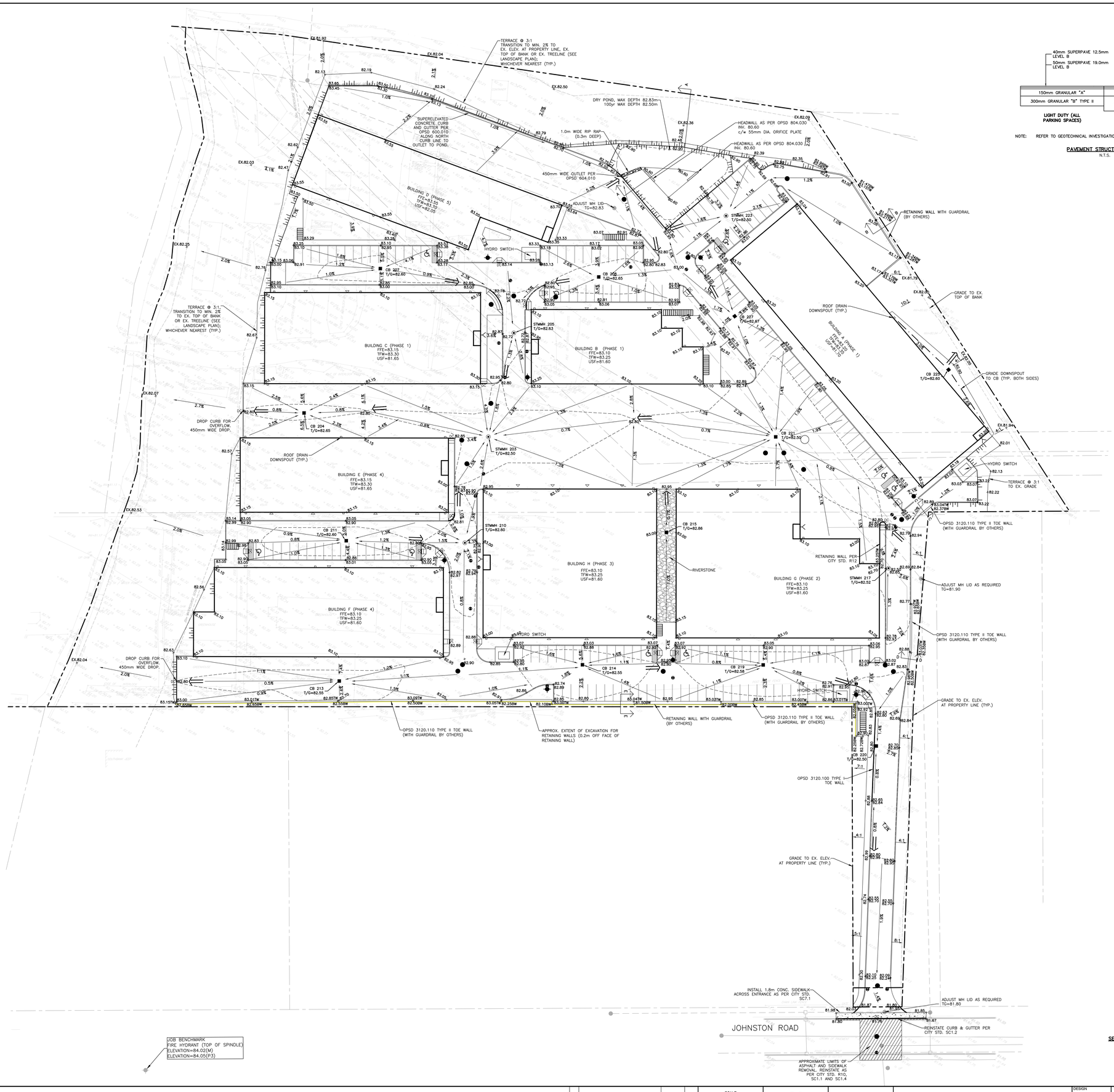
DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

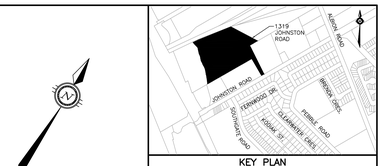
2079 ARTISTIC PLACE GP INC.

1319 JOHNSTON ROAD
CITY OF OTTAWA

SERVICING PLAN

PROJECT No.	23034
SURVEY	STANTEC
DATED	JUL 2024
DWG. No:	23034-S1





KEY PLAN

40mm SUPERPAVE 12.5mm LEVEL B 50mm SUPERPAVE 19.0mm LEVEL B	50mm SUPERPAVE 12.5mm LEVEL D 70mm SUPERPAVE 19.0mm LEVEL D
150mm GRANULAR "A"	150mm GRANULAR "A"
300mm GRANULAR "B" TYPE II	450mm GRANULAR "B" TYPE II
LIGHT DUTY (ALL PARKING SPACES)	**HEAVY DUTY (ALL DRIVE AISLES AND LOADING BAYS)**

NOTE: REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY GEMTEC DATED JULY 2023

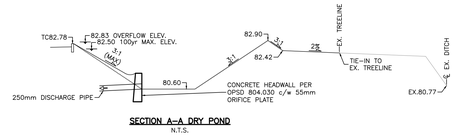
PAVEMENT STRUCTURE DETAIL
N.T.S.

LEGEND

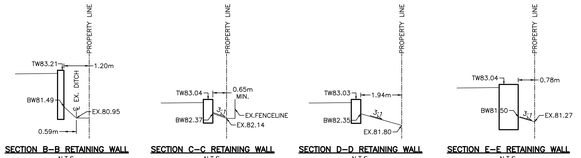
- PROPERTY BOUNDARY
- 100-YEAR PONDING LIMIT
- EXISTING ELEVATION
- ×105.00 PROPOSED GRADE
- 2.0% DRAINAGE SLOPE & DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- TERRACING (3H:1V MAX.)
- SWALE
- DC DEPRESSED CURB
- EXISTING HYDRANT
- EXISTING CATCH BASIN
- EXISTING TREE
- HYDRANT
- CATCH BASIN
- CATCH BASIN MANHOLE
- STORM/SANITARY MANHOLE
- BUILDING ENTRANCE
- ROOF DRAIN DOWNSPOUT
- FIRE DEPARTMENT CONNECTION

SURFACE STORAGE VOLUME SUMMARY

STRUCTURE	100-YEAR PROVIDED STORAGE VOLUME (m^3)	100-YEAR PONDING ELEVATION (m)	100-YEAR PONDING DEPTH (m)	REQUIRED STORAGE VOLUME (m^3)	DISCHARGE FLOW RATE (L/s)
STMMH216	138	82.80	0.30	–	–
STMMH203	91.2	82.80	0.30	–	–
CB204	6.4	82.80	0.25	–	–
STMMH205	8.9	82.80	0.27	–	–
CB207	13.7	82.80	0.25	–	–
CB208	12.0	82.80	0.25	–	–
STMH210	18.2	82.78	0.18	–	–
CB211	23.3	82.80	0.20	–	–
CB213	40.5	82.80	0.25	–	–
CB214	39.2	82.80	0.25	–	–
CB215	N/A	82.80	0.00	–	–
STMMH217	28.1	82.80	0.30	–	–
CB219	43.3	82.80	0.22	–	–
CB220	46.6	82.80	0.30	–	–
TOTAL (MAIN SITE)	1577	82.80	0.30 (MAX.)	1573	91.1
POND	541	82.50	1.90	–	–
TOTAL (POND SITE)	541	82.50	1.90 (MAX.)	527	8.7



SECTION A-A DRY POND
N.T.S.



SECTION B-B RETAINING WALL
N.T.S.

SECTION C-C RETAINING WALL
N.T.S.

SECTION D-D RETAINING WALL
N.T.S.

SECTION E-E RETAINING WALL
N.T.S.

NOTES

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.

PROPERTY BOUNDARIES AND TOPOGRAPHIC SURVEY ARE FROM "TOPOGRAPHIC SKETCH OF PART OF LOS 2 & 3 CONCESSION 3 (RIDEAU FRONT)" STANTEC GEOMATICS LTD., ONTARIO LAND SURVEYORS. DATED MAY 17, 2023

NO.	REVISION DESCRIPTION	DATE	BY
6	REVISED PER SITE PLAN	06/08/24	SM
5	REVISED PER SITE PLAN	16/07/24	BM
4	REISSUED FOR SPA	11/06/24	SM
3	REISSUED FOR SPA	27/03/24	SM
2	ISSUED FOR SPA	23/11/23	CC
1	ISSUED FOR SPA	21/08/23	CC

SCALE
0 4m 8m 16m
HORIZONTAL 1:400

LICENSED PROFESSIONAL ENGINEER
AUG 06/24
S.A.G.MCCAUGHEY
100211133
PROVINCE OF ONTARIO

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

2079 ARTISTIC PLACE GP INC.

1319 JOHNSTON ROAD
CITY OF OTTAWA

GRADING PLAN

PROJECT No.	23034
SURVEY	STANTEC
DATED	AUG 2024
DWG. No:	23034-GR1

GENERAL NOTES:

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), AS AMENDED BY THE CITY OF OTTAWA.
2. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
4. DESIGN ELEVATIONS GIVEN ARE TO BE ADHERED TO WITH NO CHANGES WITHOUT PRIOR WRITTEN APPROVAL BY ROBINSON LAND DEVELOPMENT.
5. ANY AREAS BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
6. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.
7. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
8. ALL CONSTRUCTION SIGNAGE MUST CONFORM TO THE M.T.O. MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (LATEST AMENDMENT).
9. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
10. THE SUPPORT OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
11. THE CONTRACTOR WILL BE RESPONSIBLE FOR ADDITIONAL BEDDING OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH, AS SPECIFIED BY OPSD, IS EXCEEDED.
12. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH THE CITY OF OTTAWA PRIOR TO AND TREE CUTTING.
13. REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY GEMTEC, DATED JULY 2023.
14. THE CONTRACTOR IS RESPONSIBLE FOR AND SHALL PROVIDE FOR DEWATERING, SUPPORT AND PROTECTION OF EXCAVATIONS AND TRENCHING AS WELL AS RELEASE OF ANY PUMPED GROUNDWATER IN A CONTROLLED AND APPROVED MANNER.
15. DO NOT CONSTRUCT USING DRAWINGS THAT ARE NOT MARKED "ISSUED FOR CONSTRUCTION".
16. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.

STORM SEWERS:

1. FOR PIPES 450mm DIAMETER AND LARGER: ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2 (LATEST AMENDMENT). ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1 (LATEST AMENDMENT). PIPE SHALL BE JOINTED WITH STD. RUBBER GASKETS AS PER CSA A257.3 (LATEST AMENDMENT).
2. FOR PIPES 375mm DIAMETER AND SMALLER: ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
3. ALL STORM SEWER TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
4. STORM MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24.1 AND S25. CBMH COVER AND FRAME PER CITY OF OTTAWA STD. S19.
5. CB FRAME AND COVER PER OPSD 400.020 AND 400.030
6. OGS SIZING BASED ON STORMCEPTOR EF04 AND EF08 FOR 80% TSS REMOVAL BASED ON ETV TESTING VERIFICATION. APPROVED EQUIVALENTS SHALL BE ETV VERIFIED.
7. STORM SEWER MANHOLES SERVING SEWERS LESS THAN 900mm SHALL BE CONSTRUCTED WITH A 300mm SUMP. FOR STORM SEWERS 900mm AND OVER USE BENCHING IN ACCORDANCE WITH OPSD 701.021.
8. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED ABOVE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADDITIONAL BEDDING, A DIFFERENT TYPE OF BEDDING OR A HIGHER PIPE STRENGTH AT HIS OWN EXPENSE AND SHALL ALSO BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
9. ALL STORM MANHOLES SHALL BE 1200mm DIAMETER AS PER OPSD 701.010 UNLESS OTHERWISE NOTED.
10. ALL CATCH BASINS SHALL BE 600mm X 600mm AS PER OPSD 705.010 UNLESS OTHERWISE NOTED. TWIN INLET PER OPSD 705.020
11. SEWERS WITH LESS THAN 2m COVER SHALL BE INSULATED PER CITY OF OTTAWA STD. S35.

SANITARY SEWERS:

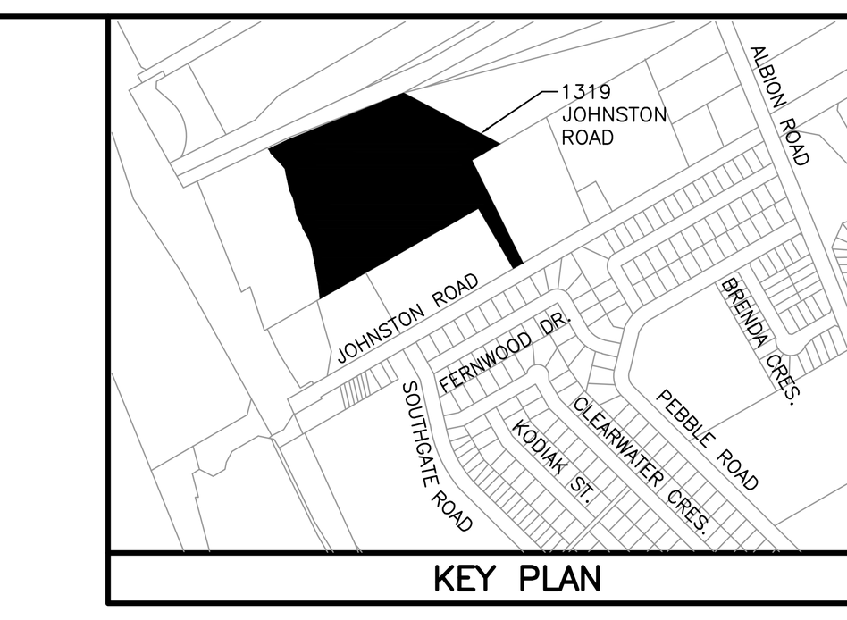
1. ALL SANITARY SEWERS SHALL BE PVC SDR 35, IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS.
2. SANITARY SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B' BEDDING UNLESS OTHERWISE NOTED.
3. ALL SANITARY SERVICES ARE TO BE EQUIPPED WITH APPROVED BACKWATER VALVES.
4. SANITARY MANHOLE FRAME AND COVERS SHALL BE WATERTIGHT AS PER CITY OF OTTAWA STD. S24 AND S25.
5. SANITARY SEWER MANHOLES SHALL BE 1200mm DIAMETER AS PER OPSD 701.010 AND BE BENCHED AS PER OPSD 701.021.
6. SANITARY PRE-CAST MANHOLE SHALL BE CONSTRUCTED WITH A HIGHER PERCENTAGE OF SILICA FUME IN THE CONCRETE TO MAKE IT MORE DENSE AND LESS SUSCEPTIBLE TO CORROSION OR PINHOLE LEAKS.
7. FOR SANITARY MANHOLES, DEPENDING ON THE ELEVATION OF THE GROUNDWATER TABLE, AND BASED ON THE RECOMMENDATION OF THE PROJECT GEOTECHNICAL CONSULTANT, CRETEX SEALS, OR A SIMILAR PRODUCT, SHALL BE INSTALLED IN THE PRE-CAST MANHOLE SECTION TO JUST BELOW THE MANHOLE FRAME TO PREVENT INFILTRATION.
17. CLAY SEALS SHALL BE INSTALLED WITHIN SEWER TRENCHES IN ACCORDANCE WITH CITY STANDARD S8.
18. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 410 AND OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL STORM AND SANITARY SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.
19. SEWERS AND LATERALS WITH LESS THAN 2m COVER SHALL BE INSULATED PER CITY OF OTTAWA STD. S35.

WATER SUPPLY:

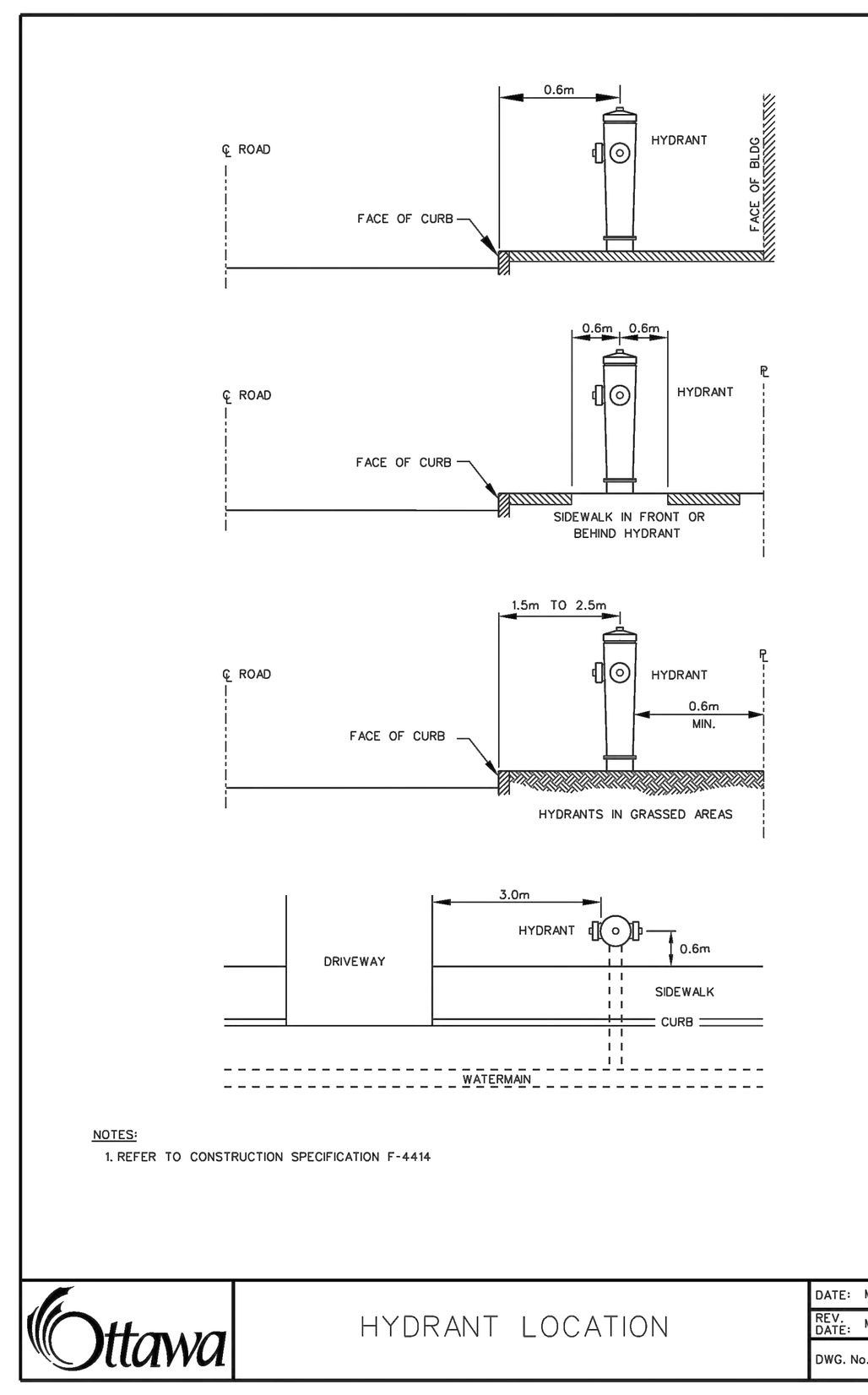
1. ALL PVC WATERMAINS SHALL BE EQUAL TO AWWA C-900 CLASS 150, SDR 18, OR APPROVED EQUAL.
2. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17, UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
3. ALL PVC WATERMAINS SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W36.
4. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS AS PER CITY OF OTTAWA STD. W40 AND W42.
5. CONTRACTOR TO SUPPLY HYDRANT EXTENSION TO ADJUST THE LENGTH OF HYDRANT BARREL IF REQUIRED.
6. FIRE HYDRANTS SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W19, AND LOCATED AS PER CITY STD. W18.
7. VALVE IN BOXES SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W24.
8. WATERMAIN IN FILL AREAS TO BE INSTALLED WITH RESTRAINED JOINTS AS PER CITY OF OTTAWA STD. W25.5 AND W25.6.
9. THRUST BLOCKING OF WATERMAIN TO BE INSTALLED AS PER CITY OF OTTAWA STD. W25.3 AND W25.4.
10. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW-OFFS AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
11. INSULATION FOR WATERMAIN CROSSING OVER AND BELOW SEWER SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY, WHERE WATERMAIN COVER IS LESS THAN 2.4m.
12. AS PER CITY GUIDELINE, THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER / UTILITY IS 0.25m FOR CROSSING OVER THE SEWER, AS PER CITY STD. W25.2. FOR CROSSING UNDER SEWER, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER AS PER CITY STD. W25.
13. CONNECTION TO EXISTING WATERMAIN TO BE PERFORMED BY CITY FORCES. CONTRACTOR TO PROVIDE LABOUR, EQUIPMENT AND MATERIAL REQUIRED FOR EXCAVATION, BEDDING AND REINSTATEMENT.
14. SWABBING, DISINFECTION, AND HYDROSTATIC TESTING TO BE CONDUCTED AS PER CITY OF OTTAWA STANDARDS IN THE PRESENCE OF A CITY INSPECTOR AND/OR CONSULTANT.

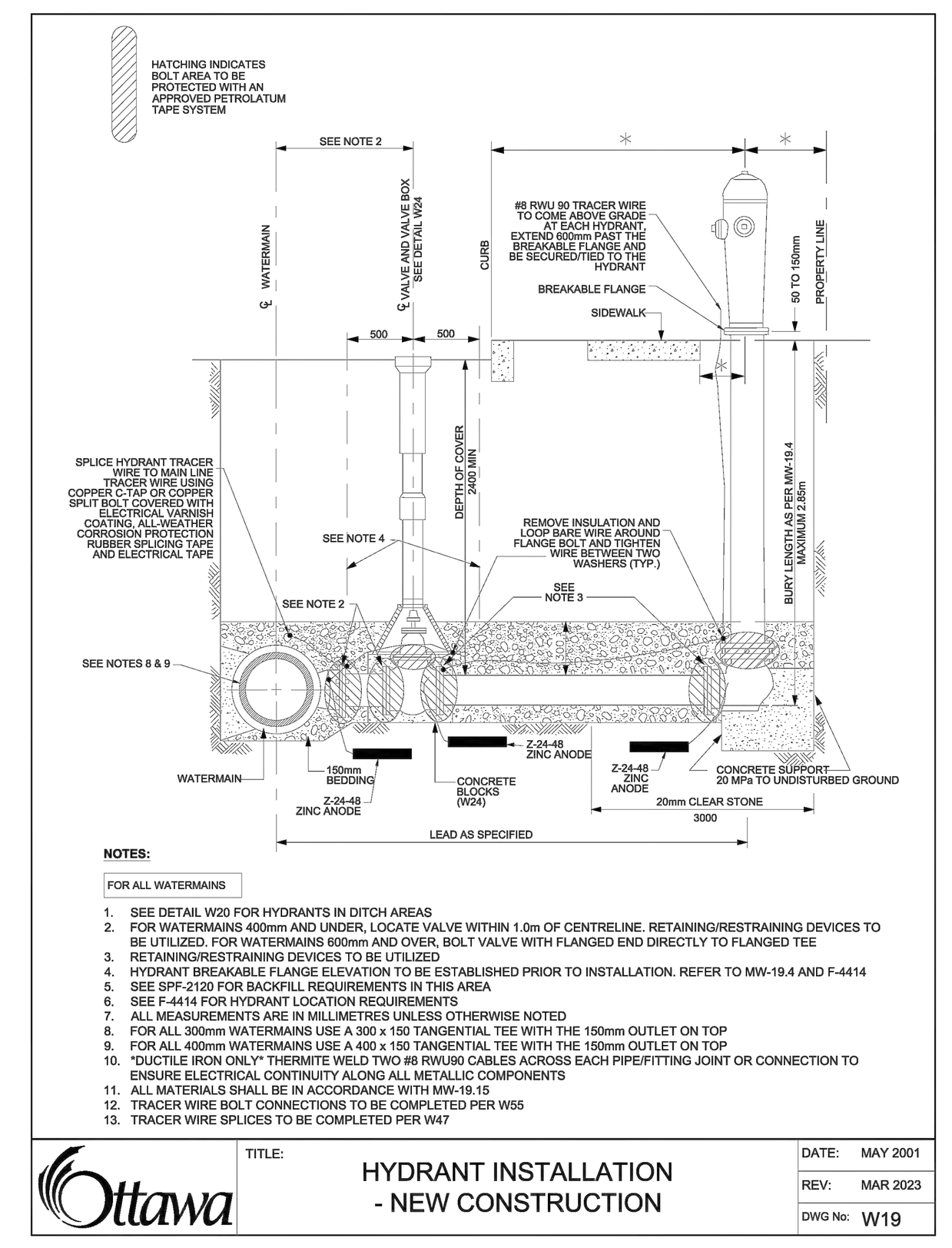
ROADWORK SPECIFICATIONS:

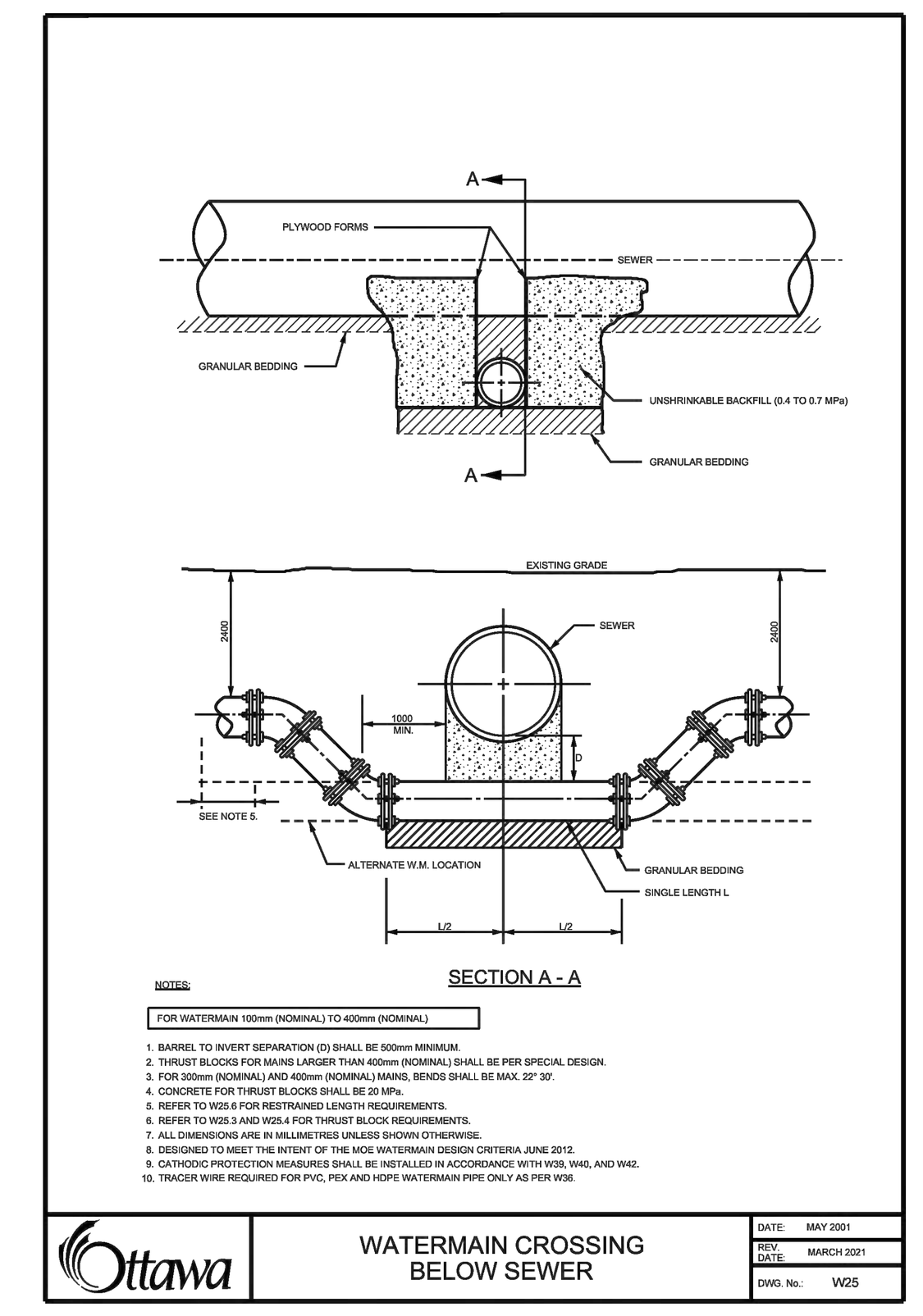
1. CONCRETE CURB SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SC1.1 (BARRIER CURB) UNLESS NOTED OTHERWISE. PROVISION SHALL BE MADE FOR CURB DEPRESSIONS AT SIDEWALKS AND DRIVEWAYS.
2. ALL BARRIER CURB TO BE 150mm ABOVE FINISHED ASPHALT GRADE UNLESS OTHERWISE NOTED. SUPERELEVATED CURB AND GUTTER TO BE 200mm ABOVE FINISHED ASPHALT GRADE UNLESS OTHERWISE NOTED.
3. MONOLITHIC CURB AND SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SC2.
4. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. R10 AND OPSD 509.010, OPSS 310.
5. GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300mm AROUND ALL STRUCTURES WITHIN PAVEMENT AREA.
6. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS & NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE ENGINEER.
7. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 300mm LIFTS.
8. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW-CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW ASPHALT.
9. PAVEMENT DESIGN AS PER GEOTECHNICAL RECOMMENDATIONS.

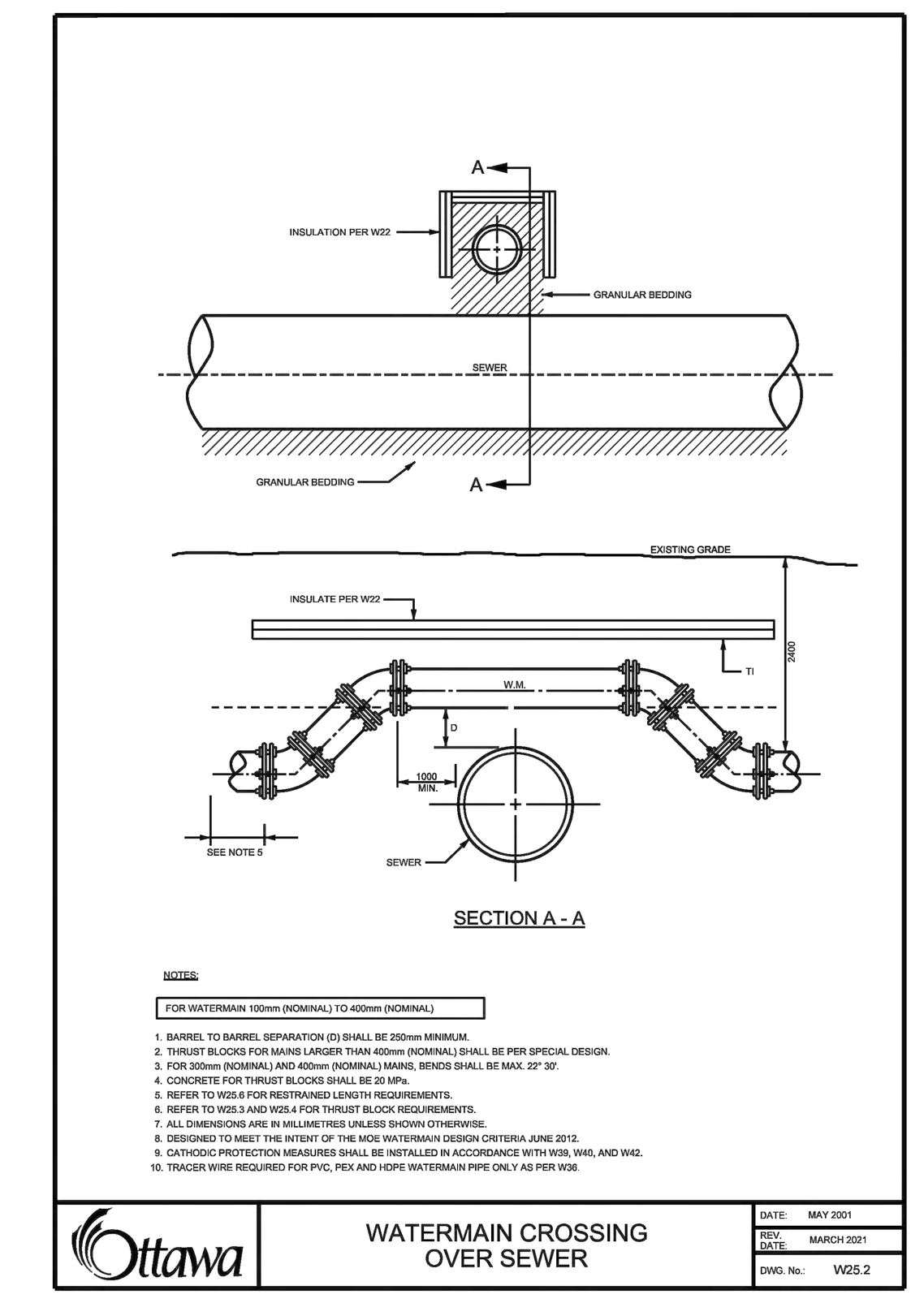


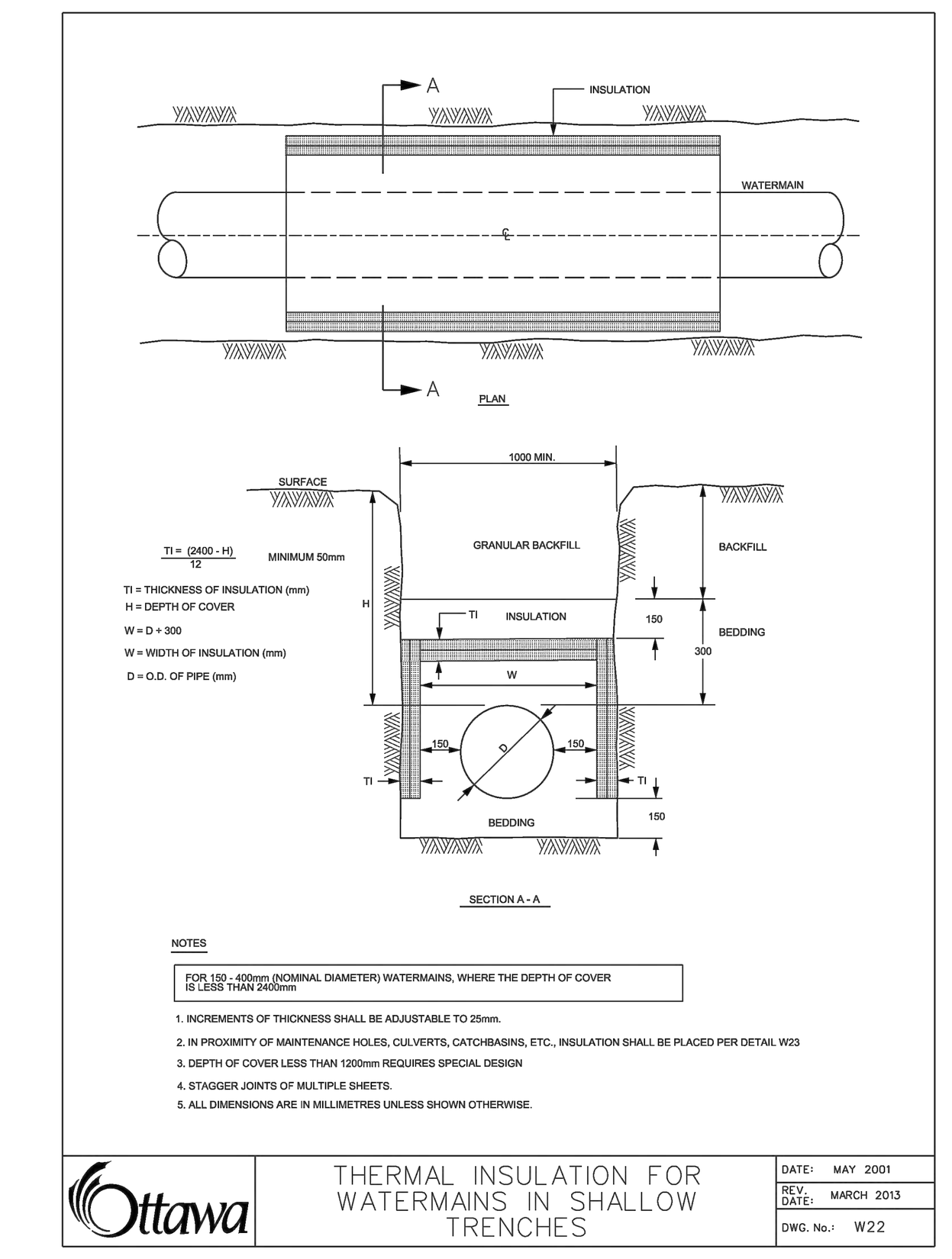
KEY PLAN

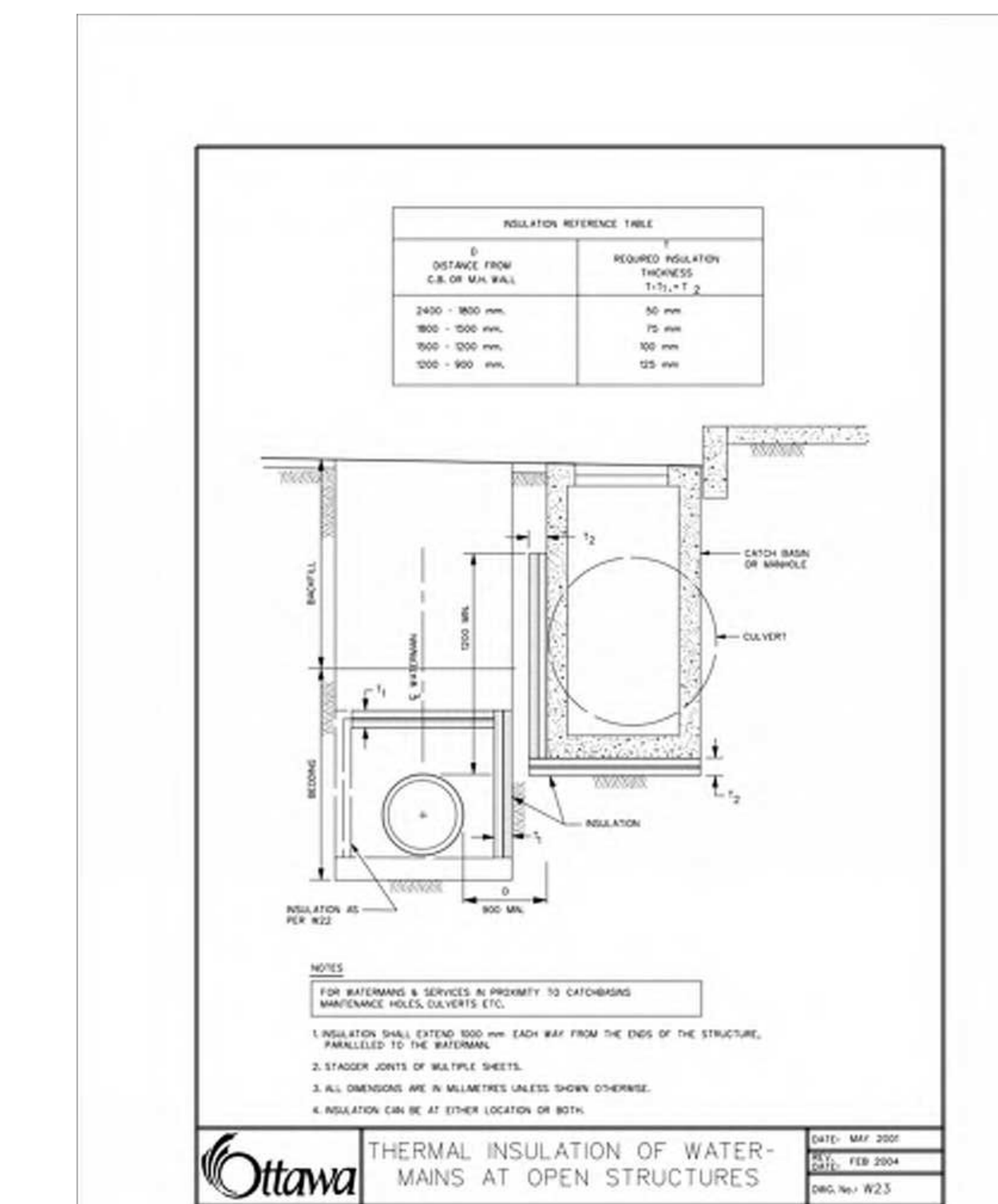


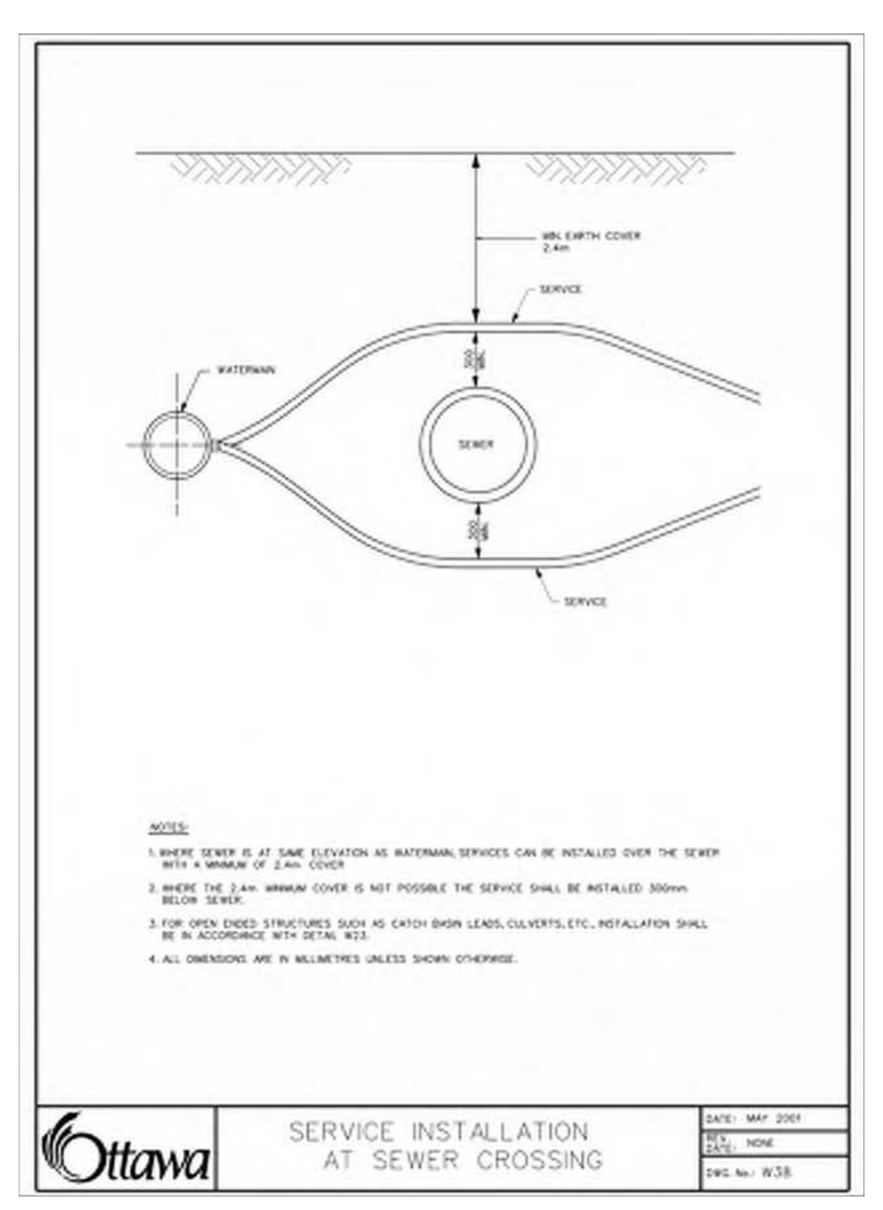


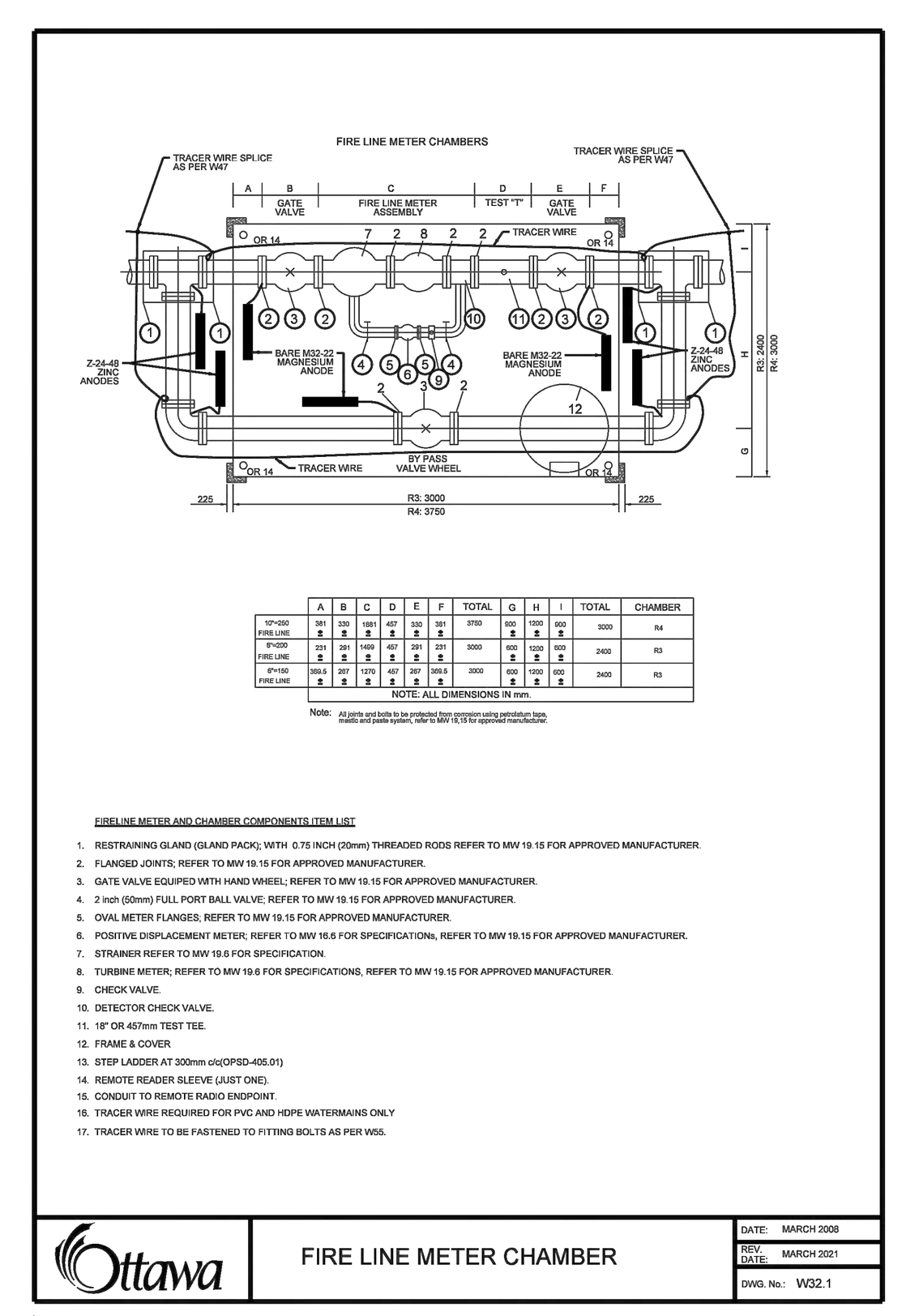


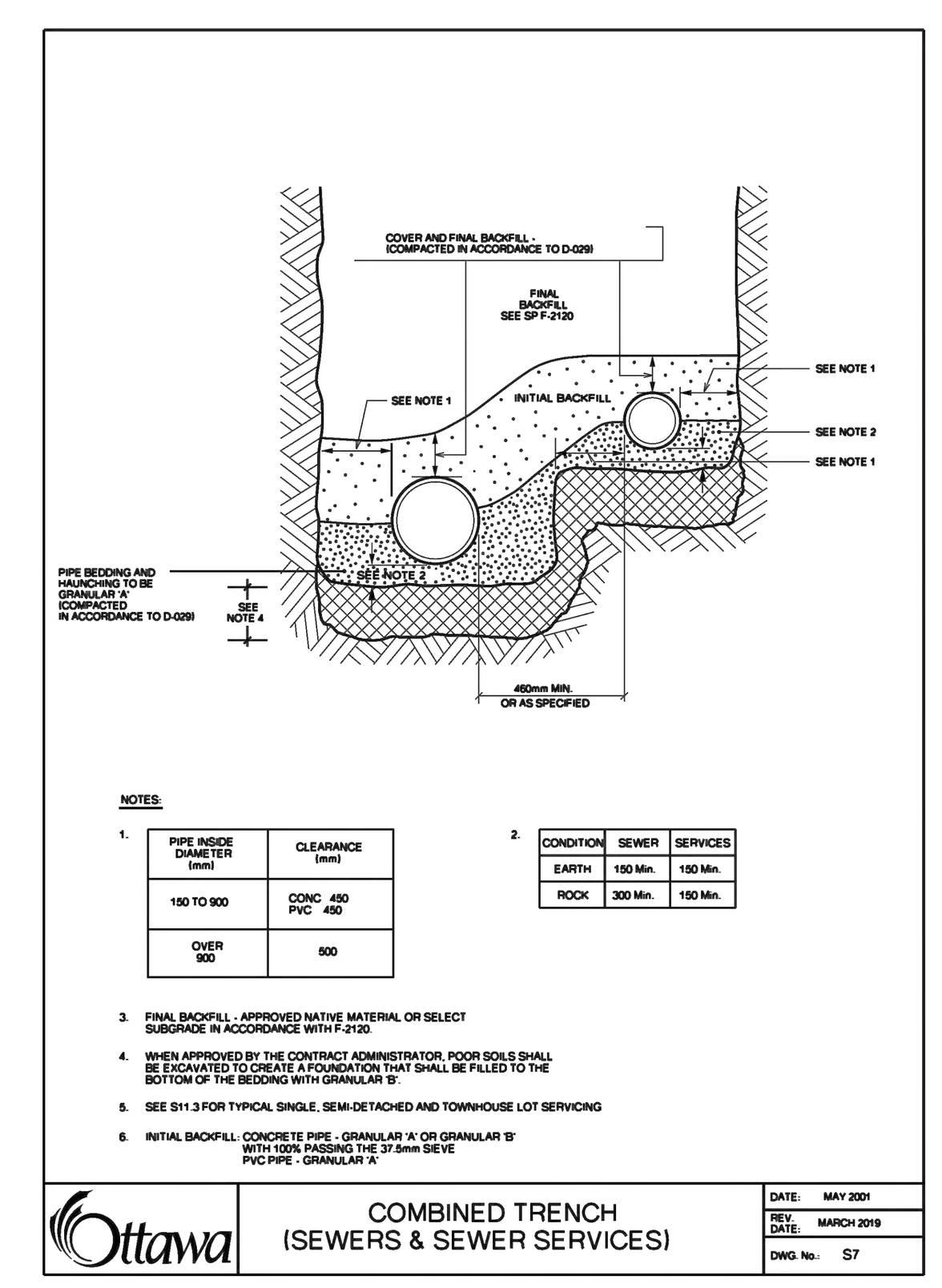


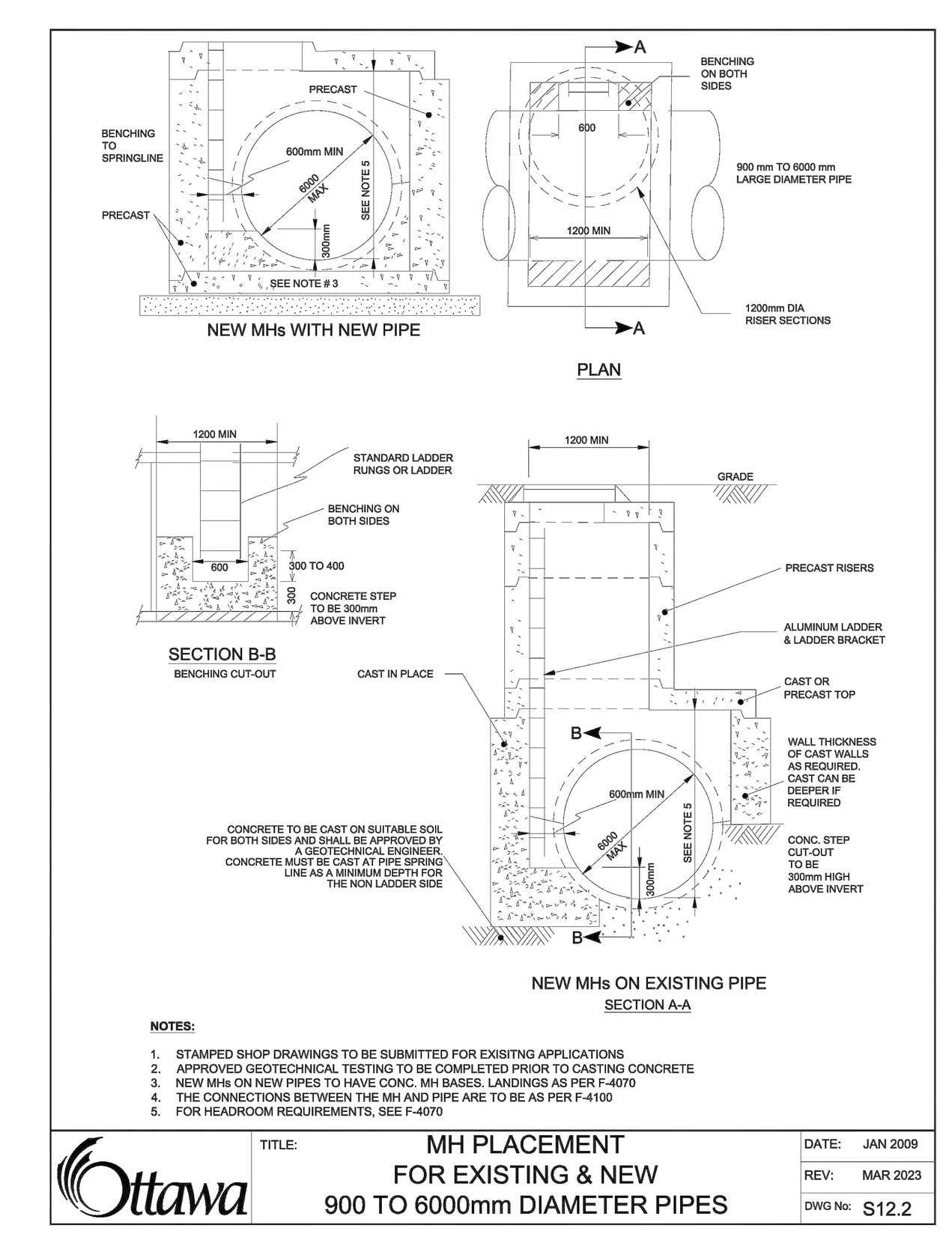


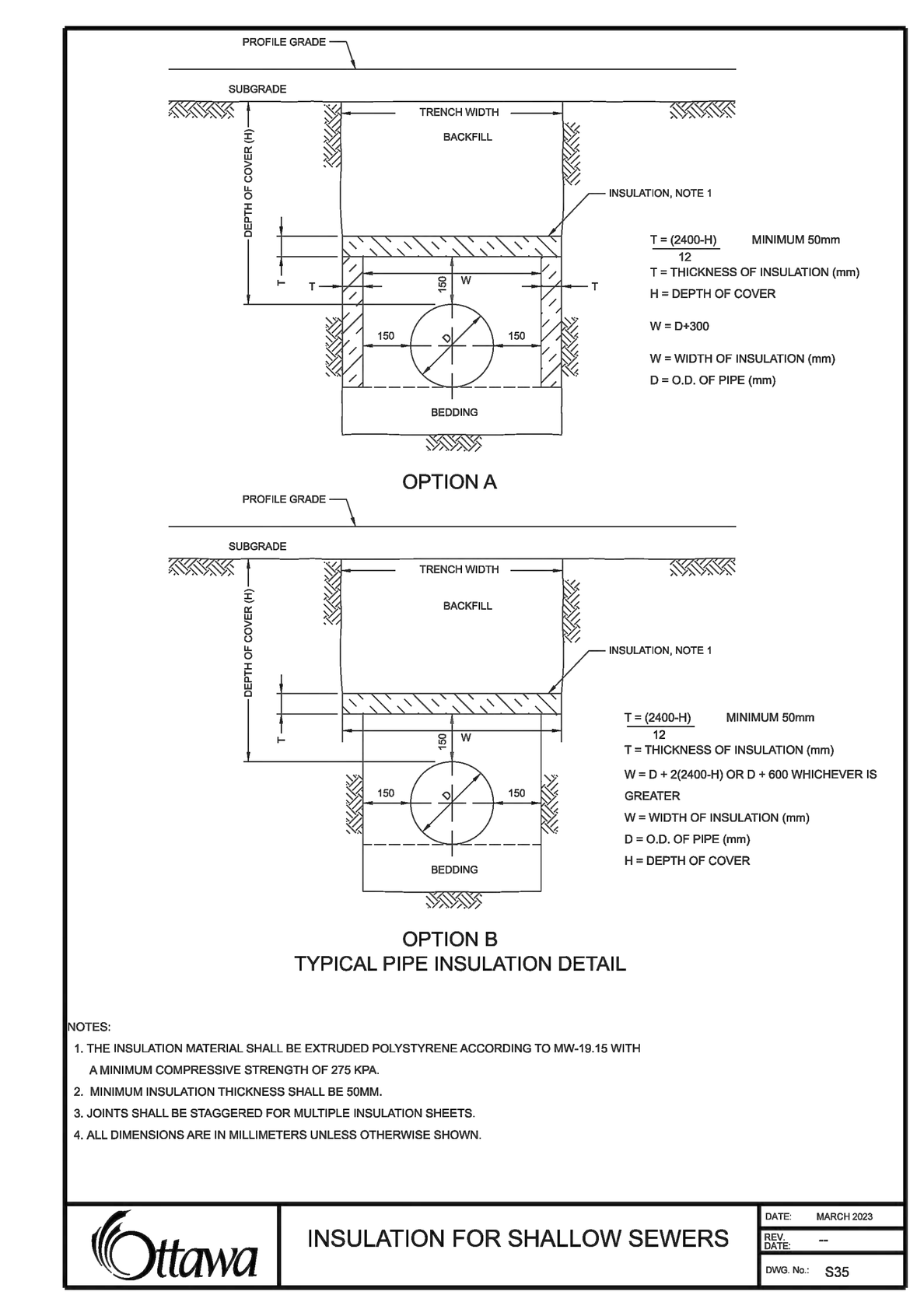


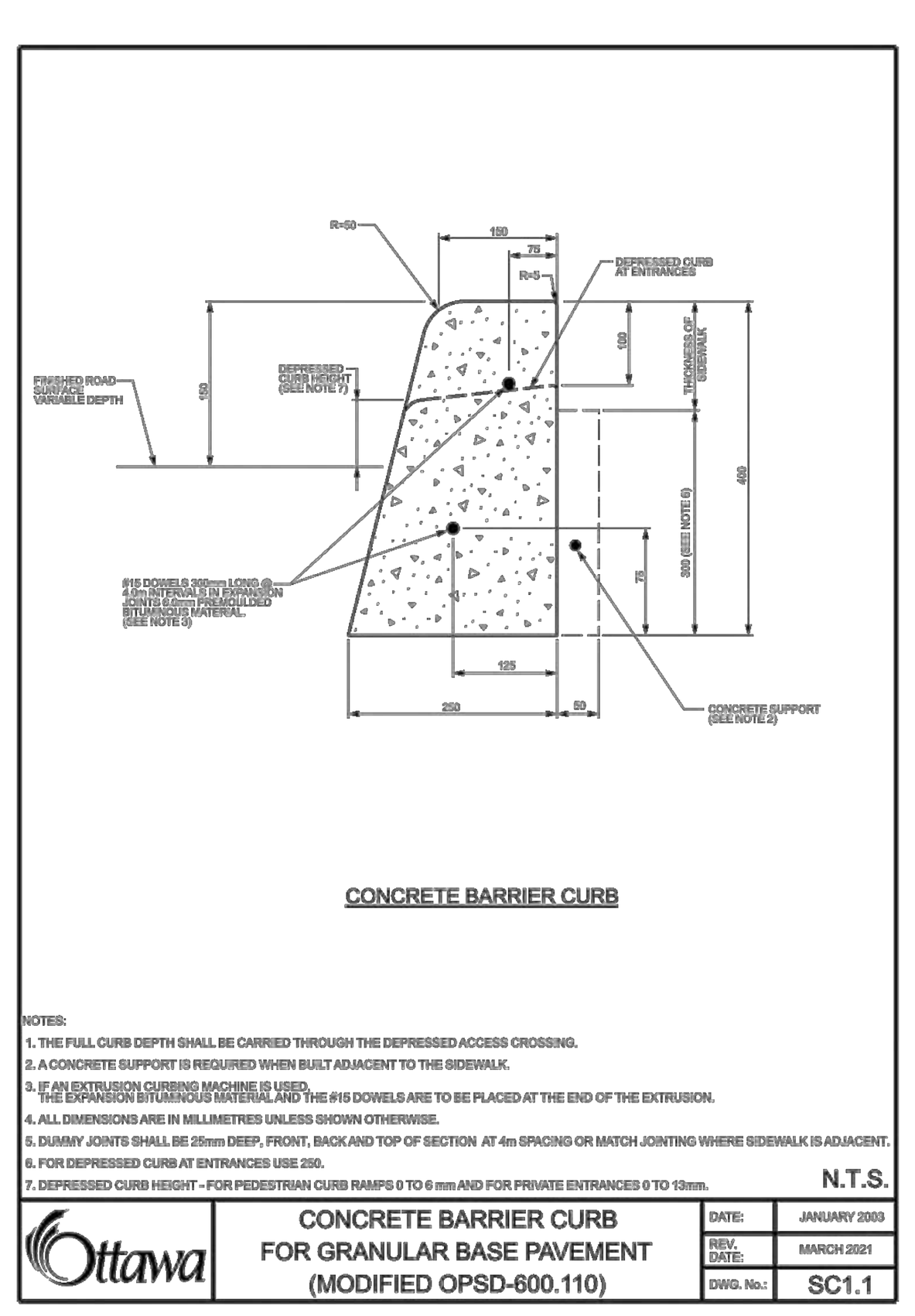


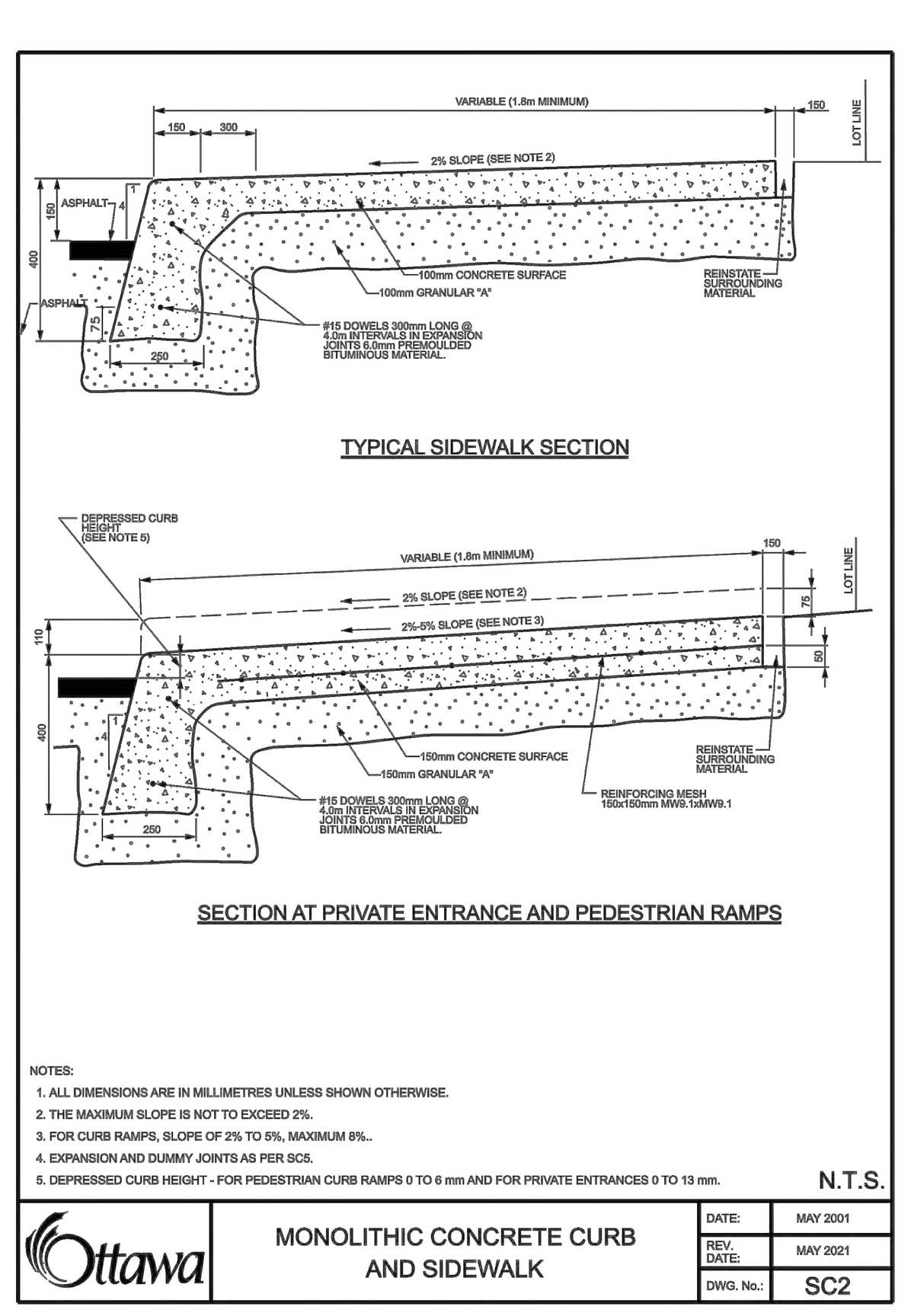


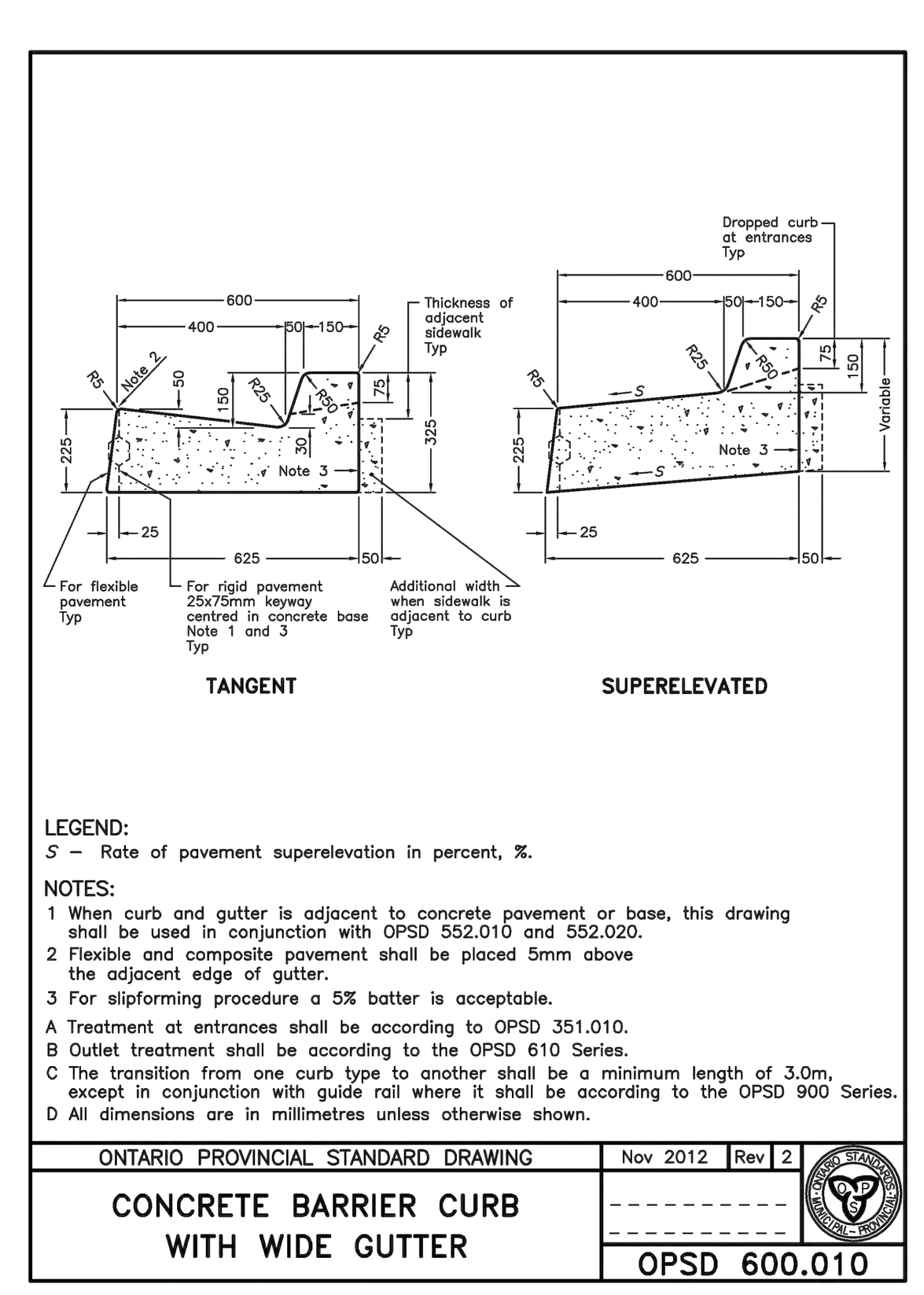


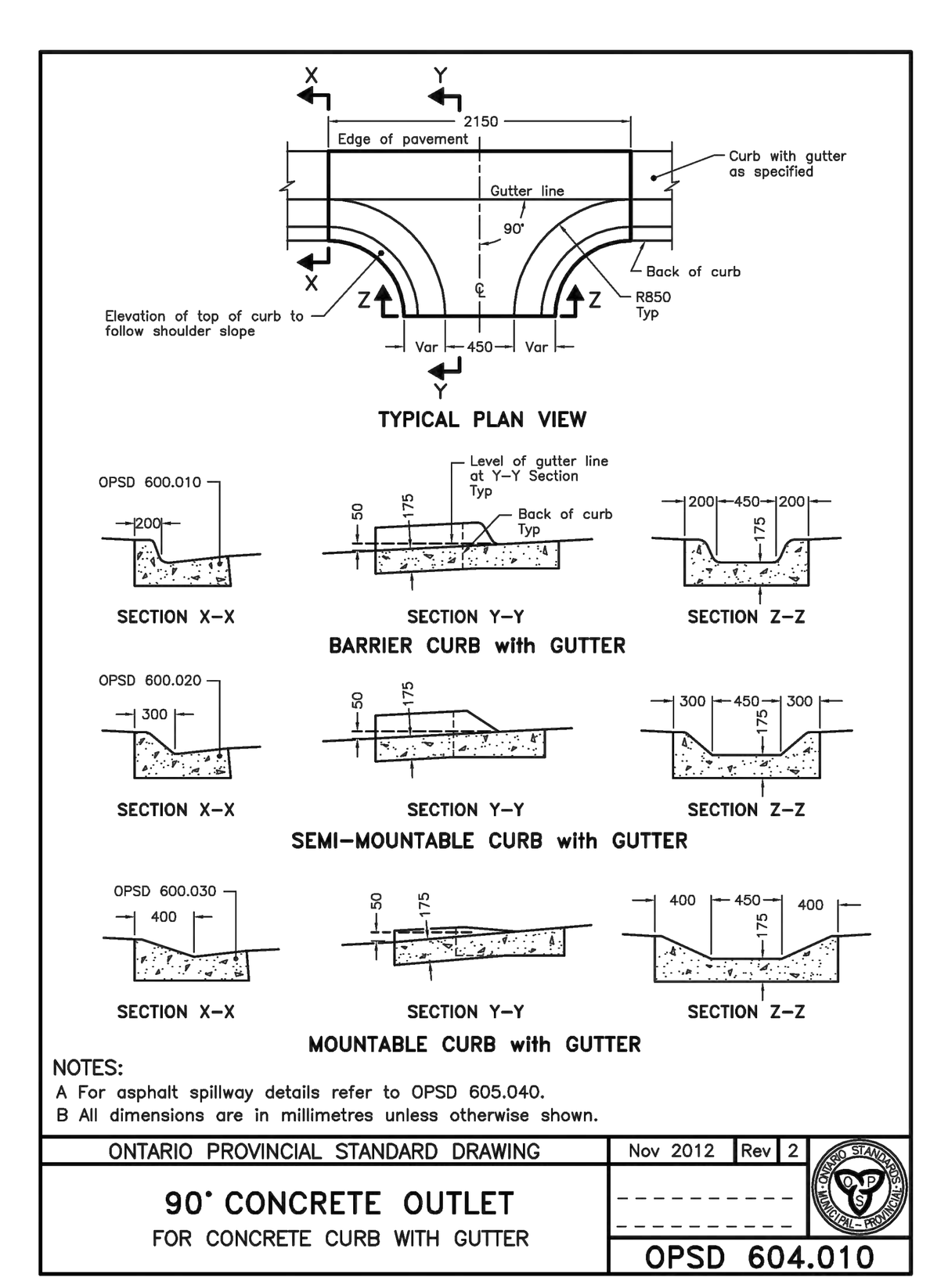


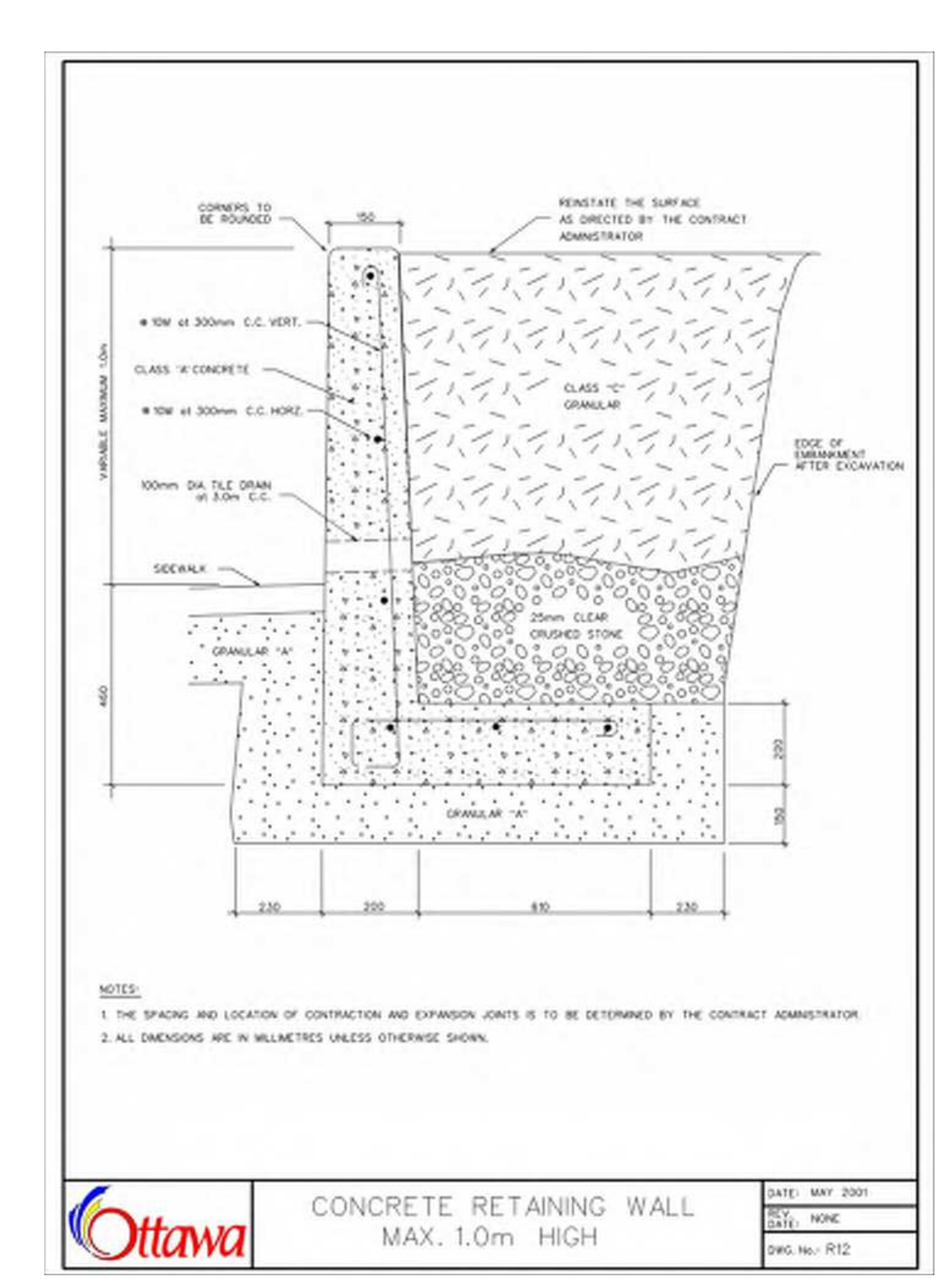


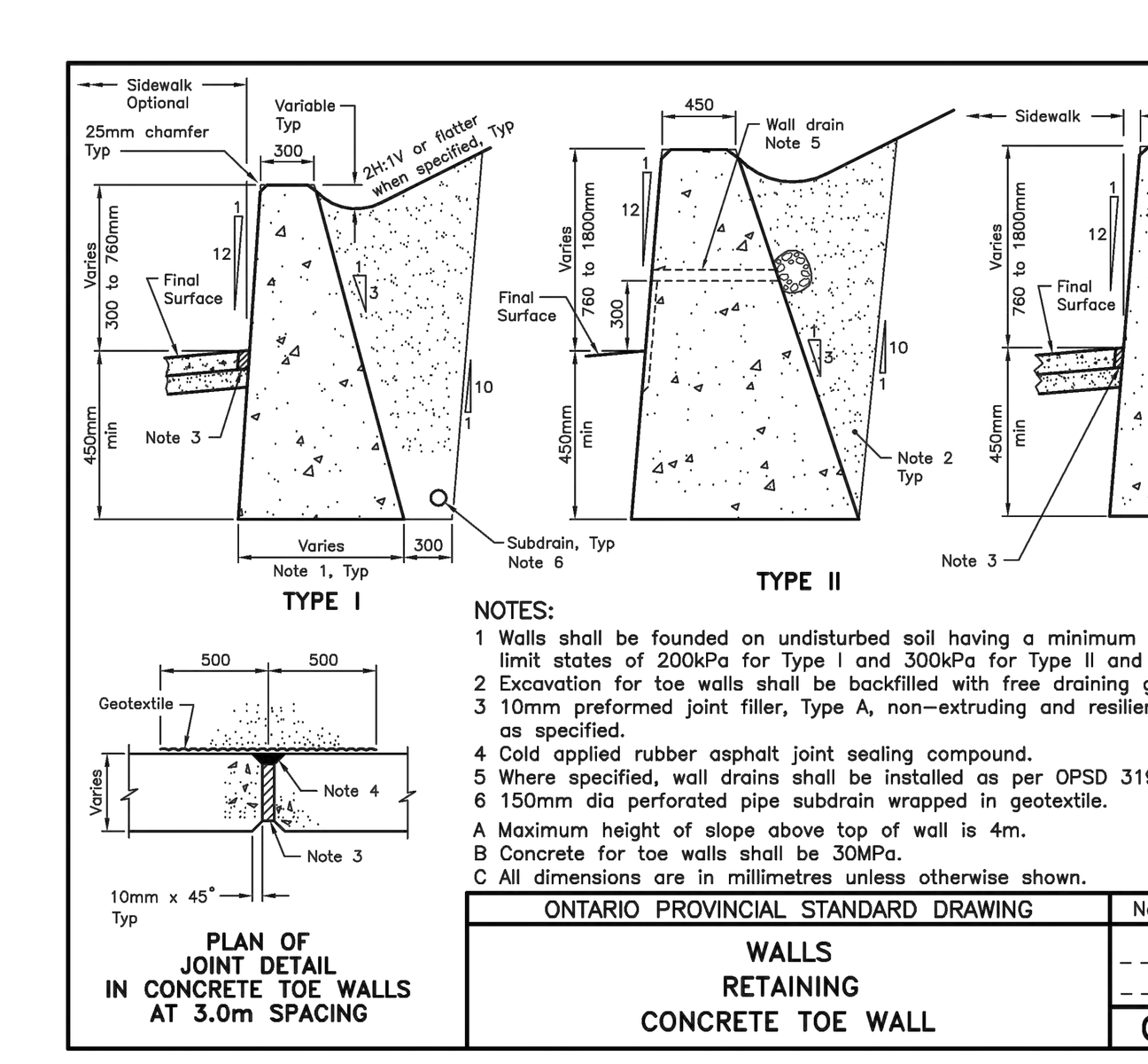


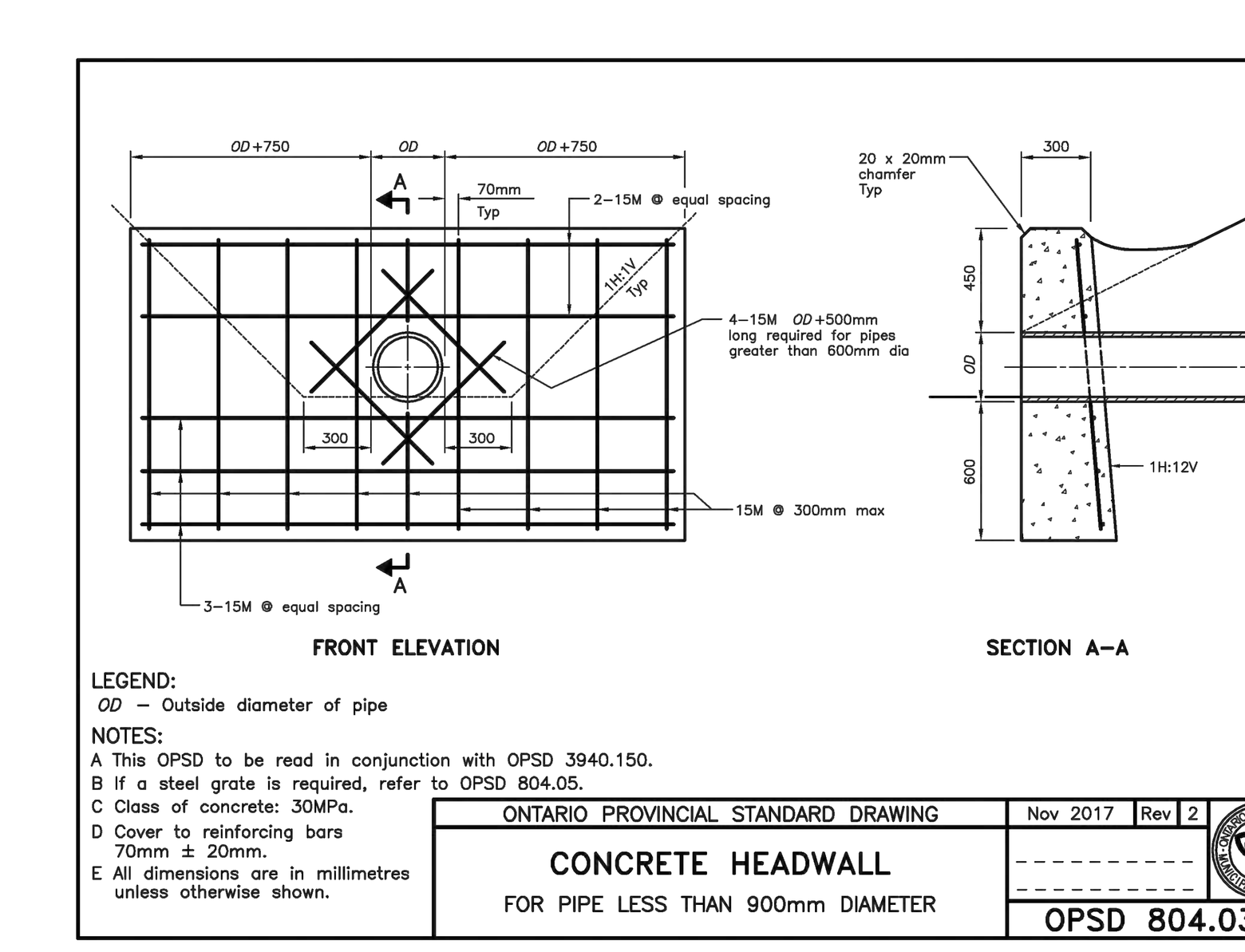












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NO.	REVISION DESCRIPTION	DATE	BY
5	REISSUED FOR SPA	30/07/24	SM
4	REISSUED FOR SPA	11/06/24	SM
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2	ISSUED FOR SPA	15/11/23	CC
1	ISSUED FOR SPA	14/08/23	CC

SCALE
0 4m 8m 16m
HORIZONTAL 1:400

LICENSED PROFESSIONAL ENGINEER
JUL 30/24
S.A.G.MCCAUGHEY
100217133
PROVINCE OF ONTARIO

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350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

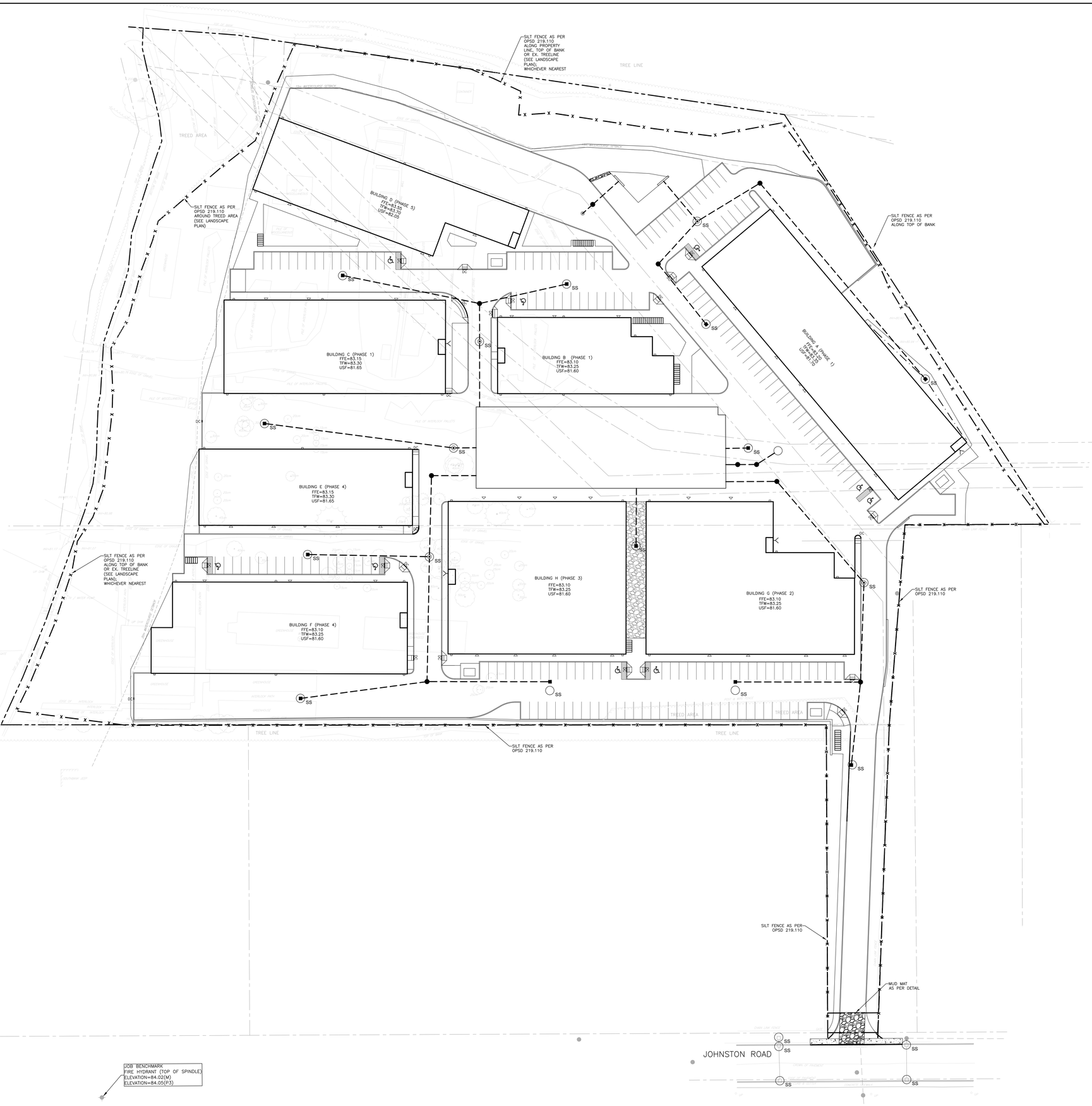
DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

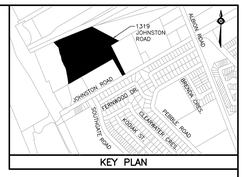
2079 ARTISTIC PLACE GP INC

1319 JOHNSTON ROAD
CITY OF OTTAWA

NOTES & DETAILS

PROJECT No. 23034
SURVEY
DATED JUL 2024
DWG. No: 23034-N1



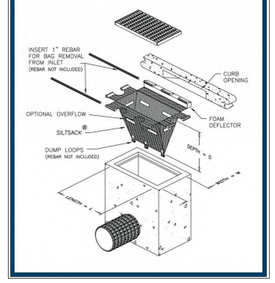


KEY PLAN

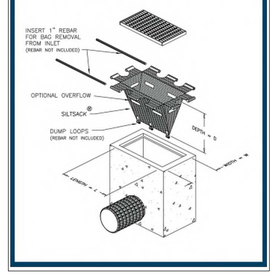
LEGEND

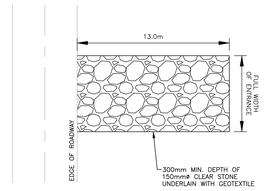
- PROPERTY BOUNDARY
- EXISTING CATCH BASIN
- CATCH BASIN
- SILT FENCE
- SILT SACK (OR APPROVED EQUIVALENT)

Typical Siltsack® Construction - Type A



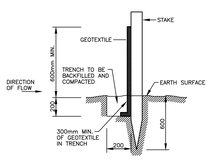
Typical Siltsack® Construction - Type B



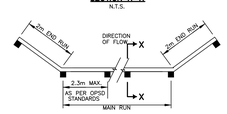


NOTES:
1. MUD MAT TO BE UNDERLAIN WITH A GEOTEXTILE FABRIC.
2. SEDIMENT SHALL BE CLEANED FROM ROADWAYS AS REQUIRED.
3. STORM INLETS IN CLOSE VICINITY TO MUD MAT SHALL BE PROTECTED WITH INLET CONTROL MEASURES.

MUD MAT DETAIL
N.T.S.



SECTION X–X
N.T.S.



SILT FENCE BARRIER DETAIL
N.T.S.

NOTES:
1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE ULTIMATE 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.
2. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
3. ENSURE ALL EROSION AND SEDIMENT CONTROL MEASURES ARE MAINTAINED UNTIL VEGETATION HAS BEEN RE-ESTABLISHED IN ALL DISTURBED AREAS. RE-VEGETATE DISTURBED AREAS AS SOON AS POSSIBLE.
4. STOCKPILE SOIL AWAY (1/4 METRES OR GREATER) FROM WATERCOURSES, DRAINAGE FEATURES AND TOP OF STEEP SLOPES.
5. SILT SACKS ARE TO BE PLACED UNDERNEATH THE FRAME AND COVER OF ALL PROPOSED AND EXISTING CATCH BASIN AND OPEN COVER STORM MANHOLES UNTIL CONSTRUCTION IS COMPLETED.
6. A SILT FENCE BARRIER SHALL BE INSTALLED AS PER OPSD 219.110 WHERE INDICATED AND MAINTAINED AS REQUIRED.
7. INSTALL MUD MATS AT ALL CONSTRUCTION ENTRANCES.
8. DURING ACTIVE CONSTRUCTION PERIODS, VISUAL INSPECTIONS SHALL BE UNDERTAKEN ON A WEEKLY BASIS AND AFTER MAJOR STORM EVENTS (>25mm RAIN IN 24 HOUR PERIOD) ON SEDIMENT CONTROL BARRIERS AND ANY DAMAGE REPAIRED IMMEDIATELY.
9. EROSION AND SEDIMENT CONTROL BARRIERS SHALL ALSO BE ASSESSED (AND REPAIRED AS REQUIRED) FOLLOWING SIGNIFICANT SNOWMELT EVENTS.
10. VISUAL INSPECTIONS SHALL ALSO BE UNDERTAKEN IN ANTICIPATION OF LARGE STORM EVENTS (OR A SERIES OF RAINFALL AND/OR SNOWMELT DAYS) THAT COULD POTENTIALLY YIELD SIGNIFICANT RUNOFF VOLUMES.
11. CARE SHALL BE TAKEN TO PREVENT DAMAGE TO EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION OPERATIONS.
12. IN SOME CASES, BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMMODATE THE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS SHALL BE REINSTATED IMMEDIATELY AFTER CONSTRUCTION OPERATIONS ARE COMPLETED.
13. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE ADJUSTED AS REQUIRED AS THE SITE BECOMES DEVELOPED.
14. SEDIMENT CONTROL DEVICES SHALL BE CLEANED OF ACCUMULATED SEDIMENTATION AS REQUIRED AND REPLACED AS NECESSARY.
15. DURING THE COURSE OF CONSTRUCTION, IF THE ENGINEER BELIEVES THAT ADDITIONAL PREVENTION METHODS ARE REQUIRED TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES, AS REQUIRED, TO THE SATISFACTION OF THE ENGINEER.
16. CONSTRUCTION AND MAINTENANCE REQUIREMENTS FOR EROSION AND SEDIMENT CONTROLS ARE TO COMPLY WITH OPSS 805.

NOT FOR CONSTRUCTION

NOTES

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PROPERTY BOUNDARIES AND TOPOGRAPHIC SURVEY ARE FROM "TOPOGRAPHIC SKETCH OF PART OF LOS 2 & 3 CONCESSION 3 (RIDEAU FRONT)" STANTEC GEOMATICS LTD., ONTARIO LAND SURVEYORS. DATED MAY 17, 2023

NO.	REVISION DESCRIPTION	DATE	BY
4	REDSSUED FOR SPA	30/07/24	SM
3	REDSSUED FOR SPA	27/03/24	SM
2	ISSUED FOR SPA	23/11/23	CC
1	ISSUED FOR SPA	21/08/23	CC

SCALE
0 4m 8m 16m
HORIZONTAL 1:400

LICENSED PROFESSIONAL ENGINEER
S.A.G.MCCAUGHEY
100171133
PROVINCE OF ONTARIO

Robinson Land Development
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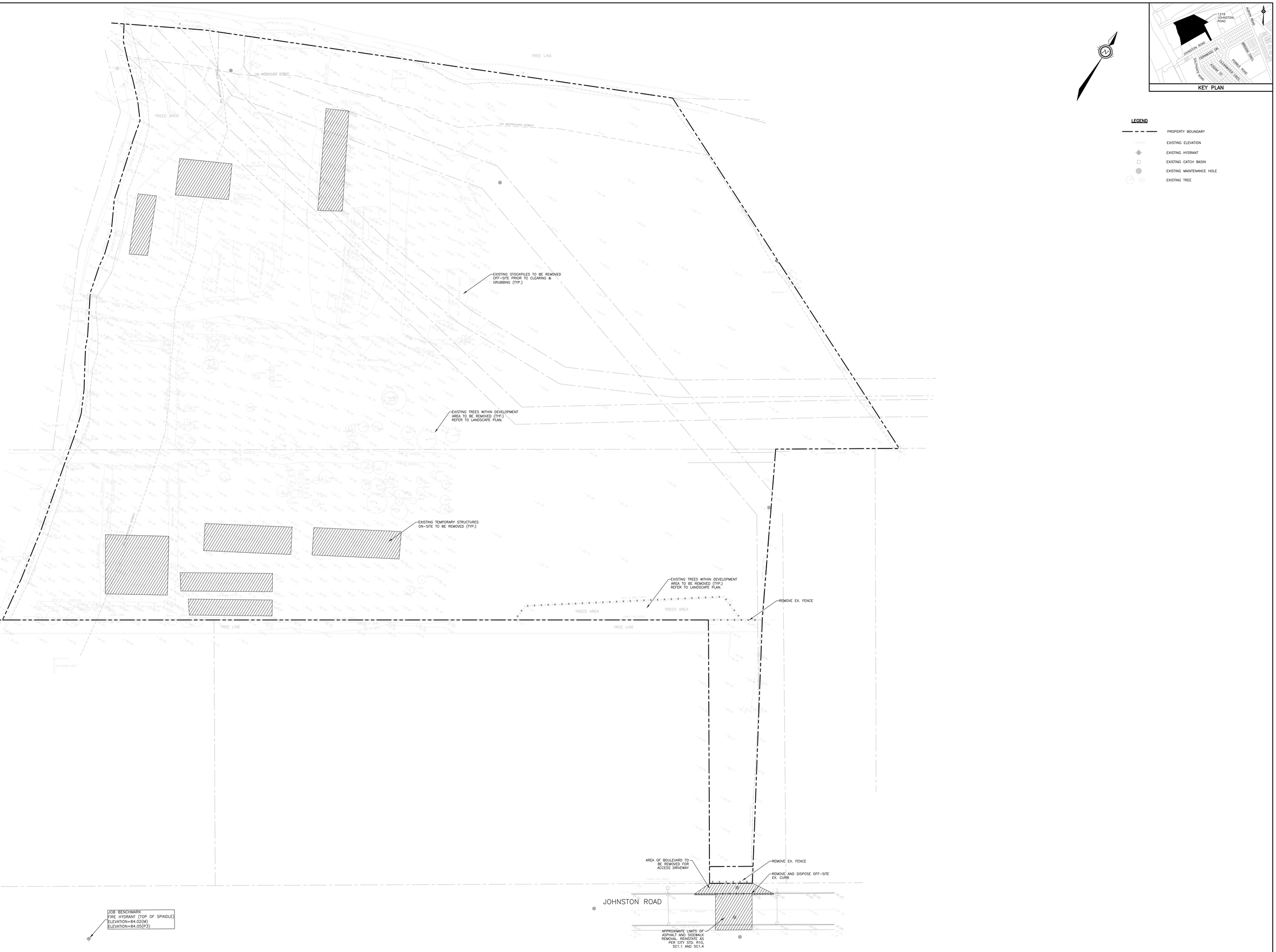
DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

2079 ARTISTIC PLACE GP INC.

1319 JOHNSTON ROAD
CITY OF OTTAWA

EROSION AND SEDIMENT CONTROL PLAN

PROJECT No.	23034
SURVEY	STANTEC
DATED	JUL 2024
DWG. No:	23034-ESC1



KEY PLAN

LEGEND

- PROPERTY BOUNDARY
- EXISTING ELEVATION
- EXISTING HYDRANT
- EXISTING CATCH BASIN
- EXISTING MAINTENANCE HOLE
- EXISTING TREE

NOTES

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2	ISSUED FOR SPA	23/11/23	CC
1	ISSUED FOR SPA	14/08/23	CC

SCALE
0 4m 8m 16m
HORIZONTAL 1:400

LICENCED PROFESSIONAL ENGINEER
S.A.G.MCCAUGHEY
100217133
PROVINCE OF ONTARIO
30/7/24

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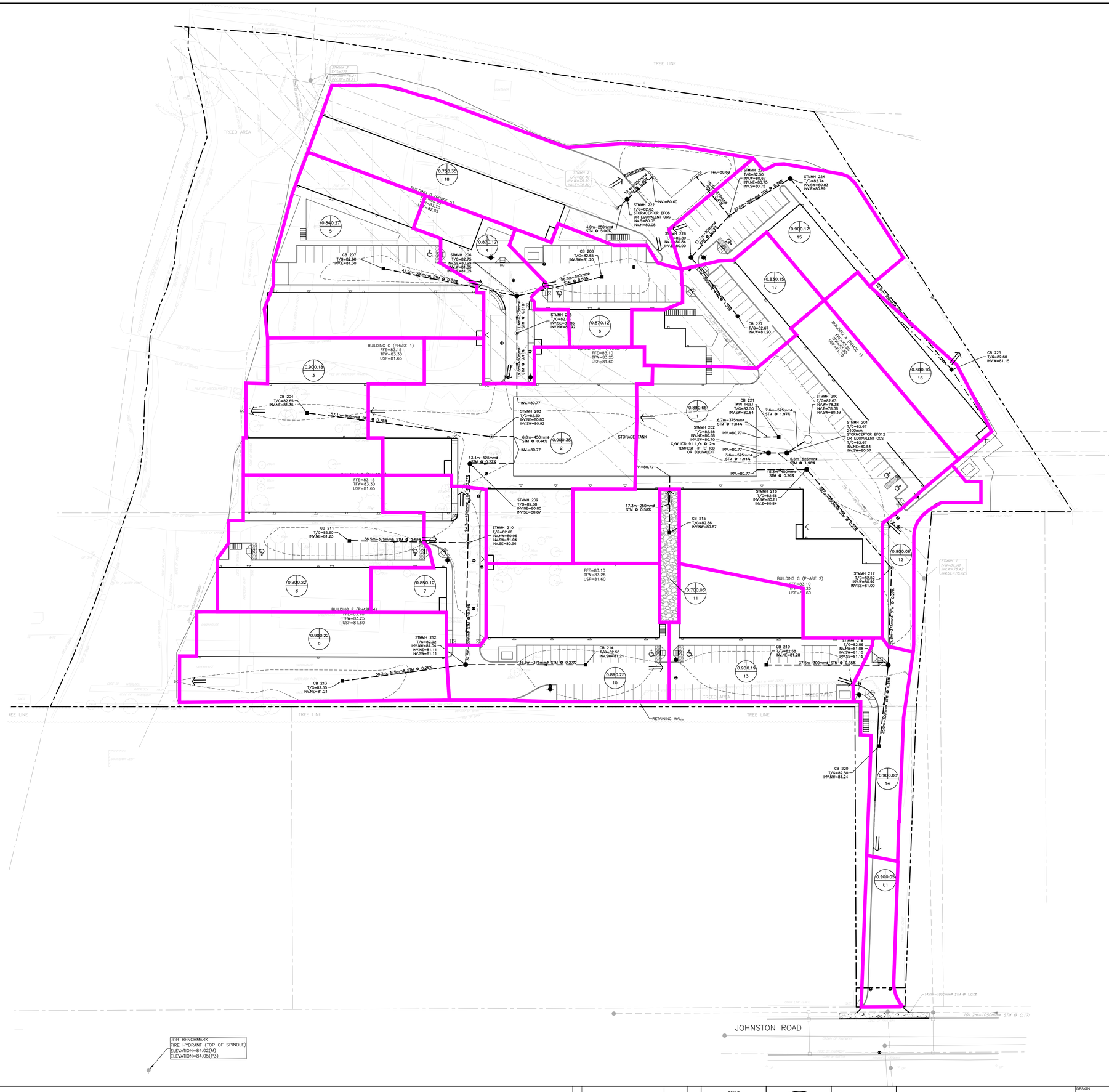
DESIGN	SM
CHECKED	BM
DRAWN	SM
CHECKED	BM
APPROVED	CC

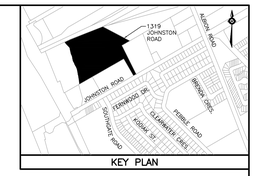
2079 ARTISTIC PLACE GP INC.

1319 JOHNSTON ROAD
CITY OF OTTAWA

EXISTING CONDITIONS AND REMOVALS PLAN

PROJECT No.	23034
SURVEY	STANTEC
DATED	JUL 2024
DWG. No.	23034-R1





LEGEND

- PROPERTY BOUNDARY
- EXISTING CATCH BASIN
- EXISTING STORM SEWER & MANHOLE
- CATCH BASIN
- CATCH BASIN MANHOLE
- STORM SEWER & MANHOLE
- STORM DRAINAGE AREA BOUNDARY
- MAJOR OVERLAND FLOW ROUTE
- 100-YEAR PONDING LIMIT

RUNOFF COEFFICIENT
0.50 0.28 ← AREA (ha)
STM1 ← DRAINAGE AREA ID

SURFACE STORAGE VOLUME SUMMARY

STRUCTURE	100-YEAR				
	PROVIDED STORAGE VOLUME (m^3)	PONDING ELEVATION (m)	PONDING DEPTH (m)	REQUIRED STORAGE VOLUME (m^3)	DISCHARGE FLOW RATE (L/s)
STMMH216	138	82.80	0.30	–	–
STMMH203	91.2	82.80	0.30	–	–
CB204	6.4	82.80	0.25	–	–
STMMH205	8.9	82.80	0.27	–	–
CB207	13.7	82.80	0.25	–	–
CB208	12.0	82.80	0.25	–	–
STMH210	18.2	82.78	0.18	–	–
CB211	23.3	82.80	0.20	–	–
CB213	40.5	82.80	0.25	–	–
CB214	39.2	82.80	0.25	–	–
CB215	N/A	82.80	0.00	–	–
STMMH217	28.1	82.80	0.30	–	–
CB219	43.3	82.80	0.22	–	–
CB220	46.6	82.80	0.30	–	–
TOTAL (MAIN SITE)	1577	82.80	0.30 (MAX.)	1573	91.1
POND	541	82.50	1.90	–	–
TOTAL (POND SITE)	541	82.50	1.90 (MAX.)	527	8.7

NOTES

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3	REISSUED FOR SPA	27/03/24	SM
2	ISSUED FOR SPA	23/11/23	CC
1	ISSUED FOR SPA	21/08/23	CC

SCALE
0 40m 80m 160m
HORIZONTAL 1:400

LICENCED PROFESSIONAL ENGINEER
26 JULY 2024
S.A.G.MCCAUGHEY
100211133
PROVINCE OF ONTARIO

Robinson Land Development
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(613) 592-6060 rcii.com

DESIGN	SM
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DRAWN	SM
CHECKED	BM
APPROVED	CC

2079 ARTISTIC PLACE GP INC.

1319 JOHNSTON ROAD
CITY OF OTTAWA

STORM AREA DRAINAGE PLAN

PROJECT No.	23034
SURVEY	STANTEC
DATED	JUL 2024
DWG. No:	23034-STM1

NOT FOR CONSTRUCTION

Appendix C

Water Demand Calculations

Fire Demand Calculations

Boundary Conditions

Water Model Outputs

WATERMAIN DESIGN SHEET

1319 Johnston Road Site Plan
Project No. 23034

Robinson Consultants

Junction Node Number	RESIDENTIAL POPULATION				NON-RES			AVG. DAILY					MAX. DAILY					PEAK HOURLY				
	ACTUAL COUNT				IND.	COMM.	INST.	DEMAND (L/s)					DEMAND (L/s)					DEMAND (L/s)				
	Low Density	Medium Density	High Density	Total Population	(ha)	(ha)	(ha)	RES.	IND.	COMM.	INST.	TOTAL	RES.	IND.	COMM.	INST.	TOTAL	RES.	IND.	COMM.	INST.	TOTAL
Bldg G					0.62				0.25			0.25		0.38			0.38		0.68			0.68
Bldg H					0.50				0.20			0.20		0.30			0.30		0.55			0.55
Bldg F					0.40				0.16			0.16		0.24			0.24		0.44			0.44
Bldg E					0.44				0.18			0.18		0.27			0.27		0.48			0.48
Bldg C					0.32				0.13			0.13		0.19			0.19		0.35			0.35
Bldg B					0.27				0.11			0.11		0.16			0.16		0.30			0.30
Bldg A					0.65				0.26			0.26		0.39			0.39		0.71			0.71
Bldg D					0.40				0.16			0.16		0.24			0.24		0.44			0.44
Total					**3.60**							**1.46**					**2.19**					**3.94**

Residential Densities

Low Density (SFH's) =	3.4	cap/unit
Medium Density (Townhouses) =	2.7	cap/unit
High Density (Apartments) =	1.8	cap/unit

Avg. Daily Demand:			Max. Daily Demand:		Max. Hourly Demand:	
Residential =	280	L/cap/day	2.5	x Avg. Day	2.2	x Max. Day
Industrial (Light) =	35000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Commercial =	28000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Institutional =	28000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day

2024-07-26

Table 6

Distance to the Exposure (m)	Length-Height Factor of Exposing Building Face	Construction Type of Exposed Building Face				
		Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 - 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30	All	0%	0%	0%	0%	0%

[2] *with unprotected openings*
[3] *without unprotected openings*

1.5 for **Type V** Wood Frame Construction
0.8 for **Type IV-A** Mass Timber Construction
0.9 for **Type IV-B** Mass Timber Construction
1.0 for **Type IV-C** Mass Timber Construction
1.5 for **Type IV-D** Mass Timber Construction
1.0 for **Type III** Ordinary Construction
0.8 for **Type II** Noncombustible Construction
0.6 for **Type I** Fire Resistive Construction

Type V

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	20%	21%	22%	23%	24%	25%
3	15%	16%	17%	18%	19%	20%
10	10%	11%	12%	13%	14%	15%
20	0%	2%	4%	6%	8%	10%
30.00001	0%	0%	0%	0%	0%	0%

Type III-IV2

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	15%	16%	17%	18%	19%	20%
3	10%	11%	12%	13%	14%	15%
10	5%	6%	7%	8%	9%	10%
20	0%	1%	2%	3%	4%	5%
30.00001	0%	0%	0%	0%	0%	0%

Type III-IV3

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	5%	6%	7%	8%	9%	10%
3	3%	4%	5%	6%	7%	8%
10	0%	1%	2%	3%	4%	5%
20	0%	0%	0%	1%	2%	3%
30.00001	0%	0%	0%	0%	0%	0%

Type I-II2

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	10%	11%	12%	13%	14%	15%
3	6%	7%	8%	9%	10%	11%
10	3%	4%	5%	6%	7%	8%
20	0%	0%	1%	2%	3%	4%
30.00001	0%	0%	0%	0%	0%	0%

Type I-II3

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	0%	1%	2%	3%	4%	5%
3	0%	0%	1%	2%	3%	4%
10	0%	0%	0%	1%	2%	3%
20	0%	0%	0%	0%	0%	0%
30.00001	0%	0%	0%	0%	0%	0%

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg G

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				4948.9	m^2
	Total Effective Floor Area				**4,948.9**	**m^2**
C	**Fire Flow**				**12,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1800**	**L/min**
	Fire Flow				**13,800**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-6,900**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				46	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				92	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				6.0	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				4.7	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				9.4	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	32.3	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			10	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			20	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			25	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			62.5	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			125	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	145	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**7,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg H

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				4879.2	m^2
	Total Effective Floor Area				**4,879.2**	**m^2**
C	**Fire Flow**				**12,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1800**	**L/min**
	Fire Flow				**13,800**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-6,900**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				28.7	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				57.4	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				12.0	m
	West Side Exposure Charge				**0.05**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				47	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				94	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	32.3	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			46	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			92	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			6	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			53.3	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			106.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	145	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0.05**	**< 0.75**
	Increase for Exposures			**690**	**L/min**
G	**Total Required Fire Flow**			**8,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg F

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				4046.3	m^2
	Total Effective Floor Area				**4,046.3**	**m^2**
C	**Fire Flow**				**11,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1650**	**L/min**
	Fire Flow				**12,650**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	None	0.00	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	No	0.00	
		Full Supervision of the Sprinker System	-0.10	No	0.00	
	Sprinkler Reduction				**0**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				27.4	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				54.8	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	70.0	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				64	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				128	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance			17.0	m
	North Side Exposure Charge			**0.08**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			28	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			56	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			12	m
	East Side Exposure Charge			**0.03**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			76.8	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			153.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	145	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0.105**	**< 0.75**
	Increase for Exposures			**1328.25**	**L/min**
G	**Total Required Fire Flow**			**14,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg E

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				2927.3	m^2
	Total Effective Floor Area				**2,927.3**	**m^2**
C	**Fire Flow**				**10,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1500**	**L/min**
	Fire Flow				**11,500**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	None	0.00	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	No	0.00	
		Full Supervision of the Sprinker System	-0.10	No	0.00	
	Sprinkler Reduction				**0**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				23	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				46	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100.0	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				57.6	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				115.2	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance			16.7	m
	North Side Exposure Charge			**0.08**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			7.2	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			14.4	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			10.7	m
	East Side Exposure Charge			**0.02**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			64	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			128	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			17	m
	South Side Exposure Charge			**0.08**	
	Total Exposure Charage			**0.175**	**< 0.75**
	Increase for Exposures			**2012.5**	**L/min**
G	**Total Required Fire Flow**			**14,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg C

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				3717.5	m^2
	Total Effective Floor Area				**3,717.5**	**m^2**
C	**Fire Flow**				**11,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1650**	**L/min**
	Fire Flow				**12,650**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-6,325**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				22.9	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				45.8	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100.0	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				32	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				64	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance			16.2	m
	North Side Exposure Charge			**0.06**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			22.9	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			45.8	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			15.6	m
	East Side Exposure Charge			**0.05**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			57.6	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			115.2	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			16.7	m
	South Side Exposure Charge			**0.08**	
	Total Exposure Charage			**0.19**	**< 0.75**
	Increase for Exposures			**2403.5**	**L/min**
G	**Total Required Fire Flow**			**9,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg B

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				2196.8	m^2
	Total Effective Floor Area				**2,196.8**	**m^2**
C	**Fire Flow**				**8,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1200**	**L/min**
	Fire Flow				**9,200**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	None	0.00	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	No	0.00	
		Full Supervision of the Sprinker System	-0.10	No	0.00	
	Sprinkler Reduction				**0**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				22.9	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				45.8	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				15.6	m
	West Side Exposure Charge				**0.05**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				18.2	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				36.4	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance			23.7	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			17.4	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			34.8	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			29.4	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			51.7	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			103.4	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	32.3	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0.05**	**< 0.75**
	Increase for Exposures			**460**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg D

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				3177.1	m^2
	Total Effective Floor Area				**3,177.1**	**m^2**
C	**Fire Flow**				**10,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1500**	**L/min**
	Fire Flow				**11,500**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	None	0.00	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	No	0.00	
		Full Supervision of the Sprinker System	-0.10	No	0.00	
	Sprinkler Reduction				**0**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				23	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				46	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100.0	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				80	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				160	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	100.0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			12	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			24	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	55	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			50.2	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			100.4	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			16.2	m
	South Side Exposure Charge			**0.08**	
	Total Exposure Charage			**0.08**	**< 0.75**
	Increase for Exposures			**920**	**L/min**
G	**Total Required Fire Flow**			**12,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	1319 Johnston Rd
Project Location:	Ottawa ON
Project No:	23034
Date:	26-Mar-24
Building Type:	Light Industrial
Building Being Considered:	Bldg A

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				4907.1	m^2
	Total Effective Floor Area				**4,907.1**	**m^2**
C	**Fire Flow**				**12,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**1800**	**L/min**
	Fire Flow				**13,800**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-6,900**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				15.9	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				31.8	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance				29.4	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Building Fully Protected with Automatic Sprinker Systems				No	
	Exposed Wall Length				118	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				236	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	100.0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			26.8	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			53.6	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	39	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Building Fully Protected with Automatic Sprinker Systems			No	
	Exposed Wall Length			19.9	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			39.8	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			25	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**7,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Floor areas used in Step B equivalent to 2-storey given ~8m building height

3. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Stephen McCaughey

From: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Sent: July 31, 2023 8:25 PM
To: Stephen McCaughey
Subject: RE: 1319 Johnston Rd - SPA criteria
Attachments: 1319 Johnston Road July 2023.pdf

"CAUTION: External Sender"
Hi Stephen,

Please find below the boundary conditions for the proposed development at 1319 Johnston Road:

The following are boundary conditions, HGL, for hydraulic analysis at 1319 Johnston Road (zone 2W2C) assumed to be connected to the 305 mm on Johnston Road (see attached PDF for location).

Minimum HGL = 123.9 m

Maximum HGL = 131.3 m

Max Day + FireFlow (133.3 L/s): 126.2 m

Max Day + FireFlow (233.3 L/s): 123.7 m

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

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

The results were based on the following demand scenarios:

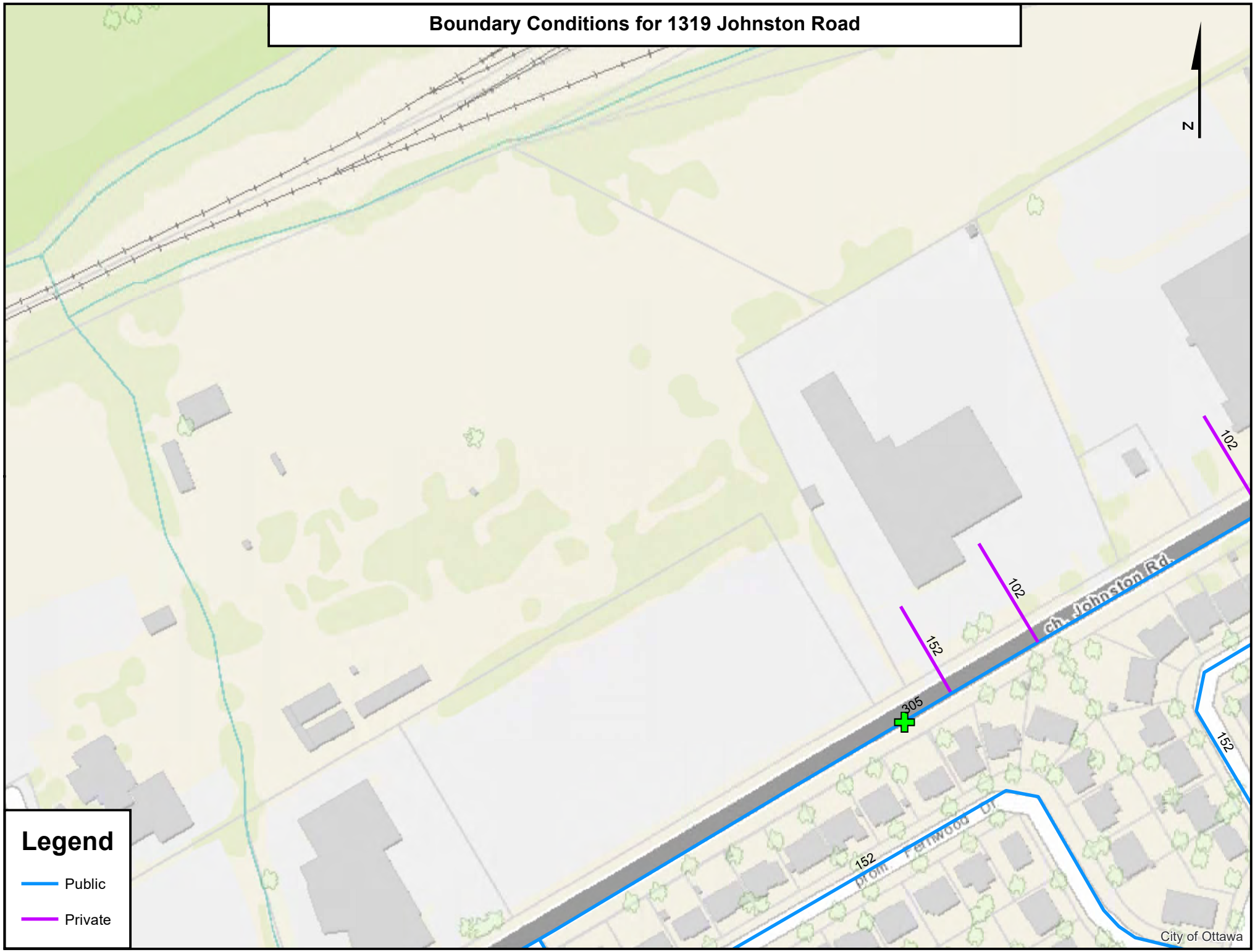
Water avg day: 1.46 L/s
Water peak hour: 8.02 L/s
Water max day + fire 1: 3.65 L/s + 8,000 L/min (Bldg F) = 136.98 L/s
Water max day + fire 2: 3.65 + 14,000 L/min = 237 L/s

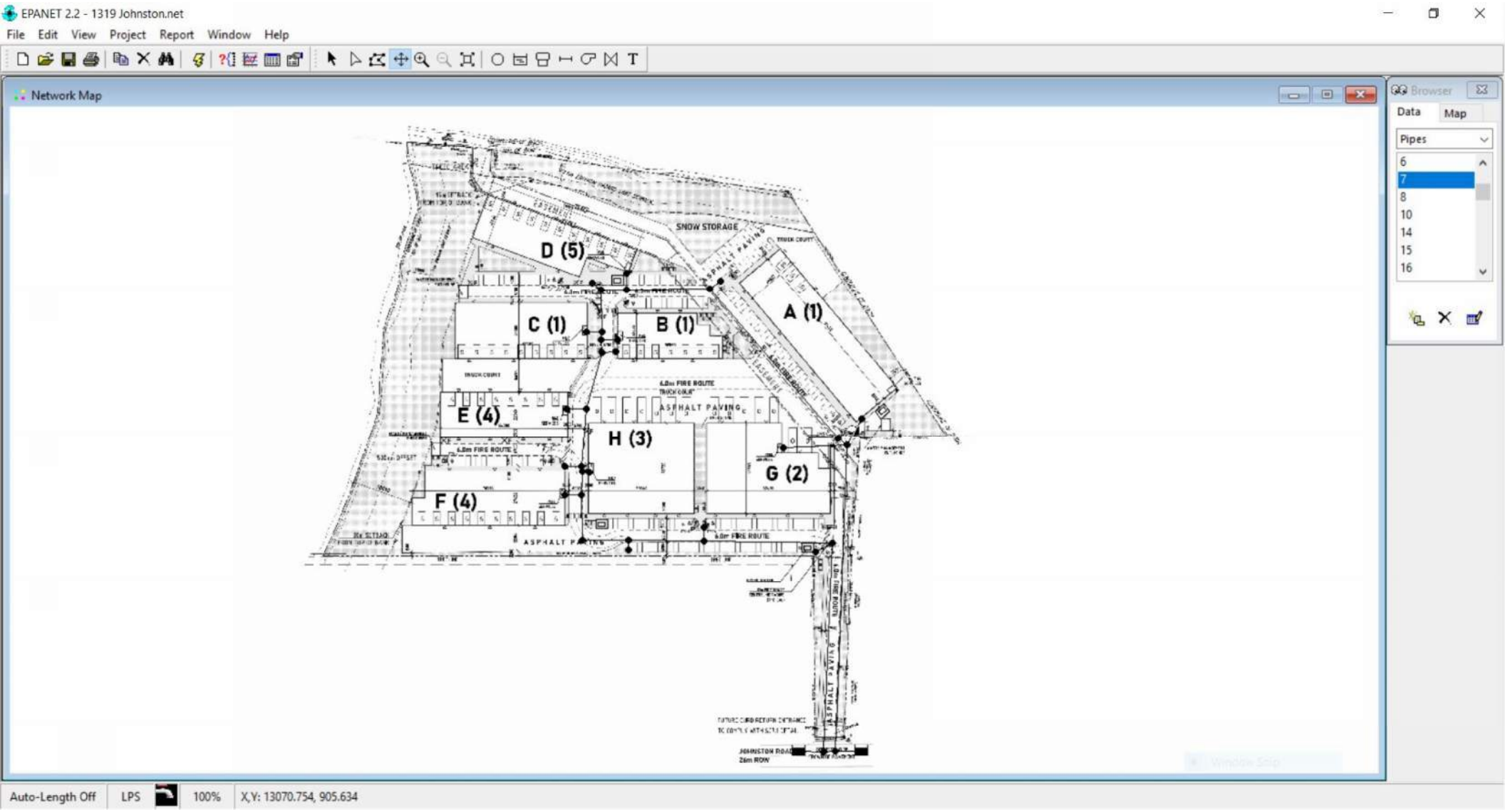
Feel free to reach out at any time.

Thank you,

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: July 28, 2023 7:42 AM
To: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Subject: RE: 1319 Johnston Rd - SPA criteria

Boundary Conditions for 1319 Johnston Road




EPANET 2.2 - 1319 Johnston.net
File Edit View Project Report Window Help
Network Map
SNOW STORAGE
D (5)
C (1)
B (1)
A (1)
E (4)
H (3)
G (2)
F (4)
4.0m FIRE ROUTE
ASPHALT PAVING
Browser
Data
Map
Pipes
6
7
8
10
14
15
16
Auto-Length Off
LPS
100%
X,Y: 13070.754, 905.634

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

Input File: 1319 Johnston.net
Average Day Demand
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	131.30	51.95	0.00	
EastConnect	0.00	131.30	51.95	0.00	
HYD-1	0.00	131.30	48.80	0.00	
HYD-2	0.00	131.30	48.30	0.00	
HYD-3	0.00	131.30	48.30	0.00	
HYD-4	0.00	131.30	48.40	0.00	
HYD-5	0.00	131.30	48.20	0.00	
HYD-6	0.00	131.30	48.00	0.00	
HYD-8	0.00	131.30	48.30	0.00	
BldgG	0.25	131.30	48.20	0.00	
BldgA	0.26	131.30	48.10	0.00	
BldgAGConnect	0.00	131.30	51.20	0.00	
HYD8Connect	0.00	131.30	51.20	0.00	
HYD1Connect	0.00	131.30	51.20	0.00	
HYD2Connect	0.00	131.30	51.20	0.00	
HYD3Connect	0.00	131.30	51.20	0.00	
20	0.00	131.30	51.20	0.00	
BldgFConnect	0.00	131.30	51.20	0.00	
BldgF	0.16	131.29	48.19	0.00	
HYD4Connect	0.00	131.30	51.20	0.00	
BldgEConnect	0.00	131.30	51.20	0.00	
BldgE	0.18	131.29	48.19	0.00	
HYD5Connect	0.00	131.30	51.20	0.00	
BldgCConnect	0.00	131.30	51.20	0.00	
BldgC	0.13	131.30	48.00	0.00	
HYD6Connect	0.00	131.30	51.20	0.00	
BldgDConnect	0.00	131.30	51.20	0.00	
BldgD	0.16	131.30	47.75	0.00	
HYD7Connect	0.00	131.30	51.20	0.00	
HYD-7	0.00	131.30	48.30	0.00	
BldgHConnect	0.00	131.30	51.20	0.00	
BldgH	0.20	131.30	48.20	0.00	
BldgB	0.11	131.30	48.20	0.00	
BldgBConnect	0.00	131.30	51.20	0.00	
West	-0.72	131.30	0.00	0.00	Reservoir
East	-0.73	131.30	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	0.72	0.01	0.00	Open
2	0.07	0.00	0.00	Open
3	-0.73	0.01	0.00	Open
4	-0.80	0.03	0.01	Open
5	-0.29	0.01	0.00	Open
6	0.00	0.00	0.00	Open
7	-0.26	0.01	0.01	Open
8	0.25	0.01	0.00	Open
10	-0.29	0.01	0.00	Open
14	0.16	0.08	0.43	Open
15	0.13	0.00	0.00	Open
16	0.00	0.00	0.00	Open
17	0.13	0.00	0.00	Open
18	0.13	0.01	0.00	Open
20	0.00	0.00	0.00	Open
21	-0.11	0.00	0.00	Open
22	0.18	0.09	0.53	Open
23	-0.29	0.01	0.00	Open
24	0.00	0.00	0.00	Open
26	0.16	0.08	0.43	Open
27	-0.65	0.02	0.01	Open
28	-0.65	0.02	0.01	Open
29	0.00	0.00	0.00	Open
32	0.00	0.00	0.00	Open
34	-0.65	0.02	0.01	Open
35	0.00	0.00	0.00	Open
36	-0.65	0.02	0.01	Open
37	0.00	0.00	0.00	Open
9	-0.65	0.02	0.01	Open
25	0.49	0.02	0.00	Open
30	0.29	0.01	0.00	Open
31	0.20	0.10	0.64	Open
33	0.11	0.00	0.00	Open
38	0.00	0.00	0.00	Open
39	0.11	0.01	0.00	Open
40	-0.29	0.01	0.00	Open

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

Input File: 1319 Johnston.net
Peak Hour Demand

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.90	44.55	0.00	
EastConnect	0.00	123.90	44.55	0.00	
HYD-1	0.00	123.90	41.40	0.00	
HYD-2	0.00	123.89	40.89	0.00	
HYD-3	0.00	123.89	40.89	0.00	
HYD-4	0.00	123.89	40.99	0.00	
HYD-5	0.00	123.89	40.79	0.00	
HYD-6	0.00	123.89	40.59	0.00	
HYD-8	0.00	123.89	40.89	0.00	
BldgG	0.68	123.89	40.79	0.00	
BldgA	0.71	123.89	40.69	0.00	
BldgAGConnect	0.00	123.89	43.79	0.00	
HYD8Connect	0.00	123.89	43.79	0.00	
HYD1Connect	0.00	123.90	43.80	0.00	
HYD2Connect	0.00	123.89	43.79	0.00	
HYD3Connect	0.00	123.89	43.79	0.00	
20	0.00	123.89	43.79	0.00	
BldgFConnect	0.00	123.89	43.79	0.00	
BldgF	0.44	123.87	40.77	0.00	
HYD4Connect	0.00	123.89	43.79	0.00	
BldgEConnect	0.00	123.89	43.79	0.00	
BldgE	0.48	123.85	40.75	0.00	
HYD5Connect	0.00	123.89	43.79	0.00	
BldgCConnect	0.00	123.89	43.79	0.00	
BldgC	0.35	123.89	40.59	0.00	
HYD6Connect	0.00	123.89	43.79	0.00	
BldgDConnect	0.00	123.89	43.79	0.00	
BldgD	0.44	123.87	40.32	0.00	
HYD7Connect	0.00	123.89	43.79	0.00	
HYD-7	0.00	123.89	40.89	0.00	
BldgHConnect	0.00	123.89	43.79	0.00	
BldgH	0.55	123.88	40.78	0.00	
BldgB	0.30	123.89	40.79	0.00	
BldgBConnect	0.00	123.89	43.79	0.00	
West	-1.97	123.90	0.00	0.00	Reservoir
East	-1.98	123.90	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	1.97	0.03	0.01	Open
2	0.19	0.00	0.00	Open
3	-1.98	0.03	0.01	Open
4	-2.18	0.07	0.05	Open
5	-0.79	0.03	0.01	Open
6	0.00	0.00	0.00	Open
7	-0.71	0.04	0.03	Open
8	0.68	0.04	0.03	Open
10	-0.79	0.03	0.01	Open
14	0.44	0.22	2.79	Open
15	0.35	0.01	0.00	Open
16	0.00	0.00	0.00	Open
17	0.35	0.01	0.00	Open
18	0.35	0.02	0.01	Open
20	0.00	0.00	0.00	Open
21	-0.30	0.01	0.00	Open
22	0.48	0.24	3.27	Open
23	-0.78	0.02	0.01	Open
24	0.00	0.00	0.00	Open
26	0.44	0.22	2.79	Open
27	-1.77	0.06	0.04	Open
28	-1.77	0.06	0.04	Open
29	0.00	0.00	0.00	Open
32	0.00	0.00	0.00	Open
34	-1.77	0.06	0.04	Open
35	0.00	0.00	0.00	Open
36	-1.77	0.06	0.04	Open
37	0.00	0.00	0.00	Open
9	-1.77	0.06	0.04	Open
25	1.33	0.04	0.02	Open
30	0.78	0.02	0.01	Open
31	0.55	0.28	4.21	Open
33	0.30	0.01	0.00	Open
38	0.00	0.00	0.00	Open
39	0.30	0.02	0.01	Open
40	-0.79	0.03	0.01	Open

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

Input File: 1319 Johnston.net
Max Day + Building F (14,000 L/min)

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.65	44.30	0.00	
EastConnect	0.00	123.65	44.30	0.00	
HYD-1	0.00	110.36	27.86	0.00	
HYD-2	77.80	101.25	18.25	0.00	
HYD-3	77.80	101.47	18.47	0.00	
HYD-4	77.80	100.21	17.31	0.00	
HYD-5	0.00	104.78	21.68	0.00	
HYD-6	0.00	106.58	23.28	0.00	
HYD-8	0.00	114.49	31.49	0.00	
BldgG	0.38	114.86	31.76	0.00	
BldgA	0.39	114.86	31.66	0.00	
BldgAGConnect	0.00	114.86	34.76	0.00	
HYD8Connect	0.00	114.49	34.39	0.00	
HYD1Connect	0.00	110.36	30.26	0.00	
HYD2Connect	0.00	102.98	22.88	0.00	
HYD3Connect	0.00	101.85	21.75	0.00	
20	0.00	101.88	21.78	0.00	
BldgFConnect	0.00	101.91	21.81	0.00	
BldgF	0.24	101.91	18.81	0.00	
HYD4Connect	0.00	101.94	21.84	0.00	
BldgEConnect	0.00	103.25	23.15	0.00	
BldgE	0.27	103.24	20.14	0.00	
HYD5Connect	0.00	104.78	24.68	0.00	
BldgCConnect	0.00	105.41	25.31	0.00	
BldgC	0.19	105.41	22.11	0.00	
HYD6Connect	0.00	106.58	26.48	0.00	
BldgDConnect	0.00	107.17	27.07	0.00	
BldgD	0.24	107.16	23.61	0.00	
HYD7Connect	0.00	109.57	29.47	0.00	
HYD-7	0.00	109.57	26.57	0.00	
BldgHConnect	0.00	101.93	21.83	0.00	
BldgH	0.30	101.93	18.83	0.00	
BldgB	0.16	105.25	22.15	0.00	
BldgBConnect	0.00	105.25	25.15	0.00	
West	-119.74	123.70	0.00	0.00	Reservoir
East	-115.83	123.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
1	119.74	1.69	10.40	Open
2	-23.66	0.33	0.52	Open
3	-115.83	1.64	9.79	Open
4	-92.17	2.93	54.26	Open
5	-91.40	2.91	53.42	Open
6	0.00	0.00	0.00	Open
7	-0.39	0.02	0.01	Open
8	0.38	0.02	0.01	Open
10	-91.40	2.91	53.42	Open
14	0.24	0.12	0.91	Open
15	91.16	2.90	53.16	Open
16	0.00	0.00	0.00	Open
17	91.16	2.90	53.16	Open
18	0.19	0.01	0.00	Open
20	0.00	0.00	0.00	Open
21	90.81	2.89	52.79	Open
22	0.27	0.14	1.13	Open
23	90.54	2.88	52.50	Open
24	77.80	4.40	192.04	Open
26	0.24	0.12	0.91	Open
27	12.20	0.39	1.28	Open
28	12.20	0.39	1.28	Open
29	77.80	4.40	192.03	Open
32	-77.80	4.40	192.04	Open
34	-143.40	4.56	123.02	Open
35	0.00	0.00	0.00	Open
36	-143.40	4.56	123.02	Open
37	0.00	0.00	0.00	Open
9	-65.60	2.09	28.90	Open
25	-12.44	0.40	1.33	Open
30	-12.74	0.41	1.40	Open
31	0.30	0.15	1.37	Open
33	-90.81	2.89	52.79	Open
38	-90.97	2.90	52.96	Open
39	0.16	0.01	0.00	Open
40	-91.40	2.91	53.42	Open

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*********************************************************************
*                            E P A N E T                            *
*                     Hydraulic and Water Quality                   *
*                     Analysis for Pipe Networks                    *
*                          Version 2.2                              *
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Input File: 1319 Johnston.net
Max Day + Building H (8,000 L/min)

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.68	44.33	0.00	
EastConnect	0.00	123.68	44.33	0.00	
HYD-1	0.00	119.24	36.74	0.00	
HYD-2	0.00	116.77	33.77	0.00	
HYD-3	66.70	114.87	31.87	0.00	
HYD-4	66.70	113.77	30.87	0.00	
HYD-5	0.00	116.19	33.09	0.00	
HYD-6	0.00	116.90	33.60	0.00	
HYD-8	0.00	120.02	37.02	0.00	
BldgG	0.38	120.17	37.07	0.00	
BldgA	0.39	120.17	36.97	0.00	
BldgAGConnect	0.00	120.17	40.07	0.00	
HYD8Connect	0.00	120.02	39.92	0.00	
HYD1Connect	0.00	119.24	39.14	0.00	
HYD2Connect	0.00	116.77	36.67	0.00	
HYD3Connect	0.00	115.16	35.06	0.00	
20	0.00	115.13	35.03	0.00	
BldgFConnect	0.00	115.09	34.99	0.00	
BldgF	0.24	115.09	31.99	0.00	
HYD4Connect	0.00	115.07	34.97	0.00	
BldgEConnect	0.00	115.59	35.49	0.00	
BldgE	0.27	115.57	32.47	0.00	
HYD5Connect	0.00	116.19	36.09	0.00	
BldgCConnect	0.00	116.43	36.33	0.00	
BldgC	0.19	116.43	33.13	0.00	
HYD6Connect	0.00	116.90	36.80	0.00	
BldgDConnect	0.00	117.13	37.03	0.00	
BldgD	0.24	117.12	33.57	0.00	
HYD7Connect	0.00	118.08	37.98	0.00	
HYD-7	0.00	118.08	35.08	0.00	
BldgHConnect	0.00	115.07	34.97	0.00	
BldgH	0.30	115.07	31.97	0.00	
BldgB	0.16	116.37	33.27	0.00	
BldgBConnect	0.00	116.37	36.27	0.00	
West	-68.53	123.70	0.00	0.00	Reservoir
East	-67.04	123.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	68.53	0.97	3.70	Open
2	-10.88	0.15	0.12	Open
3	-67.04	0.95	3.56	Open
4	-56.17	1.79	21.68	Open
5	-55.40	1.76	21.13	Open
6	0.00	0.00	0.00	Open
7	-0.39	0.02	0.01	Open
8	0.38	0.02	0.01	Open
10	-55.40	1.76	21.13	Open
14	0.24	0.12	0.91	Open
15	55.16	1.76	20.96	Open
16	0.00	0.00	0.00	Open
17	55.16	1.76	20.96	Open
18	0.19	0.01	0.00	Open
20	0.00	0.00	0.00	Open
21	54.81	1.74	20.72	Open
22	0.27	0.14	1.13	Open
23	54.54	1.74	20.53	Open
24	66.70	3.77	144.40	Open
26	0.24	0.12	0.91	Open
27	-12.70	0.40	1.38	Open
28	-12.70	0.40	1.38	Open
29	66.70	3.77	144.40	Open
32	0.00	0.00	0.00	Open
34	-79.40	2.53	41.17	Open
35	0.00	0.00	0.00	Open
36	-79.40	2.53	41.17	Open
37	0.00	0.00	0.00	Open
9	-79.40	2.53	41.17	Open
25	12.46	0.40	1.33	Open
30	12.16	0.39	1.27	Open
31	0.30	0.15	1.37	Open
33	-54.81	1.74	20.72	Open
38	-54.97	1.75	20.83	Open
39	0.16	0.01	0.00	Open
40	-55.40	1.76	21.13	Open

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*********************************************************************
*                            E P A N E T                            *
*                     Hydraulic and Water Quality                   *
*                     Analysis for Pipe Networks                    *
*                          Version 2.2                              *
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Input File: 1319 Johnston.net
Max Day + Building E (14,000 L/min)

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200
38	BldgBConnect	BldgCConnect	3	200

39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.65	44.30	0.00	
EastConnect	0.00	123.65	44.30	0.00	
HYD-1	0.00	112.14	29.64	0.00	
HYD-2	0.00	105.75	22.75	0.00	
HYD-3	77.80	101.21	18.21	0.00	
HYD-4	77.80	98.54	15.64	0.00	
HYD-5	77.80	98.96	15.86	0.00	
HYD-6	0.00	102.71	19.41	0.00	
HYD-8	0.00	112.42	29.42	0.00	
BldgG	0.38	112.88	29.78	0.00	
BldgA	0.39	112.88	29.68	0.00	
BldgAGConnect	0.00	112.88	32.78	0.00	
HYD8Connect	0.00	112.42	32.32	0.00	
HYD1Connect	0.00	112.14	32.04	0.00	
HYD2Connect	0.00	105.75	25.65	0.00	
HYD3Connect	0.00	101.59	21.49	0.00	
20	0.00	101.11	21.01	0.00	
BldgFConnect	0.00	100.59	20.49	0.00	
BldgF	0.24	100.59	17.49	0.00	
HYD4Connect	0.00	100.26	20.16	0.00	
BldgEConnect	0.00	100.37	20.27	0.00	
BldgE	0.27	100.36	17.26	0.00	
HYD5Connect	0.00	100.50	20.40	0.00	
BldgCConnect	0.00	101.28	21.18	0.00	
BldgC	0.19	101.28	17.98	0.00	
HYD6Connect	0.00	102.71	22.61	0.00	
BldgDConnect	0.00	103.43	23.33	0.00	
BldgD	0.24	103.43	19.88	0.00	
HYD7Connect	0.00	106.38	26.28	0.00	
HYD-7	0.00	106.38	23.38	0.00	
BldgHConnect	0.00	100.28	20.18	0.00	
BldgH	0.30	100.28	17.18	0.00	
BldgB	0.16	101.08	17.98	0.00	
BldgBConnect	0.00	101.08	20.98	0.00	
West	-118.54	123.70	0.00	0.00	Reservoir
East	-117.03	123.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	118.54	1.68	10.21	Open
2	-14.16	0.20	0.20	Open
3	-117.03	1.66	9.97	Open
4	-102.87	3.27	66.50	Open
5	-102.10	3.25	65.58	Open
6	0.00	0.00	0.00	Open
7	-0.39	0.02	0.01	Open
8	0.38	0.02	0.01	Open
10	-102.10	3.25	65.58	Open
14	0.24	0.12	0.91	Open
15	101.86	3.24	65.30	Open
16	0.00	0.00	0.00	Open
17	101.86	3.24	65.30	Open
18	0.19	0.01	0.00	Open
20	77.80	4.40	192.04	Open
21	23.71	0.75	4.39	Open
22	0.27	0.14	1.13	Open
23	23.44	0.75	4.30	Open
24	77.80	4.40	192.04	Open
26	0.24	0.12	0.91	Open
27	-54.90	1.75	20.78	Open
28	-54.90	1.75	20.78	Open
29	77.80	4.40	192.03	Open
32	0.00	0.00	0.00	Open
34	-132.70	4.22	106.56	Open
35	0.00	0.00	0.00	Open
36	-132.70	4.22	106.56	Open
37	0.00	0.00	0.00	Open
9	-132.70	4.22	106.56	Open
25	54.66	1.74	20.61	Open
30	54.36	1.73	20.40	Open
31	0.30	0.15	1.37	Open
33	-101.51	3.23	64.88	Open
38	-101.67	3.24	65.07	Open
39	0.16	0.01	0.00	Open
40	-102.10	3.25	65.58	Open

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*********************************************************************
*                            E P A N E T                            *
*                     Hydraulic and Water Quality                   *
*                     Analysis for Pipe Networks                    *
*                          Version 2.2                              *
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Input File: 1319 Johnston.net
Max Day + Building C (9,000 L/min)

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.68	44.33	0.00	
EastConnect	0.00	123.68	44.33	0.00	
HYD-1	0.00	119.63	37.13	0.00	
HYD-2	0.00	117.39	34.39	0.00	
HYD-3	0.00	115.93	32.93	0.00	
HYD-4	0.00	113.53	30.63	0.00	
HYD-5	75.00	110.11	27.01	0.00	
HYD-6	75.00	109.75	26.45	0.00	
HYD-8	0.00	117.15	34.15	0.00	
BldgG	0.38	117.42	34.32	0.00	
BldgA	0.39	117.42	34.22	0.00	
BldgAGConnect	0.00	117.42	37.32	0.00	
HYD8Connect	0.00	117.15	37.05	0.00	
HYD1Connect	0.00	119.63	39.53	0.00	
HYD2Connect	0.00	117.39	37.29	0.00	
HYD3Connect	0.00	115.93	35.83	0.00	
20	0.00	115.06	34.96	0.00	
BldgFConnect	0.00	114.13	34.03	0.00	
BldgF	0.24	114.12	31.02	0.00	
HYD4Connect	0.00	113.53	33.43	0.00	
BldgEConnect	0.00	112.61	32.51	0.00	
BldgE	0.27	112.60	29.50	0.00	
HYD5Connect	0.00	111.54	31.44	0.00	
BldgCConnect	0.00	111.54	31.44	0.00	
BldgC	0.19	111.54	28.24	0.00	
HYD6Connect	0.00	111.54	31.44	0.00	
BldgDConnect	0.00	111.96	31.86	0.00	
BldgD	0.24	111.95	28.40	0.00	
HYD7Connect	0.00	113.67	33.57	0.00	
HYD-7	0.00	113.67	30.67	0.00	
BldgHConnect	0.00	113.57	33.47	0.00	
BldgH	0.30	113.57	30.47	0.00	
BldgB	0.16	111.54	28.44	0.00	
BldgBConnect	0.00	111.54	31.44	0.00	
West	-76.08	123.70	0.00	0.00	Reservoir
East	-76.09	123.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	76.08	1.08	4.49	Open
2	0.64	0.01	0.00	Open
3	-76.09	1.08	4.49	Open
4	-76.72	2.44	38.63	Open
5	-75.95	2.42	37.92	Open
6	0.00	0.00	0.00	Open
7	-0.39	0.02	0.01	Open
8	0.38	0.02	0.01	Open
10	-75.95	2.42	37.92	Open
14	0.24	0.12	0.91	Open
15	75.71	2.41	37.70	Open
16	75.00	4.24	179.43	Open
17	0.71	0.02	0.01	Open
18	0.19	0.01	0.00	Open
20	75.00	4.24	179.43	Open
21	-74.64	2.38	36.71	Open
22	0.27	0.14	1.13	Open
23	-74.91	2.38	36.95	Open
24	0.00	0.00	0.00	Open
26	0.24	0.12	0.91	Open
27	-75.45	2.40	37.45	Open
28	-75.45	2.40	37.45	Open
29	0.00	0.00	0.00	Open
32	0.00	0.00	0.00	Open
34	-75.45	2.40	37.45	Open
35	0.00	0.00	0.00	Open
36	-75.45	2.40	37.45	Open
37	0.00	0.00	0.00	Open
9	-75.45	2.40	37.45	Open
25	75.21	2.39	37.23	Open
30	74.91	2.38	36.95	Open
31	0.30	0.15	1.37	Open
33	-0.36	0.01	0.00	Open
38	-0.52	0.02	0.01	Open
39	0.16	0.01	0.00	Open
40	-75.95	2.42	37.92	Open

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

Input File: 1319 Johnston.net
Max Day + Building D (12,000 L/min)

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.66	44.31	0.00	
EastConnect	0.00	123.66	44.31	0.00	
HYD-1	0.00	117.38	34.88	0.00	
HYD-2	0.00	113.89	30.89	0.00	
HYD-3	0.00	111.62	28.62	0.00	
HYD-4	0.00	107.90	25.00	0.00	
HYD-5	66.70	103.65	20.55	0.00	
HYD-6	66.70	103.16	19.86	0.00	
HYD-8	0.00	111.67	28.67	0.00	
BldgG	0.38	112.16	29.06	0.00	
BldgA	0.39	112.16	28.96	0.00	
BldgAGConnect	0.00	112.16	32.06	0.00	
HYD8Connect	0.00	111.67	31.57	0.00	
HYD1Connect	0.00	117.38	37.28	0.00	
HYD2Connect	0.00	113.89	33.79	0.00	
HYD3Connect	0.00	111.62	31.52	0.00	
20	0.00	110.28	30.18	0.00	
BldgFConnect	0.00	108.83	28.73	0.00	
BldgF	0.24	108.82	25.72	0.00	
HYD4Connect	0.00	107.90	27.80	0.00	
BldgEConnect	0.00	106.47	26.37	0.00	
BldgE	0.27	106.45	23.35	0.00	
HYD5Connect	0.00	104.81	24.71	0.00	
BldgCConnect	0.00	104.73	24.63	0.00	
BldgC	0.19	104.73	21.43	0.00	
HYD6Connect	0.00	104.60	24.50	0.00	
BldgDConnect	0.00	104.72	24.62	0.00	
BldgD	0.24	104.72	21.17	0.00	
HYD7Connect	0.00	105.22	25.12	0.00	
HYD-7	66.70	104.36	21.36	0.00	
BldgHConnect	0.00	107.96	27.86	0.00	
BldgH	0.30	107.96	24.86	0.00	
BldgB	0.16	104.75	21.65	0.00	
BldgBConnect	0.00	104.75	24.65	0.00	
West	-101.00	123.70	0.00	0.00	Reservoir
East	-101.27	123.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	101.00	1.43	7.59	Open
2	5.30	0.08	0.03	Open
3	-101.27	1.43	7.63	Open
4	-106.58	3.39	71.01	Open
5	-105.81	3.37	70.06	Open
6	0.00	0.00	0.00	Open
7	-0.39	0.02	0.01	Open
8	0.38	0.02	0.01	Open
10	-105.81	3.37	70.06	Open
14	0.24	0.12	0.91	Open
15	38.87	1.24	10.96	Open
16	66.70	3.77	144.40	Open
17	-27.83	0.89	5.91	Open
18	0.19	0.01	0.00	Open
20	66.70	3.77	144.40	Open
21	-94.88	3.02	57.25	Open
22	0.27	0.14	1.13	Open
23	-95.15	3.03	57.56	Open
24	0.00	0.00	0.00	Open
26	0.24	0.12	0.91	Open
27	-95.69	3.05	58.16	Open
28	-95.69	3.05	58.16	Open
29	0.00	0.00	0.00	Open
32	0.00	0.00	0.00	Open
34	-95.69	3.05	58.16	Open
35	0.00	0.00	0.00	Open
36	-95.69	3.05	58.16	Open
37	66.70	3.77	144.40	Open
9	-95.69	3.05	58.16	Open
25	95.45	3.04	57.89	Open
30	95.15	3.03	57.55	Open
31	0.30	0.15	1.37	Open
33	28.18	0.90	6.05	Open
38	28.02	0.89	5.98	Open
39	0.16	0.01	0.00	Open
40	-39.11	1.24	11.09	Open

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

Input File: 1319 Johnston.net
Max Day + Building G or A (7,000 L/min)

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	West	WestConnect	5	300
2	WestConnect	EastConnect	6	300
3	EastConnect	East	5	300
4	BldgAGConnect	EastConnect	162	200
5	HYD8Connect	BldgAGConnect	7	200
6	HYD8Connect	HYD-8	5	150
7	BldgA	BldgAGConnect	18	150
8	BldgAGConnect	BldgG	29	150
10	HYD7Connect	HYD8Connect	92	200
14	BldgDConnect	BldgD	8	50
15	BldgDConnect	HYD6Connect	11	200
16	HYD6Connect	HYD-6	10	150
17	HYD6Connect	BldgCConnect	22	200
18	BldgCConnect	BldgC	6	150
20	HYD5Connect	HYD-5	8	150
21	HYD5Connect	BldgEConnect	29	200
22	BldgEConnect	BldgE	12	50
23	BldgEConnect	HYD4Connect	25	200
24	HYD4Connect	HYD-4	9	150
26	BldgFConnect	BldgF	9	50
27	BldgFConnect	20	25	200
28	20	HYD3Connect	23	200
29	HYD3Connect	HYD-3	2	150
32	HYD-2	HYD2Connect	9	150
34	HYD2Connect	HYD1Connect	60	200
35	HYD1Connect	HYD-1	4	150
36	HYD1Connect	WestConnect	108	200
37	HYD7Connect	HYD-7	6	150
9	HYD3Connect	HYD2Connect	39	200
25	BldgFConnect	BldgHConnect	15	200
30	BldgHConnect	HYD4Connect	1	200
31	BldgHConnect	BldgH	3	50
33	HYD5Connect	BldgBConnect	9	200

38	BldgBConnect	BldgCConnect	3	200
39	BldgBConnect	BldgB	9	150
40	BldgDConnect	HYD7Connect	45	200

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
WestConnect	0.00	123.69	44.34	0.00	
EastConnect	0.00	123.69	44.34	0.00	
HYD-1	58.30	120.11	37.61	0.00	
HYD-2	0.00	120.53	37.53	0.00	
HYD-3	0.00	120.51	37.51	0.00	
HYD-4	0.00	120.48	37.58	0.00	
HYD-5	0.00	120.45	37.35	0.00	
HYD-6	0.00	120.44	37.14	0.00	
HYD-8	58.30	119.83	36.83	0.00	
BldgG	0.38	120.52	37.42	0.00	
BldgA	0.39	120.52	37.32	0.00	
BldgAGConnect	0.00	120.52	40.42	0.00	
HYD8Connect	0.00	120.39	40.29	0.00	
HYD1Connect	0.00	120.56	40.46	0.00	
HYD2Connect	0.00	120.53	40.43	0.00	
HYD3Connect	0.00	120.51	40.41	0.00	
20	0.00	120.50	40.40	0.00	
BldgFConnect	0.00	120.48	40.38	0.00	
BldgF	0.24	120.47	37.37	0.00	
HYD4Connect	0.00	120.48	40.38	0.00	
BldgEConnect	0.00	120.46	40.36	0.00	
BldgE	0.27	120.45	37.35	0.00	
HYD5Connect	0.00	120.45	40.35	0.00	
BldgCConnect	0.00	120.45	40.35	0.00	
BldgC	0.19	120.45	37.15	0.00	
HYD6Connect	0.00	120.44	40.34	0.00	
BldgDConnect	0.00	120.44	40.34	0.00	
BldgD	0.24	120.43	36.88	0.00	
HYD7Connect	0.00	120.42	40.32	0.00	
HYD-7	0.00	120.42	37.42	0.00	
BldgHConnect	0.00	120.48	40.38	0.00	
BldgH	0.30	120.47	37.37	0.00	
BldgB	0.16	120.45	37.35	0.00	
BldgBConnect	0.00	120.45	40.35	0.00	
West	-59.66	123.70	0.00	0.00	Reservoir
East	-59.11	123.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	59.66	0.84	2.86	Open
2	-6.02	0.09	0.04	Open
3	-59.11	0.84	2.81	Open
4	-53.09	1.69	19.53	Open
5	-52.32	1.67	19.01	Open
6	58.30	3.30	112.54	Open
7	-0.39	0.02	0.01	Open
8	0.38	0.02	0.01	Open
10	5.98	0.19	0.34	Open
14	0.24	0.12	0.91	Open
15	-6.22	0.20	0.37	Open
16	0.00	0.00	0.00	Open
17	-6.22	0.20	0.37	Open
18	0.19	0.01	0.00	Open
20	0.00	0.00	0.00	Open
21	-6.57	0.21	0.41	Open
22	0.27	0.14	1.13	Open
23	-6.84	0.22	0.44	Open
24	0.00	0.00	0.00	Open
26	0.24	0.12	0.91	Open
27	-7.38	0.23	0.51	Open
28	-7.38	0.23	0.51	Open
29	0.00	0.00	0.00	Open
32	0.00	0.00	0.00	Open
34	-7.38	0.23	0.51	Open
35	58.30	3.30	112.54	Open
36	-65.68	2.09	28.97	Open
37	0.00	0.00	0.00	Open
9	-7.38	0.23	0.51	Open
25	7.14	0.23	0.48	Open
30	6.84	0.22	0.44	Open
31	0.30	0.15	1.37	Open
33	6.57	0.21	0.41	Open
38	6.41	0.20	0.39	Open
39	0.16	0.01	0.00	Open
40	5.98	0.19	0.34	Open

Appendix D

Sanitary Sewer Design Sheet

Confirmation of Ex. Sewer Capacity

SANITARY SEWER DESIGN SHEET
for
1319 JOHNSTON RD., CITY OF OTTAWA

Robinson
Land Development

LOCATION				RESIDENTIAL FLOW			COMM./INST. FLOW		INDUSTRIAL FLOW						CUM. PEAK DESIGN FLOW (L/s)	PIPE							
STREET	FROM MH	TO MH	DRAINAGE AREA	PEAK FACTOR	PEAK POP. FLOW (L/s)	EXTRAN. FLOW (L/s)	PEAK FACTOR	PEAK FLOW (L/s)	DRAINAGE AREA (ha)	CUM. DRAINAGE AREA (ha)	AVG FLOW (L/s)	PEAK FLOW (L/s)	EXTRAN. FLOW (L/s)	INDIV. PEAK FLOW (L/s)		LENGTH (m)	DIAMETER (mm)	UPSTREAM MH INV. (m)	DNSTREAM MH INV. (m)	SLOPE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	EXCESS CAPACITY (L/s)	PERCENT FULL
	SANMH107	SANMH106	BLDG D						0.50	0.50	0.20	1.42	0.17	1.58	**1.58**	20.0	250.00	80.07	79.96	0.55%	44.15	0.90	42.56	4%
	SANMH106	SANMH105	BLDG B+C						0.65	1.15	0.26	1.84	0.21	2.06	**3.64**	30.4	250.00	79.89	79.73	0.53%	43.19	0.88	39.55	8%
	SANMH105	SANMH104							0.00	1.15	0.00	0.00	0.00	0.00	**3.64**	14.4	250.00	79.70	79.63	0.49%	41.50	0.85	37.86	9%
	SANMH104	SANMH103	BLDG E,F+H						1.24	2.39	0.50	3.52	0.41	3.93	**7.57**	71.0	250.00	79.60	79.21	0.55%	44.12	0.90	36.55	17%
	SANMH103	SANMH102							0.00	2.39	0.00	0.00	0.00	0.00	**7.57**	63.1	250.00	79.15	78.85	0.48%	41.05	0.84	33.48	18%
	SANMH102	SANMH101							0.00	2.39	0.00	0.00	0.00	0.00	**7.57**	70.8	250.00	78.83	78.50	0.47%	40.64	0.83	33.07	19%
	SANMH108	SANMH101	BLDG G+A						1.12	1.12	0.45	3.18	0.37	3.55	**3.55**	49.6	250.00	80.65	80.40	0.50%	42.26	0.86	38.72	8%
	SANMH101	SANMH100							0.00	3.51	0.00	0.00	0.00	0.00	**11.11**	96.7	250.00	78.44	78.00	0.46%	40.15	0.82	29.04	28%
Johnston Road	SANMH100	SANMH99							0.00	3.51	0.00	0.00	0.00	0.00	**11.11**	15.6	250.00	76.50	76.08	2.69%	97.67	1.99	86.56	11%
									3.51	3.51	1.22	8.54	0.99	9.53	**11.11**									

DESIGN PARAMETERS

Average Daily Flow =	280	L/cap/day
Comm./Inst. Flow =	28000	L/ha/day
Industrial Flow =	35000	L/ha/day
Maximum Residential Peak Factor =	4.0	
Harmon - Correction Factor (K) =	0.8	
Institutional/Commercial Peak Factor =	1.5	
Industrial Peak Factor =	7	per OSDG App. 4-B
Extraneous Flow =	0.33	L/s/ha
Minimum Velocity =	0.6	m/s
Maximum Velocity =	3.0	m/s

2024-07-26

Stephen McCaughey

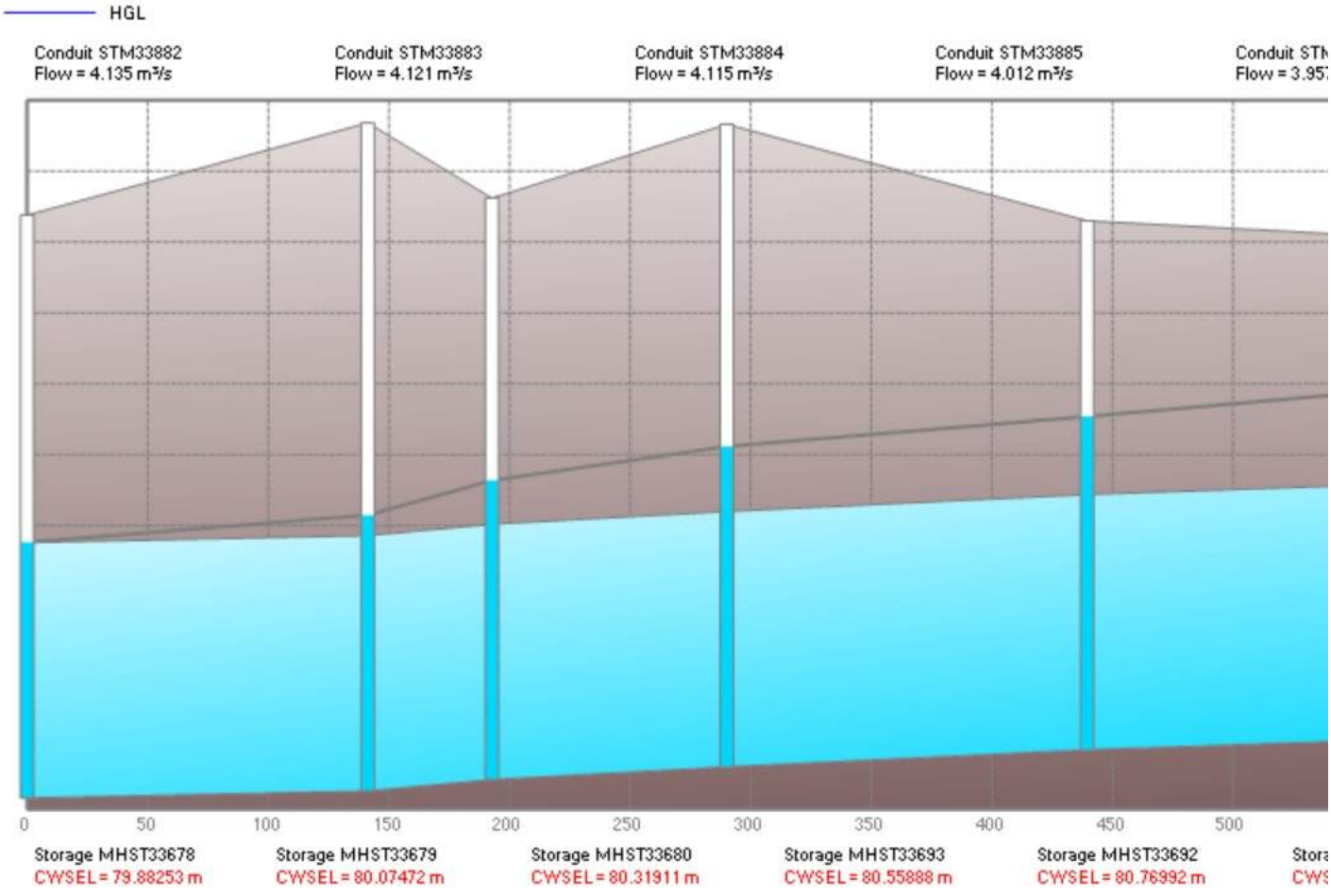
From: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Sent: July 13, 2023 3:18 PM
To: Stephen McCaughey
Subject: RE: 1319 Johnston Rd - SPA criteria

Follow Up Flag: Follow up
Flag Status: Flagged

"CAUTION: External Sender"
Hi Stephen,

I have received responses from various internal groups at the City regarding the two (2) questions you had:

1) Sanitary Sewer Capacity: There are no capacity concerns based on your proposed sanitary contributions.
2) Please see the inline image below of the City's hydraulic model of the Hydraulic Grade Line (HGL) during the 1:100 year event for the storm trunk sewer running through 2059 Artistic Place



Note that the following storm structure IDs are running through the site:

- MHST33680 to MHST33693 (1800 mm dia. Conc)
- MHST33693 to MHST33692 (1800 mm dia. Conc)

Appendix E

Confirmation of SWM Criteria

1800mm Storm HGL

Pre-Development Calculations

Storm Sewer Design Sheet

Storage Volume Calculations

ICD Calculations

Infiltration Calculations

Underground Storage Tank Information

ICD Information

OGS Cutsheets

Stephen McCaughey

From: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Sent: July 5, 2023 12:22 PM
To: Stephen McCaughey
Subject: RE: 1319 Johnston Rd - SPA criteria

"CAUTION: External Sender"
Hi Stephen,

I've provided my responses in red to your questions in the body of the email below. Feel free to reach out if you need further clarification.

Thank you,

Tyler Cassidy, P.Eng
Infrastructure Project Manager,
Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique - South Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 12977, Tyler.Cassidy@ottawa.ca

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: July 04, 2023 11:44 AM
To: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Subject: 1319 Johnston Rd - SPA criteria

Hi Tyler,

I understand you're the engineering reviewer for the proposed 1319 Johnston Rd. I will be following up with sanitary and water demand estimates but I wanted to confirm about SWM criteria, particularly in reference to the 2003 Sawmill Creek Subwatershed Study:

- Is the pre-development runoff coefficient to be estimated from current land-use or as defined by the Study?
  Please base the pre-development runoff coefficient on the existing land-use, up to a maximum of C=0.5.
- If I am understanding correctly, the peak flow rate is to be limited to pre-development rate for each storm condition from 2-yr to 100-yr (2-yr post- to pre-development, 50-yr post- to pre-development, 100-yr post- to pre-development) as opposed to bringing the 100-yr post-development down to the 2-yr pre-development. Is this correct?
  The 2-year, 5-year & 100-year post-development peak flows are to be controlled to the 2-year pre-development peak flow. Any flows exceeding the 2-year pre-development peak flow (for all storms up to and including the 100-year storm) are to be stored on site.
- Are there any infiltration targets or requirements? We are awaiting geotechnical information currently but there is some potential about elevated groundwater levels making infiltration challenging.

There are infiltration targets based on the Sawmill Creek Subwatershed Study (see section 9.3: Creek Baseflow Protection). In general, we would like to see the capturing and infiltration of runoff from ~40% of hard surfaces. If groundwater conditions make certain infiltration measures unfeasible (exfiltration pipe systems), then total impervious area on site may need to be limited.

- Quality control is to be “enhanced” level (80% TSS removal)
  That is correct.

Thank you,

Stephen McCaughey, P.Eng. | Project Engineer – Land Development
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

Stephen McCaughey

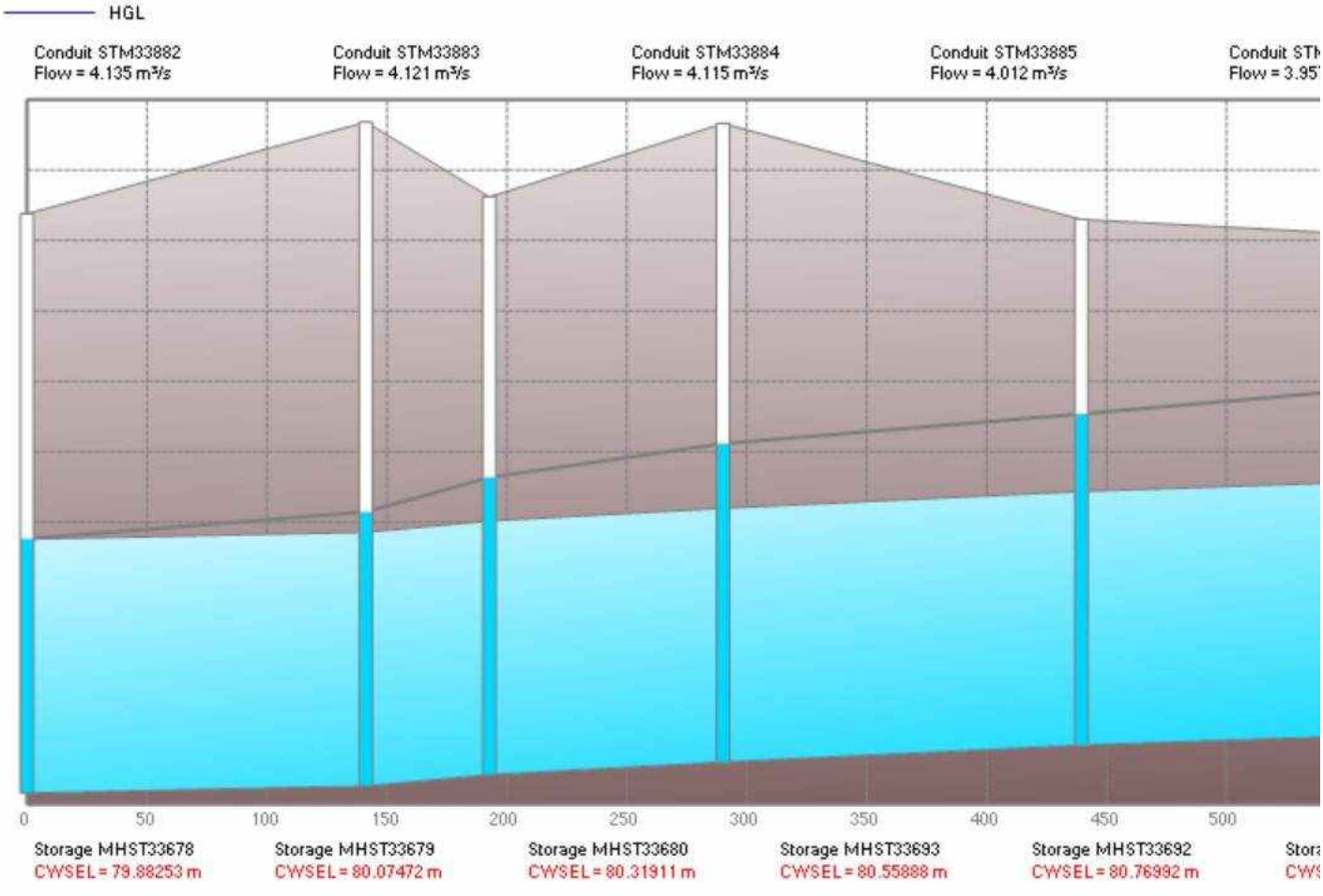
From: Cassidy, Tyler <tyler.cassidy@ottawa.ca>
Sent: July 13, 2023 3:18 PM
To: Stephen McCaughey
Subject: RE: 1319 Johnston Rd - SPA criteria

Follow Up Flag: Follow up
Flag Status: Flagged

"CAUTION: External Sender"
Hi Stephen,

I have received responses from various internal groups at the City regarding the two (2) questions you had:

1) Sanitary Sewer Capacity: There are no capacity concerns based on your proposed sanitary contributions.
2) Please see the inline image below of the City's hydraulic model of the Hydraulic Grade Line (HGL) during the 1:100 year event for the storm trunk sewer running through 2059 Artistic Place



Note that the following storm structure IDs are running through the site:

- MHST33680 to MHST33693 (1800 mm dia. Conc)
- MHST33693 to MHST33692 (1800 mm dia. Conc)

	Impervious	Pervious	Gravel
C	0.9	0.2	0.7

Overall Runoff Coefficient Calculations

Development Condition	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)
PRE		3.70		3.70	0.20	0.25
POST	3.52	0.15	0.03	3.70	0.87	1.00

Sub-Drainage Area Runoff Coefficient Calculations

Drainage Area ID	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)
1	0.65	0.005		0.65	0.89	1.00
2	0.38	0.000		0.38	0.90	1.00
3	0.18	0.000		0.18	0.90	1.00
4	0.11	0.005		0.12	0.87	1.00
5	0.24	0.024		0.27	0.84	1.00
6	0.11	0.005		0.12	0.87	1.00
7	0.12	0.008		0.12	0.85	1.00
8	0.22	0.000		0.22	0.90	1.00
9	0.22	0.000		0.22	0.90	1.00
10	0.25	0.003		0.25	0.89	1.00
11	0.000	0.000	0.03	0.03	0.70	0.88
12	0.06	0.000		0.06	0.90	1.00
13	0.19	0.000		0.19	0.90	1.00
14	0.08	0.000		0.08	0.90	1.00
15	0.17	0.000		0.17	0.90	1.00
16	0.09	0.014		0.10	0.80	1.00
17	0.13	0.015		0.15	0.83	1.00
18	0.28	0.075		0.35	0.75	0.94

Uncontrolled Flow Area Runoff Coefficient Calculations

Drainage Area ID	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)
U1	0.05	0.00	0.00	0.05	0.90	1.00

Notes:

1. Runoff Coefficients: Cimp=0.90, Cper=0.20, Cgravel=0.80
2. C (100 YR) = C + 25% (to a mximum of 1.0)

Robinson Consultants

Pre-Development Flow Calculations

Given:

Area (ha) = 3.70

C = 0.20

C (100 YR) = 0.25

Return Period	Time of Concentration (min)	Rainfall Intensity, i (mm/hr)	Flow, Q (L/s)
2 Year	15.0	61.8	127.0
5 Year	15.0	83.6	171.8
100 Year	15.0	142.9	367.3

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).
3. C (100 YR) = C + 25% (to a maximum of 1.0)
4. Time of concentration assumed as 15 minutes for greenfield

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Uncontrolled Flow Calculations

U1 (Entranceway)

Given:

Area (ha) = 0.05

C = 0.90

C (100 YR) = 1.00

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)
2 Year	10	76.8	10.4
5 Year	10	104.2	14.1
100 Year	10	178.6	26.8

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

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Allowable Flow Calculations

Given:

Area (ha) = 3.70

C = 0.87

C (100 YR)[*3] = 1.00

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)	Allowable Release Rate[*4] (L/s)
2 Year	10	76.8	686.6	116.6
5 Year	10	104.2	931.4	112.9
100 Year	10	178.6	1835.9	100.2

Notes:

1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).
3. C (100 YR) = C + 25% (Max. 1.0)
4. Allowable Release Rate = 2-Year Pre-Development Flow less Uncontrolled Flow

	Impervious	Pervious	Gravel
C	0.9	0.2	0.7

Runoff Coefficient Calculations

Drainage Area ID	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)	Percent Impervious (%)
1	0.65	0.005		0.65	0.89	1.00	99.2
2	0.38			0.38	0.90	1.00	100.0
3	0.18			0.18	0.90	1.00	100.0
4	0.11	0.005		0.12	0.87	1.00	95.8
5	0.24	0.024		0.27	0.84	1.00	91.0
6	0.11	0.005		0.12	0.87	1.00	95.8
7	0.12	0.008		0.12	0.85	1.00	93.5
8	0.22			0.22	0.90	1.00	100.0
9	0.22			0.22	0.90	1.00	100.0
10	0.25	0.003		0.25	0.89	1.00	98.8
11	0.00		0.03	0.03	0.70	0.88	100.0
12	0.06			0.06	0.90	1.00	100.0
13	0.19			0.19	0.90	1.00	100.0
14	0.08			0.08	0.90	1.00	100.0
15	0.17			0.17	0.90	1.00	100.0
16	0.09	0.014		0.10	0.80	1.00	86.0
17	0.13	0.015		0.15	0.83	1.00	89.8
18	0.28	0.075		0.35	0.75	0.94	78.7
TOTAL DEVELOPMENT	**3.46**	**0.15**	**0.03**	**3.64**	**0.87**	**1.00**	**95.8**

STORM SEWER DESIGN SHEET
for
1319 JOHNSTON ROAD, OTTAWA

Robinson Consultants

LOCATION			2 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	2 YEAR RAINFALL INTENSITY (mm/hr)	2 YEAR PEAK FLOW (L/s)	DESIGN PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
BUILDING A																			
17	227	226	0.15	0.83	0.34	0.34	10.00	76.81	26.01	26.01	300	81.20	80.90	1.30	23.1	110.31	1.56	0.25	24%
	226	223	0.00	0.00	0.00	0.34	10.25	75.87	25.69	25.69	300	80.84	80.75	0.52	17.3	69.82	0.99	0.29	37%
16	225	224	0.10	0.80	0.22	0.22	10.00	76.81	17.12	17.12	300	81.15	80.89	0.34	76.9	56.28	0.80	1.61	30%
	224	223	0.00	0.00	0.00	0.22	11.61	71.13	15.86	15.86	300	80.83	80.75	0.36	22.0	58.38	0.83	0.44	27%
15	223	POND	0.17	0.90	0.43	0.99	12.05	69.73	69.16	69.16	375	80.67	80.60	0.45	15.7	117.19	1.06	0.25	59%
18	POND	222	0.35	0.75	0.73	1.73	12.30	68.97	119.09	119.09	250	80.60	80.08	5.00	10.4	133.11	2.71	0.06	89%
	222	EX. STMMH	0.00	0.00	0.00	1.73	12.36	68.78	118.76	118.76	250	80.05	79.85	5.00	4.0	133.11	2.71	0.02	89%
MAIN DRAINAGE AREA																			
1	221	TANK	0.65	0.89	1.62	1.62	10.00	76.81	124.16	124.16	375	80.84	80.77	1.04	6.7	179.39	1.62	0.07	69%
14	220	218	0.08	0.90	0.19	0.19	10.00	76.81	14.80	14.80	300	81.24	81.15	0.36	25.0	58.08	0.82	0.51	25%
13	219	218	0.19	0.90	0.47	0.47	10.00	76.81	36.32	36.32	300	81.28	81.15	0.35	37.5	56.99	0.81	0.78	64%
	218	217	0.00	0.00	0.00	0.67	10.78	73.95	49.22	49.22	375	81.08	81.00	0.27	29.8	90.94	0.82	0.60	54%
12	217	216	0.06	0.90	0.15	0.81	11.38	71.89	58.28	58.28	450	80.92	80.84	0.20	40.0	127.63	0.80	0.83	46%
	216	TANK	0.00	0.00	0.00	0.81	12.21	69.25	56.14	56.14	450	80.81	80.77	0.26	15.3	145.92	0.92	0.28	38%
11	215	TANK	0.03	0.70	0.05	0.05	10.00	76.81	4.04	4.04	250	80.87	80.77	0.58	17.3	45.26	0.92	0.31	9%
10	214	212	0.25	0.89	0.63	0.63	10.00	76.81	48.27	48.27	375	81.21	81.11	0.27	36.9	91.37	0.83	0.74	53%
9	213	212	0.22	0.90	0.55	0.55	10.00	76.81	41.89	41.89	375	81.21	81.11	0.26	38.2	89.80	0.81	0.78	47%
	212	210	0.00	0.00	0.00	1.17	10.78	73.92	86.78	86.78	450	81.04	80.96	0.21	37.5	131.82	0.83	0.75	66%
8	211	210	0.22	0.90	0.55	0.55	10.00	76.81	41.89	41.89	375	81.23	81.04	0.52	36.5	126.63	1.15	0.53	33%
7	210	209	0.12	0.85	0.29	2.01	11.54	71.37	143.73	143.73	450	80.96	80.87	0.37	24.3	173.69	1.09	0.37	83%
	209	TANK	0.00	0.00	0.00	2.01	11.91	70.18	141.34	141.34	525	80.80	80.77	0.22	13.4	203.69	0.94	0.24	69%
6	208	206	0.12	0.87	0.29	0.29	10.00	76.81	21.93	21.93	300	81.20	81.05	0.56	26.8	72.42	1.02	0.44	30%
5	207	206	0.27	0.84	0.62	0.62	10.00	76.81	47.72	47.72	300	81.30	81.05	0.60	41.9	74.77	1.06	0.66	64%
	206	205	0.00	0.00	0.00	0.91	10.66	74.36	67.43	67.43	375	80.99	80.92	0.61	11.4	137.53	1.25	0.15	49%
4	205	TANK	0.12	0.87	0.29	1.19	10.81	73.82	88.02	88.02	450	80.85	80.77	0.41	19.6	182.33	1.15	0.28	48%
3	204	203	0.18	0.90	0.45	0.45	10.00	76.81	34.40	34.40	300	81.35	80.92	0.75	57.1	84.00	1.19	0.80	41%
2	203	TANK	0.38	0.90	0.94	1.39	10.80	73.86	102.75	102.75	450	80.80	80.77	0.44	6.8	189.56	1.19	0.10	54%
	TANK	202	0.00	0.00	0.00	7.08	12.49	68.41	484.18	484.18	525	80.77	80.70	1.94	3.6	600.30	2.77	0.02	81%
	202	201	0.00	0.00	0.00	7.08	12.51	68.35	483.73	483.73	525	80.68	80.57	1.96	5.6	603.35	2.79	0.03	80%
	201	200	0.00	0.00	0.00	7.08	12.54	68.25	483.03	483.03	525	80.54	80.39	1.97	7.6	604.80	2.79	0.05	80%
			3.64																

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Peak flows calculated using the Rational Method.
3. Manning's roughness coefficient = 0.013
4. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)

STORM SEWER DESIGN SHEET
for
1319 JOHNSTON ROAD, OTTAWA

Robinson Consultants

LOCATION			5 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	5 YEAR RAINFALL INTENSITY (mm/hr)	5 YEAR PEAK FLOW (L/s)	DESIGN PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
BUILDING A																			
17	227	226	0.15	0.83	0.34	0.34	10.00	104.19	35.28	35.28	300	81.20	80.90	1.30	23.1	110.31	1.56	0.25	32%
	226	223	0.00	0.00	0.00	0.34	10.25	102.91	34.84	34.84	300	80.84	80.75	0.52	17.3	69.82	0.99	0.29	50%
16	225	224	0.10	0.80	0.22	0.22	10.00	104.19	23.23	23.23	300	81.15	80.89	0.34	76.9	56.28	0.80	1.61	41%
	224	223	0.00	0.00	0.00	0.22	11.61	96.40	21.49	21.49	300	80.83	80.75	0.36	22.0	58.38	0.83	0.44	37%
15	223	POND	0.17	0.90	0.43	0.99	12.05	94.47	93.70	93.70	375	80.67	80.60	0.45	15.7	117.19	1.06	0.25	80%
18	POND	222	0.35	0.75	0.73	1.73	12.30	93.43	161.33	*8.70*	250	80.60	80.08	5.00	10.4	133.11	2.71	0.06	7%
	222	EX. STMMH	0.00	0.00	0.00	1.73	12.36	93.17	160.87	*8.70*	250	80.05	79.85	5.00	4.0	133.11	2.71	0.02	7%
MAIN DRAINAGE AREA																			
1	221	TANK	0.65	0.89	1.62	1.62	10.00	104.19	168.44	168.44	375	80.84	80.77	1.04	6.7	179.39	1.62	0.07	94%
14	220	218	0.08	0.90	0.19	0.19	10.00	104.19	20.07	20.07	300	81.24	81.15	0.36	25.0	58.08	0.82	0.51	35%
13	219	218	0.19	0.90	0.47	0.47	10.00	104.19	49.27	49.27	300	81.28	81.15	0.35	37.5	56.99	0.81	0.78	86%
	218	217	0.00	0.00	0.00	0.67	10.78	100.27	66.73	66.73	375	81.08	81.00	0.27	29.8	90.94	0.82	0.60	73%
12	217	216	0.06	0.90	0.15	0.81	11.38	97.44	78.99	78.99	450	80.92	80.84	0.20	40.0	127.63	0.80	0.83	62%
	216	TANK	0.00	0.00	0.00	0.81	12.21	93.81	76.05	76.05	450	80.81	80.77	0.26	15.3	145.92	0.92	0.28	52%
11	215	TANK	0.03	0.70	0.05	0.05	10.00	104.19	5.47	5.47	250	80.87	80.77	0.58	17.3	45.26	0.92	0.31	12%
10	214	212	0.25	0.89	0.63	0.63	10.00	104.19	65.48	65.48	375	81.21	81.11	0.27	36.9	91.37	0.83	0.74	72%
9	213	212	0.22	0.90	0.55	0.55	10.00	104.19	56.83	56.83	375	81.21	81.11	0.26	38.2	89.80	0.81	0.78	63%
	212	210	0.00	0.00	0.00	1.17	10.78	100.23	117.66	117.66	450	81.04	80.96	0.21	37.5	131.82	0.83	0.75	89%
8	211	210	0.22	0.90	0.55	0.55	10.00	104.19	56.83	56.83	375	81.23	81.04	0.52	36.5	126.63	1.15	0.53	45%
7	210	209	0.12	0.85	0.29	2.01	11.54	96.72	194.79	194.79	450	80.96	80.87	0.37	24.3	173.69	1.09	0.37	112%
	209	TANK	0.00	0.00	0.00	2.01	11.91	95.09	191.51	191.51	525	80.80	80.77	0.22	13.4	203.69	0.94	0.24	94%
6	208	206	0.12	0.87	0.29	0.29	10.00	104.19	29.75	29.75	300	81.20	81.05	0.56	26.8	72.42	1.02	0.44	41%
5	207	206	0.27	0.84	0.62	0.62	10.00	104.19	64.74	64.74	300	81.30	81.05	0.60	41.9	74.77	1.06	0.66	87%
	206	205	0.00	0.00	0.00	0.91	10.66	100.83	91.44	91.44	375	80.99	80.92	0.61	11.4	137.53	1.25	0.15	66%
4	205	TANK	0.12	0.87	0.29	1.19	10.81	100.09	119.34	119.34	450	80.85	80.77	0.41	19.6	182.33	1.15	0.28	65%
3	204	203	0.18	0.90	0.45	0.45	10.00	104.19	46.66	46.66	300	81.35	80.92	0.75	57.1	84.00	1.19	0.80	56%
2	203	TANK	0.38	0.90	0.94	1.39	10.80	100.14	139.31	139.31	450	80.80	80.77	0.44	6.8	189.56	1.19	0.10	73%
	TANK	202	0.00	0.00	0.00	7.08	12.49	92.67	655.81	*91.08*	525	80.77	80.70	1.94	3.6	600.30	2.77	0.02	15%
	202	201	0.00	0.00	0.00	7.08	12.51	92.58	655.19	*91.08*	525	80.68	80.57	1.96	5.6	603.35	2.79	0.03	15%
	201	200	0.00	0.00	0.00	7.08	12.54	92.44	654.23	*91.08*	525	80.54	80.39	1.97	7.6	604.80	2.79	0.05	15%
			3.64																

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Peak flows calculated using the Rational Method.
3. Manning's roughness coefficient = 0.013
4. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
5. Design Peak Flow modified by ICD:
   POND OUT 8.7 L/s
   STMMH202 91.1 L/s

1319 Johnston Road, Ottawa
23034

STORM SEWER DESIGN SHEET
for
1319 JOHNSTON ROAD, OTTAWA

Robinson Consultants

LOCATION			100 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	100 YEAR RAINFALL INTENSITY (mm/hr)	100 YEAR PEAK FLOW (L/s)	DESIGN PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
BUILDING A																			
17	227	226	0.15	1.00	0.41	0.41	10.00	178.56	72.97	72.97	300	81.20	80.90	1.30	23.1	110.31	1.56	0.25	66%
	226	223	0.00	0.00	0.00	0.41	10.25	176.33	72.06	72.06	300	80.84	80.75	0.52	17.3	69.82	0.99	0.29	103%
16	225	224	0.10	1.00	0.28	0.28	10.00	178.56	49.64	49.64	300	81.15	80.89	0.34	76.9	56.28	0.80	1.61	88%
	224	223	0.00	0.00	0.00	0.28	11.61	165.07	45.89	45.89	300	80.83	80.75	0.36	22.0	58.38	0.83	0.44	79%
15	223	POND	0.17	1.00	0.48	1.16	12.05	161.74	188.40	188.40	375	80.67	80.60	0.45	15.7	117.19	1.06	0.25	161%
18	POND	222	0.35	0.94	0.92	2.08	12.30	159.95	333.22	*8.7*	250	80.60	80.08	5.00	10.4	133.11	2.71	0.06	7%
	222	EX. STMMH	0.00	0.00	0.00	2.08	12.36	159.50	332.27	*8.7*	250	80.05	79.85	5.00	4.0	133.11	2.71	0.02	7%
MAIN DRAINAGE AREA																			
1	221	TANK	0.65	1.00	1.81	1.81	10.00	178.56	322.66	322.66	375	80.84	80.77	1.04	6.7	179.39	1.62	0.07	180%
14	220	218	0.08	1.00	0.21	0.21	10.00	178.56	38.22	38.22	300	81.24	81.15	0.36	25.0	58.08	0.82	0.51	66%
13	219	218	0.19	1.00	0.53	0.53	10.00	178.56	93.82	93.82	300	81.28	81.15	0.35	37.5	56.99	0.81	0.78	165%
	218	217	0.00	0.00	0.00	0.74	10.78	171.77	127.02	127.02	375	81.08	81.00	0.27	29.8	90.94	0.82	0.60	140%
12	217	216	0.06	1.00	0.16	0.90	11.38	166.87	150.30	150.30	450	80.92	80.84	0.20	40.0	127.63	0.80	0.83	118%
	216	TANK	0.00	0.00	0.00	0.90	12.21	160.61	144.66	144.66	450	80.81	80.77	0.26	15.3	145.92	0.92	0.28	99%
11	215	TANK	0.03	0.88	0.07	0.07	10.00	178.56	11.73	11.73	250	80.87	80.77	0.58	17.3	45.26	0.92	0.31	26%
10	214	212	0.25	1.00	0.70	0.70	10.00	178.56	125.84	125.84	375	81.21	81.11	0.27	36.9	91.37	0.83	0.74	138%
9	213	212	0.22	1.00	0.61	0.61	10.00	178.56	108.21	108.21	375	81.21	81.11	0.26	38.2	89.80	0.81	0.78	121%
	212	210	0.00	0.00	0.00	1.31	10.78	171.70	225.06	225.06	450	81.04	80.96	0.21	37.5	131.82	0.83	0.75	171%
8	211	210	0.22	1.00	0.61	0.61	10.00	178.56	108.21	108.21	375	81.23	81.04	0.52	36.5	126.63	1.15	0.53	85%
7	210	209	0.12	1.00	0.34	2.26	11.54	165.63	374.58	374.58	450	80.96	80.87	0.37	24.3	173.69	1.09	0.37	216%
	209	TANK	0.00	0.00	0.00	2.26	11.91	162.82	368.21	368.21	525	80.80	80.77	0.22	13.4	203.69	0.94	0.24	181%
6	208	206	0.12	1.00	0.33	0.33	10.00	178.56	58.57	58.57	300	81.20	81.05	0.56	26.8	72.42	1.02	0.44	81%
5	207	206	0.27	1.00	0.74	0.74	10.00	178.56	132.54	132.54	300	81.30	81.05	0.60	41.9	74.77	1.06	0.66	177%
	206	205	0.00	0.00	0.00	1.07	10.66	172.74	184.88	184.88	375	80.99	80.92	0.61	11.4	137.53	1.25	0.15	134%
4	205	TANK	0.12	1.00	0.33	1.40	10.81	171.46	239.75	239.75	450	80.85	80.77	0.41	19.6	182.33	1.15	0.28	131%
3	204	203	0.18	1.00	0.50	0.50	10.00	178.56	88.85	88.85	300	81.35	80.92	0.75	57.1	84.00	1.19	0.80	106%
2	203	TANK	0.38	1.00	1.05	1.55	10.80	171.56	265.17	265.17	450	80.80	80.77	0.44	6.8	189.56	1.19	0.10	140%
	TANK	202	0.00	0.00	0.00	7.98	12.49	158.62	1265.66	*91.1*	525	80.77	80.70	1.94	3.6	600.30	2.77	0.02	15%
	202	201	0.00	0.00	0.00	7.98	12.51	158.47	1264.45	*91.1*	525	80.68	80.57	1.96	5.6	603.35	2.79	0.03	15%
	201	200	0.00	0.00	0.00	7.98	12.54	158.24	1262.57	*91.1*	525	80.54	80.39	1.97	7.6	604.80	2.79	0.05	15%
			3.64																

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Peak flows calculated using the Rational Method.
3. Manning's roughness coefficient = 0.013
4. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
5. Design Peak Flow modified by ICD:
   POND OUT 8.7 L/s
   STMMH202 91.1 L/s

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Surface Storage Volume Calculations

Drainage Area = **1**
2.78* AC = 1.81
Oveflow El. = 82.80
T/G = 82.50
Ponding Area (m2) = 1378
Available Storage (m3) = 137.8

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	**10.0**	**178.6**	**322.7**	**179.4**	**143.3**	**86.0**
	11.0	169.9	307.0	179.4	127.6	84.2
	12.0	162.1	293.0	179.4	113.6	81.8
	13.0	155.1	280.3	179.4	100.9	78.7
	14.0	148.7	268.7	179.4	89.3	75.1
	15.0	142.9	258.2	179.4	78.8	70.9

Drainage Area = **2**
2.78* AC = 1.55
Oveflow El. = 82.80
T/G = 82.50
Ponding Area (m2) = 912
Available Storage (m3) = 91.2

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)*
100 Year	**10.8**	**171.6**	**265.2**	**189.6**	**75.6**	**49.0**
	11.8	163.6	252.9	189.6	63.3	44.8
	12.8	156.5	241.8	189.6	52.3	40.1
	13.8	149.9	231.8	189.6	42.2	35.0
	14.8	144.0	222.6	189.6	33.0	29.3
	15.8	138.6	214.2	189.6	24.6	23.4

*Required storage for Drainage Areas 2&3

Drainage Area = **3**
2.78* AC = 0.50
Oveflow El. = 82.80
T/G = 82.65
Ponding Area (m2) = 128
Available Storage (m3) = 6.4

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	**10**	**178.6**	**88.9**	**84.0**	**4.9**	**2.9**
	11	169.9	84.5	84.0	0.5	0.4
	12	162.1	80.7	84.0	-3.3	-2.4
	13	155.1	77.2	84.0	-6.8	-5.3
	14	148.7	74.0	84.0	-10.0	-8.4
	15	142.9	71.1	84.0	-12.9	-11.6

Drainage Area = **4**
2.78* AC = 1.40
Oveflow El. = 82.80
T/G = 82.63
Ponding Area (m2) = 157
Available Storage (m3) = 8.9

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)*
100 Year	**10.8**	**171.5**	**239.8**	**182.3**	**57.4**	**37.3**
	11.8	163.5	228.7	182.3	46.3	32.8
	12.8	156.4	218.7	182.3	36.3	27.9
	13.8	149.9	209.6	182.3	27.2	22.6
	14.8	143.9	201.3	182.3	19.0	16.8
	15.8	138.5	193.7	182.3	11.4	10.8

*Required storage for Drainage Areas 4,5&6

Drainage Area = **5**
2.78* AC = 0.74
Oveflow El. = 82.85
T/G = 82.60
Ponding Area (m2) = 313
Available Storage (m3) = 26.1

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	**10**	**178.6**	**132.5**	**74.8**	**57.8**	**34.7**
	15	142.9	106.1	74.8	31.3	28.2
	20	120.0	89.0	74.8	14.3	17.1
	25	103.8	77.1	74.8	2.3	3.5
	30	91.9	68.2	74.8	-6.6	-11.8
	35	82.6	61.3	74.8	-13.5	-28.3

Drainage Area = **6**
2.78* AC = 0.33
Oveflow El. = 82.80
T/G = 82.65
Ponding Area (m2) = 240
Available Storage (m3) = 12.0

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	10	178.6	58.6	72.4	-13.8	-8.3
	15	142.9	46.9	72.4	-25.5	-23.0
	20	120.0	39.3	72.4	-33.1	-39.7
	25	103.8	34.1	72.4	-38.4	-57.5
	30	91.9	30.1	72.4	-42.3	-76.1
	35	82.6	27.1	72.4	-45.3	-95.2

Drainage Area = **7**
2.78* AC = 2.01
Oveflow El. = 82.78
T/G = 82.60
Ponding Area (m2) = 304
Available Storage (m3) = 18.2

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)*
5 Year	**11.5**	**96.72**	**194.8**	**173.7**	**21.1**	**14.6**
	12.5	92.5	186.2	173.7	12.5	9.4
	13.5	88.6	178.4	173.7	4.8	3.9
	14.5	85.1	171.4	173.7	-2.3	-2.0
	15.5	81.9	164.9	173.7	-8.8	-8.2
	16.5	78.9	158.9	173.7	-14.8	-14.7

*Required storage for Drainage Areas 7,8,9&10

Drainage Area = **7**
2.78* AC = 2.26
Oveflow El. = 82.78
T/G = 82.60
Ponding Area (m2) = 304
Available Storage (m3) = 18.2

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)*
100 Year	**11.5**	**165.6**	**374.6**	**173.7**	**200.9**	**139.1**
	12.5	158.3	357.9	173.7	184.3	138.6
	13.5	151.6	342.9	173.7	169.2	137.4
	14.5	145.5	329.1	173.7	155.4	135.6
	15.5	140.0	316.5	173.7	142.9	133.2
	16.5	134.9	305.0	173.7	131.3	130.3

*Required storage for Drainage Areas 7,8,9&10

Drainage Area = **8**
2.78* AC = 0.61
Oveflow El. = 82.80
T/G = 82.60
Ponding Area (m2) = 350
Available Storage (m3) = 23.3

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	10	178.6	108.2	126.6	-18.4	-11.0
	15	142.9	86.6	126.6	-40.0	-36.0
	20	120.0	72.7	126.6	-53.9	-64.7
	25	103.8	62.9	126.6	-63.7	-95.5
	30	91.9	55.7	126.6	-71.0	-127.7
	35	82.6	50.0	126.6	-76.6	-160.8

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Drainage Area = **9**
2.78* AC = 0.61
Oveflow El. = 82.80
T/G = 82.55
Ponding Area (m2) = 486
Available Storage (m3) = 40.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	**10**	**178.6**	**108.2**	**89.8**	**18.4**	**11.1**
	11	169.9	103.0	89.8	13.2	8.7
	12	162.1	98.3	89.8	8.5	6.1
	13	155.1	94.0	89.8	4.2	3.3
	14	148.7	90.1	89.8	0.3	0.3
	15	142.9	86.6	89.8	-3.2	-2.9

Drainage Area = **10**
2.78* AC = 0.70
Oveflow El. = 82.80
T/G = 82.55
Ponding Area (m2) = 470
Available Storage (m3) = 39.2

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	**10**	**178.6**	**125.8**	**91.4**	**34.5**	**20.7**
	15	142.9	100.7	91.4	9.3	8.4
	20	120.0	84.5	91.4	-6.8	-8.2
	25	103.8	73.2	91.4	-18.2	-27.3
	30	91.9	64.7	91.4	-26.6	-47.9
	35	82.6	58.2	91.4	-33.2	-69.7

Drainage Area = **11**
2.78* AC = 0.07
Oveflow El. = 82.95
T/G = 82.86
Ponding Area (m2) = 52
Available Storage (m3) = 1.6

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	10	178.6	11.7	45.3	-33.5	-20.1
	15	142.9	9.4	45.3	-35.9	-32.3
	20	120.0	7.9	45.3	-37.4	-44.9
	25	103.8	6.8	45.3	-38.4	-57.7
	30	91.9	6.0	45.3	-39.2	-70.6
	35	82.6	5.4	45.3	-39.8	-83.7

Drainage Area = **12**
2.78* AC = 0.90
Oveflow El. = 82.80
T/G = 82.50
Ponding Area (m2) = 281
Available Storage (m3) = 28.1

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)*
100 Year	**11.4**	**166.9**	**150.3**	**127.6**	**22.7**	**15.5**
	12.4	159.4	143.6	127.6	15.9	11.8
	13.4	152.6	137.5	127.6	9.8	7.9
	14.4	146.5	131.9	127.6	4.3	3.7
	15.4	140.8	126.8	127.6	-0.8	-0.7
	16.4	135.6	122.2	127.6	-5.5	-5.4

*Required storage for Drainage Areas 12,13&14

Drainage Area = **13**
2.78* AC = 0.53
Oveflow El. = 82.80
T/G = 82.58
Ponding Area (m2) = 590
Available Storage (m3) = 43.3

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	**10**	**178.6**	**93.8**	**57.0**	**36.8**	**22.1**
	15	142.9	75.1	57.0	18.1	16.3
	20	120.0	63.0	57.0	6.0	7.2
	25	103.8	54.6	57.0	-2.4	-3.6
	30	91.9	48.3	57.0	-8.7	-15.7
	35	82.6	43.4	57.0	-13.6	-28.6

Drainage Area = **14**
2.78* AC = 0.21
Oveflow El. = 82.80
T/G = 82.50
Ponding Area (m2) = 466
Available Storage (m3) = **46.6**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	10	178.6	38.2	58.1	-19.9	-11.9
	15	142.9	30.6	58.1	-27.5	-24.7
	20	120.0	25.7	58.1	-32.4	-38.9
	25	103.8	22.2	58.1	-35.8	-53.8
	30	91.9	19.7	58.1	-38.4	-69.1
	35	82.6	17.7	58.1	-40.4	-84.8

Drainage Area = **15**
2.78* AC = 1.16
Oveflow El. = 82.80
T/G = 82.50
Ponding Area (m2) = 559
Available Storage (m3) = 55.9

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)*
100 Year	**12.1**	**161.7**	**188.4**	**117.2**	**71.2**	**51.5**
	13.1	154.8	180.3	117.2	63.1	49.4
	14.1	148.4	172.9	117.2	55.7	46.9
	15.1	142.6	166.1	117.2	48.9	44.2
	16.1	137.3	159.9	117.2	42.7	41.1
	17.1	132.4	154.2	117.2	37.0	37.9

*Required storage for Drainage Areas 15&16

Drainage Area = **16**
2.78* AC = 0.28
Oveflow El. = 82.90
T/G = 82.60
Ponding Area (m2) = 65
Available Storage (m3) = 6.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	10	178.6	49.6	56.3	-6.6	-4.0
	15	142.9	39.7	56.3	-16.6	-14.9
	20	120.0	33.3	56.3	-22.9	-27.5
	25	103.8	28.9	56.3	-27.4	-41.1
	30	91.9	25.5	56.3	-30.7	-55.3
	35	82.6	23.0	56.3	-33.3	-70.0

Drainage Area = **17**
2.78* AC = 0.41
Oveflow El. = 82.86
T/G = 82.67
Ponding Area (m2) = 300
Available Storage (m3) = 19.0

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)
100 Year	10	178.6	73.0	110.3	-37.3	-22.4
	15	142.9	58.4	110.3	-51.9	-46.7
	20	120.0	49.0	110.3	-61.3	-73.6
	25	103.8	42.4	110.3	-67.9	-101.8
	30	91.9	37.5	110.3	-72.8	-131.0
	35	82.6	33.7	110.3	-76.6	-160.8

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Drainage Area =	**18 (Pond)**	Max El. =	82.50	Max Area (m2) =	489.0
2.78* AC =	2.08	Bot. El. =	80.60	Base Area (m2) =	80.4
		Available Storage (m3) =	**540.9**		

Drainage Area =	**Tank**	Top El.	81.37
2.78* AC =	7.98	Bot. El. =	80.77
		Storage Area (m2)	1850
		Available Storage (m3) =	**1067.9**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity* (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)**
100 Year	450	11.5	23.9	4.4	19.5	527.0
	460	11.3	23.4	4.4	19.1	527.1
	470	11.1	23.0	4.4	18.7	527.1
	480	**10.9**	**22.7**	**4.4**	**18.3**	**527.1**
	490	10.7	22.3	4.4	17.9	527.1
	500	10.5	21.9	4.4	17.6	527.0

*For storage calculations with ICD, 50% of max flow rate assumed account for ICD flow curve varying with head
**Required storage for Drainage Areas 15-18

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Pipe Capacity* (L/s)	Net Runoff to be Stored (L/s)	Storage Required (m^3)**
100 Year	130	30.9	246.5	45.5	201.0	1567.8
	140	29.2	232.6	45.5	187.1	1571.3
	150	**27.6**	**220.3**	**45.5**	**174.8**	**1572.9**
	160	26.2	209.4	45.5	163.8	1572.7
	170	25.0	199.6	45.5	154.0	1571.0
	180	23.9	190.7	45.5	145.2	1567.9

*For storage calculations with ICD, 50% of max flow rate assumed account for ICD flow curve varying with head
**Required storage for Drainage Areas 1-14

Total Storage Available

Drainage Area ID	Available Storage (m3) (up to spillover el. 82.80)
1	137.80
2	91.20
3	6.40
4	8.90
5	13.70
6	12.00
7	18.24
8	23.33
9	40.50
10	39.17
11	0.00
12	28.10
13	43.27
14	46.60
Tank	1067.91
Main Site	**1577.12**
Drainage Area ID	**Available Storage (m3) (up to spillover el. 82.50)**
15	0.00
16	0.00
17	0.00
18	540.93
Building A	**540.93**

100-Year Storage Available **2118.05 m3**

100-Year Post-Development Storage Required **2100.02 m3**

Sawmill Creek Subwatershed Storage Required **1850 m3**

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ICD Sizing

Pond Outlet

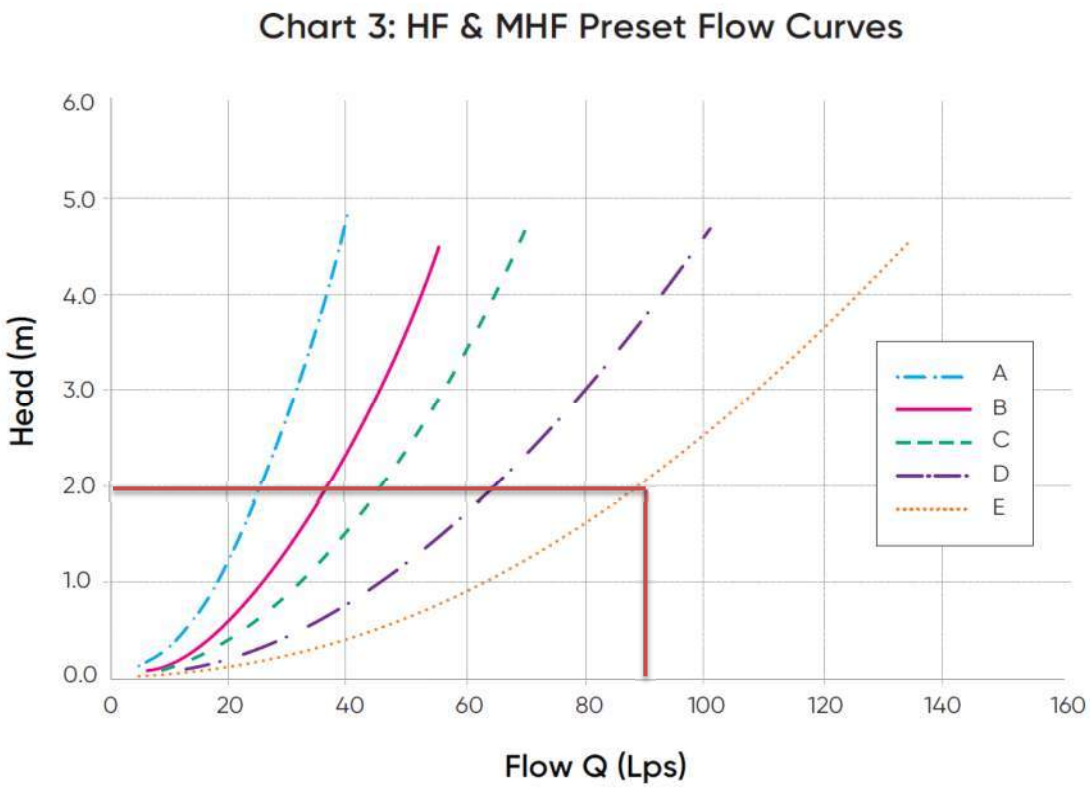
Bot El.	80.60	m
Max El.	82.50	m
Head	1.9	m
Orifice Size	55	mm
Max Flow	8.7	L/s
55mm Orifice Plate		

Tank Outlet

Bot El.	80.77	m
Max El.	82.80	m
Head	2.03	m
Orifice Size	175	mm
Max Flow	91.1	L/s
Tempest HF Model 'E'		

Total Controlled Discharge Rate **99.8 L/s**

Total Controlled Discharge Allowed **100.2 L/s**



1319 Johnston Road, Ottawa
23034

Infiltration

Total Impervious Area	3.46	ha	
Required Infiltration	40%		
Total Runoff to Infiltrate	9433	m3	(per year, per below average total yearly rainfall)

Percolation Rate	35	min/cm	(average for silty-clayey sands)
Percolation Rate	70	min/cm	(2.0 Factor of Safety for high groundwater)

Average total yearly rainfall	756.52	mm	(per Environment Canada monitoring station at Ottawa MacDonald-Cartier International Airport; years 1993-2023)*
Average number of rain events per year	119		(per Environment Canada monitoring station at Ottawa MacDonald-Cartier International Airport; years 1993-2023)*
Average rainfall per event	6.4	mm	

Storm Storage Tank

Infiltration Area	1850	m2	
Infiltration Depth	0.15	m	(granular base under storage tank)
Void Ratio	40%		
Infiltration Volume	111	m3	
Percolation Time	17.5	hr	

Total Drainage Area	2.87	ha	
Runoff Coefficient	0.89		
Runoff to Infiltrate per Event	162	m3	(per above average rainfall per event)

Check

Number of Events Required	85		
Total Infiltration per Year	13209	m3	(per average number of rain events per year)

*Environment Canada Data Source: https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Table 3
Approximate Relationship of Coarse Grained Soil Types to Permeability and Percolation Time

Soil Type (Unified Soil Classification) — Fine Grained More than 50% Passing #200	Coefficient of Permeability, K - cm/sec	Percolation Time, T - mins/cm	Comment
M.L. - Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, clayey silts with slight plasticity	10^{-5} - 10^{-6}	20 - 50	medium to low permeability
C.L. - Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	10^{-6} and less	over 50	unacceptable
O.L. - Organic silts, organic silty clays of low plasticity; liquid limit less than 50	10^{-5} and less	20 - over 50	acceptable depends on clay content
M.H. - Inorganic silts, micareaous or diatomageous fine sandy or silty soils, elastic silts	10^{-6} and less	over 50	unacceptable
C.H. - Inorganic clays of medium to high plasticity, organic silts	10^{-7} and less	over 50	unacceptable
O.H. - Organic clays of medium to high plasticity organic silt; liquid limit over 50	10^{-6} and less	over 50	unacceptable
Column 1	2	3	4

Pond Retention Time During 100yr Storm

Time Step (min)	Start Elevation (m)	Start Volume (m3)	Outlet Rate (L/s)	Percolation (L/s)	End Volume (m3)
0	82.50	540.9	8.7	0.00056	540.93
10	82.50	540.9	8.7	0.00056	535.7
20	82.49	535.7	8.7	0.00056	530.5
30	82.48	530.5	8.7	0.00056	525.3
40	82.47	525.3	8.6	0.00056	520.1
50	82.46	520.1	8.6	0.00056	515.0
60	82.40	515.0	8.5	0.00056	509.9
70	82.39	509.9	8.4	0.00056	504.8
80	82.38	504.8	8.4	0.00056	499.8
90	82.36	499.8	8.4	0.00056	494.7
100	82.35	494.7	8.4	0.00056	489.7
110	82.29	489.7	8.2	0.00056	484.8
120	82.28	484.8	8.2	0.00056	479.9
130	82.27	479.9	8.2	0.00056	475.0
140	82.26	475.0	8.1	0.00056	470.1
150	82.25	470.1	8.1	0.00056	465.2
160	82.19	465.2	8.0	0.00056	460.4
170	82.18	460.4	7.9	0.00056	455.7
180	82.17	455.7	7.9	0.00056	450.9
190	82.16	450.9	7.9	0.00056	446.2
200	82.10	446.2	7.7	0.00056	441.5
210	82.09	441.5	7.7	0.00056	436.9
220	82.08	436.9	7.7	0.00056	432.3
230	82.08	432.3	7.7	0.00056	427.7
240	82.07	427.7	7.6	0.00056	423.1
250	82.01	423.1	7.5	0.00056	418.6
260	82.00	418.6	7.5	0.00056	414.1
270	81.99	414.1	7.4	0.00056	409.7
280	81.98	409.7	7.4	0.00056	405.2
290	81.97	405.2	7.4	0.00056	400.8
300	81.91	400.8	7.2	0.00056	396.4
310	81.90	396.4	7.2	0.00056	392.1
320	81.89	392.1	7.2	0.00056	387.8
330	81.88	387.8	7.2	0.00056	383.5
340	81.87	383.5	7.1	0.00056	379.2
350	81.82	379.2	7.0	0.00056	375.1
360	81.81	375.1	6.9	0.00056	370.9
370	81.80	370.9	6.9	0.00056	366.8
380	81.79	366.8	6.9	0.00056	362.6
390	81.78	362.6	6.9	0.00056	358.5
400	81.72	358.5	6.7	0.00056	354.5
410	81.71	354.5	6.7	0.00056	350.5
420	81.71	350.5	6.6	0.00056	346.5
430	81.70	346.5	6.6	0.00056	342.5
440	81.64	342.5	6.4	0.00056	338.7
450	81.63	338.7	6.4	0.00056	334.8
460	81.62	334.8	6.4	0.00056	331.0
470	81.62	331.0	6.4	0.00056	327.2
480	81.61	327.2	6.3	0.00056	323.4
490	81.60	323.4	6.3	0.00056	319.6
500	81.54	319.6	6.1	0.00056	315.9
510	81.53	315.9	6.1	0.00056	312.2

520	81.53	312.2	6.1	0.00056	308.6
530	81.52	308.6	6.1	0.00056	305.0
540	81.51	305.0	6.0	0.00056	301.3
550	81.45	301.3	5.8	0.00056	297.8
560	81.45	297.8	5.8	0.00056	294.3
570	81.44	294.3	5.8	0.00056	290.9
580	81.43	290.9	5.8	0.00056	287.4
590	81.43	287.4	5.7	0.00056	284.0
600	81.37	284.0	5.5	0.00056	280.6
610	81.36	280.6	5.5	0.00056	277.3
620	81.35	277.3	5.5	0.00056	274.0
630	81.35	274.0	5.5	0.00056	270.8
640	81.34	270.8	5.4	0.00056	267.5
650	81.28	267.5	5.2	0.00056	264.4
660	81.28	264.4	5.2	0.00056	261.3
670	81.27	261.3	5.2	0.00056	258.1
680	81.27	258.1	5.2	0.00056	255.1
690	81.26	255.1	5.1	0.00056	252.0
700	81.25	252.0	5.1	0.00056	248.9
710	81.20	248.9	4.9	0.00056	246.0
720	81.19	246.0	4.9	0.00056	243.1
730	81.18	243.1	4.8	0.00056	240.2
740	81.18	240.2	4.8	0.00056	237.3
750	81.17	237.3	4.8	0.00056	234.4
760	81.12	234.4	4.5	0.00056	231.7
770	81.11	231.7	4.5	0.00056	229.0
780	81.11	229.0	4.5	0.00056	226.3
790	81.10	226.3	4.5	0.00056	223.6
800	81.09	223.6	4.4	0.00056	221.0
810	81.09	221.0	4.4	0.00056	218.3
820	81.03	218.3	4.2	0.00056	215.8
830	81.03	215.8	4.1	0.00056	213.4
840	81.02	213.4	4.1	0.00056	210.9
850	81.02	210.9	4.1	0.00056	208.4
860	81.01	208.4	4.1	0.00056	206.0
870	81.01	206.0	4.0	0.00056	203.6
880	81.00	203.6	4.0	0.00056	201.2
890	80.95	201.2	3.7	0.00056	199.0
900	80.94	199.0	3.7	0.00056	196.7
910	80.94	196.7	3.7	0.00056	194.5
920	80.93	194.5	3.6	0.00056	192.3
930	80.93	192.3	3.6	0.00056	190.2
940	80.92	190.2	3.6	0.00056	188.0
950	80.92	188.0	3.6	0.00056	185.9
960	80.87	185.9	3.3	0.00056	183.9
970	80.86	183.9	3.2	0.00056	182.0
980	80.86	182.0	3.2	0.00056	180.1
990	80.85	180.1	3.2	0.00056	178.1
1000	80.85	178.1	3.2	0.00056	176.2
1010	80.85	176.2	3.1	0.00056	174.4
1020	80.84	174.4	3.1	0.00056	172.5
1030	80.79	172.5	2.7	0.00056	170.9
1040	80.78	170.9	2.7	0.00056	169.2
1050	80.78	169.2	2.7	0.00056	167.6
1060	80.78	167.6	2.7	0.00056	166.0

1070	80.77	166.0	2.6	0.00056	164.4
1080	80.77	164.4	2.6	0.00056	162.9
1090	80.77	162.9	2.6	0.00056	161.3
1100	80.77	161.3	2.6	0.00056	159.8
1110	80.76	159.8	2.5	0.00056	158.2
1120	80.71	158.2	2.1	0.00056	157.0
1130	80.71	157.0	2.1	0.00056	155.8
1140	80.70	155.8	2.0	0.00056	154.5
1150	80.70	154.5	2.0	0.00056	153.3
1160	80.70	153.3	2.0	0.00056	152.1
1170	80.70	152.1	2.0	0.00056	151.0
1180	80.69	151.0	1.9	0.00056	149.8
1190	80.69	149.8	1.9	0.00056	148.7
1200	80.69	148.7	1.9	0.00056	147.5
1210	80.69	147.5	1.9	0.00056	146.4
1220	80.68	146.4	1.8	0.00056	145.3
1230	80.63	145.3	1.1	0.00056	144.6
1240	80.63	144.6	1.1	0.00056	144.0
1250	80.63	144.0	1.1	0.00056	143.3
1260	80.63	143.3	1.1	0.00056	142.7
1270	80.63	142.7	1.0	0.00056	142.1
1280	80.63	142.1	1.0	0.00056	141.5
1290	80.62	141.5	1.0	0.00056	140.9
1300	80.62	140.9	1.0	0.00056	140.3
1310	80.62	140.3	0.9	0.00056	139.8
1320	80.62	139.8	0.9	0.00056	139.2
1330	80.62	139.2	0.9	0.00056	138.7
1340	80.62	138.7	0.9	0.00056	138.2
1350	80.62	138.2	0.8	0.00056	137.7
1360	80.62	137.7	0.8	0.00056	137.2
1370	80.62	137.2	0.8	0.00056	136.7
1380	80.61	136.7	0.8	0.00056	136.3
1390	80.61	136.3	0.7	0.00056	135.8
1400	80.61	135.8	0.7	0.00056	135.4
1410	80.61	135.4	0.7	0.00056	135.0
		540.9	m^3 total	**0.04724**	m^3 infiltrated
				0.009%	

End Elevation (m)
82.50
82.49
82.48
82.47
82.46
82.40
82.39
82.38
82.36
82.35
82.29
82.28
82.27
82.26
82.25
82.19
82.18
82.17
82.16
82.10
82.09
82.08
82.08
82.07
82.01
82.00
81.99
81.98
81.97
81.91
81.90
81.89
81.88
81.87
81.82
81.81
81.80
81.79
81.78
81.72
81.71
81.71
81.70
81.64
81.63
81.62
81.62
81.61
81.60
81.54
81.53
81.53

Pond Volume

Elevation	Volume (m3)
80.60	0.0
80.65	4.3
80.70	9.1
80.75	14.5
80.80	20.4
80.85	26.8
80.90	33.8
80.95	41.3
81.00	49.4
81.05	58.0
81.10	67.1
81.15	76.7
81.20	86.9
81.25	97.7
81.30	109.0
81.35	120.8
81.40	133.1
81.45	146.0
81.50	159.5
81.55	173.4
81.60	187.9
81.65	203.0
81.70	218.5
81.75	234.7
81.80	251.3
81.85	268.5
81.90	286.2
81.95	304.5
82.00	323.3
82.05	342.7
82.10	362.5
82.15	383.0
82.20	403.9
82.25	425.4
82.30	447.4
82.35	470.0
82.40	493.1
82.45	516.7
82.50	540.9

100yr El. = 82.5
Bot. El. = 80.6

81.52
81.51
81.45
81.45
81.44
81.43
81.43
81.37
81.36
81.35
81.35
81.34
81.28
81.28
81.27
81.27
81.26
81.25
81.20
81.19
81.18
81.18
81.17
81.12
81.11
81.11
81.10
81.09
81.09
81.03
81.03
81.02
81.02
81.01
81.01
81.00
80.95
80.94
80.94
80.93
80.93
80.92
80.92
80.87
80.86
80.86
80.85
80.85
80.85
80.84
80.79
80.78
80.78
80.78
80.77

80.77
80.77
80.77
80.76
80.71
80.71
80.70
80.70
80.70
80.70
80.69
80.69
80.69
80.69
80.68
80.63
80.63
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80.62
80.62
80.62
80.62
80.61
80.61
80.61
80.61
80.61

100yr area (m2) =	489.0	
Base Area (m2) =	80.4	
Pond Area Rate=	215.1	m2/m
Percolation Rate =	25	mm/hr*

*based on MMAH SB-6 Table 2 w. 2.0 Factor of Safety for high groundwater level

Tank Retention Time During 100yr Storm

Time Step (min)	Start Elevation (m)	Start Volume (m3)	Outlet Rate (L/s)	Percolation (L/s)	End Volume (m3)
0	82.80	1565.2	91.1	0.013	1565.2
10	82.80	1565.2	91.1	0.013	1510.5
20	82.64	1510.5	87.5	0.013	1458.0
30	82.49	1458.0	83.9	0.013	1407.7
40	82.35	1407.7	80.3	0.013	1359.5
50	82.21	1359.5	76.7	0.013	1313.5
60	82.08	1313.5	73.1	0.013	1269.7
70	81.95	1269.7	69.4	0.013	1228.0
80	81.83	1228.0	65.8	0.013	1188.5
90	81.72	1188.5	62.2	0.013	1151.2
100	81.61	1151.2	58.6	0.013	1116.0
110	81.51	1116.0	54.9	0.013	1083.1
120	81.41	1083.1	51.3	0.013	1052.3
130	81.36	1052.3	49.2	0.013	1022.8
140	81.34	1022.8	48.5	0.013	993.7
150	81.33	993.7	47.8	0.013	965.0
160	81.31	965.0	47.1	0.013	936.8
170	81.30	936.8	46.4	0.013	909.0
180	81.28	909.0	45.7	0.013	881.5
190	81.27	881.5	45.0	0.013	854.5
200	81.25	854.5	44.3	0.013	827.9
210	81.24	827.9	43.6	0.013	801.8
220	81.22	801.8	42.9	0.013	776.0
230	81.21	776.0	42.2	0.013	750.7
240	81.19	750.7	41.5	0.013	725.8
250	81.18	725.8	40.8	0.013	701.3
260	81.16	701.3	40.1	0.013	677.2
270	81.15	677.2	39.4	0.013	653.5
280	81.14	653.5	38.7	0.013	630.3
290	81.12	630.3	38.0	0.013	607.5
300	81.11	607.5	37.3	0.013	585.0
310	81.10	585.0	36.6	0.013	563.0
320	81.09	563.0	36.0	0.013	541.5
330	81.07	541.5	35.3	0.013	520.3
340	81.06	520.3	34.6	0.013	499.6
350	81.05	499.6	33.9	0.013	479.2
360	81.04	479.2	33.2	0.013	459.3
370	81.03	459.3	32.5	0.013	439.8
380	81.02	439.8	31.8	0.013	420.7
390	81.01	420.7	31.1	0.013	402.1
400	81.00	402.1	30.4	0.013	383.9
410	80.99	383.9	29.7	0.013	366.0
420	80.98	366.0	29.0	0.013	348.6
430	80.97	348.6	28.3	0.013	331.6
440	80.96	331.6	27.6	0.013	315.1
450	80.95	315.1	26.9	0.013	298.9
460	80.94	298.9	26.2	0.013	283.2
470	80.93	283.2	25.5	0.013	267.9
480	80.92	267.9	24.8	0.013	253.0
490	80.91	253.0	24.1	0.013	238.5
500	80.90	238.5	23.4	0.013	224.5
510	80.90	224.5	22.7	0.013	210.9

520	80.89	210.9	22.0	0.013	197.7
530	80.88	197.7	21.3	0.013	184.9
540	80.87	184.9	20.6	0.013	172.5
550	80.87	172.5	19.9	0.013	160.6
560	80.86	160.6	19.2	0.013	149.0
570	80.85	149.0	18.5	0.013	137.9
580	80.85	137.9	17.8	0.013	127.2
590	80.84	127.2	17.1	0.013	117.0
600	80.84	117.0	16.4	0.013	107.1
610	80.83	107.1	15.7	0.013	97.7
620	80.82	97.7	15.0	0.013	88.7
630	80.82	88.7	14.3	0.013	80.1
640	80.82	80.1	13.6	0.013	72.0
650	80.81	72.0	12.9	0.013	64.3
660	80.81	64.3	12.1	0.013	57.0
670	80.80	57.0	11.4	0.013	50.1
680	80.80	50.1	10.7	0.013	43.7
690	80.79	43.7	10.0	0.013	37.7
700	80.79	37.7	9.3	0.013	32.1
710	80.79	32.1	8.6	0.013	26.9
720	80.79	26.9	7.9	0.013	22.2
730	80.78	22.2	7.1	0.013	17.9
740	80.78	17.9	6.4	0.013	14.0
750	80.78	14.0	5.7	0.013	10.6
760	80.78	10.6	4.9	0.013	7.7
770	80.77	7.7	4.2	0.013	5.1
780	80.77	5.1	3.4	0.013	3.1
790	80.77	3.1	2.7	0.013	1.5
800	80.77	1.5	1.8	0.013	0.4
		1565.2	m^3 total	**0.61667**	m^3
				0.039%	

End Elevation (m)
82.80
82.64
82.49
82.35
82.21
82.08
81.95
81.83
81.72
81.61
81.51
81.41
81.36
81.34
81.33
81.31
81.30
81.28
81.27
81.25
81.24
81.22
81.21
81.19
81.18
81.16
81.15
81.14
81.12
81.11
81.10
81.09
81.07
81.06
81.05
81.04
81.03
81.02
81.01
81.00
80.99
80.98
80.97
80.96
80.95
80.94
80.93
80.92
80.91
80.90
80.90
80.89

Pond Volume

Elevation	Volume (m3)
82.80	1565.2
81.37	1067.9
80.77	0.0

Percolation Rate = 25
Tank Area = 1850
*based on MMAH SB-6 Table 2 w. 2

80.88
80.87
80.87
80.86
80.85
80.85
80.84
80.84
80.83
80.82
80.82
80.82
80.81
80.81
80.80
80.80
80.79
80.79
80.79
80.79
80.78
80.78
80.78
80.78
80.77
80.77
80.77
80.77
80.77

mm/hr*
m²
.0 Factor of Safety for high groundwater level

STORMCON
STORMWATER MANAGEMENT SOLUTIONS.

GreenStorm ST

Rigofill ST product by FRÄNKISCHE

Underground storage infiltration modules

www.stormcon.ca

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*Rigofill ST product by FRÄNKISCHE

Storing stormwater with storage/infiltration systems

Basic element for underground water storage facilities

GreenStorm ST* are plastic tanks to be installed underground (storage/ infiltration modules) in which water is collected and stored. Storage/infiltration systems temporarily collect stormwater and discharge it later. In addition to infiltration using underdrained swale systems, pipe swales, and gravel swales common in the past, increasingly more storage/infiltration systems are being built today.

The storage space of the storage/ infiltration system consists of numerous GreenStorm ST* modules which can be combined three-dimensionally to form large systems.

The advantage of this method is that the void ratio is up to three times larger in these infiltration systems than in gravel swales which saves space and excavation work.

GreenStorm ST* is a modular system which is characterised by high flexibility, rapid installation and a high level of user-friendliness.

*Rigofill ST product by FRÄNKISCHE

Application – infiltration

Stormwater infiltration – giving back to nature

Large amounts of stormwater can reduce the performance of wastewater treatment systems. Infiltrating unpolluted stormwater nearby has therefore several advantages.

A constant growth in built-up areas and increase in impervious surfaces prevent natural infiltration of stormwater into the soil. Special infiltration systems are used in order to discharge it to the water cycle. In addition to infiltration using pipe swales, increasingly more storage/infiltration systems are being built.

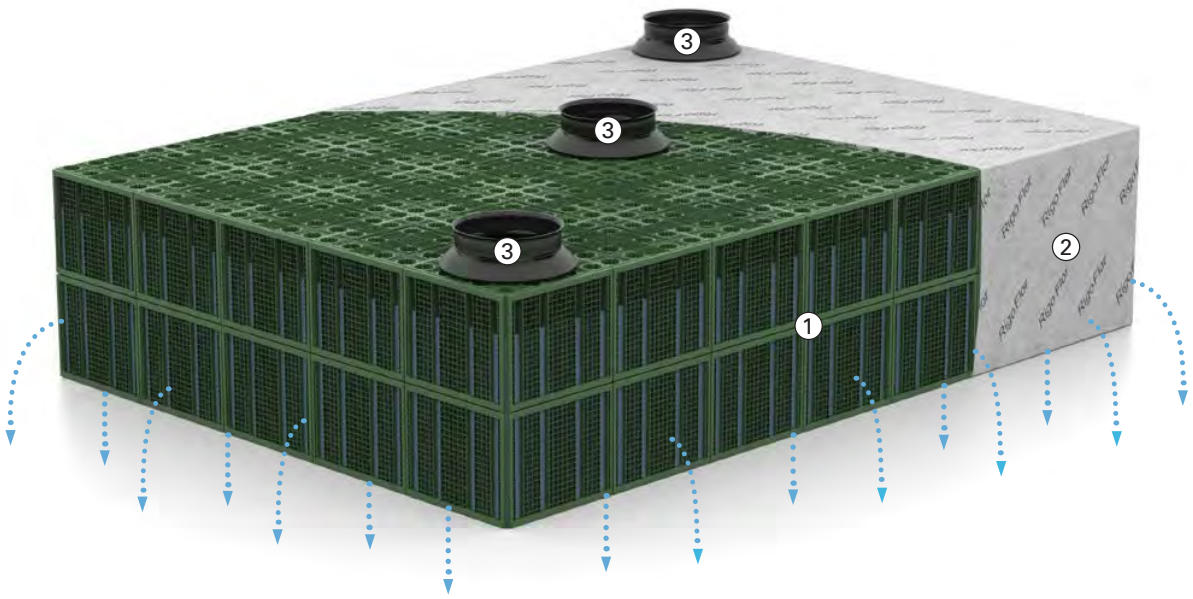
The advantage of this method is that the storage volume of the infiltration system is increased, and space and excavation are saved as compared to gravel swales. Stormwater is thus returned to the natural water cycle and can contribute to producing new groundwater. Infiltration systems are subject to very high requirements. Consequently, they have become an important component of urban drainage.

Storage/infiltration systems considerably increase the underground storage volume. High-performance storage/infiltration systems can be installed even in confined space.

In particular in urban construction no additional space is required and precious building ground is saved.

Légende

1. GreenStorm ST* storage /infiltration module
2. Geotextile
3. QuadroControl ST system shaft



*Rigofill ST product by FRÄNKISCHE

Application – retention

Retaining stormwater – instead of flooding

If subsoil conditions are unfavourable to infiltration, the goal is to retain the stormwater and ensure a retarded, timelagged discharge. Exposure to impulsive stress can be eliminated or reduced in sewer networks, wastewater treatment systems and waterbodies.

Stormwater retention systems retard the infiltration of stormwater. They are comprised of a watertight retaining element, an inlet and a vortex outlet.

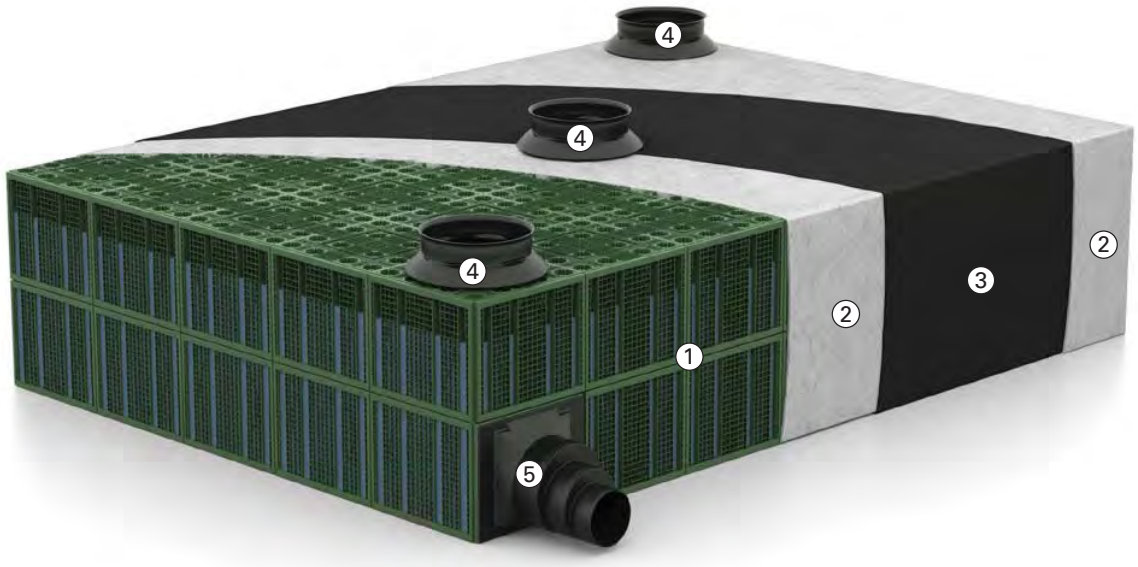
The stormwater distributes evenly in the system where it can be stored and is then discharged in a controlled manner through throttle shafts. If infiltration must be avoided or to prevent unintended discharge of groundwater or strata water (e.g., in case of contaminated soil), it is necessary to waterproof the retention system.

Stormwater runoff from impervious surfaces that cannot infiltrate naturally leads to peak loads in sewer systems.

Stormwater retention facilities collect stormwater in an underground storage tank and discharge it in a retarded manner but continuously. Their very short construction times make storage/ infiltration systems an inexpensive alternative to conventional retention facilities such as retention channels or underground concrete tanks.

Légende

1. GreenStorm ST* storage /infiltration module
2. Geotextile
3. Impermeable membrane
4. QuadroControl ST system shaft
5. Adapter



*Rigofill ST product by FRÄNKISCHE

Application – harvesting / fire water storage

Harvesting stormwater – saving drinking water

Water – particularly drinking water – is a priceless resource which should be treated responsibly and used sparingly. It is therefore wise to collect, store and use stormwater if the water must not necessarily be suitable for drinking purposes, instead of allowing the water to infiltrate into the soil unused or diverting it into the sewer system.

There are many examples: irrigation for greens, car wash, use in toilets, etc.

Water is diverted into a waterproof storage/infiltration system and can be supplied for use via a pumping system.

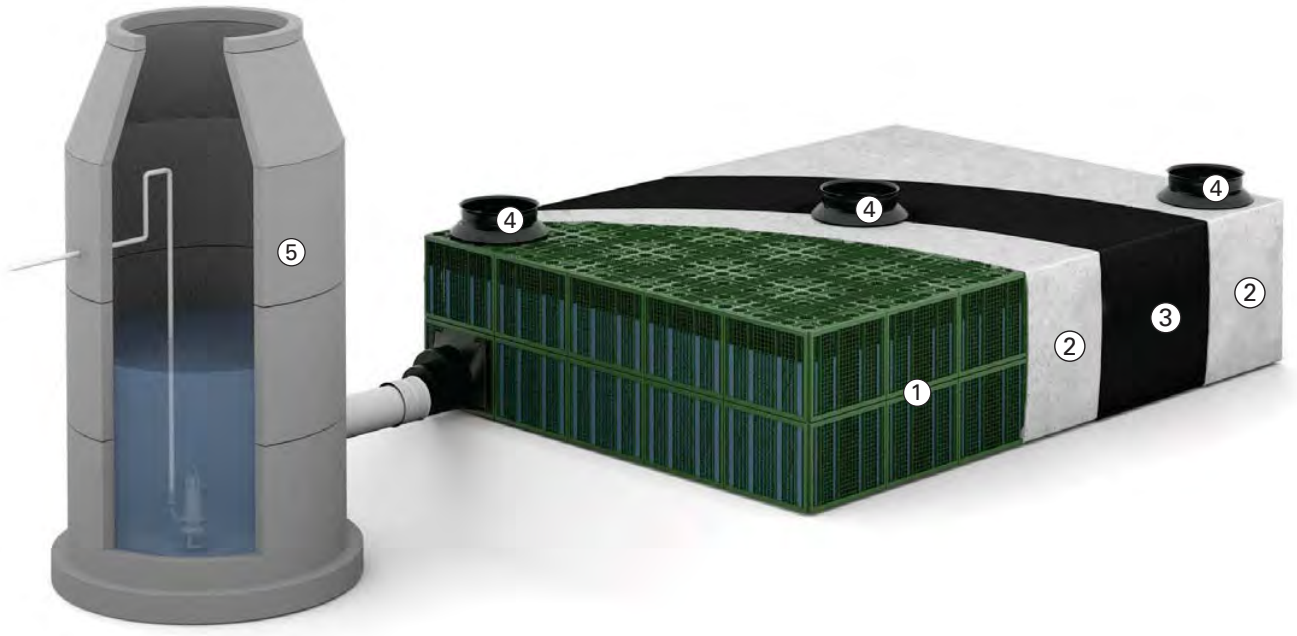
The use of the GreenStorm inspect system allows for finding solutions that fit project-specific requirements – even under the most difficult conditions such as very tight space, narrow conditions, low cover, high groundwater level, etc.

Stormwater harvesting systems provide water for different domestic and industrial water uses. They comprise a watertight retaining element, an inlet with upstream stormwater treatment system, a pump shaft and a system control.

Using GreenStorm ST* for fire water storage also saves water, since system checks can be made in a filled state and water does not have to be pumped out as is the case with conventional concrete tanks.

Légende

1. GreenStorm ST* storage/infiltration module
2. Geotextile
3. Impermeable membrane
4. QuadroControl ST system shaft
5. Tapping shaft (on-site)



*Rigofill ST product by FRÄNKISCHE

Modular design

Individual system geometries due to modular design

Sizes (length and width) of GreenStorm ST*orage/infiltration systems can be freely designed with hardly any limitations. The 800 mm cellular block type structure can easily be adapted to fit nearly any layout.

With heights of 660 mm (full block) and 350 mm (half block), systems can be built in various sizes to accommodate any single- or multi-layer combination. Therefore, the system can very easily be adapted to on-site requirements. Under high groundwater conditions or low permeability of backfill soil, for example, rather shallow depth systems are to be preferred.

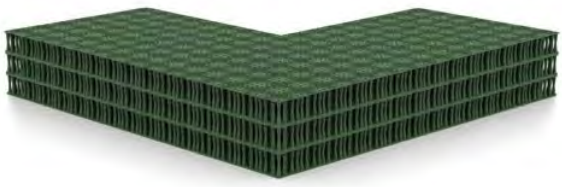
For soils with good permeability, however, high and compact systems are favourable and may be built accordingly. The maximum space available is used.

*Rigofill ST product by FRÄNKISCHE

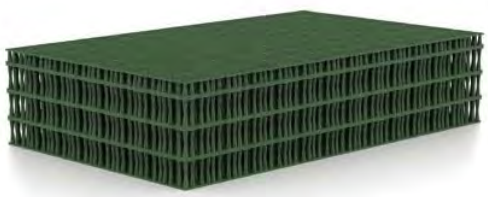
Possible system geometries

GreenStorm ST*
2-layer

GreenStorm ST*
1-layer



GreenStorm ST*
3-layer



GreenStorm ST*
3 1/2-layer

*Rigofill ST product by FRÄNKISCHE

Storage volume

Extremely high volume

The GreenStorm ST* full block provides a storage volume of 406 litres with a gross volume of 422 litres. With a storage volume of more than 96 %, it stores three times as much water as gravel swales.

The half block has a height of 350 mm and is used if shallow systems are required, e.g., in case of high groundwater levels. With a gross volume of 224 litres, it offers a storage volume of 212 litres.

Column void
The column void of the storage/infiltration module is 100 % available as storage space. Large openings at the column base and at the column connection allow unrestricted filling and emptying of the columns.

Storage/infiltration systems as compared to gravel swales

Pipe and gravel swales only use approx. 30 % of their volume to store water. Therefore, three times the required water storage volume must be provided by excavation. This requires lots of space which is frequently not available in urban areas.

GreenStorm ST* storage/infiltration systems save an enormous amount of space and excavation work. Thus, subsoil storage spaces for stormwater can be built in a very efficient and cost-saving way.

Storage/infiltration systems considerably increase the storage space. High-performance storage/infiltration systems can be installed even in confined space.

*Rigofill ST product by FRÄNKISCHE

Installation

Easy construction site handling

Requires little space for storage
The storage/infiltration modules are delivered in compact, stacked units with 17 modules per pallet.
The easy stackability of the GreenStorm ST* and ST-B modules allows them to be stored even in confined construction space, even outside the excavation pit.
This facilitates installation, since no additional storage space must be provided in the excavation pit. Installation is neither impeded nor constrained.

Pre-assembly
Depending on the requirements, GreenStorm
ST and GreenStorm ST*-B modules can be pre-assembled in no time at all, both outside and inside the excavation pit with just one easy move. Easy high tensile strength snap connections allow for combining two half elements to create a reliable unit in only a short period of time. This can easily be done by one person alone without requiring any additional tools. The moveable parts of the snap connection are recessed and thus protected from damage.

Easy assembly
There is no need to adhere to any complex installation pattern – the pre-assembled modules or half blocks can just as well be connected to create a single unit.
The low weight allows this to be done by one person only. Connectors establish firm connections between the individual modules. The surface can be accessed immediately without any risk of accidents, since the hole size of the columns is dimensioned respectively (< 100 mm).
Thus, no additional covers of column holes are required.

Montage dans la fouille

Up to

88 %

storage space saved as compared to unstackable storage/infiltration modules

*Rigofill ST product by FRÄNKISCHE

Inspection

CCTV inspection even when filled

Storage/infiltration systems are durable structures for urban drainage; they must work reliably for decades. Durability and reliability are essential requirements.
The best way to inspect the state of a system using state-of-the-art technology is CCTV inspection. Thus, a storage/infiltration system can be inspected excellently – for final acceptance or later. This provides safety for authorities, engineers, construction companies, customers, and operators.

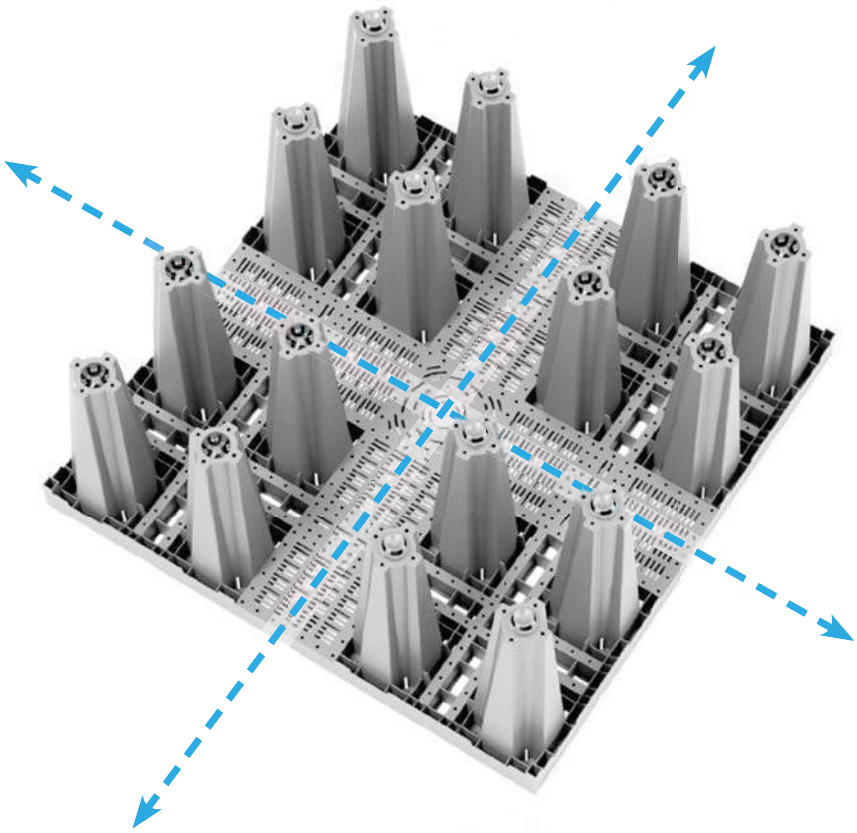
Cross-shaped inspection tunnel

GreenStorm ST* modules have a cross-shaped tunnel which makes the storage/infiltration system camera-accessible and flushable in two axes and thus in four dimensions.
The special and open design of the inspection tunnel allows for an unobstructed view of the entire interior and not only the inspection tunnel.

For example, the statically relevant load-bearing elements, the condition of the geotextile and the entire soil area can be viewed. GreenStorm ST* and GreenStorm ST*-B thus provide excellent options to control the “inner life” of a storage/infiltration system at any time.

The ideal, level and vibration-free running surface and the slim column structure allow for an unobstructed view of the entire module volume. The Quadro Control ST shaft for GreenStorm ST*, which can be integrated, allows for easy access of the automotive dolly for both professional final acceptance inspection and flushing technology.

100 %
inspectable



*Rigofill ST product by FRÄNKISCHE

Inspection

Recommended camera equipment

A standard sewer camera is sufficient for camera inspection.
A rotatable and height-adjustable camera head allows for an optimal view of the lateral soil area, a controllable carriage ensures a centred positioning, and high-performance optics together with lighting allow for a perfect picture.

Certified CCTV accessibility

GreenStorm ST* has been designed for the use of modern CCTV inspection technology.
The inspectability of the GreenStorm ST* and QuadroControl ST system unit has been tested and confirmed by leading manufacturers of pipe CCTV inspection technology!

Recommended: tender invitation for final acceptance inspection

Final acceptance of sewers using camera inspection has long since become a matter of course in sewer construction.
Also in the construction of storage/infiltration systems, the final acceptance inspection is important! Planning engineers should absolutely include this in their tender documents. For instructions on the professional system configuration of the CCTV inspection technology, please refer to **www.fraenkische.com**

Loading

GreenStorm ST* Heavy traffic

Storage/infiltration systems are subsoil structures and must have sufficient load-carrying capacity against impacting soil and traffic loads.

GreenStorm ST* storage/ infiltration systems are extremely strong and have been designed with various applications in mind:
While GreenStorm ST* has been designed in
particular for traffic loads of up to 13 tons axle load.

Certification CSTB

High resistance

When installed under traffic areas, relevant national guidelines must be observed.

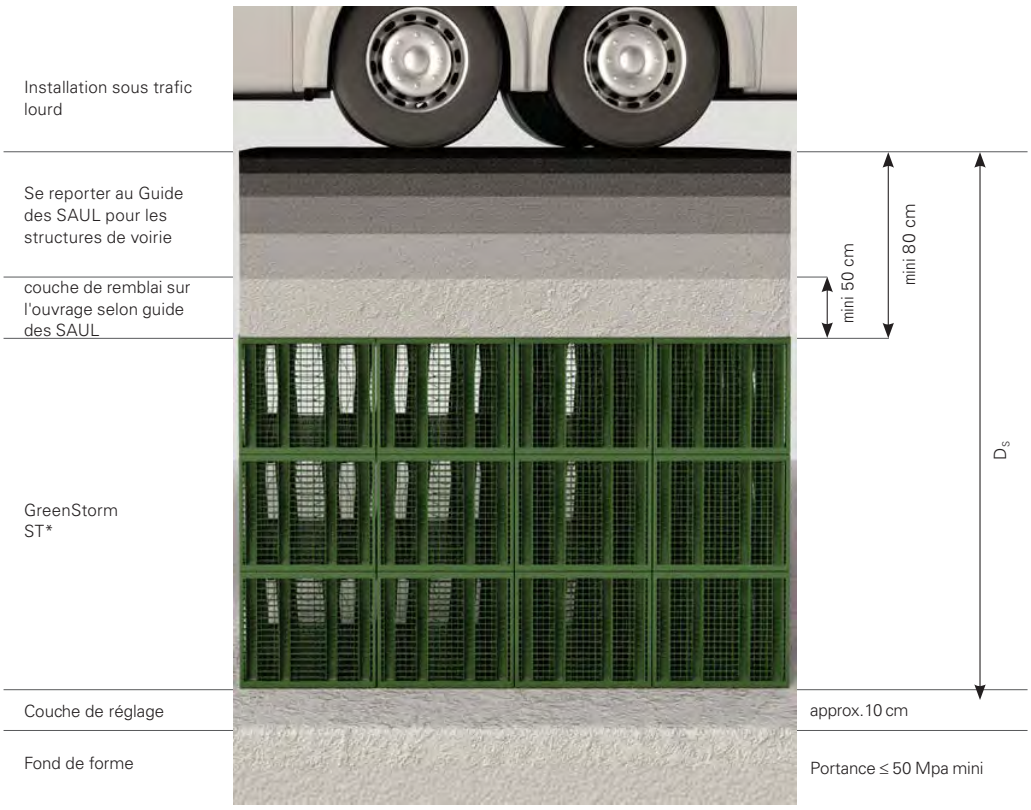
To build the planum for the road construction, an upper levelling layer must be provided. It should preferably be built as a gravel sub-base with a thickness of at least 350 mm, other materials usually result in larger covers.

Generally, a uniform modulus of deformation EV2 ≥ 45 MN/m² must be proven on the planum.

Installation under traffic area

The subsoil structures must have sufficient load-carrying capacity against impacting soil and traffic loads to ensure reliable stability.

This is why GreenStorm ST* is suitable for traffic loads of up to 15 tons axle load (20 tons possible, please refer to our technical department).



With conventional installation parameters*, depths of cover of DC 4 m and soil depths DSof 6 m are possible for infiltration systems. A project-specific stability analysis can be prepared by STORMCON.

*specific weight of soil 18 kN/m³
Mean soil temperature max. 23 °C,
6 m soil depth, = 0.3, 4-laye

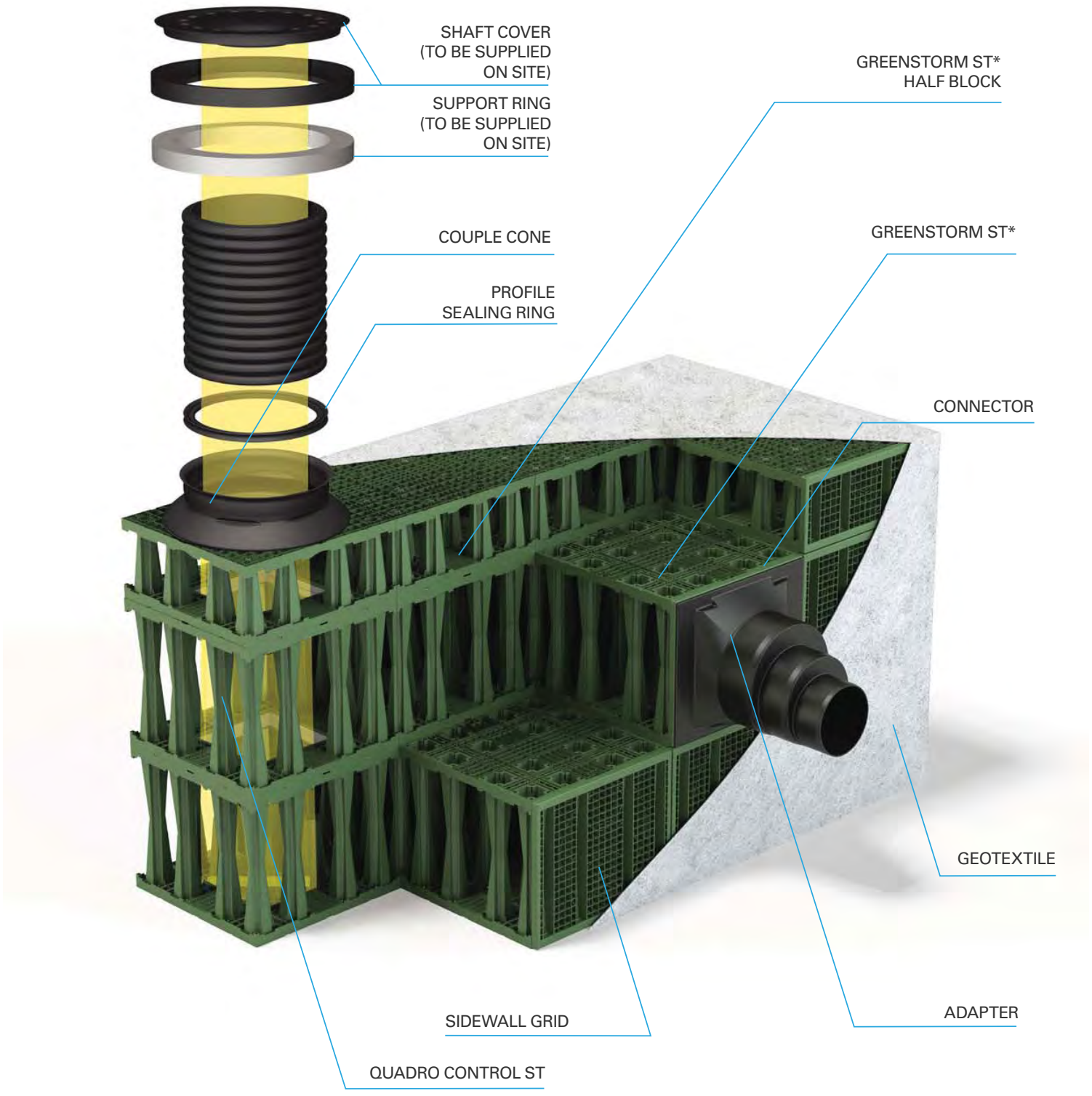
*Rigofill ST product by FRÄNKISCHE

Example

GreenStorm ST* Heavy traffic

*Rigofill ST product by FRÄNKISCHE

Quadro® Control ST – system shaft



*Rigofill ST product by FRÄNKISCHE

Quadro® Control ST – system shaft

Integrated inspection shafts

Quadro® Control ST is a polypropylene inspection shaft which can be integrated in the storage/infiltration system.

It is square with a base of 800 x 800 mm and can be used in any position of the layout.

Its height results from the number of layers of the connected storage/infiltration system. The shaft allows for comfortable access to the inspection tunnel from aboveground. High-performance inspection and flushing equipment can easily be inserted into the inspection tunnel. The shaft is integrated in the storage/infiltration system and grows layer by layer as construction progresses. QuadroControl ST is delivered with all required components and will be assembled on site.

Structure

The shaft cone is the transition to the extension pipe. The length of the extension pipe is chosen depending on the installation depth.

The shaft is integrated in the storage/infiltration system and grows layer by layer as construction progresses.

The shaft components are stackable and delivery includes the cone with all required components as shaft package.

Arrangement of inspection shafts

Number of and position in the system are above all determined by the size of the system, access, pipe connections and design of the outdoor facilities.

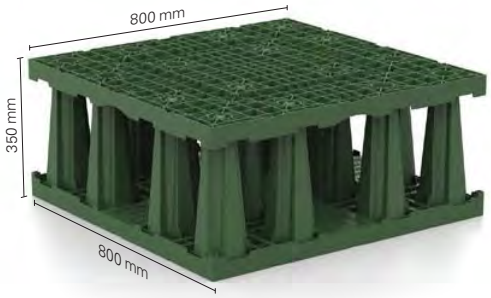
In order to ensure that flushing of the complete system is possible, each module should comprise at least one inspection shaft. In addition, the shafts should be positioned such that the shaft covers do not interfere with the design of the outdoor facilities, but can easily be accessed by vehicles for maintenance purposes.

Adjacent shafts should be staggered in the layout.

*Rigofill ST product by FRÄNKISCHE

GreenStorm ST* – Design-relevant dimensions

Dimensions



Sidewall grid connection options

Full block connection options
Dia 100 mm, 135 mm, 150 mm, 200 mm,
250 mm, 300 mm, 375 mm et 450 mm

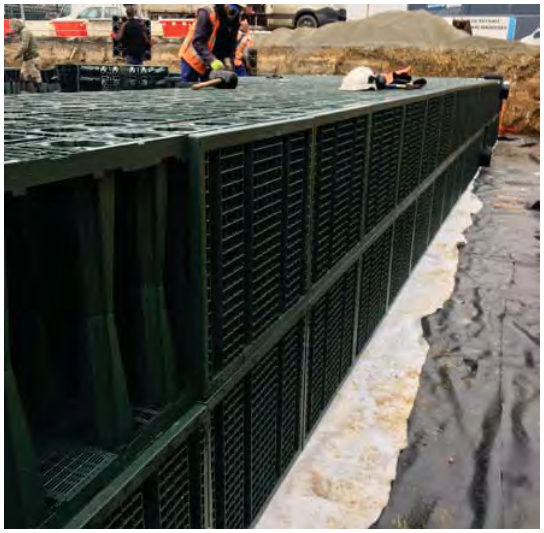
This allows all available nominal diameters to be realised both at the top and the bottom of the module.

GreenStorm ST* – Design-relevant dimensions

Sidewall grid connection options

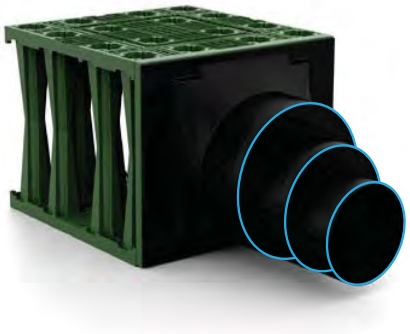
Half block connection options
Dia 100 mm, 135 mm, 150 mm, 200 mm
et 250 mm

The side plates can be drilled to the height and desired position within the frame.



Adapter connection options

Connections:
Dia 300 mm, 450 mm
et 525 mm



Outside diameter 315 mm for a pipe diameter 300 mm PVC

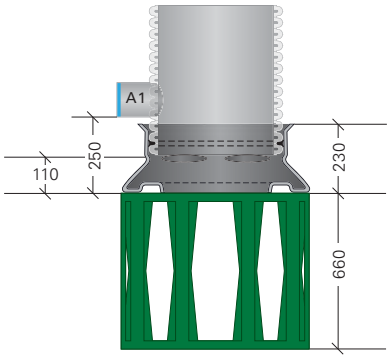
Outside diameter 400 mm for a pipe diameter 450 mm PVC. A flexible sleeve off center is required.

Outside diameter 500 mm for a pipe of diameter 525 mm. A flexible sleeve off center is required

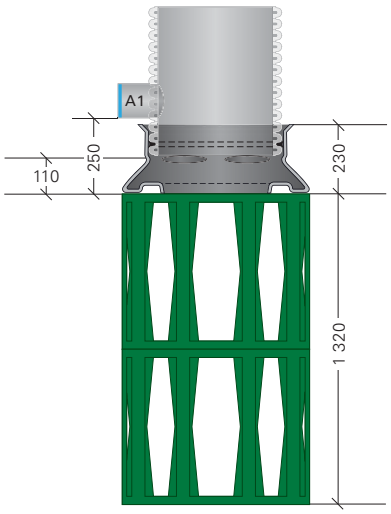
Quadro® Control ST – Design-relevant dimensions

Dimensions of Quadro® Control ST

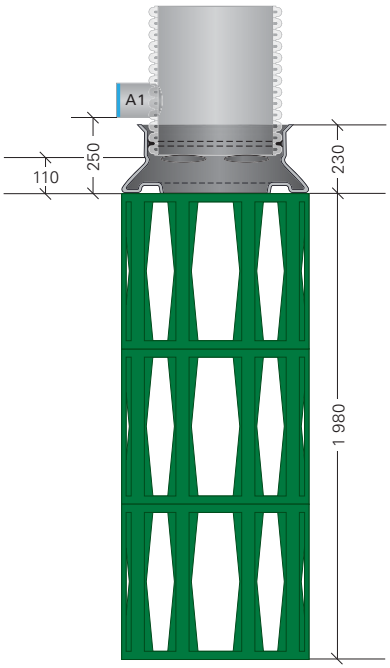
Connection options	
A1	DN/OD 200 or DN/OD 315 connection possible



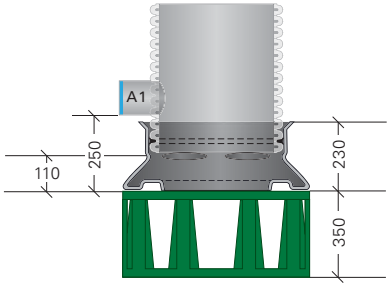
1-layer



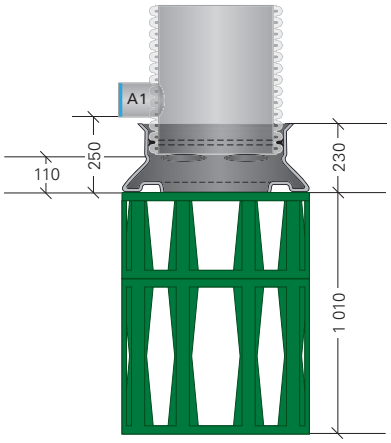
2-layer



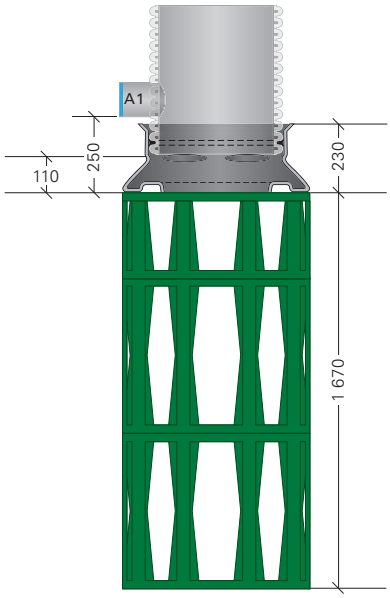
3-layer



1/2-layer



1 1/2-layer



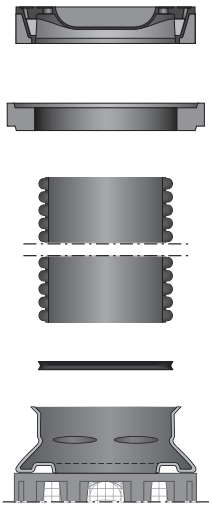
2 1/2-layer

*Rigofill ST product by FRÄNKISCHE

Quadro® Control ST – Design-relevant dimensions

Shaft design of Quadro® Control ST

Structure of inspection shaft

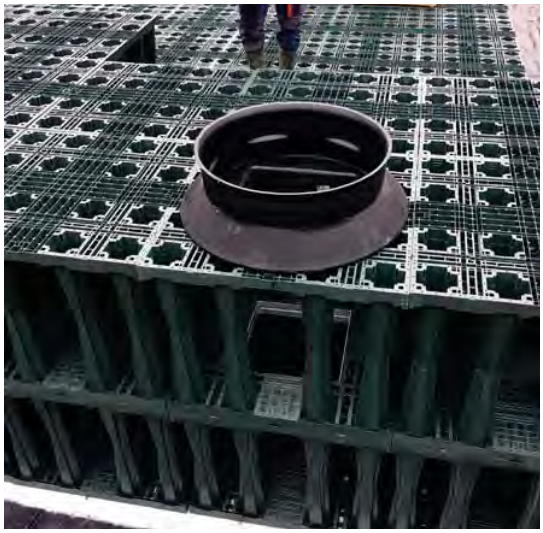


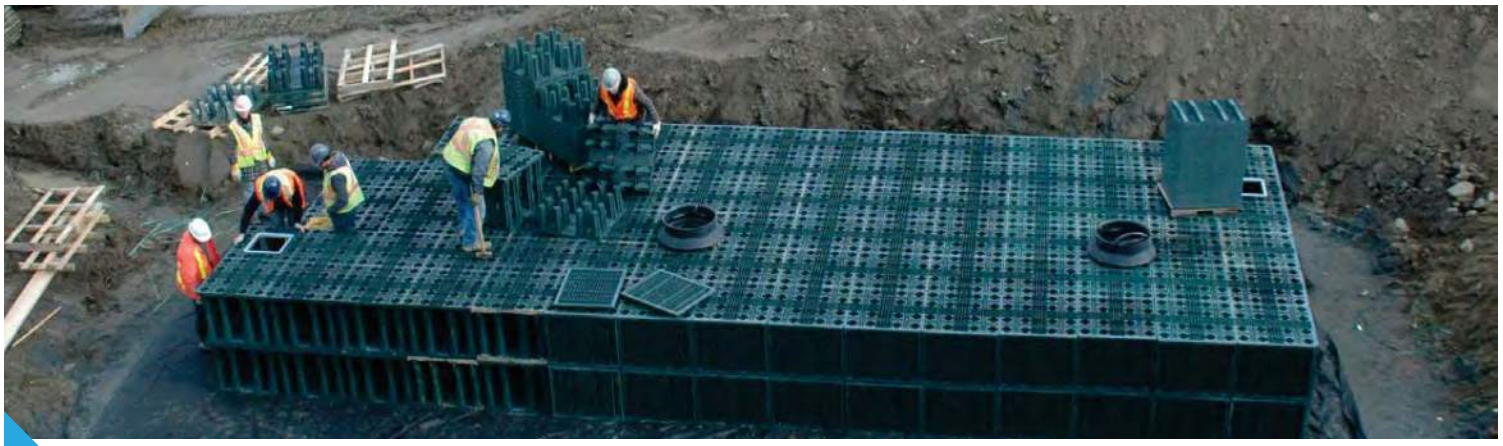
Class B or D
shaft cover acc. to DIN EN 124,
CW 610

Support ring acc. to DIN 4034,
D_i = 625 mm

Extension pipe
D_o 600

Sealing ring





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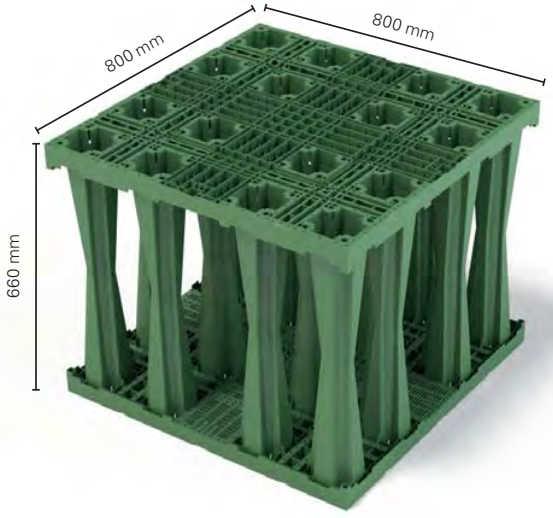
GreenStorm ST*

GreenStorm ST*

GreenStorm ST* IS highly durable and hard-wearing storage/infiltration module with a base of 800 x 800 mm and a height of 660 mm full blocks.

The polypropylene full block consists of two half elements to be installed on site and has a void ratio of more than 96 %. Water can flow through the module three-dimensionally almost without any obstacles. GreenStorm ST* allows for virtually any size and geometry of the systems.

The cross-shaped inspection tunnel in the storage/ infiltration modules has been designed for the use of automotive dollies. This allows the effective drainage surface and the entire system volume with all statically relevant bearing-type fixtures to be inspected.



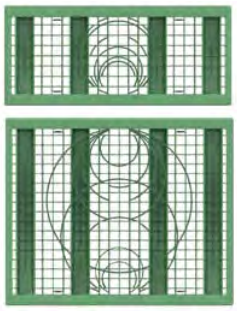
GreenStorm ST* – half block

The GreenStorm ST* half block has a base of 800 x 800 mm and a height of 350 mm.

It consists of only one half element which must be assembled with a roof slab on site. This roof slab is only required for the half block. The GreenStorm ST* half block is used in particular for systems with shallow installation depths, e.g., in case of high groundwater levels.

Systems in various heights can be realised in 35 cm steps and adjusted to almost any layout in combination with the full block.

GreenStorm ST* – Accessories



Différentes hauteurs de connexion (indépendamment du diamètre nominal) sont requises au-dessus du fond selon le nombre d'étages :

Nombre d'étages	Hauteur de raccord
0.5-layer	40 mm
1-layer	40 mm
1.5-layer	700 mm
2-layer	700 mm
2.5-layer	1 360 mm
3-layer	1 360 mm

Sidewall grid

The sidewall grids serve as external boundary.

They can be assembled easily using snap connections. The predefined position of the connections at the sidewall grids guarantees that the connections of inlet pipe and outlet pipe and the tunnel are same level. The sidewall grids can be assembled easily also outside the excavation pit.

The sidewall grid for the full block and Quadro® Control ST has a size of W x D x H = 800 x 30 x 660 mm and is suited for connecting lateral solid wall pipes DN 110, 125, 160, 200, 225, 250, 315, 400 and 500.

The sidewall grid for the half block or the half-layer shaft has a size of W x D x H = 800 x 30 x 350 mm and is suited for connecting lateral solid wall pipes DN 110, 125, 160, 200, 225 and 250. In storage/infiltration designs with inside corners, shortened sidewall grids are used at one side.

Adapter

The adapter for GreenStorm ST* has a length of 800 mm and a height of 660 mm and serves as an inlet and outlet connection.

It provides an inlet connection with an optimised flow design with diffusor effect for solid wall pipes DN 315, 400 and 500. It can be connected to GreenStorm ST* easily and quickly thanks to the snap connection.

The predefined position of the snap connection at the module guarantees that inlet pipe and outlet pipe and tunnel connect same level.

The adapter ensures a connection with the same crown, as it is installed turned by 180°.

STORMCON
STORMWATER MANAGEMENT SOLUTIONS

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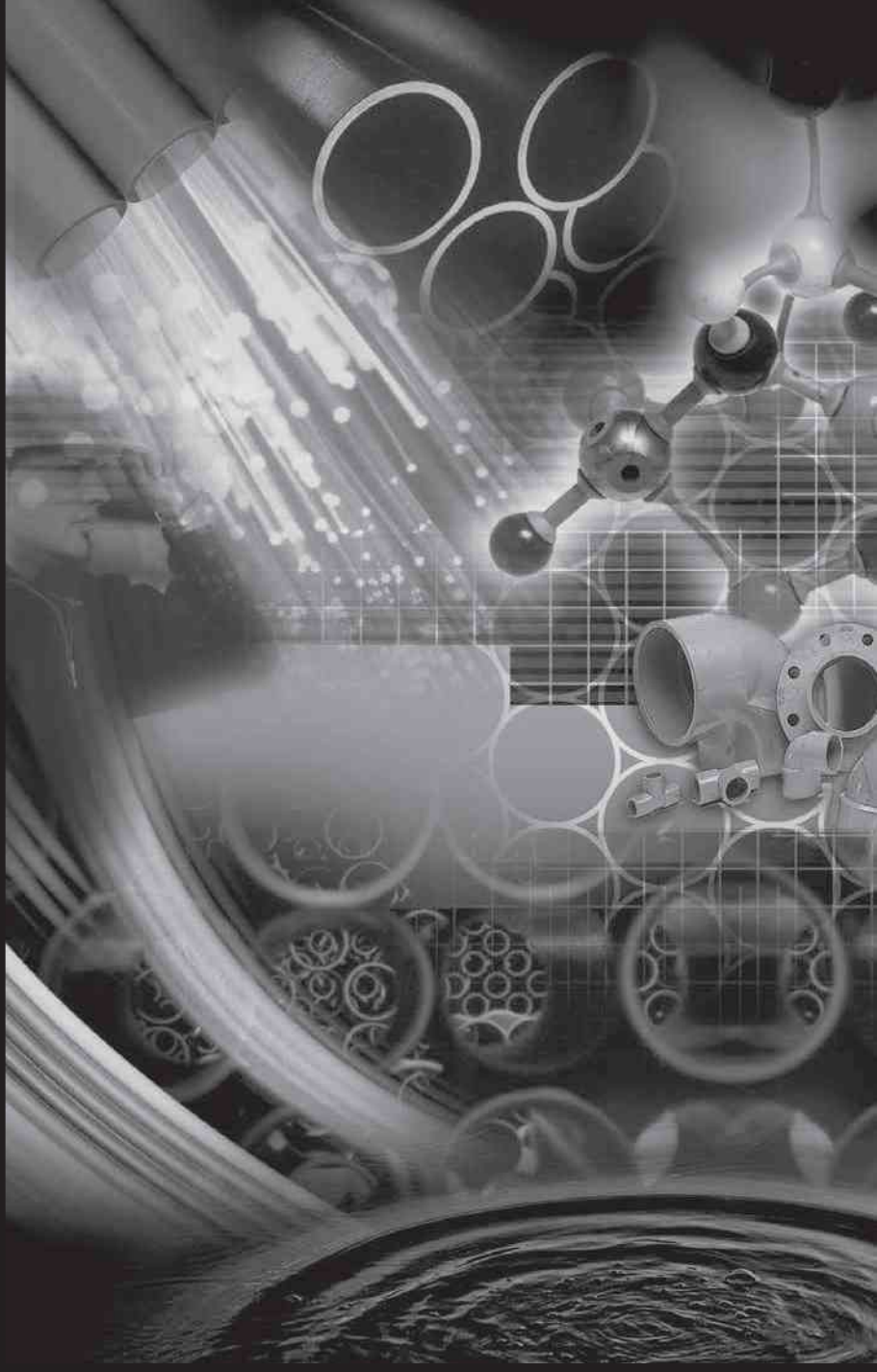
Volume III: TEMPEST INLET CONTROL DEVICES



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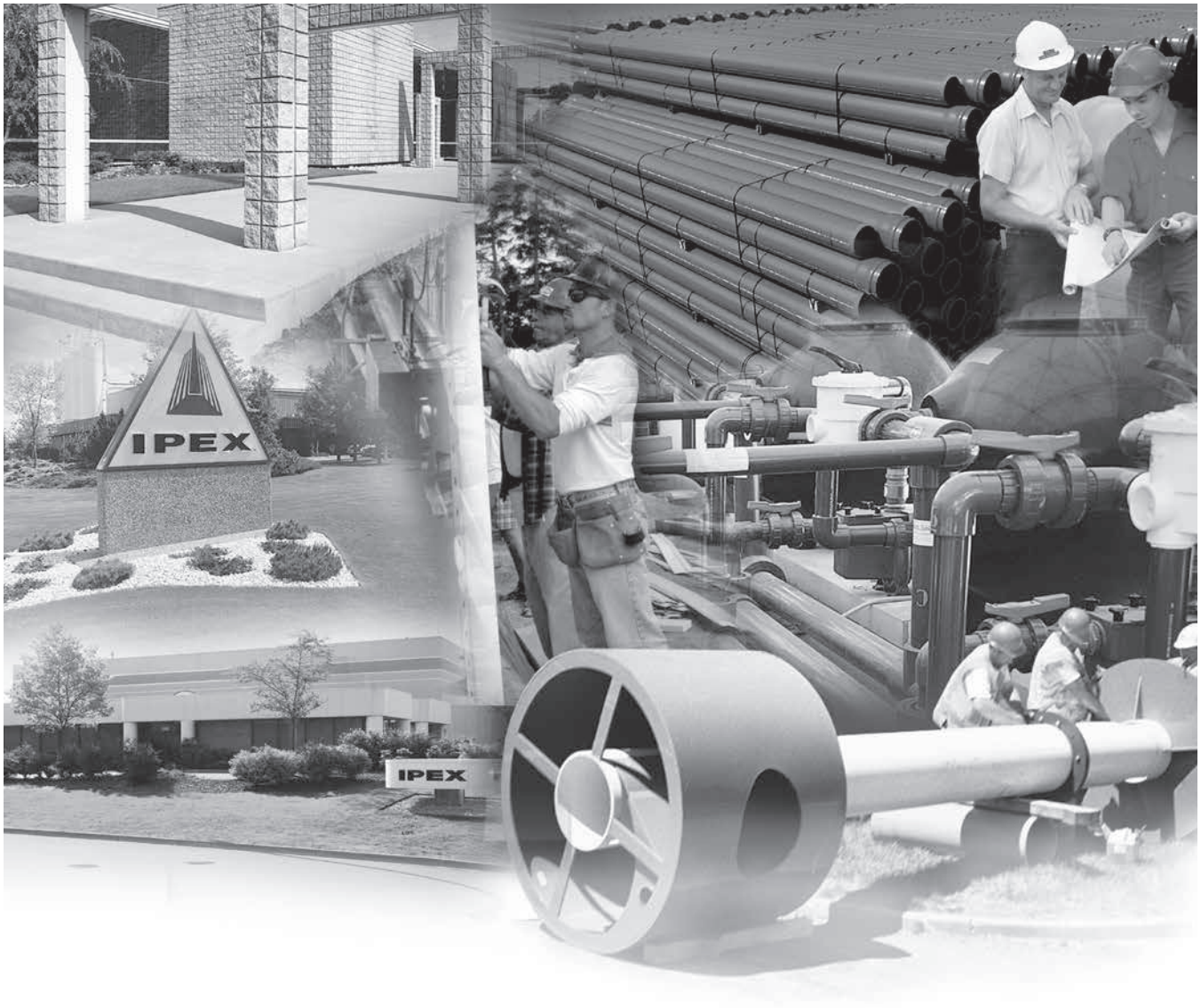


ABOUT IPEX

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

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

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

CONTENTS

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

Purpose

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

Product Description

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

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

Product Function

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

Product Construction

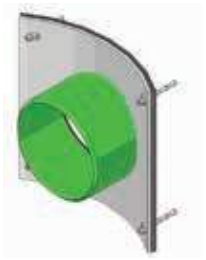
Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

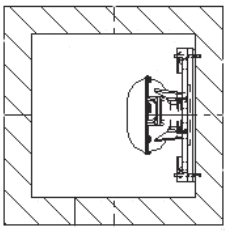
Will accommodate both square and round applications:

Square Application

Round Application



Universal
Mounting Plate



+

Spigot CB
Wall Plate

=

Universal
Mounting
Plate Hub
Adapter

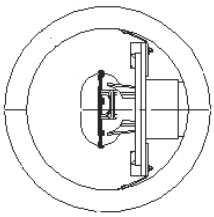


Chart 1: LMF 14 Preset Flow Curves

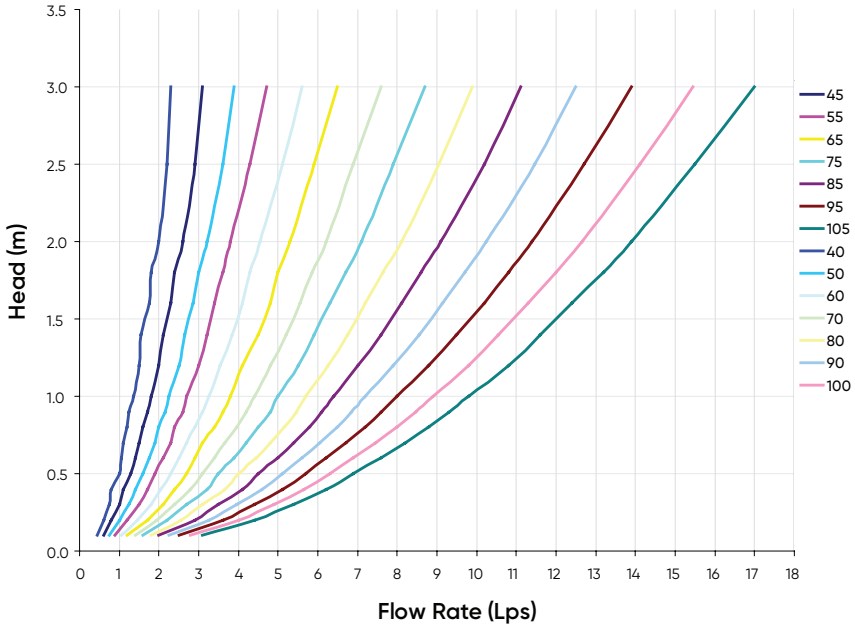
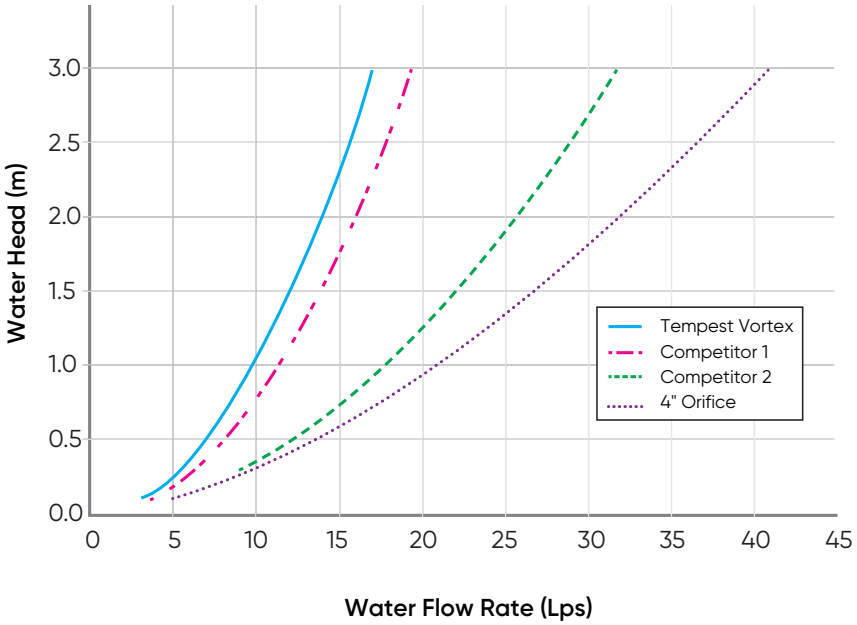


Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

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

STEPS:

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

⚠ WARNING

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

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

STEPS:

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

⚠ WARNING

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

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

PRODUCT TECHNICAL SPECIFICATION

General

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

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

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

ICD's shall have no moving parts.

Materials

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

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

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

All hardware will be made from 304 stainless steel.

Dimensioning

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

Installation

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

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

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

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

Product Function

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

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

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

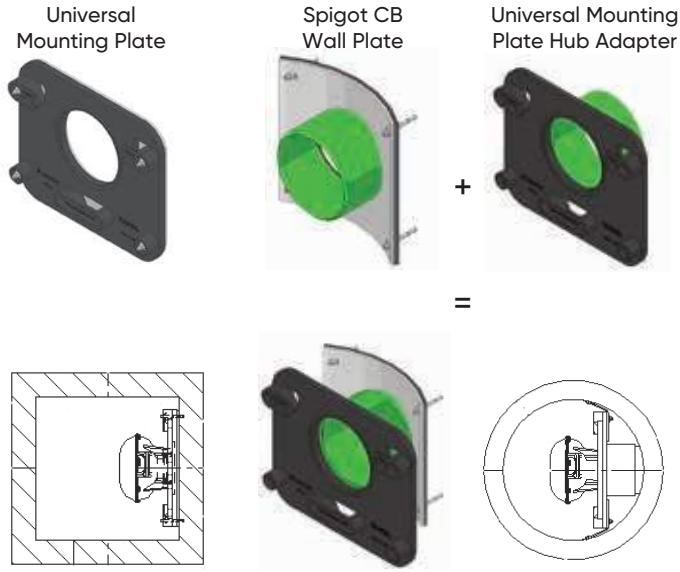
Product Construction

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

Product Applications

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

Square Application **Round Application**



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

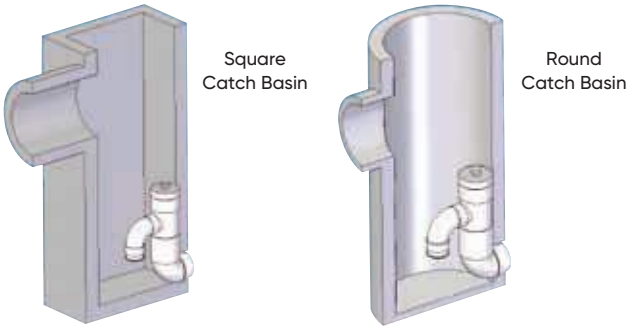
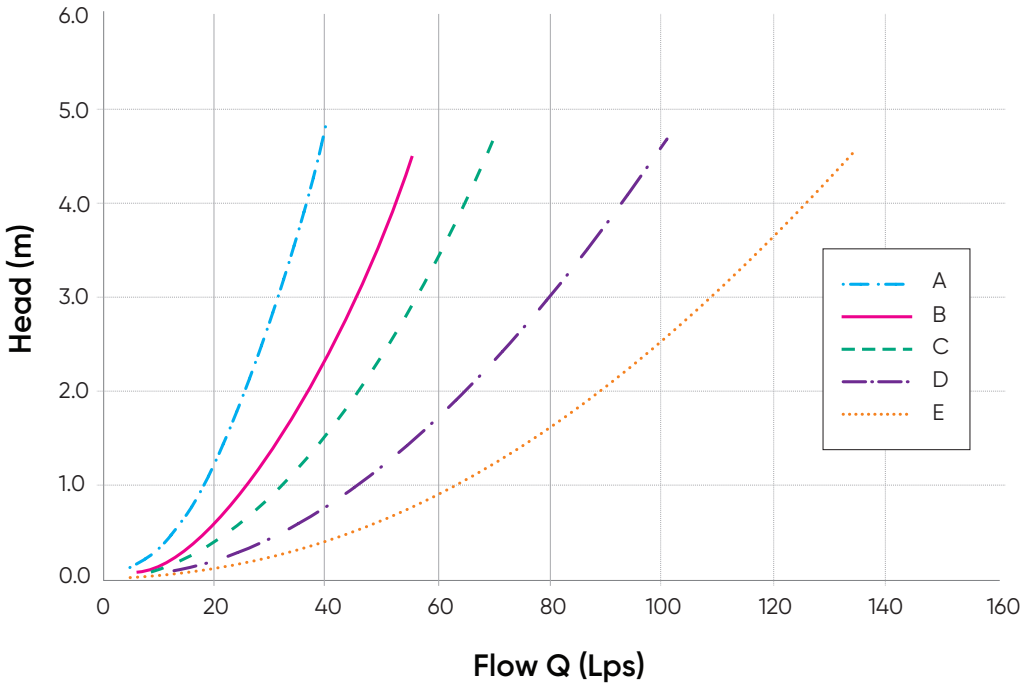


Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

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

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

⚠ WARNING

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

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

STEPS:

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

⚠ WARNING

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

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

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

STEPS:

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

⚠ WARNING

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

PRODUCT TECHNICAL SPECIFICATION

General

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

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

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

ICD's shall have no moving parts.

Materials

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

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

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

All hardware will be made from 304 stainless steel.

Dimensioning

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

Installation

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

NOTES

SALES AND CUSTOMER SERVICE

IPEX USA LLC
Toll Free: (800) 463-9572
ipexna.com

About the IPEX Group of Companies

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

Markets served by IPEX group products are:

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

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

IPEX by aliaxis

MNMNTPIP110817RU

Stormceptor EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

03/13/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	2.86
Runoff Coefficient 'c':	0.89

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	82.15
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	91.10
Peak Conveyance (maximum) Flow Rate (L/s):	91.10
Influent TSS Concentration (mg/L):	150
Estimated Average Annual Sediment Load (kg/yr):	1780
Estimated Average Annual Sediment Volume (L/yr):	1447

Project Name:	1319 Johnston Road
Project Number:	23034
Designer Name:	Stephen McCaughey
Designer Company:	Robinson Consultants
Designer Email:	smccaughey@rcii.com
Designer Phone:	613-592-6060
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	35
EFO6	46
EFO8	53
EFO10	57
EFO12	62

Recommended Stormceptor EFO Model: EFO12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 62

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

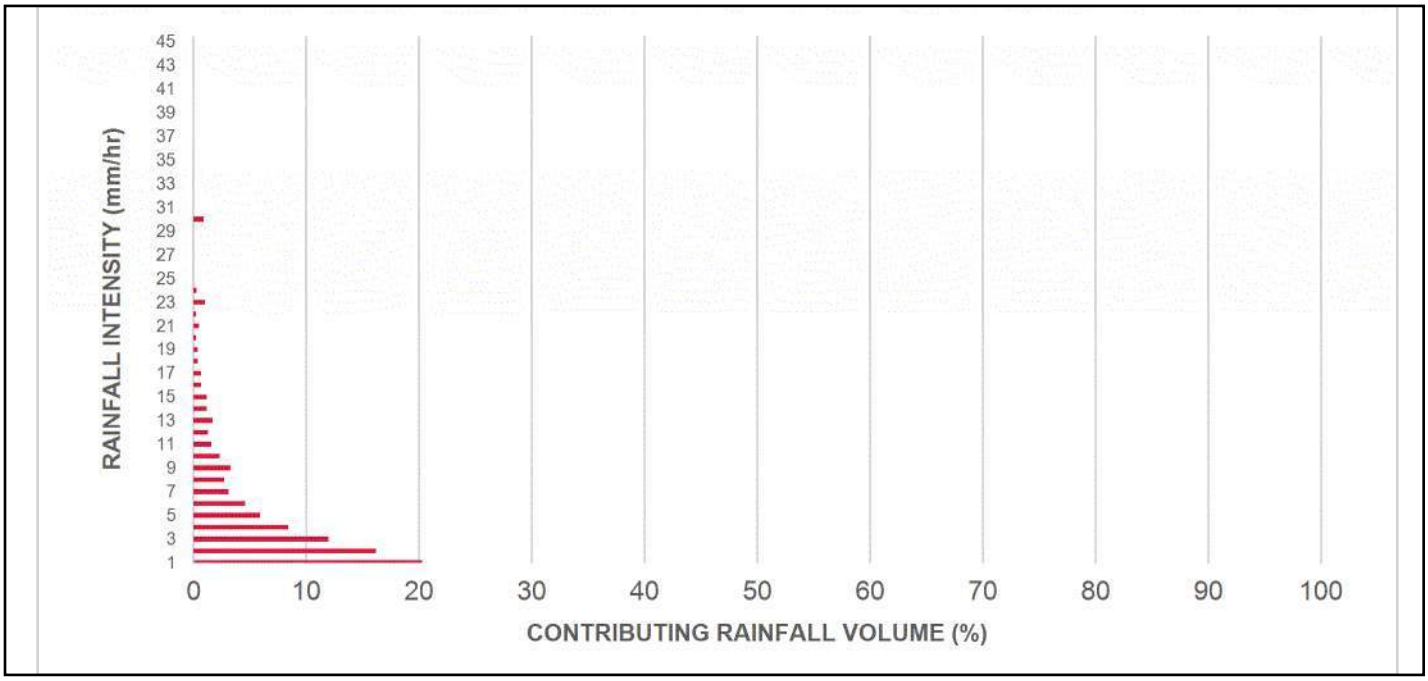
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

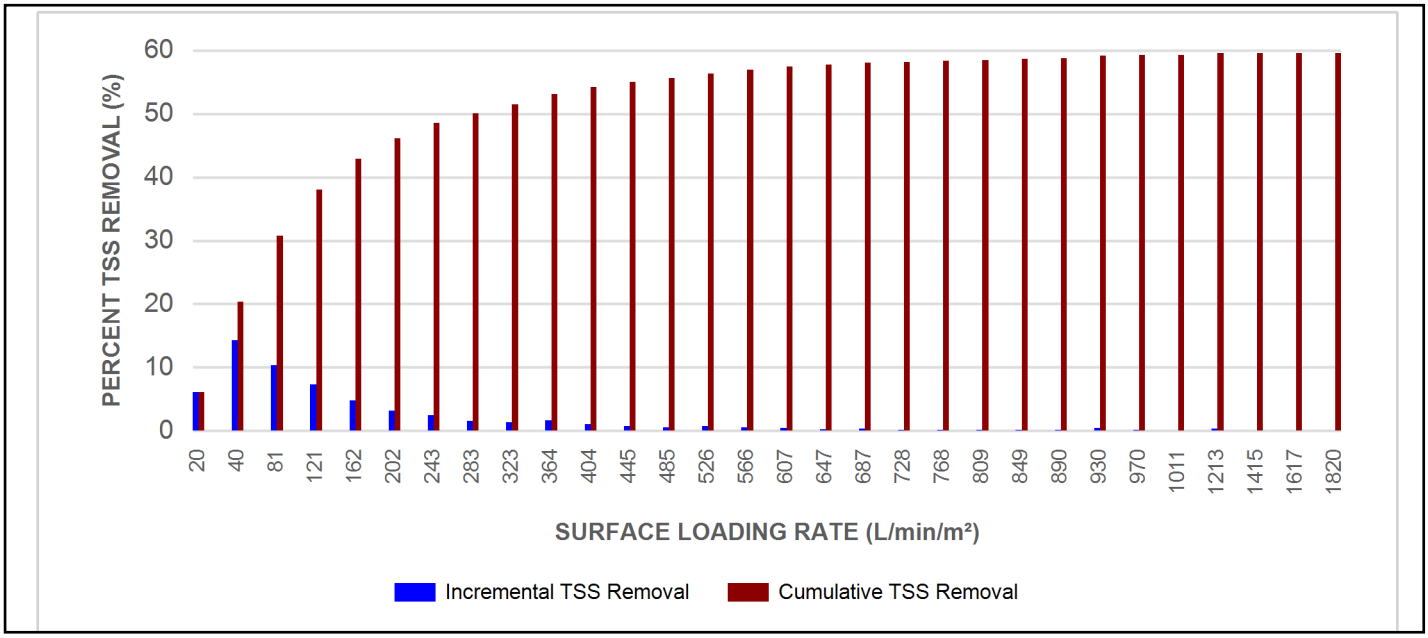
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	3.54	212.0	17.0	70	6.1	6.1
1.00	20.3	29.0	7.08	425.0	34.0	70	14.3	20.4
2.00	16.2	45.2	14.15	849.0	68.0	67	10.9	31.3
3.00	12.0	57.2	21.23	1274.0	102.0	62	7.5	38.8
4.00	8.4	65.6	28.30	1698.0	136.0	60	5.1	43.8
5.00	5.9	71.6	35.38	2123.0	170.0	57	3.4	47.2
6.00	4.6	76.2	42.46	2547.0	204.0	54	2.5	49.7
7.00	3.1	79.3	49.53	2972.0	238.0	53	1.6	51.3
8.00	2.7	82.0	56.61	3397.0	272.0	52	1.4	52.7
9.00	3.3	85.3	63.69	3821.0	306.0	51	1.7	54.4
10.00	2.3	87.6	70.76	4246.0	340.0	50	1.1	55.6
11.00	1.6	89.2	77.84	4670.0	374.0	49	0.8	56.3
12.00	10.8	100.0	84.91	5095.0	408.0	48	5.2	61.5
13.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
14.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
15.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
16.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
17.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
18.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
19.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
20.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
21.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
22.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
23.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
24.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
25.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
30.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
35.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
40.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
45.00	0.0	100.0	91.00	5460.0	437.0	47	0.0	61.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**62 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

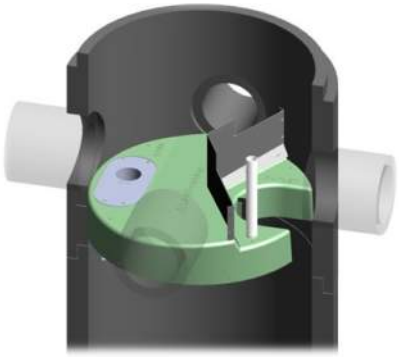
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

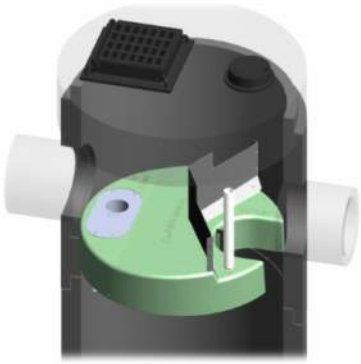
DESIGN FLEXIBILITY

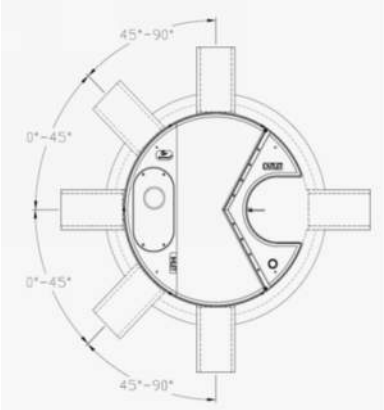
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

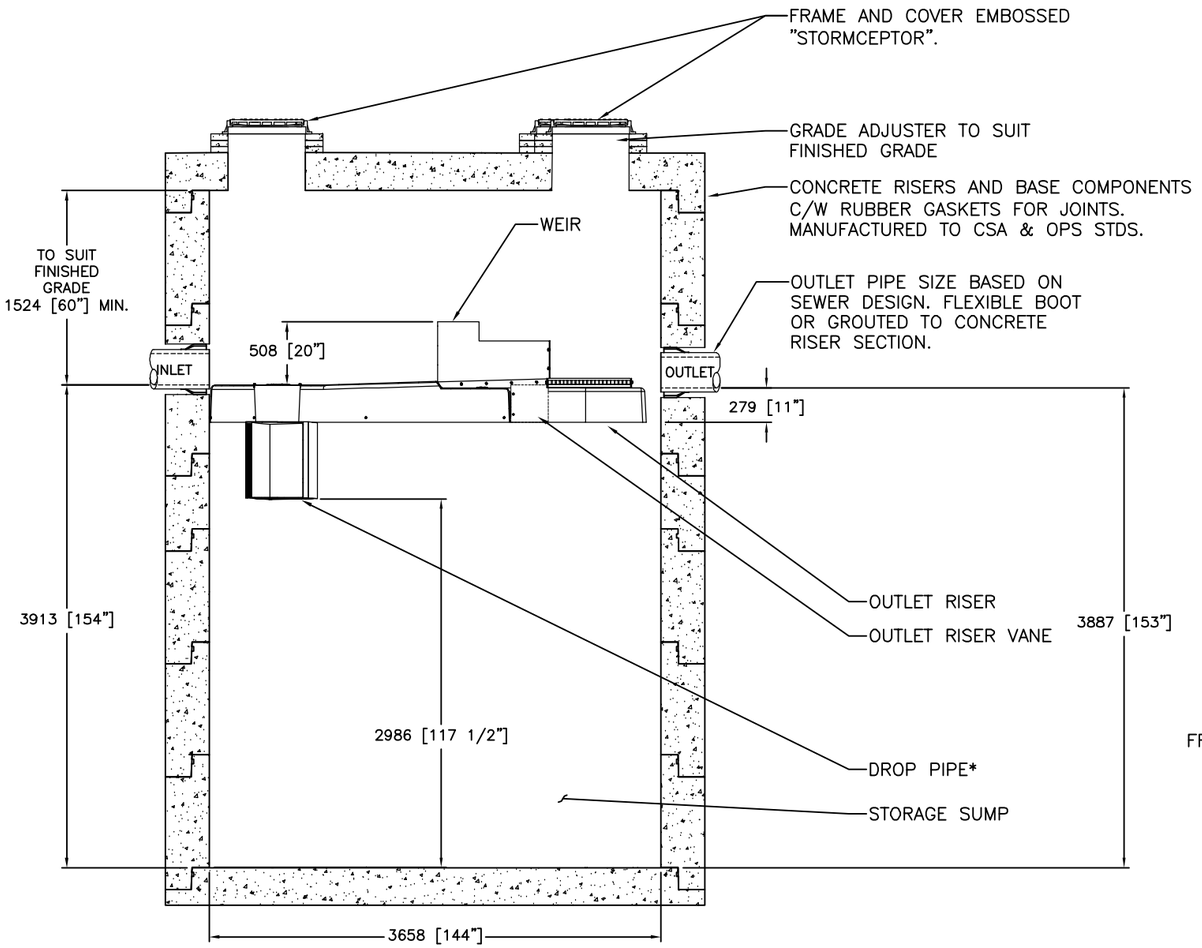
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

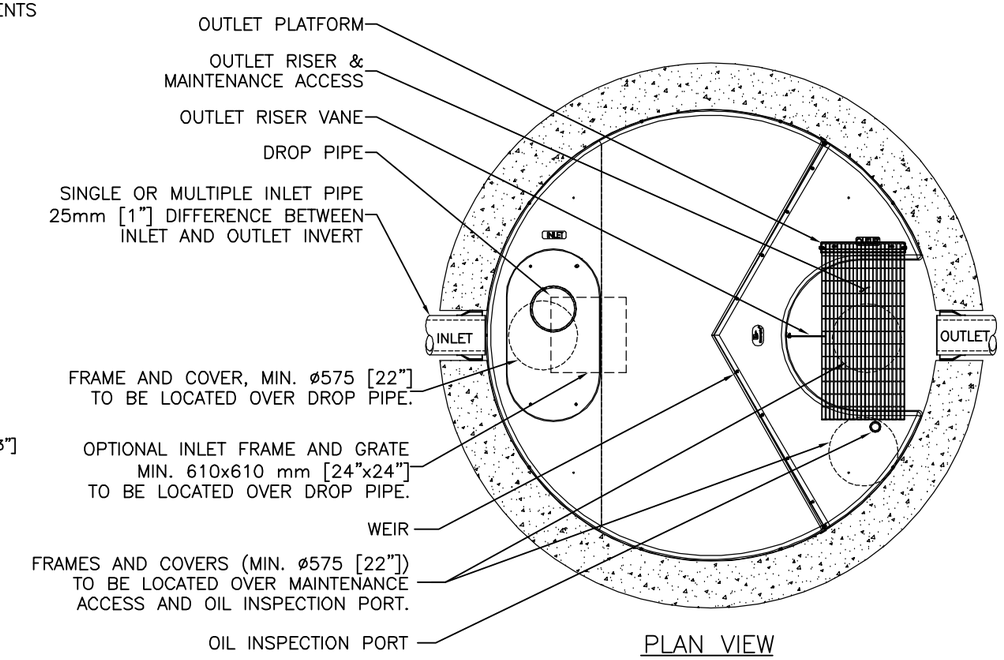
assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF12 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO12 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

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 STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO12
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	OUTLET PLATFORM	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON L1N 9A9
TF 800-565-4801 CA 416-665-8900 INTL +1-416-665-8900

DATE: 10/24/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EFO12	*

SHEET: 1 OF 1

Stormceptor EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

03/13/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20
Site Name:	
Drainage Area (ha):	0.78
Runoff Coefficient 'c':	0.83
Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Project Name:	1319 Johnston Road
Project Number:	23034
Designer Name:	Stephen McCaughey
Designer Company:	Robinson Consultants
Designer Email:	smccaughey@rcii.com
Designer Phone:	613-592-6060
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	20.90
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	8.70
Peak Conveyance (maximum) Flow Rate (L/s):	8.70
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	581
Estimated Average Annual Sediment Volume (L/yr):	473

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	54
EFO6	62
EFO8	66
EFO10	69
EFO12	70

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 62

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

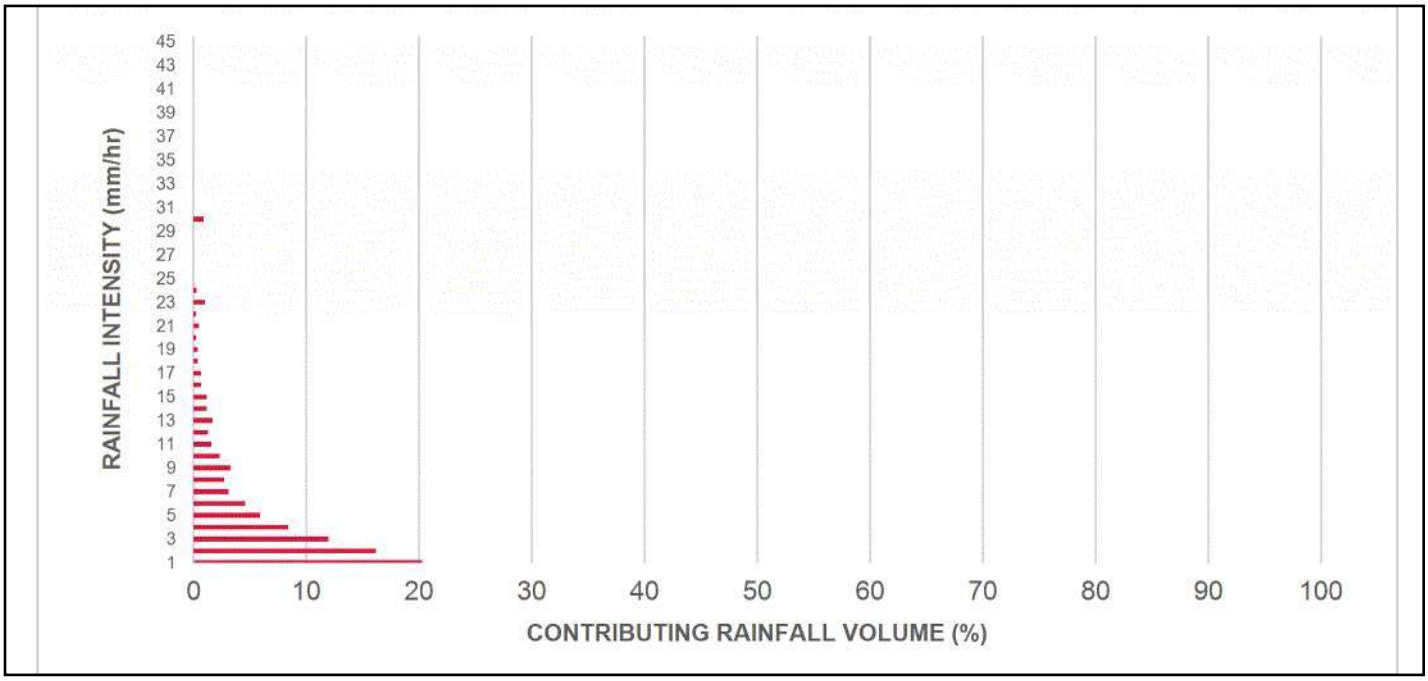
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

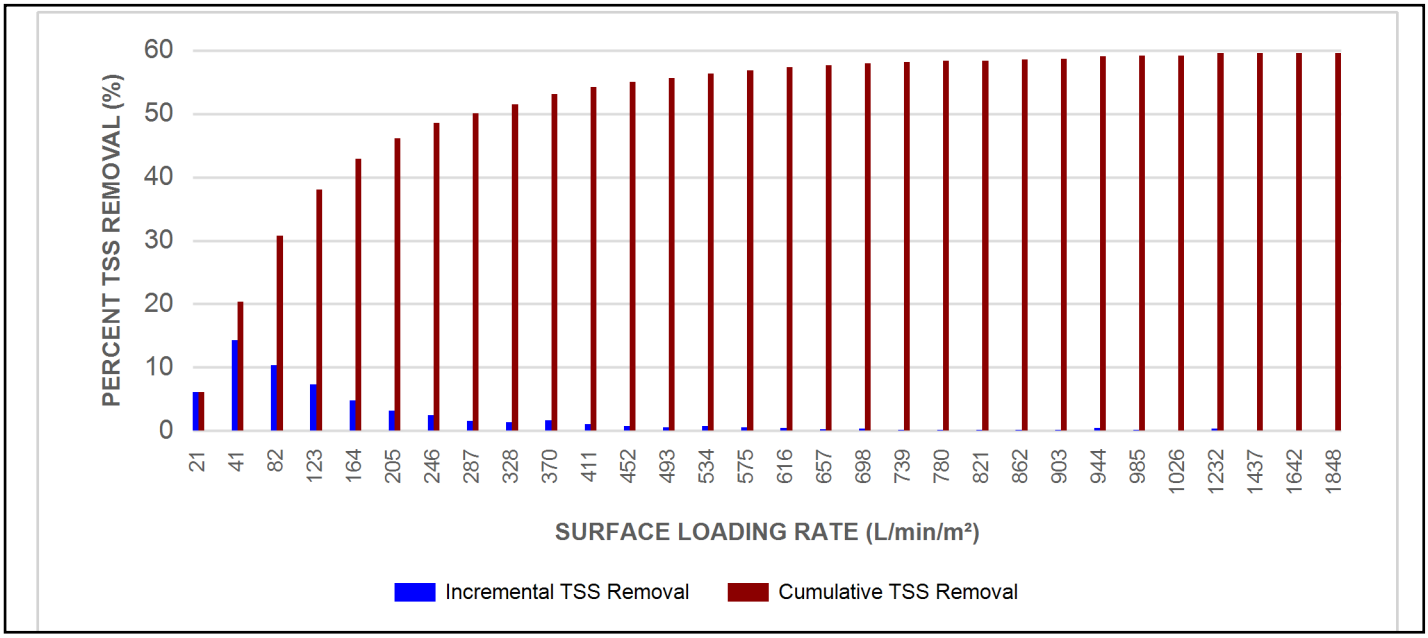
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.90	54.0	21.0	70	6.1	6.1
1.00	20.3	29.0	1.80	108.0	41.0	70	14.3	20.4
2.00	16.2	45.2	3.60	216.0	82.0	64	10.4	30.8
3.00	12.0	57.2	5.40	324.0	123.0	61	7.3	38.0
4.00	8.4	65.6	7.20	432.0	164.0	57	4.8	42.9
5.00	34.4	100.0	9.00	540.0	205.0	54	18.6	61.5
6.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
7.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
8.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
9.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
10.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
11.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
12.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
13.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
14.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
15.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
16.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
17.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
18.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
19.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
20.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
21.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
22.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
23.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
24.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
25.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
30.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
35.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
40.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
45.00	0.0	100.0	9.00	540.0	205.0	54	0.0	61.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**61 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

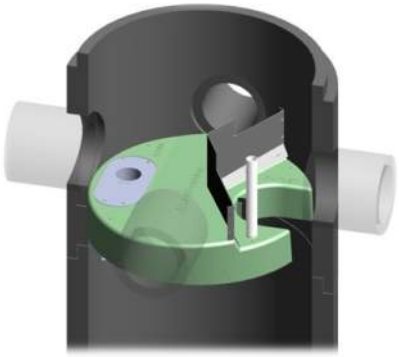
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

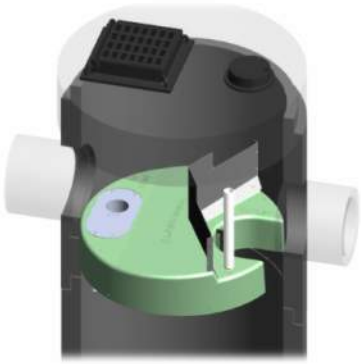
DESIGN FLEXIBILITY

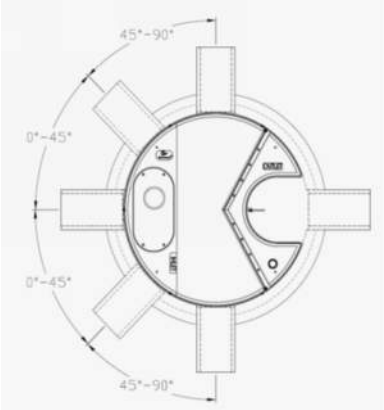
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

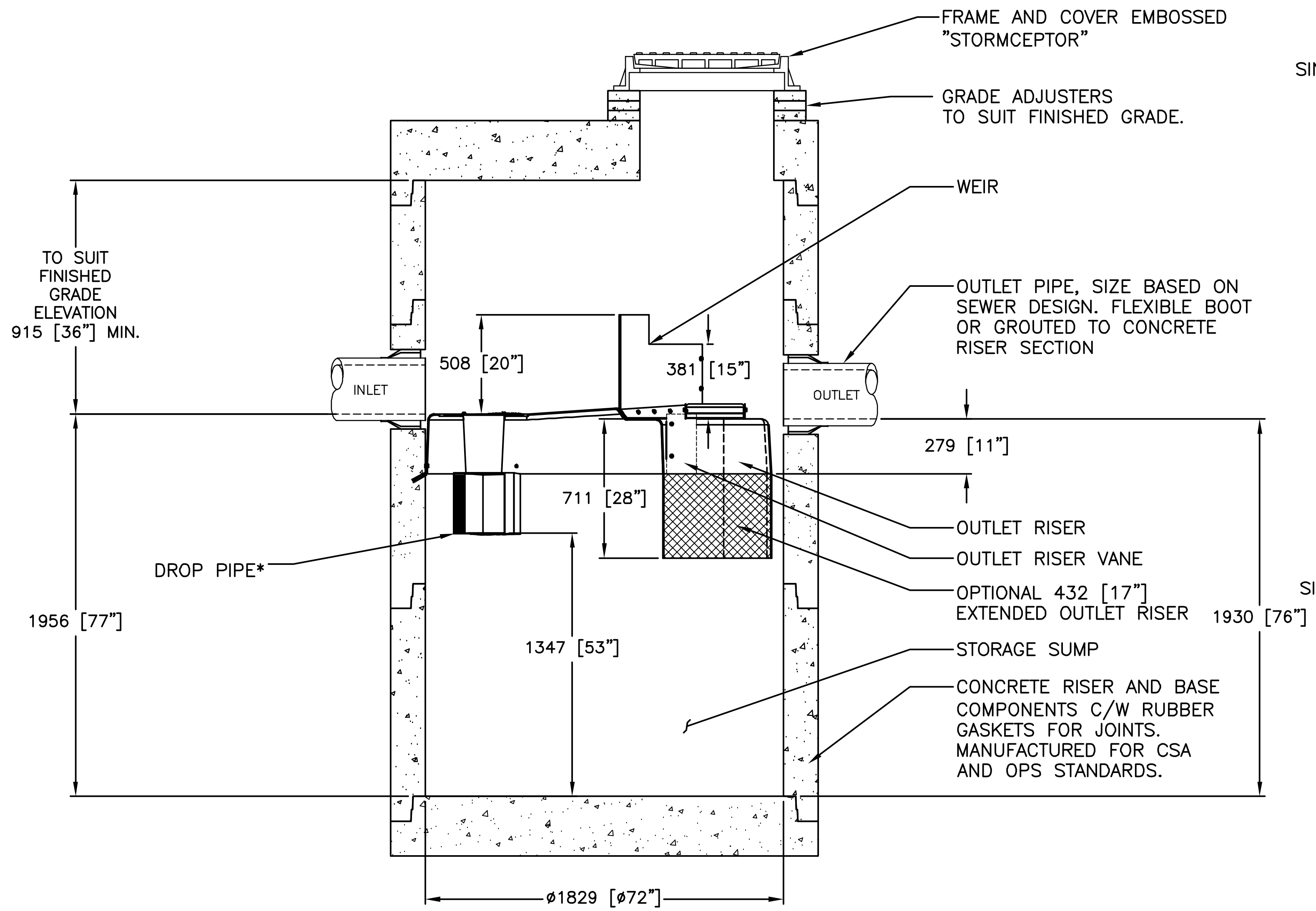
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

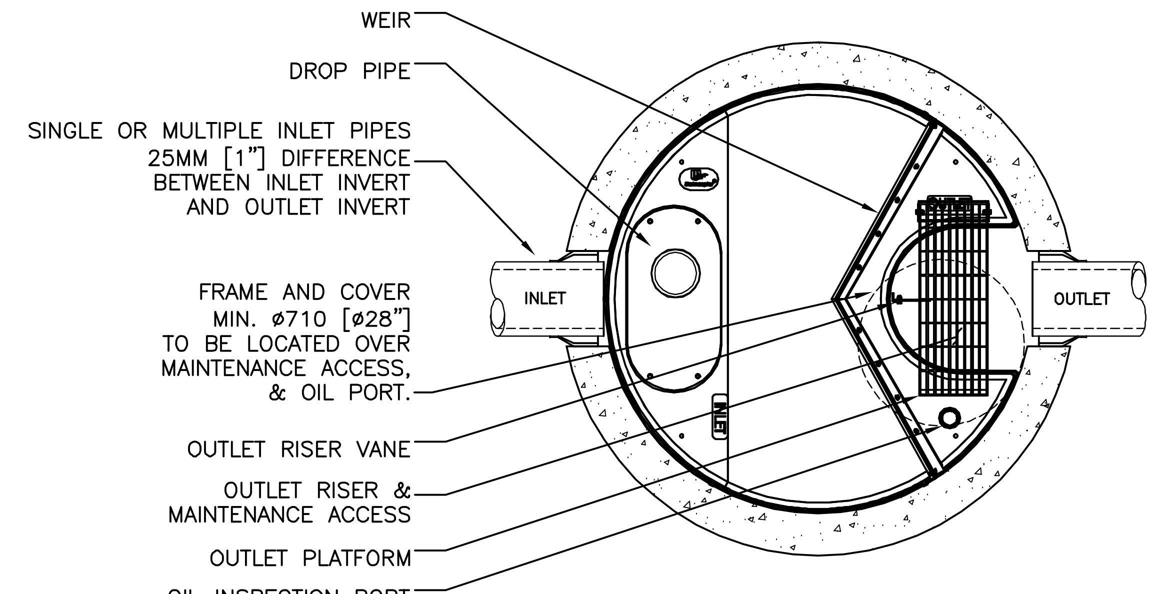
assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

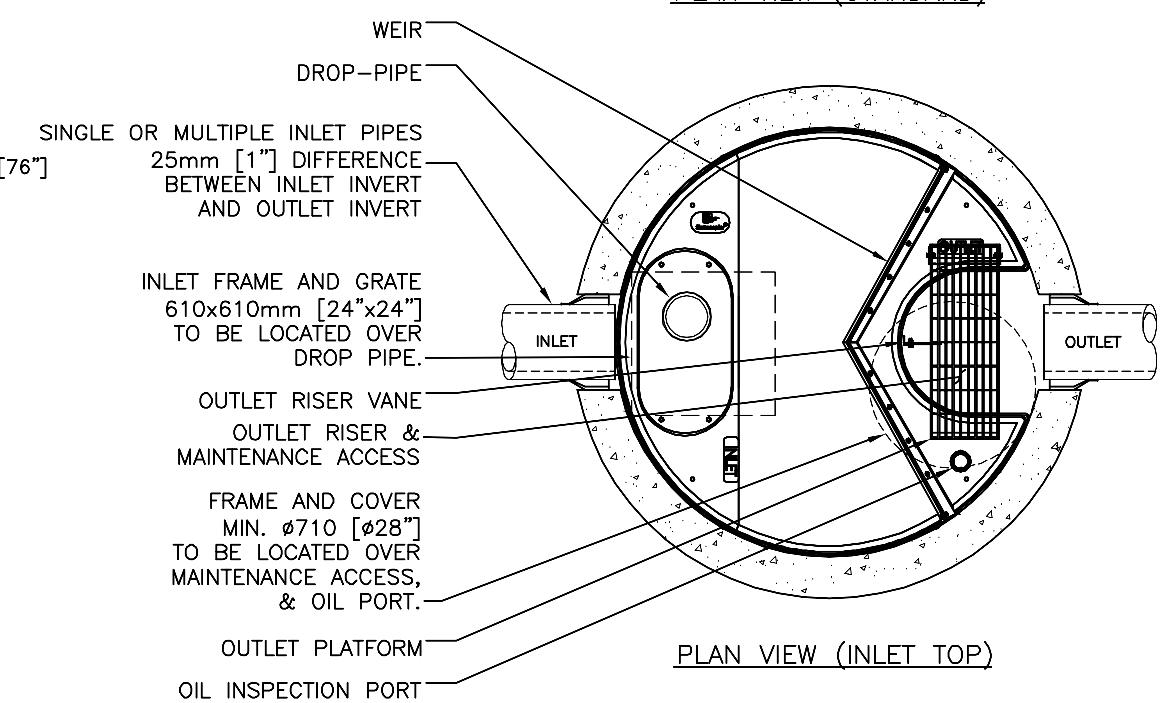
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF6 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO6 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

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 STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO6				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
####	####	####	####
####	####	####	####
####	####	####	####
1	6/8/18	OUTLET PLATFORM	JSK
0	05/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9
TF 800-565-4801 CA 416-960-9900 INTL +1-416-960-9900

DATE: 10/13/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO6	SEQUENCE No.: *
SHEET: 1 OF 1	

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