

SERVICING & STORM WATER MANAGEMENT REPORT MIXED USE DEVELOPMENT 1518-1526 STITTSVILLE MAIN STREET



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Prepared for:

Inverness Homes (c/o Krumac Holdings Inc.)

38 Auriga Drive, Suite 200

Ottawa, Ontario K2E 8A5

Prepared by:

Egis Canada

115 Walgreen Road

Carp, ON K0A 1L0

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1.0 PROJECT DESCRIPTION

1.1 Purpose

Egis Canada (Egis) has been retained by Krumac Holding Inc. to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control process for the proposed Mixed-Use Development located at 1518, 1524, & 1526 Stittsville Main Street within the City of Ottawa (City File No. D07-12-20-0167).

The main purpose of this report is to present a servicing design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Mississippi Valley Conservation Authority (MVCA), and the Ministry of the Environment, Conservation and Parks (MECP). This report will address the water, sanitary, and storm sewer servicing for the development, ensuring that existing and available services will adequately service the proposed development.

This report should be read in conjunction with the following drawings:

- CP-19-0608, C101 – Site Grading and Drainage Plan, and
- CP-19-0608, C102 – Site Servicing, Sediment & Erosion Control Plan.

1.2 Site Description

The property is located at 1518-1526 Stittsville Main Street within ward 6 Stittsville/Glen Gower. It is described as Plan 4R-11524, Park of Lot 23, Concession 10, Geographic Township of Stittsville, City of Ottawa. The land in question covers approximately 0.48 ha. The development area for the proposed works is approximately 0.48 ha. See Site Location Plan in Appendix A for more details.

The existing site is currently developed as a residential property and is made up of gravel parking areas. The existing site has no sanitary, storm, or water services, however there are sanitary and storm sewers, and watermains within Stittsville Main Street.

The proposed development consists of a 649 m² four-storey residential building and a 501 m² two-storey mixed-use building. The residential building proposes a total of 27 units. Parking and drive aisles will be provided throughout the site, along with landscaping. There will be one site access for the development: a new entrance along Stittsville Main Street.

2.0 BACKGROUND STUDIES, STANDARDS, AND REFERENCES

2.1 Background Reports / Reference Information

Background studies that have been completed for the proposed development, which include City of Ottawa as-built drawings, a topographical survey, a geotechnical report, a Phase I Environmental Site Assessment (Phase I ESA), and a Phase II Environmental Site Assessment (Phase II ESA).

As-built drawings of existing services within the vicinity of the proposed site were reviewed in order to determine accurate servicing and stormwater management schemes for the site.

The following is a list of reports available but not included in this submission:

- Topographical Survey (Completed by Fairhall Moffatt & Woodland)
- Geotechnical Report (Completed by Paterson Group Inc.)
- Phase I Environmental Assessment (Completed by Paterson Group Inc.)
- Phase II Environmental Site Assessment Update, 1518, 1524, 1526 Stittsville Main Street Ottawa, Ontario (Completed by Paterson Group Inc.)
- Low Impact Development Stormwater Management Planning and Design Guide (CVC, TRC)

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation meeting was conducted on November 30, 2023, regarding the proposed site. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall be calculated using a time of concentration (T_c) greater than or equal to 10 minutes.
- Control 5- through 100-Year post-development flows to the 5-Year pre-development flows with a combined C value to a maximum of 0.50.
- Quality control is required to be provided for this site (80% TSS removal) as per City requirements.

The notes from the City of Ottawa can be found in Appendix B.

4.0 WATER SERVICING

4.1 Existing Watermain

The site is located within the 3W pressure zone as per the Water Distribution System mapping. There is an existing 406 mm diameter PVC watermain within Stittsville Main Street. The watermain services the adjacent properties as well as the fire hydrants along Stittsville Main Street.

4.2 Proposed Water Servicing

A new 150-200 mm diameter PVC watermain is proposed to service the site, complete with a water valve located at the property line and will be connected to the existing 406 mm diameter watermain within Stittsville Main Street. The 200 mm diameter watermain will be extended into the site in order to provide sufficient fire flow at the private fire hydrant. The watermain will then be reduced to a 150 mm diameter watermain, west of the fire hydrant, and will service the proposed buildings. The watermain is designed to have a minimum of 2.4 m cover. Refer to drawing C102 for ad detailed servicing layout.

The Ontario Building Code (OBC) method was used to estimate the required fire flow for the proposed buildings. A fire flow of 3,600 L/min was calculated for the mixed-use building and a fire flow of 9,000 L/min was calculated for the residential building. The detailed calculations can be found in Appendix C.

In accordance with ISTB-2021-03, the Fire Underwriters Survey 2020 (FUS) method should be used when the OBC method calculates a fire flow demand of 9,000 L/min. As a result, the FUS method was used for the residential building. Fire flow requirements were calculated per City of Ottawa Technical Bulletin ISTB-2018-2. The following parameters were coordinated with the architect:

- Type of Construction – Wood Frame Construction
- Occupancy Type – Limited Combustible
- Sprinkler Protection – Standard Sprinkler System

The results of the FUS calculations yielded a required fire flow of 11,000 L/min (183.3 L/s). The detailed calculations can be found in Appendix C.

The water demands for the proposed building have been calculated to adhere to the Ottawa Design Guidelines – Water Distribution manual and can be found in Appendix C. The results have been summarized in Table 1.

Table 1: Water Supply Design Criteria and Water Demands

Site Area (ha)	0.48
Residential Demand (L/cap/day)	280
Commercial/Office Space Demand (L/gross ha/day)	28,000
Restaurant Demand (L/9.2 m ² /day)	125
Average Day Demand (L/s)	0.21
Maximum Day Demand (L/s)	1.46
Peak Hour Demand (L/s)	2.22
OBC Fire Flow Requirement (L/s) – Mixed-Use Building	60.00
OBC Fire Flow Requirement (L/s) – Residential Building	150.00
FUS Fire Flow Requirement (L/s) – Mixed-Use Building	133.33
FUS Fire Flow Requirement (L/s) – Residential Building	183.33

The City provided the estimated water pressures at both for the average day scenario, peak hour scenario, and the max day plus fire flow scenario for the demands indicated by the correspondence in Appendix C. The resulting pressures for the boundary conditions results are shown in Table 2.

Table 2: Boundary Conditions Results

Scenario	Proposed Demands (L/s)	Connection 1 (m H ₂ O)* / kPa
Average Day Demand	0.21	40.3 / 395.0
Max Daily + Fire Flow Demand	184.79	33.3 / 326.3
Peak Hour Demand	2.22	35.8 / 350.8
*Adjusted for an estimated top of watermain elevation of 119.94 m		

The normal operating pressure range is anticipated to be 326 kPa to 395 kPa and will not be less than 275 kPa (40 psi) or exceed 689 kPa (100 psi). The proposed watermains will meet the minimum required 20 psi (140 kPa) from the Ottawa Water Guidelines at the ground level under maximum day demand and fire flow conditions.

To confirm the adequacy of fire flow to protect the proposed development, public fire hydrants within 150 m of the proposed building were analysed per City of Ottawa ISTB 2018-02, Appendix I Table 1. The results are summarized in Table 3, and a fire hydrant coverage figure has been provided in Appendix C, which shows the hydrants included in the analysis.

Table 3: Fire Protection Confirmation

Building	Fire Flow Demand (L/min)	Fire Hydrant(s) within 75m (5,700 L/min)	Fire Hydrant(s) within 150m (3,800 L/min)	Combined Fire Flow (L/min)
1518 Stittsville Main Street	11,000	1	2	13,300

4.3 Water Modelling

Boundary conditions were provided by the City of Ottawa for the estimated demands (dated January 12th, 2024) and are available in Appendix C. A water model was completed using EPA Net modeling software based on previous boundary conditions provided by the City and development demands. The results determined that the proposed 150-200 mm diameter watermain can adequately service the proposed development and provide the required fire flow of 11,000 L/min while maintaining the minimum required pressure of 140 kPa (20 psi). The results are available in Appendix C.

Table 4: Water Pressure at Junctions per Scenario

Junction	Average Day (kPa)	Max. Day + Fire Flow (kPa)	Peak Hourly (kPa)	Ground Elev. (m)
J1	399.62	266.57	355.50	121.84
J2	399.62	266.57	355.40	121.64
BLD1 (Com)	397.07	264.03	352.85	122.14
BLD2 (Res)	396.68	263.63	352.36	122.13
HYD	397.36	223.24	353.24	122.07

Using EPA Net, the normal operating pressure range is anticipated to be 352 kPa to 399 kPa and will not be less than 275 kPa (20 psi) at the ground level under maximum day demand and fire flow conditions.

5.0 SANITARY SERVICING

5.1 Existing Sanitary Sewers

There is an existing 250 mm diameter concrete sanitary sewer within Stittsville Main Street that is available to service the development. The local sanitary sewer is tributary to the Stittsville Trunk, approximately 800 m downstream.

5.2 Proposed Sanitary Servicing

A new 150-200 mm diameter gravity sanitary service will be connected to the existing 250 mm diameter sanitary sewer within Stittsville Main Street. The sanitary service will be complete with a maintenance manhole which will be installed just inside the property line as per the City of Ottawa – Sewer Design Guidelines, October 2012, Clause 4.4.4.7 and City of Ottawa Sewer-Use By-Law 2003-514 (14).

The subject site proposes a 501 m² mixed-use building with a restaurant and office, and a 649 m² residential building. The peak design flows for the proposed building were calculated using criteria from the Ottawa Sewer Design Guidelines and are summarized in Table 5. The proposed site development area (0.48 ha) will generate a flow of 0.75 L/s.

Table 5: Sanitary Design Criteria

Design Parameter	Value
Site Area (ha)	0.48
Residential (L/cap/day)	280
Commercial/Amenity (L/(1000 m ²)/day)	2,800
Restaurant (L/(9.2 m ²)/day)	125
Extraneous Flow Allowance (L/s/ha)	0.33

Table 6 summarizes the estimated wastewater flow from the proposed development. Refer to Appendix D for detailed calculations.

Table 6: Summary of Estimated Sanitary Flow

Design Parameter	Total Flow (L/s)
Total Estimated Average Dry Weather Flow	0.23
Total Estimated Peak Dry Weather Flow	0.61
Total Estimated Peak Wet Weather Flow	0.75

The proposed 150-200 mm diameter gravity sanitary services will be installed throughout the subject property with a minimum full flow target velocity (cleansing velocity) of 0.6 m/s and a full flow velocity of not more than 3.0 m/s. Design parameters for the site include an infiltration rate of 0.33 L/s/ha. Refer to the sanitary sewer design calculations available in Appendix D.

Due to the complexity of the downstream network, City staff will need to advise of any downstream constraints.

6.0 STORM SEWER SERVICING

6.1 Existing Storm Sewers

There is an existing 750 mm diameter concrete storm sewer within Stittsville Main Street.

6.2 Proposed Storm Servicing

A new sewer system will be extended from the existing 750 mm diameter storm sewer within Stittsville Main Street. The new pipe network will collect storm flows and restrict runoff prior to leaving the site. The storm service from the proposed building will be connected to the proposed on-site storm system downstream of the restriction device.

Runoff from the proposed site will be collected and directed towards the existing 750 mm storm main within Stittsville Main Street. Proposed CB1, CBMH1, and OGS1 (Stormceptor EF04 or approved equivalent) will collect at grade runoff from the parking lot area. Quality treatment will be provided to the runoff via OGS1 prior to being conveyed to MH2. Flow will be restricted by an inlet control device (ICD) located in MH2 with the required storage for the subject property will be provided in a Triton S29 (or approved equivalent) subsurface storage chamber and above the proposed storm structures in the parking area. Attenuated runoff will be conveyed by MH3, which will be used for monitoring purposes, prior to discharging to the 750 mm diameter storm sewer within Stittsville Main Street. The storm sewers will range from 150 – 375 mm in diameter throughout the subject property.

The minor storm sewers will be sized for the 5-Year flow without any restriction. A storm sewer design sheet was created using the rational method and City of Ottawa 5-Year storm event. Storm flows will be controlled by an ICD to limit flows to the specified allowable release rate.

The storm design sheet calculates the proper sizing of the storm pipes within the development. Drainage area information, along with respective pipe slopes and other necessary information were used to evaluate the performance of the storm sewer network. The time of concentration calculated for the storm sewer system is based on a 10-minute inlet time at the uppermost sewer run. Within the design sheet, pipe capacities and associated full flow velocities have been calculated. The design flow (peak flow) was checked against the theoretical capacity to ensure that each storm sewer pipe can convey the 5-Year unrestricted flow.

See CP-19-0608 - POST and Storm Sewer Design Sheet in Appendix F of this report for more details. The Stormwater Management design for the subject property will be outlined in Section 6.0.

7.0 PROPOSED STORMWATER MANAGEMENT

7.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through positive drainage away from the proposed building and into a new underground storm sewer system. The storm system will capture the sloped roof and parking lot runoff and direct the flow to MH2 where it will be restricted. Some of the roof runoff will be captured and restricted creating ponding on the flat roof. The restricted flow will then release into a proposed storm sewer network that connects to the existing 750 mm storm sewer located within Stittsville Main Street. The emergency overland flow route for the proposed site will be directed east towards Stittsville Mains Street. The quantitative and qualitative properties of the storm runoff for both the pre & post development flows are further detailed below. Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. These concepts will be explained further in Section 7.6.

In summary, the following design criteria have been employed in developing the stormwater management design for the site as directed by the City:

Quality Control

- The site has been designed to achieve an 80% total suspended solids removal (enhanced level) using a proposed oil/grit separator.

Quantity Control

- Post-development flow 5-/100-Year is be restricted to match the 5-Year pre-development flow with a maximum C value of 0.50.

7.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA \text{ (L/s)}$$

Where:	C	= Runoff coefficient
	I	= Rainfall intensity in mm/hr (City of Ottawa IDF curves)
	A	= Drainage area in hectares

It is recognized that the Rational Method tends to overestimate runoff rates. As a result, the conservative calculation of runoff ensures that any SWM facility sized using this method is expected to function as intended.

The following coefficients were used to develop an average C for each area:

Roofs/ Concrete/ Asphalt	0.90
Gravel	0.60
Undeveloped and Grass	0.20

As per the City of Ottawa - Sewer Design Guidelines, the 5-Year balanced 'C' value must be increased by 25% for a 100-Year storm event to a maximum of 1.0.

As per the pre-consultation meeting with the City of Ottawa the time of concentration (Tc) used for pre-development shall be calculated using a minimum Tc of 10 minutes and post-development flows shall be calculated using a Tc of 10 minutes.

7.3 Pre-Development Drainage

The existing site drainage limits are demonstrated on the Pre-Development Drainage Area Plan. Area A0 represents the portion of the existing site that drains to the Trans Canada Trail, while Area A1 is the remainder of the site. A summary of the pre-development runoff calculations can be found in Table 7.

Table 7: Pre-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2-/5-Year)	Runoff Coefficient (100-Year)	2-Year Peak Flow (L/s)	5-Year Peak Flow (L/s)	100-Year Peak Flow (L/s)
A0	0.13	0.60	0.74	16.40	22.25	46.96
A1	0.35	0.35	0.43	26.05	35.33	74.23
Total	0.48			42.45	57.59	121.19

See CP-19-0608 – PRE in Appendix E and Appendix G for calculations.

7.4 Post-Development Drainage

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See CP-19-0608 - POST in Appendix F. A summary of the Post-Development Runoff Calculations can be found in Table 8.

Table 8: Post-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2/5-Year)	Runoff Coefficient (100-Year)	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
B0	0.100	0.61	0.69	13.07	17.73	34.33
B1	0.050	0.52	0.59	5.58	7.57	14.78
B2A	0.004	0.90	1.00	0.85	1.15	2.18
B2B	0.022	0.90	1.00	4.25	5.76	10.97
B2C	0.015	0.90	1.00	2.82	3.83	7.30
B3	0.284	0.85	0.94	51.32	69.62	132.87
Total	0.475			77.88	105.66	202.43

Area B0 represents the post-development runoff going to the Trans Canada Trail and it is noted that the post-development flows do not exceed the pre-development flows to this location. Area B1 is the remainder of the site's unrestricted runoff. Runoff for Areas B2 and B3 will be restricted before flowing to the existing system within Stittsville Main Street. The flow will be controlled within roof drains for Area B2. Runoff for Area B3 will be restricted, and the required storage will be provided within the parking area. The flow will be controlled by an ICD located within CBMH2. The restriction device will account for the unrestricted flow (Area B1) leaving the site. This quantity and quality control will be further detailed in Section 7.5 and Section 7.6.

7.5 Quantity Control

After discussing the stormwater management criteria for the site with City staff, the total post-development runoff for this site has been restricted to match the 5-Year pre-development flow rate with a combined C value of 0.50 (see Appendix B for pre-consultation notes). These values create the following allowable release rate and storage volumes for the development site, summarized in Table 9.

Table 9: Allowable Release Rate Summary

Drainage Area	Area (ha)	5-Year Runoff Coefficient	Required Restricted Flow *5-Year* (L/s)
A0 + A1	0.48	0.42	57.59

See Appendix G for calculations.

Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from Areas B2 and B3 will be restricted as shown in Table 10.

Table 10: Post-Development Runoff Summary

Drainage Area	Post Development Unrestricted Flow (L/s)			Post Development Restricted Flow (L/s)			
	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year	
B0	13.07	17.73	34.33	13.07	17.73	34.33	Unrestricted to Trans Canada Trail
B1	5.58	7.57	14.78	5.58	7.57	14.78	Unrestricted
B2A	0.85	1.15	2.18	0.19	0.25	0.50	Restricted – Roof Drains
B2B	4.25	5.76	10.97	0.32	0.44	0.76	
B2C	2.82	3.83	7.30	0.32	0.44	0.76	
B3	51.32	69.62	132.87	2.10	6.00	6.10	Restricted – MH2
Total	77.88	105.66	202.43	21.58	32.43	57.23	

See Appendix G for calculations.

Area B2 will be restricted through three (3) roof drains (B2A, B2B and B2C) before discharging to the new storm sewer downstream of MH2. The total flow leaving the roof will be 0.83 L/s, 1.13 L/s, and 2.02 L/s for the 2-, 5-, and 100-Year storm events, respectively. All the storage required for Area B2 will be located on the proposed roof, and emergency roof scuppers will be installed to ensure ponding does not exceed the proposed ponding limits.

Runoff from Area B3 will be restricted at MH2 through an IPEX Tempest LMF 65 ICD, or an approved equivalent (design head of 2.71 m). This orifice plug will restrict Area B3 to 2.10 L/s, 6.00 L/s, and 6.10 L/s, for the 2-, 5-, and 100-Year storm events, respectively. The restriction creates a water surface elevation (WSEL) of 121.69 m for the 5-Year storm event and 121.78 m for the 100-Year storm event. The storage for the 2-Year storm event will be provided in the Triton S29 subsurface storage system upstream of the ICD. Runoff for the 5- and 100-Year events will be provided via a combination of the Triton S29 subsurface storage system and surface ponding within the parking lot. See Table 11 for details of the required and provided storage volumes.

Table 11: Storage Summary

Drainage Area	2-Year			5-Year			100-Year		
	Depth of Ponding (m)	Storage Required (m ³)	Storage Provided (m ³)	Depth of Ponding (m)	Storage Required (m ³)	Storage Provided (m ³)	Depth of Ponding (m)	Storage Required (m ³)	Storage Provided (m ³)
B2A	0.015	0.46	2.95	0.020	0.63	2.95	0.040	1.16	2.95
B2B	0.025	3.74	15.79	0.035	4.98	15.79	0.060	9.66	15.79
B2C	0.025	2.14	10.78	0.035	2.85	10.78	0.060	5.57	10.78
B3	N/A	54.96	58.00	0.190	57.64	86.77	0.280	132.67	163.66
Total		61.31	87.52		66.10	116.29		149.05	193.18

See Appendix G for calculations.

The underground storage tank has been incorporated in the quantity control design for two purposes: the first is to ensure no surface ponding within the parking lot during the 2-Year storm event, the second is to provide an opportunity for infiltration during minor storm events. Upon further coordination with City Staff, a deviation from the assumption of an average release rate of 50% of the area-specific peak flow rate for sizing sub surface storage is acceptable given that storage for the 100-year can be provided solely by parking lot surface storage. Based on the SWM calculations provided in Appendix G, the storage required for the 5- and 100-year storms within area B3 are 57.6m³ and 132.7m³, respectively. From AutoCAD stage storage analysis, 134.9m³ of surface storage is available within the parking lot at a WSEL of 121.80m, exceeding the storage requirements. Therefore, storage for the 5 and 100-year storms can be provided solely via surface storage.

For conservatism, additional surface storage has been provided in the parking lot during the 5- and 100-Year storms to account for volume below the Triton storm pipe invert (20.1m³). For example, the storage required for area B3 during the 100-Year event is 132.7m³ and 163.7m³ has been provided (31.0m³ excess). Please refer to Appendix G.

In the event that there is rainfall above the 100-Year storm event, or a blockage within the storm sewer system, an emergency overland flow route has been provided so that the stormwater runoff will be conveyed towards the east entrance at Stittsville Main Street.

7.6 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary retention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas.

As per City requirements, the existing storm sewers within Stittsville Main Street ties into the Poole Creek cool water system. In order to mitigate water temperature high albedo roofs have been specified in the design. A quality treatment unit has been sized to provide a TSS removal rate of 80% as per City requirements. The Stormceptor EF04 OGS Unit will provide a water quality of at least 80% TSS. The OGS Unit shall be placed upstream of the restriction unit in order to provide the required water quality treatment for the site runoff before discharging to the storm sewer within Stittsville Main Street. Detailed sizing information for the OGS Unit has been provided in Appendix G of this report.

7.6.1 Infiltration

The subject site is required to meet a yearly infiltration target in accordance with the Carp River Watershed/Subwatershed Study (Carp River Study). Infiltration of site runoff will be prompted via an underground storage tank, landscaped areas, and a rain garden.

Based on the Geotechnical Investigation by Paterson Group, soil conditions generally consist of silty sand over a layer of glacial till. For the purposes of developing an infiltration target, an infiltration potential of 230 mm/yr was selected from Table 3.5.3 of the Carp River Study. A site area 0.48 ha yields an infiltration target 1,095 m³/yr.

Using Canadian Climate Normals Data collected by Environment and Climate Change Canada at the Ottawa Airport, it was determined that approximately 53 days a year Ottawa will receive a rainfall event between 5mm and 25mm with an average depth of 11.09 mm. The climate data is available in Appendix G. Via iteration it was determined that by collecting the 7mm rainfall event from Area B3, up to 1049 m³/year can be infiltrated via the storage system while landscaped areas on site will provide 208 m³/yr. The sum of infiltration via the storage system and landscaped areas will, therefore, exceed the target of 1,095 m³/yr. Refer to Appendix G for calculations.

Based on a required infiltration rate of 230 mm/yr Carp River Watershed/Subwatershed Study, the required infiltration volume for the site is 1095 m³/yr. It is anticipated the silty-sand soil conditions are adequate for the proposed infiltration practices. The proposed practices will slow runoff velocity and filter out suspended sediments, providing a water quality benefit, while providing infiltration into the underlying soil.

The infiltration practices will also have the added benefit of further reducing flow towards the existing Trans Canada Trail. Details of the BMP's as outlined in the Low Impact Design manual and the infiltration calculation have been provided in Appendix G.

8.0 EROSION AND SEDIMENT CONTROL

8.1 Temporary Measures

Before construction begins, temporary silt fence around the perimeter as well as around the rain garden will be installed at all natural runoff outlets from the property. It is crucial that these controls be maintained throughout construction and inspection of sediment and erosion control will be facilitated by the Contractor or Contract Administration staff throughout the construction period.

Silt fences will be installed where shown on the final engineering plans, specifically along the downstream property limits. The Contractor, at their discretion or at the instruction of the City, Conservation Authority or the Contract Administrator shall increase the quantity of sediment and erosion controls on-site to ensure that the site is operating as intended and no additional sediment finds its way off site. The silt fence and barriers shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and as required. Fibre roll barriers are to be installed at all existing curb inlet catchbasins and filter fabric is to be placed under the grates of all existing catchbasins and manholes along the frontage of the site and any new structures immediately upon installation. The measures for the existing/proposed structures is to be removed only after all areas have been paved. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of. Removal of silt fences without prior removal of the sediments shall not be permitted.

Although not anticipated, work through winter months shall be closely monitored for erosion along sloped areas. Should erosion be noted, the Contractor shall be alerted and shall take all necessary steps to rectify the situation. Should the Contractor's efforts fail at remediating the eroded areas, the Contractor shall contact the City and/or Conservation Authority to review the site conditions and determine the appropriate course of action. As the ground begins to thaw, the Contractor shall place silt fencing at all required locations as soon as ground conditions warrant. Please see the Site Servicing, Sediment & Erosion Control Plan for additional details regarding the temporary measures to be installed and their appropriate OPSD references.

8.2 Permanent Measures

It is expected that the Contractor will promptly ensure that all disturbed areas receive topsoil and seed/sod and that grass be established as soon as possible. Any areas of excess fill shall be removed or levelled as soon as possible and must be located a sufficient distance from any watercourse to ensure that no sediment is washed out into the watercourse. As the vegetation growth within the site provides a key component to the control of sediment for the site, it must be properly maintained once established. Once the construction is complete, it will be up to the landowner to maintain the vegetation and ensure that the vegetation is not overgrown or impeded by foreign objects.

9.0 SUMMARY

- A new apartment and new mixed-use building with a restaurant and office will be constructed at 1518-1526 Stittsville Main Street.
- A new 150-200 mm watermain will be installed to service the site, connecting to the 400 mm watermain within Stittsville Main Street.
- A new 150-200 mm sanitary sewer will be installed to service the proposed development and will connect to the existing 250 mm sanitary sewer within Stittsville Main Street. The buildings will be serviced via 150 mm sanitary laterals.
- The proposed 150–375 mm storm sewers will be installed throughout the site and drain to the existing 750 mm storm sewer within Stittsville Main Street.
- Storage for the 2-Year storm event will be provided within a Triton S29 Storage Chamber or approved equivalent and on the flat roof. No surface ponding within the parking lot is proposed for the 2-Year storm event. Storage for the 5- through 100-Year storm event will be provided the Storage Chamber, within the parking lot areas above the proposed storm structures, and on the proposed flat roof.
- A Stormceptor EF04 OGS unit or approved equivalent has been proposed to provide 80% TSS removal as per City requirements.

10.0 RECOMMENDATIONS

Based on the information presented in this report, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed mixed-use development.

This report is respectfully being submitted for approval.

Regards,

[Egis Canada Ltd.](#)



Robert Freel, P.Eng.
Senior Project Manager, Land
Development
T: 613.714.6174
E: robert.freel@egis-group.com



Alison Gosling
Project Engineer, Land Development
T: 613.714.4629
E: alison.gosling@egis-group.com

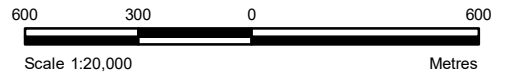
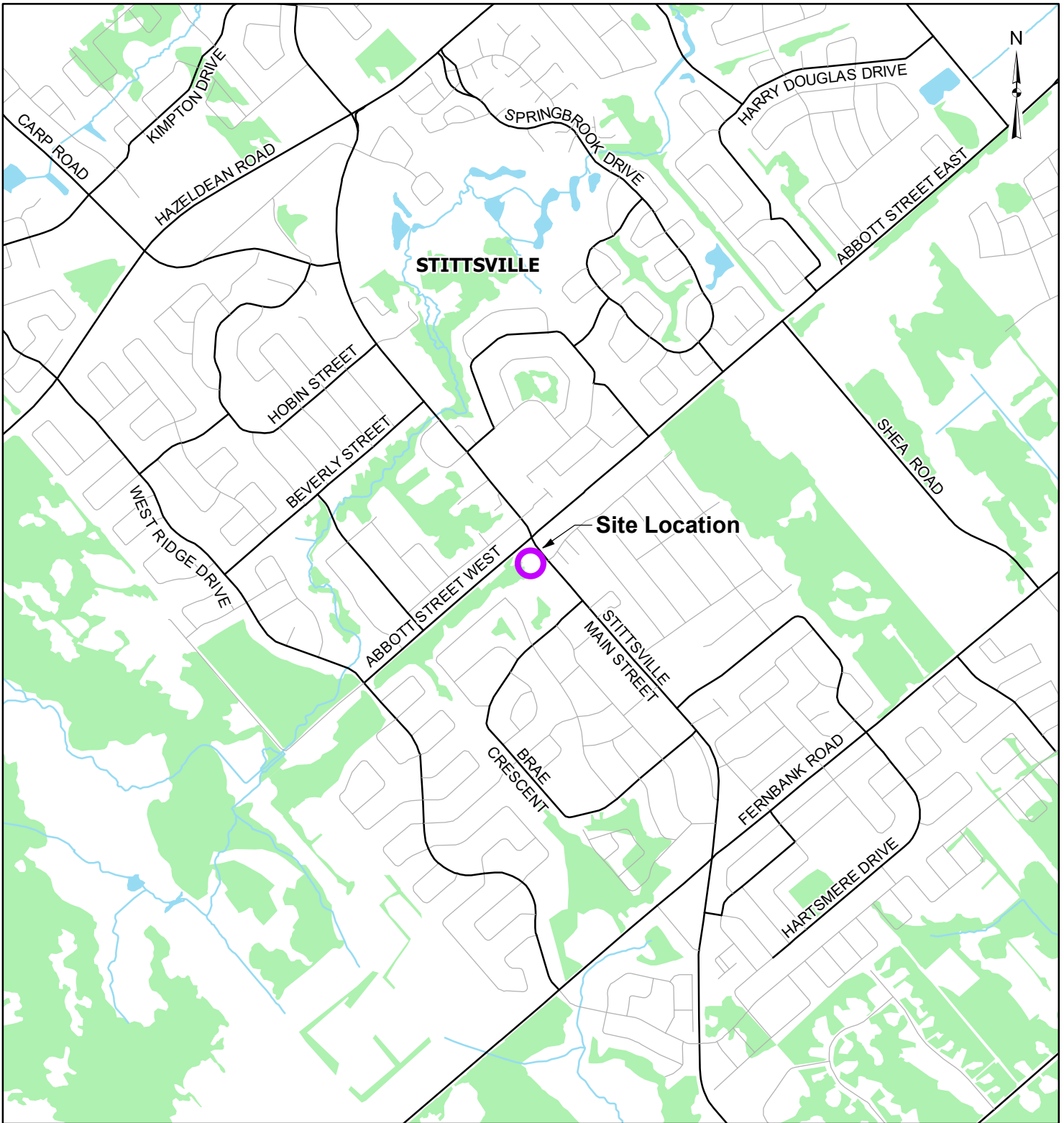
11.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of Inverness Homes. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment, Conservation and Parks, City of Ottawa and local approval agencies. Egis Canada reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by Egis Canada and site visits were performed, no field verification/ measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. Egis Canada accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, Egis Canada should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A
KEY PLAN



LEGEND

- Site Location
- Watercourse
- Local Road
- Waterbody
- Major Road
- Wooded Area

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2020.

CLIENT:		KRUMAC HOLDINGS INC.	
PROJECT:		MIXED USE BUILDING 1518 STITTSVILLE MAIN STREET	
TITLE:		KEY PLAN	
PROJECT NO: CP-19-0608		FIGURE:	
Date	Oct., 22, 2020	1	
GIS	EU		
Checked By	NV		

McINTOSH PERRY
 115 Walgreen Road, RR3, Carp, ON K0A1L0
 Tel: 613-836-2184 Fax: 613-836-3742
 www.mcintoshperry.com

APPENDIX B
BACKGROUND DOCUMENTS

Benjamin Claire
McIntosh Perry
Via email: b.clare@mcintoshperry.com

**Subject: Pre-Consultation: Meeting Feedback
Proposed Site Plan Control Application – 1518-1526 Stittsville Main Street**

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-consultation meeting held on Enter Date of Meeting.

Pre-Consultation Preliminary Assessment

1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input checked="" type="checkbox"/>	5 <input type="checkbox"/>
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One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

Next Steps

1. A review of the proposal and materials submitted for the above-noted pre-consultation has been undertaken. Please proceed to complete a Phase 3 Pre-consultation Application Form and submit it together with the necessary studies and/or plans to planningcirculations@ottawa.ca.
2. In your subsequent pre-consultation submission, please ensure that all comments or issues detailed herein are addressed. A detailed cover letter stating how each issue has been addressed must be included with the submission materials. Please coordinate the numbering of your responses within the cover letter with the comment number(s) herein.
3. Please note, if your development proposal changes significantly in scope, design, or density before the Phase 3 pre-consultation, you may be required to complete or repeat the Phase 2 pre-consultation process.

Supporting Information and Material Requirements

1. The attached **Study and Plan Identification List** outlines the information and material that has been identified, during this phase of pre-consultation, as either required (R) or advised (A) as part of a future complete application submission.
 - a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline

the specific requirements that must be met for each plan or study to be deemed adequate.

Consultation with Technical Agencies

1. You are encouraged to consult with technical agencies early in the development process and throughout the development of your project concept. A list of technical agencies and their contact information is enclosed.

Planning

Comments:

1. Policy: This site is designated as Mainstreet Corridor with an Evolving Neighbourhood Overlay. It is designated as Village Precinct in the Stittsville Mainstreet Secondary Plan and Community Design Plan.

We are pleased to see that many of the key elements of the original submission remain the same.

2. Please ensure that the amount of parking provided complies with the Zoning By-law. If a special exemption provision of the TM is used (e.g. Section 197(14)), please specify the applicable rate on the zoning matrix.
3. Please maintain the previously agreed upon 7.5 metre setback to the city-owned trans Canada trail to the north. We will include as a condition of approval warning clauses on title to notify homeowners of proximity to a future potential rail corridor.
4. We will be taking a road widening as a condition of site plan approval, which will require an R plan to be prepared and submitted prior to registration. Please design the frontage carefully with knowledge of the new right of way limits.
5. Please maintain the amount and type of trees as provided in the original approval.
6. Please look into opportunities to provide secured residential bicycle parking or perhaps provide an overhang for a weather shield. This will make the parking more usable, which will be a big asset given the proximity to the trans-Canada trail.
7. Please label the loading space on the site plan.
8. Ensure that all elements in the Terms of Reference are shown on plans (e.g. Site, Landscape, Elevations, etc.). This will speed up review time and be much appreciated!
9. An update memo to the ESA reports will be required, as the lapsing date for the validity of these reports is 18 months.

Urban Design

Comments:

10. A new Design Brief will not be required but a memo summarizing and demonstrating the changes will be required. In this memo, please conduct a visual analysis of including a peaked roof on the office expansion of the mixed-use building. It is understood that in the previous iteration the flat roof fit for the concept. However, now that the buildings no longer connect and the office portion is expanded, the concept does not have the same visual impact. A visual analysis to understand if the peaked roof should continue along the mixed-use building would be beneficial.
11. Attendance at the UDRP is not required.
12. With the removal of the underground parking and increased surface parking, there is concern about the loss of permeable surface. Please find additional opportunities for plants or permeable surface.
13. Please include two street trees in front of the office portion of the mixed-use building. The bike parking can be relocated to the side or rear of the building.
14. Please show the ROW widening and underground utilities on the landscape plan.
15. Please explore interesting landscape treatments between the buildings in addition to the bike parking.
16. Can the concrete pad at the front of the site adjacent to the public realm be removed and replaced with landscaping to screen the surface parking lot?
17. Please show the snow storage locations on the site plan and landscape plan.

Feel free to reach out to Molly Smith, Urban Design, for follow-up questions.

Engineering

Comments:

18. The Stormwater Management Criteria, for the subject site, is to be based on the following:
 - a. The 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.
 - b. For separated sewer system built pre-1970 the design of the storm sewers are based on a 2 year storm.

- c. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).
 - d. A calculated time of concentration (Cannot be less than 10 minutes).
 - e. Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site.
 - f. For a combined sewer system the maximum $C = 0.4$ or the pre-development C value, whichever is less. In the absence of other information the allowable release rate shall be based on a 2 year storm event.
 - g. Target is still to avoid unrestricted runoff to the Trans Canada Trail and adhere to the Carp river Watershed criteria. Underground storage per city requirements and use of vortex type ICDs to meet the release should not exceed what had been approved through previous design approval.
 - h. Quality control is to be 80% TSS removal.
19. (Storm, Sanitary & Water Supply)
- i. 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.
 - j. 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).
 - k. Sewer connections to be made above the springline of the sewermain as per:
 - i. Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.
 - ii. Std Dwg S11 (For rigid main sewers) – lateral must be less than 50% the diameter of the sewermain,
 - iii. 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 than 50% the diameter of the sewermain,
 - iv. 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.

- v. No submerged outlet connections.

20. Water Boundary condition requests must include the location of the service (map or plan with connection location(s) indicated) and the expected loads required by the proposed development, including calculations. Please provide the following information:

- l. Location of service
- m. Type of development and the amount of fire flow required (as per FUS).
- n. Average daily demand: ___ l/s.
- o. Maximum daily demand: ___ l/s.
- p. Maximum hourly daily demand: ___ l/s.

21. Water

- q. Service areas with a basic day demand greater than 50 m³/day (about 50 homes) shall be connected with a minimum of two watermains, separated by an isolation valve, to avoid the creation of a vulnerable service area.
- r. The maximum fire flow capacity of a fire hydrant shall be reviewed and documented to ensure a sufficient number of fire hydrants are available to service the proposed development. Please review Technical Bulletin ISTB-2018- A fire hydrant coverage plan shall be provided.
- s. Water frontage fees will apply to this site in the amount of \$9,120.00.

Feel free to contact Eric Surprenant, Infrastructure Project Manager, for follow-up questions.

Noise

Comments:

- 22. The Noise Study from the previous site plan submission is acceptable.

Feel free to contact Neeti Paudel, TPM, for follow-up questions.

Transportation

Comments:

- 23. The previous site plan approval generated slightly more trips than the proposed site plan, so a TIA is not warranted here. However, please update the screening form to reference this and resubmit.

24. Please note any infrastructure in the future ROW will have to be removed when/if the City widens the road.
25. Provide the accessible parking space further west from the access.
26. Turning templates will be required for all accesses showing the largest vehicle to access the site, and required for internal movements and at all accesses (entering and exiting and going in both directions).
27. Right-of-way protection:
 - t. See [Schedule C16 of the Official Plan](#).

Feel free to contact Neeti Paudel, Transportation Project Manager, for follow-up questions.

Environment and Trees

Comments:

28. Planning Forester TCR requirements:

The following Tree Conservation Report (TCR) requirements have been adapted from the Schedule E of the Urban Tree Protection Guidelines – for more information on these requirements please contact the Planning Forester mark.richardson@ottawa.ca

- a. A Tree Conservation Report (TCR) was approved for application D07-12-20-0167. A new TCR is not required. In lieu of this, information on tree removals must be included in the revised landscape plan; the tree permit will be based on this information.
- b. 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).
- c. The LP must show existing tree cover information along with the proposed development with tree cover information
 - i. For ease of review, the Planning Forester suggests that all trees be numbered and referenced in an inventory table
- d. Please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
 - i. Compensation may be required for the removal of city owned trees.
 - ii. The removal of trees on a property line will require the permission of both property owners

- e. 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
 - i. The location of tree protection fencing must be shown on the plan
 - ii. Show the critical root zone of the retained trees
- f. 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.

29. Planning Forester LP tree planting requirements:

- a. With the landscape plan please indicate information on tree planting including proposed species and soil volumes. The following minimum soil volume must be achieved:

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

- b. Preference should be given to planting medium to large at maturity trees
- c. Hard surface planting
 - i. If there are hard surface plantings, a planting detail must be provided
 - ii. Curb style planter is highly recommended
 - iii. No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- d. Please contact Mark.Richardson@Ottawa.ca for additional information or clarification

30. There are no comments from environmental planning.

Feel free to contact Matthew Hayley, Environmental Planner, or Mark Richardson, Forester, for follow-up questions.

Parkland

Comments:

31. Please provide an updated plan showing the breakdown distribution of residential and commercial areas. This will be needed in order to calculate if parkland dedication is required.

u. Parkland Dedication [By-law No. 2022-280](#)

Feel free to contact Daniela Gomes Tavares Correia, Parks Planner, for follow-up questions.

Heritage

Comments:

32. Heritage staff are in receipt of a Cultural Heritage Impact Statement prepared by Content Works in support of the previously approved Site Plan Application for this site. Given that the current proposal is similar to the previously approved application, staff will not require the submission of a new Heritage Impact Assessment. Staff require that the applicant submits a memo or an addendum to the original Cultural Heritage Impact Statement that provides an overview of changes to the proposal, an assessment of new or changed impacts to adjacent heritage resources and identifies any new recommended mitigation measures.

33. Please note that references to “Cultural Heritage Impact Statements” have been changed to “Heritage Impact Assessment” under the City’s new Terms of Reference documents. The Heritage Impact Assessment Terms of Reference document can be viewed [at this link](#).

Feel free to contact Greg MacPherson, Heritage Planner, for follow-up questions.

Conservation Authority

34. Please reach out directly to the MCVA and RCVA for their comments. This proposal falls right on the boundary between conservation authority districts.

Other

35. The High Performance Development Standard (HPDS) is a collection of voluntary and required standards that raise the performance of new building projects to achieve sustainable and resilient design. The HPDS was passed by Council on April 13, 2022.

v. At this time, the HPDS is not in effect and Council has referred the 2023 HPDS Update Report back to staff with direction to bring forward an updated report to Committee with recommendations for revised phasing



timelines, resource requirements and associated amendments to the Site Plan Control By-law by no later than Q1 2024.

- w. Please refer to the HPDS information attached and ottawa.ca/HPDS for more information.

Submission Requirements and Fees

1. This proposal requires a Site Plan Revision (Complex subtype) application.
 - a. Additional information regarding fees related to planning applications can be found [here](#).
2. The attached **Study and Plan Identification List** outlines the information and material that has been identified as either required (R) or advised (A) as part of a future complete application submission.
 - a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.
3. All of the above comments or issues should be addressed to ensure the effectiveness of the application submission review.

Should there be any questions, please do not hesitate to contact myself or the contact identified for the above areas / disciplines.

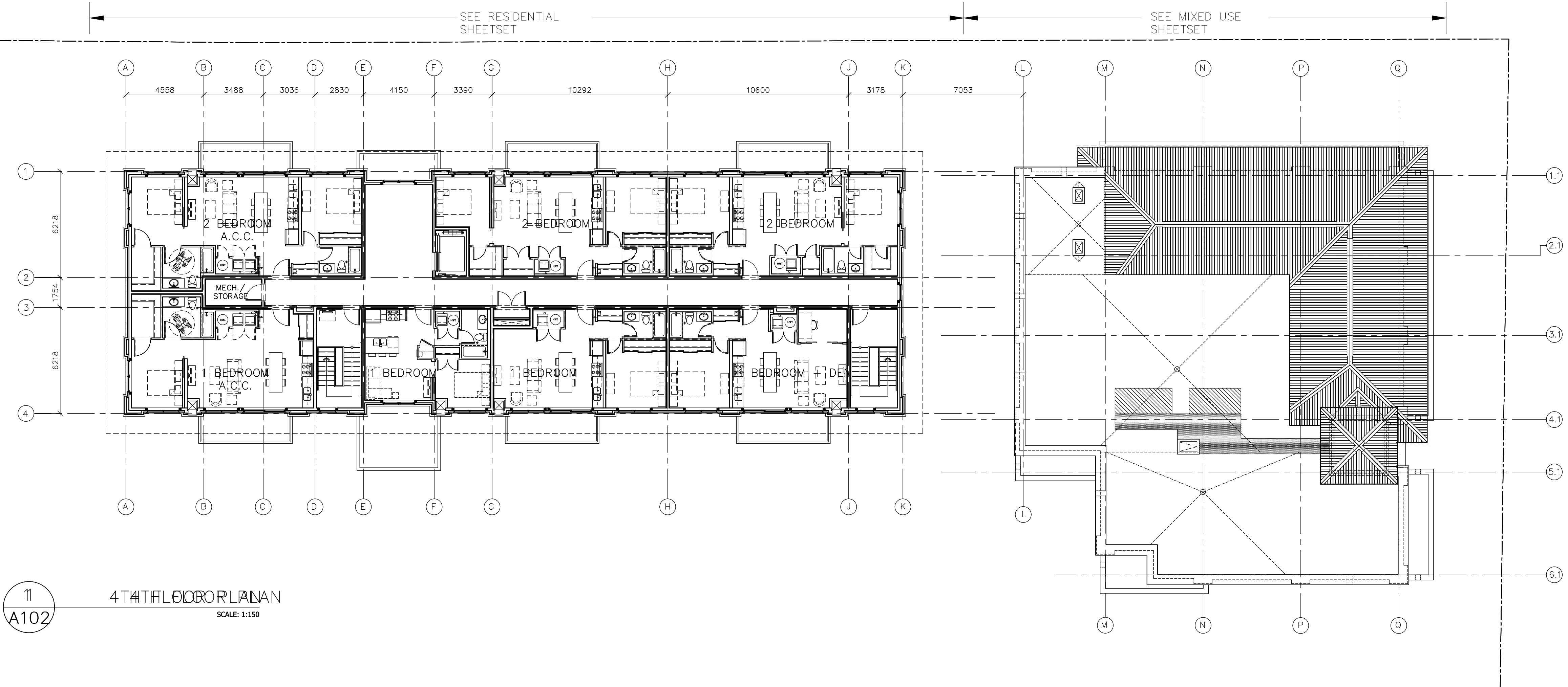
Yours Truly,
Sarah Ezzio

c.c.

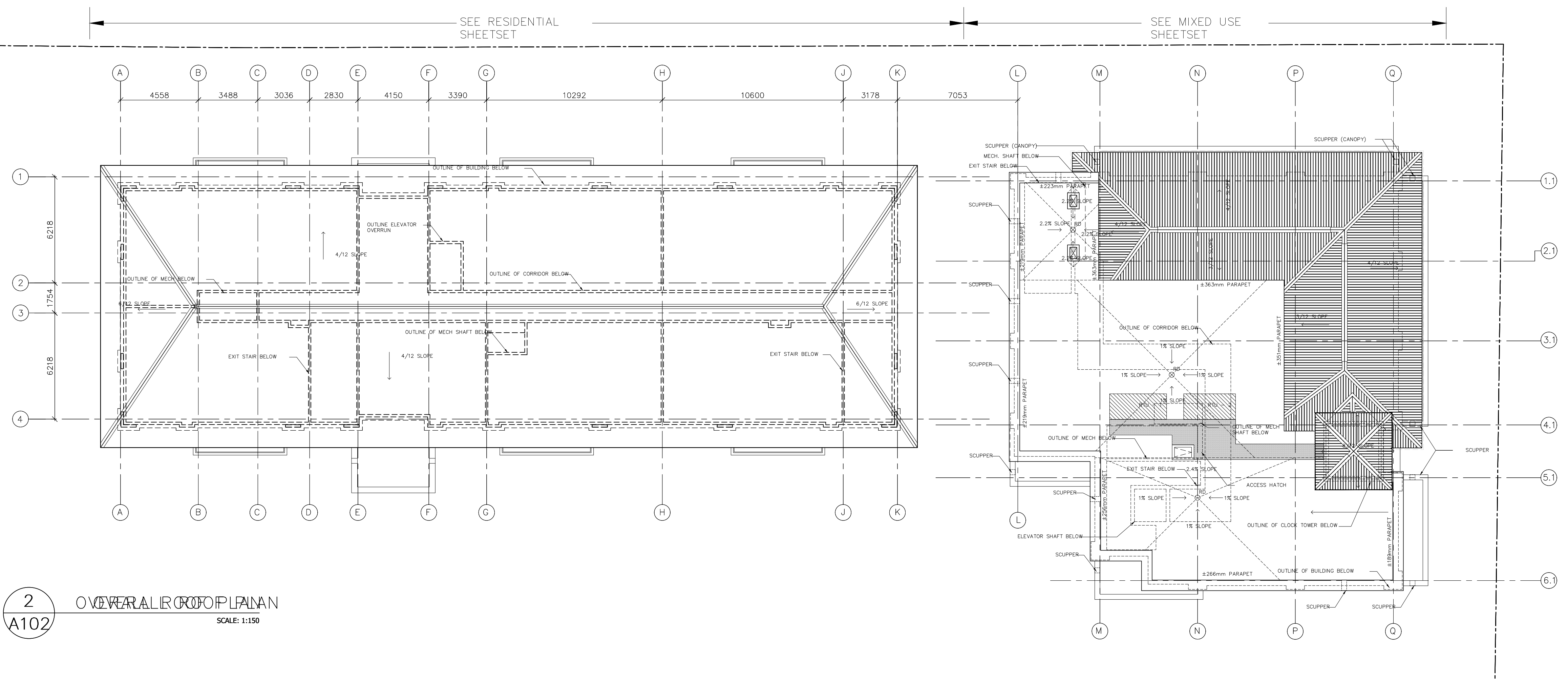
Paudel Neeti, Transportation Project Manager, City of Ottawa
Eric Suprenant, Infrastructure Project Manager, City of Ottawa
Ryan Brault, Infrastructure Project Manager, City of Ottawa
Molly Smith, Urban Designer, City of Ottawa
Mark Richardson, Planning Forester, City of Ottawa
Daniela Gomes Tavares Correia, Parks Planner, City of Ottawa
Greg MacPherson, Heritage Planner, City of Ottawa
Jasmine Law, Student Planner, City of Ottawa
Robert Freel, McIntosh Perry
Amber Guidice, McIntosh Perry
Malcolm Wildeboer, Vandenberg & Wildeboer Architects
Joshua Eckert, Vandenberg & Wildeboer Architects
Kyle MacHutchon, Inverness Homes
Joshua Laginski, Inverness Homes

#	REVISION	DATE
1	ISSUED FOR REVIEW	01-02-24
2	ISSUED FOR SITE PLAN	16-02-24
3	ISSUED FOR CO-ORDINATION	21-02-24
4	ISSUED FOR CO-ORDINATION	04-03-24
5	ISSUED FOR CO-ORDINATION	21-03-24
6	ISSUED FOR CO-ORDINATION	24-04-24
7	ISSUED FOR SITE PLAN	24-05-03
8	ISSUED FOR SITE PLAN	24-05-16
9	ISSUED FOR SITE PLAN	24-08-02
10	ISSUED FOR SITE PLAN	24-11-15

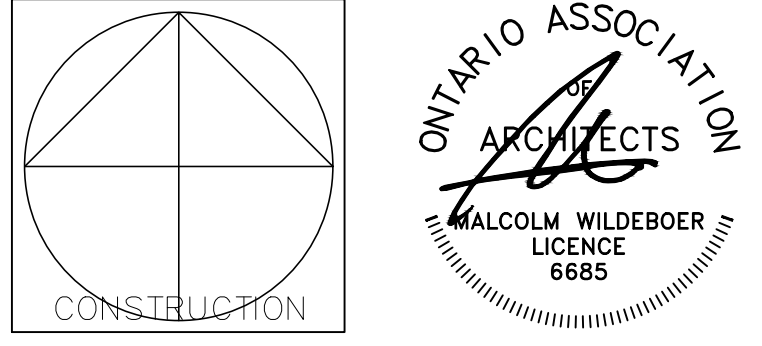
NOTES:
 1. ALL DIMENSIONS ARE TO GRIDLINES, TO FACE OF STUD, FACE OF MASONRY UNIT OR FACE OF CONCRETE WALL U.N.O



11 4TH FLOOR PLAN
 A102 SCALE: 1:150



2 OVERALL ROOF PLAN
 A102 SCALE: 1:150



Vandenberg & Wildeboer
 ARCHITECTS

PROJECT TITLE
 STITTSVILLE STATION
 1518-1524-1526 STITTSVILLE MAIN STREET

DRAWING TITLE
 OVERALL FLOOR PLANS

DESIGNED BY: MALCOLM WILDEBOER
 DRAWN BY: JE, NG, PA, JN, RP
 START DATE: AS SHOWN
 SCALE: AS SHOWN
 PROJECT NO. 2306

DRAWING NO. **A102**

D07-12-24-0093 PLAN #19180

APPENDIX C
WATERMAIN CALCULATIONS

McINTOSH PERRY

CP-19-0608 - 1518 Stittsville Main - Water Demands

Project:	1518 Stittsville Main
Project No.:	CP-19-0608
Designed By:	AJG
Checked By:	RDF
Date:	August 1, 2024
Site Area:	0.48 gross ha

<u>Residential</u>	NUMBER OF UNITS	UNIT RATE	
1 Bedroom Apartment	19 units	1.4	persons/unit
2 Bedroom Apartment	8 units	2.1	persons/unit
Total Population	44 persons		
<u>Commercial</u>	414 m2		
<u>Restaurant</u>	326 m2		
<u>Industrial - Light</u>	m2		
<u>Industrial - Heavy</u>	m2		

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	
Residential	280	L/c/d	
Industrial - Light	35,000	L/gross ha/d	
Industrial - Heavy	55,000	L/gross ha/d	
Shopping Centres	2,500	L/(1000m ² /d)	
Restaurant	125	L/(9.2m ² /d)	
Schools	70	L/(Student/d)	
Trailer Park with no Hook-Ups	340	L/(space/d)	
Trailer Park with Hook-Ups	800	L/(space/d)	
Campgrounds	225	L/(campsite/d)	
Mobile Home Parks	1,000	L/(Space/d)	
Motels	150	L/(bed-space/d)	
Hotels	225	L/(bed-space/d)	
Tourist Commercial	28,000	L/gross ha/d	
Other Commercial	28,000	L/gross ha/d	
	Residential	0.14	L/s
AVERAGE DAILY DEMAND	Commercial/ Industrial/ Institutional	0.06	L/s

McINTOSH PERRY

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT		UNITS
Residential	9.5	x avg. day	L/c/d
Industrial	1.5	x avg. day	L/gross ha/d
Commercial	1.5	x avg. day	L/gross ha/d
Institutional	1.5	x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	Residential	1.35	L/s
	Commercial/ Industrial/ Institutional	0.10	L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT		UNITS
Residential	14.3	x avg. day	L/c/d
Industrial	1.8	x max. day	L/gross ha/d
Commercial	1.8	x max. day	L/gross ha/d
Institutional	1.8	x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	Residential	2.04	L/s
	Commercial/ Industrial/ Institutional	0.17	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT

CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.21	L/s
MAXIMUM DAILY DEMAND	1.45	L/s
MAXIMUM HOUR DEMAND	2.21	L/s

McINTOSH PERRY

1518 Stittsville Main - OBC Fire Calculations (Mixed-Use Building)

Project:	CP-19-0608
Project No.:	1518 Stittsville Main
Designed By:	AJG
Checked By:	RDF
Date:	August 1, 2024

Ontario 2006 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting - Restaurant/ Office

Building is classified as Group : A-2, C & D (from table 3.2.2.55)

Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance ratings. Roof assemblies, mezzanies, loadbearing walls, columns and arches do not have a fire-resistance rating.

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) $Q = K \times V \times S_{tot}$

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

S_{tot} = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \dots \text{etc.}]$

K	23	(from Table 1 pg A-31) (Worst case occupancy {E/ F2} 'K' value used)
V	3,743	(Total building volume in m ³ .)
S _{tot}	1.3	(From figure 1 pg A-32)
Q =	111,900.75 L	

From
Figure 1
(A-32)

Snorth	7.4 m	0.3
Seast	58 m	0.0
South	15.8 m	0.0
Swest	74.1 m	0.0

* approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

3600 L/min (if Q >190,000 and Q <270,000 L)
951 gpm

McINTOSH PERRY

1518 Stittsville Main - OBC Fire Calculations (Residential Building)

Project:	CP-19-0608
Project No.:	1518 Stittsville Main
Designed By:	AJG
Checked By:	RDF
Date:	August 1, 2024

Ontario 2006 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting - Restaurant/ Office

Building is classified as Group A-2, C & D (from table 3.2.2.55)
 Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance ratings. Roof assemblies, mezzanies, loadbearing walls, columns and arches do not have a fire-resistance rating.

From Div. BA-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) $Q = K \times V \times S_{tot}$

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

S_{tot} = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \dots \text{etc.}]$

K	23	(from Table 1 pg A-31) (Worst case occupancy (E/ F2) 'K' value used)
V	9,735	(Total building volume in m ³ .)
S _{tot}	1.3	(From figure 1 pg A-32)
Q =	291,076.50 L	

			From Figure 1 (A-32)
Shorth	7.4 m	0.3	
Seast	35.2 m	0.0	
South	34.6 m	0.0	
Swest	21.4 m	0.0	

* approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

9000 L/min (if Q > 190,000 and Q < 270,000 L)
 2378 gpm

McINTOSH PERRY

CP-19-0608 - 1518 Stittsville Main - Fire Underwriters Survey (Residential Building)

Project: 1518 Stittsville Main
 Project No.: CP-19-0608
 Designed By: AJG
 Checked By: RDF
 Date: August 1, 2024

From the Fire Underwriters Survey (2020)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:
 City of Ottawa Technical Bulletin ISTB-2018-02 Applied Where Applicable

A. BASE REQUIREMENT (Rounded to the nearest 1000 L/min)

F = 220 x C x √A Where: F = Required fire flow in liters per minute
 C = Coefficient related to the type of construction.
 A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

Construction Type Wood Frame

C 1.5 A 2,596.0 m²
 Total Floor Area (per the 2020 FUS Page 20 - Total Effective Area) 2,596.0 m²

Calculated Fire Flow 16,813.8 L/min
 17,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From Page 24 of the Fire Underwriters Survey:
 Limited Combustible -15%

Fire Flow 14,450.0 L/min

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Standard Water Supply Sprinklered -40%

Reduction -5,780.0 L/min

D. INCREASE FOR EXPOSURE (No Rounding)

	Separation Distance (m)	Cons. of Exposed Wall	Length Exposed Adjacent Wall (m)	Height (Stories)	Length-Height Factor	
Exposure 1	Over 30 m		N/A	N/A	N/A	0%
Exposure 2	3.1 to 10	Wood frame	24.5	2	49.0	17%
Exposure 3	20.1 to 30	Wood frame	15.5	1	15.5	0%
Exposure 4	Over 30 m	Wood frame	15	1	15.0	0%
					% Increase*	17%

Increase* 2,456.5 L/min

E. Total Fire Flow (Rounded to the Nearest 1000 L/min)

Fire Flow 11,126.5 L/min
 Fire Flow Required** 11,000.0 L/min

* In accordance with Part II, Section 4, the Increase for separation distance is not to exceed 75%

** In accordance with Section 4 the Fire flow is not to exceed 45,000 L/min or be less than 2,000 L/min

McINTOSH PERRY

CP-19-0608 - 1518 Stittsville Main - Fire Underwriters Survey (Mixed-Use Building)

Project: 1518 Stittsville Main
 Project No.: CP-19-0608
 Designed By: AJG
 Checked By: RDF
 Date: August 1, 2024

From the Fire Underwriters Survey (2020)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:
 City of Ottawa Technical Bulletin ISTB-2018-02 Applied Where Applicable

A. BASE REQUIREMENT (Rounded to the nearest 1000 L/min)

F = 220 x C x vA Where:

F = Required fire flow in liters per minute

C = Coefficient related to the type of construction.

A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

Construction Type Wood Frame

C

1.5

A

998.0 m²

Total Floor Area (per the 2020 FUS Page 20 - Total Effective Area)

998.0 m²

Calculated Fire Flow

10,425.1 L/min

10,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From Page 24 of the Fire Underwriters Survey:

Limited Combustible

-15%

Fire Flow

8,500.0 L/min

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Standard Water Supply Sprinklered

-40%

Reduction

-3,400.0 L/min

D. INCREASE FOR EXPOSURE (No Rounding)

	Separation Distance (m)	Cons. of Exposed Wall	Length Exposed Adjacent Wall (m)	Height (Stories)	Length-Height Factor	
Exposure 1	Over 30 m	Wood frame	24	3	72.0	0%
Exposure 2	10.1 to 20	Wood frame	14	1	14.0	10%
Exposure 3	10.1 to 20	Wood frame	16	2	32.0	11%
Exposure 4	3.1 to 10	Wood frame	14.5	4	58.0	17%
					% Increase*	38%

Increase*

3,230.0 L/min

E. Total Fire Flow (Rounded to the Nearest 1000 L/min)

Fire Flow

8,330.0 L/min

Fire Flow Required**

8,000.0 L/min

* In accordance with Part II, Section 4, the Increase for separation distance is not to exceed 75%

** In accordance with Section 4 the Fire flow is not to exceed 45,000 L/min or be less than 2,000 L/min

McINTOSH PERRY

CP-19-0608 - 1518 Stittsville Main - Boundary Condition Unit Conversion

Project: 1518 Stittsville Main

Project No.: CP-19-0608

Designed By: AJG

Checked By: RDF

Date: August 1, 2024

Boundary Conditions Unit Conversion

STITTSTVILLE MAIN STREET

Scenario	Height (m)	Elevation (m)	m H ₂ O	PSI	kPa
Avg. DD	160.2	119.9	40.3	57.3	395.0
Fire Flow (183.33 L/s or 11,000 L/min)	153.2	119.9	33.3	47.3	326.3
Peak Hour	155.7	119.9	35.8	50.9	350.8

1518 Stittsville Main - Water Model Output

Project: 1518 Stittsville Main
 Project No.: CP-19-0608
 Designed By: PFR
 Checked By: PFR
 Date: 2024-08-01

MODEL INPUTS

Flow Units	L/s
Headloss Formula	H-W
Specific Gravity	1.0
Accuracy	0.001
Demand Multiplier	1.0
Maximum Fire Flow (L/s)	183.3

MODEL LOSSES

Standard Tee - Flow through run	0.6
Standard Tee - Flow through branch	1.8
45 Degree Elbow	0.4
Long Radius Elbow	0.6
Short Radius Elbow	0.9
Gate valve, fully open	0.2
Swing check valve, fully open	2.5
Reducer	0.4

MODEL RESULTS

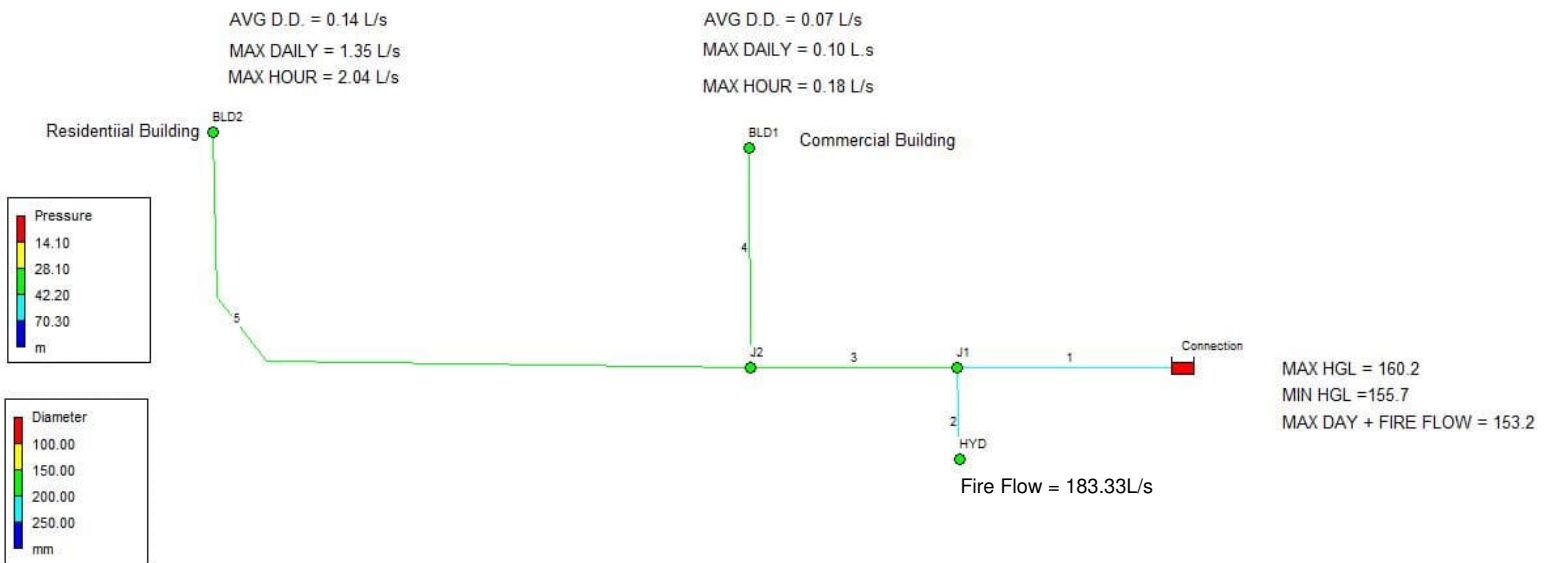
Junctions	Average Daily Demand (kPa)	Maximum Daily Demand + Fire Flow (kPa)	Peak Hourly Demand (kPa)	Junction Ground Elevation (m)
J1	399.62	266.57	355.50	121.84
J2	399.62	266.57	355.40	121.64
BLD1	397.07	264.03	352.85	122.14
BLD2	396.68	263.63	352.36	122.13
HYD	397.36	223.24	353.24	122.07

Junctions	Average Daily Demand (m)	Maximum Daily Demand + Fire Flow (m)	Peak Hourly Demand (m)	Junction Ground Elevation (m)
J1	40.76	27.19	36.26	121.84
J2	40.76	27.19	36.25	121.64
BLD1	40.50	26.93	35.99	122.14
BLD2	40.46	26.89	35.94	122.13
HYD	40.53	22.77	36.03	122.07

EPANET WATER MODEL
AVERAGE DAY SCENARIO

McINTOSH PERRY





```

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

Input File: CP-19-0608 Water Model_AVG DAILY.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Connect ion	J1	15.46	200
2	J1	HYD	3.74	200
3	J1	J2	20.95	150
4	J2	BLD1	14.82	150
5	J2	BLD2	49.27	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
J1	0.00	160.20	40.76	0.00
HYD	0.00	160.20	40.53	0.00
BLD2	0.14	160.20	40.46	0.00
J2	0.00	160.20	40.76	0.00
BLD1	0.07	160.20	40.50	0.00
Connect ion	-0.21	160.20	0.00	0.00 Reser voi r

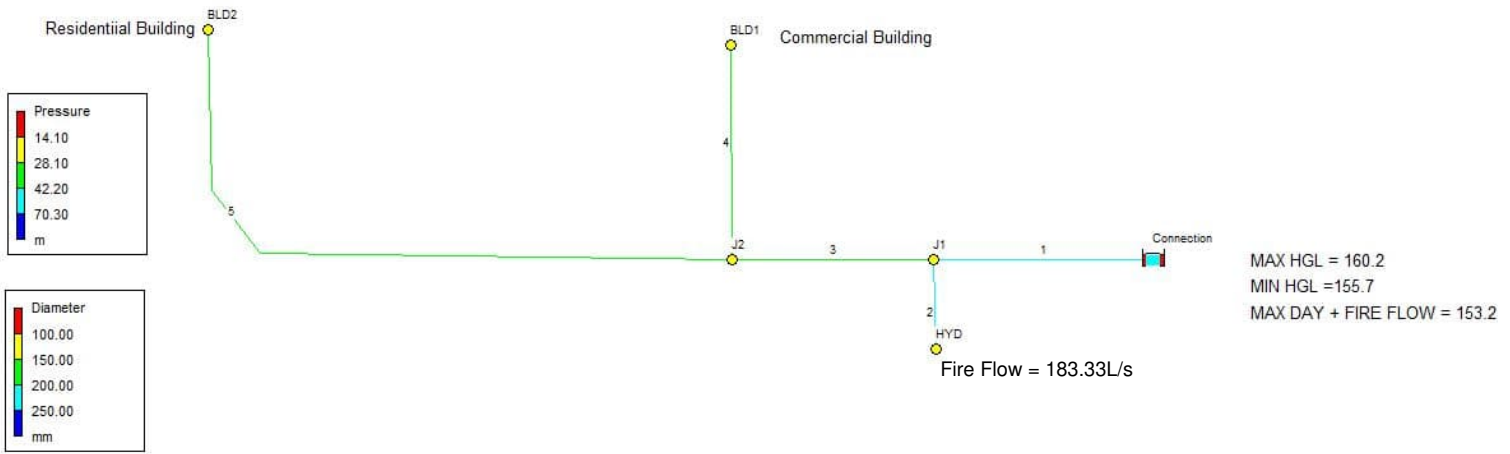
Link Results:

Link ID	Flow LPS	Velocity m/s	Head loss m/km	Status
1	0.21	0.01	0.00	Open
2	0.00	0.00	0.00	Open
3	0.21	0.01	0.00	Open
4	0.07	0.00	0.00	Open
5	0.14	0.01	0.00	Open

EPANET WATER MODEL
MAX DAY + FIRE FLOW SCENARIO

McINTOSH PERRY





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

Input File: CP-19-0608 Water Model_MAX DAY+FF.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Connect ion	J1	15.46	200
2	J1	HYD	3.74	200
3	J1	J2	20.95	150
4	J2	BLD1	14.82	150
5	J2	BLD2	49.27	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
J1	0.00	146.63	27.19	0.00
HYD	183.33	142.44	22.77	0.00
BLD2	1.35	146.63	26.89	0.00
J2	0.00	146.63	27.19	0.00
BLD1	0.10	146.63	26.93	0.00
Connect ion	-184.78	153.20	0.00	0.00 Reser voi r

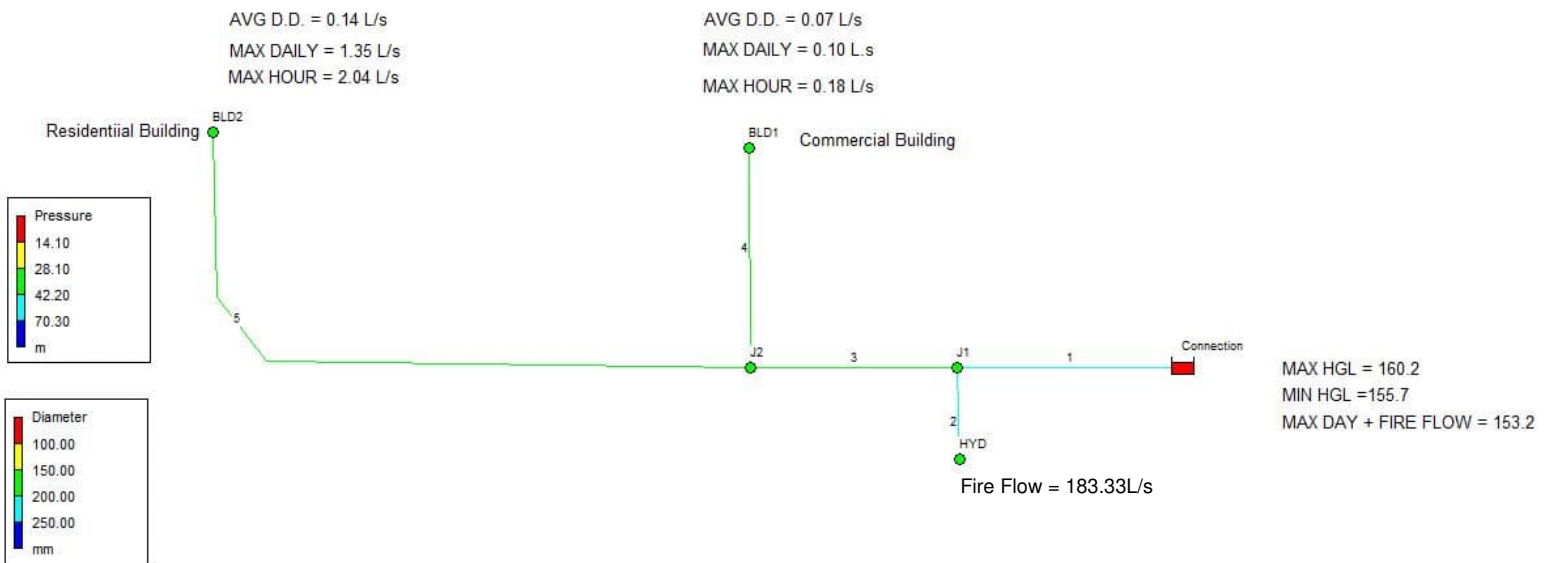
Link Results:

Link ID	Flow LPS	Velocity m/s	Head loss m km	Status
1	184.78	5.88	424.71	Open
2	183.33	5.84	1121.51	Open
3	1.45	0.08	0.14	Open
4	0.10	0.01	0.00	Open
5	1.35	0.08	0.12	Open

EPANET WATER MODEL
PEAK HOUR SCENARIO

McINTOSH PERRY





```

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

Input File: CP-19-0608 Water Model_MAX HOUR.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Connect ion	J1	15.46	200
2	J1	HYD	3.74	200
3	J1	J2	20.95	150
4	J2	BLD1	14.82	150
5	J2	BLD2	49.27	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
J1	0.00	155.70	36.26	0.00
HYD	0.00	155.70	36.03	0.00
BLD2	2.04	155.68	35.94	0.00
J2	0.00	155.69	36.25	0.00
BLD1	0.18	155.69	35.99	0.00
Connect ion	-2.22	155.70	0.00	0.00 Reser voi r

Link Results:

Link ID	Flow LPS	Velocity m/s	Head loss m/km	Status
1	2.22	0.07	0.09	Open
2	0.00	0.00	0.00	Open
3	2.22	0.13	0.30	Open
4	0.18	0.01	0.00	Open
5	2.04	0.12	0.25	Open

Boundary Conditions 1518 – 1526 Stittsville Main St

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	13	0.21
Maximum Daily Demand	88	1.46
Peak Hour	133	2.22
Fire Flow Demand #1	11,000	183.33

Location



Results

Connection 1 – Stittsville Main St

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	160.2	54.5
Peak Hour	155.7	48.0
Max Day plus Fire Flow #1	153.2	44.5

¹ Ground Elevation = 121.9 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

1518, 1524, 1526 Stittsville Main Street Hydrant Coverage Figure



APPENDIX D
SANITARY CALCULATIONS

McINTOSH PERRY

19-0608 - 1581-1526 Stittsville Main St - Sanitary Demands

Project:	1581-1526 Stittsville Main St		
Project No.:	19-0608		
Designed By:	AJG		
Checked By:	RDF		
Date:	August 1, 2024		
Ste Area	0.48	Gross ha	
1 Bedroom	19	1.40	Persons per unit
2 Bedroom	8	2.10	Persons per unit
Total Population	44	Persons	
Restaurant	326	m ²	
Office Space/ Retail	414	m ²	

DESIGN PARAMETERS

Institutional/ Commercial Peaking Factor	1	
Residential Peaking Factor	3.66	* Using Harmon Formula = $1+(14/(4+P^0.5))^*0.8$ where P = population in thousands, Harmon's Correction Factor = 0.8
Mannings coefficient (n)	0.013	
Demand (per capita)	280	L/day
Infiltration allowance	0.33	L/s/ Ha

EXTRANEOUS FLOW ALLOWANCES

Infiltration / Inflow	Flow (L/s)
Dry	0.02
Wet	0.13
Total	0.16

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d	44	0.14
Industrial - Light**	35,000	L/gross ha/d		0
Industrial - Heavy**	55,000	L/gross ha/d		0
Commercial / Amenity	2,800	L/(1000m ² /d)	414	0.01
Restaurant	125	L/(9.2m ² /d)	326	0.05
Schools	70	L/(Student/d)		0
Trailer Parks no Hook-Ups	340	L/(space/d)		0
Trailer Park with Hook-Ups	800	L/(space/d)		0
Campgrounds	225	L/(campsite/d)		0
Mobile Home Parks	1,000	L/(Space/d)		0
Hotels	150	L/(bed-space/d)		0
Hotels	225	L/(bed-space/d)		0
Office	75	L/7.0m ² /d		0
Tourist Commercial	28,000	L/gross ha/d		0
Other Commercial	28,000	L/gross ha/d		0

AVERAGE RESIDENTIAL FLOW	0.14	L/s
PEAK RESIDENTIAL FLOW	0.52	L/s
AVERAGE IQ FLOW	0.06	L/s
PEAK INSTITUTIONAL/ COMMERCIAL FLOW	0.06	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK IQ FLOW	0.06	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.23	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.61	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.74	L/s

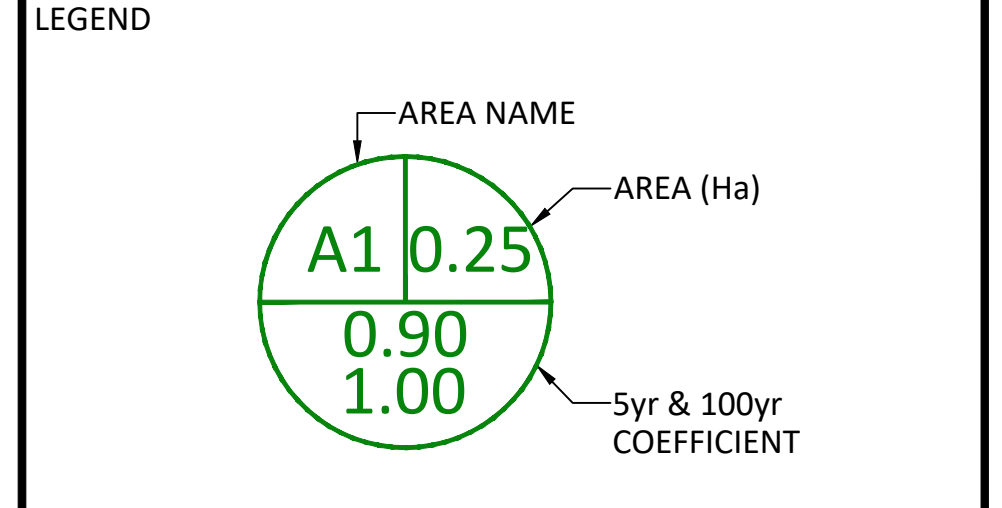
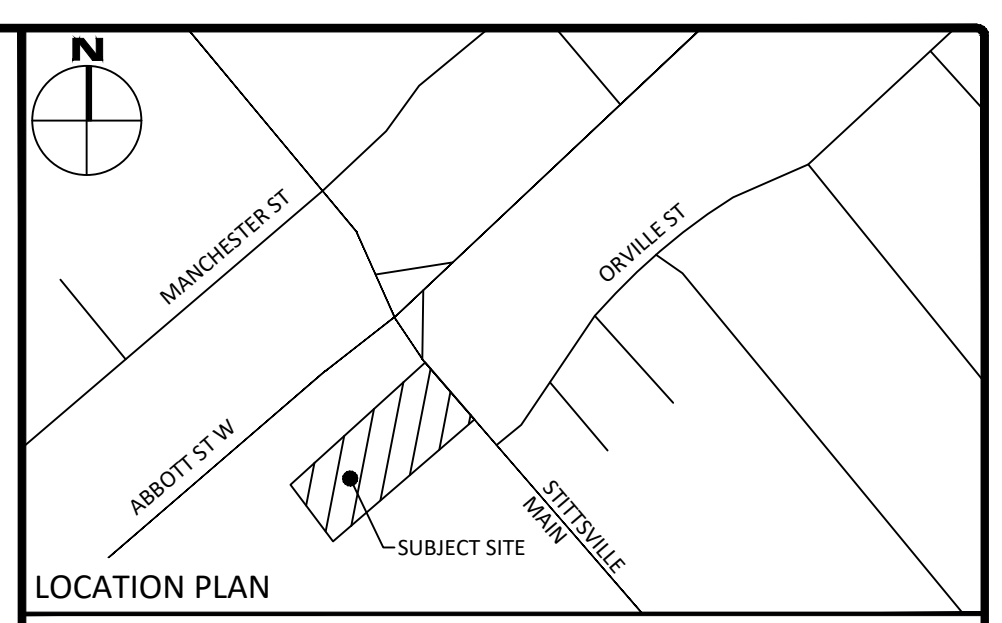
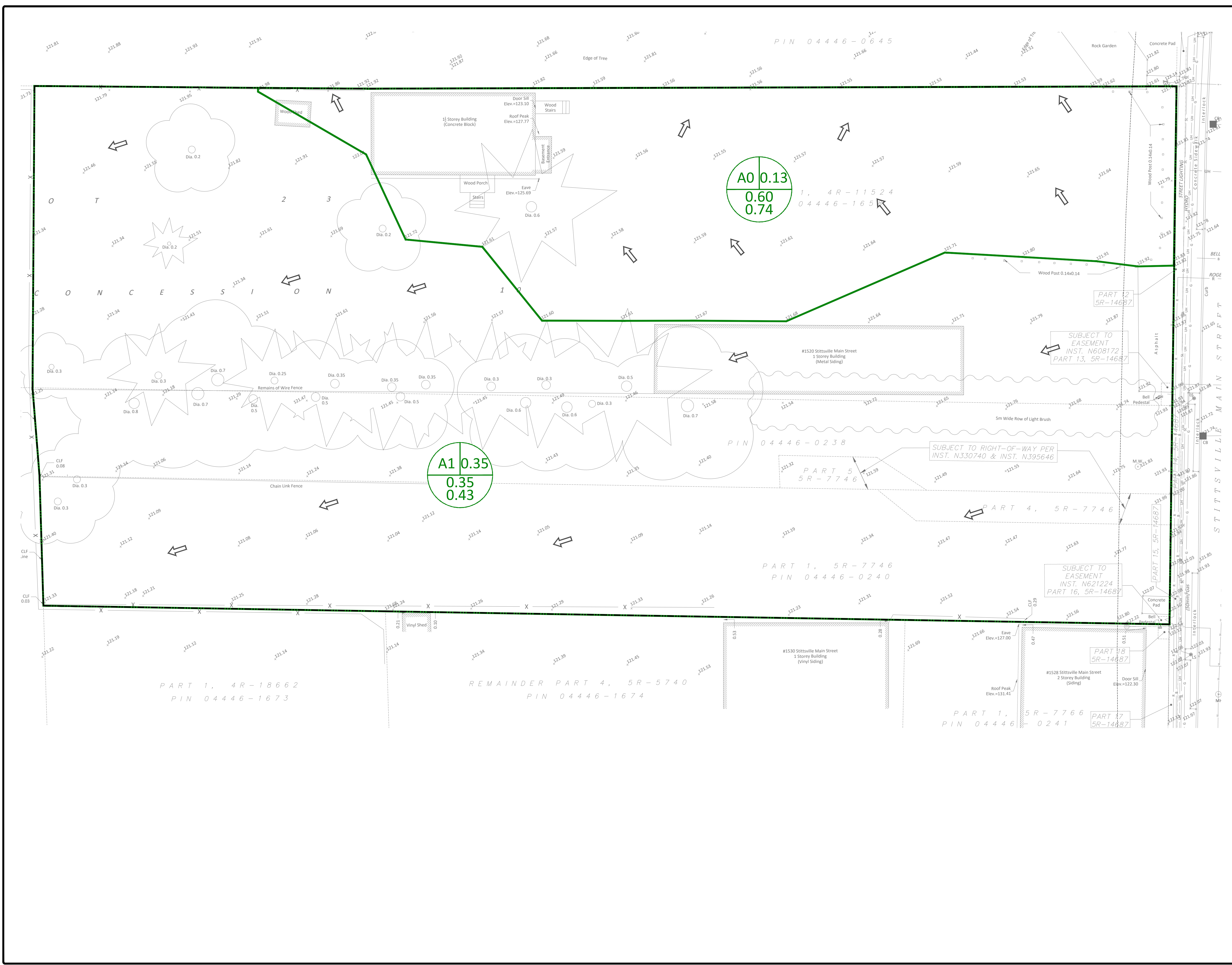
SANITARY SEWER DESIGN SHEET

PROJECT: 1518, 1524, 1526 Stittsville Main St
 LOCATION:
 CLIENT: Inverness Homes



LOCATION				RESIDENTIAL								ICI AREAS						INFILTRATION ALLOWANCE			FLOW		SEWER DATA							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
STREET	AREA ID	FROM MH	TO MH	UNIT TYPES				AREA (ha)	POPULATION		PEAK FLOW (L/s)	PEAK FLOW (L/s)	AREA (ha)						PEAK FLOW (L/s)	AREA (ha)		FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT		IND	CUM			IND	CUM	IND	CUM	IND	CUM		IND	CUM								IND	CUM
Parking	Residential Building	BLDG	MH1A				27	0.40	44.0	44.0	3.66	0.52		0.00		0.00		0.00	0.00	0.40	0.40	0.13	0.65	15.89	12.55	150	1.00	0.871	15.23	95.88
Parking	Mixed-use Building	BLDG	MH1A						0.0	0.0	3.80	0.00		0.00	0.07	0.07		0.00	0.06	0.07	0.07	0.02	0.09	15.89	10.78	150	1.00	0.871	15.80	99.44
Parking		MH1A	MH2A						0.0	44.0	3.66	0.52		0.00		0.07		0.00	0.06	0.00	0.48	0.16	0.74	24.19	53.76	200	0.50	0.746	23.45	96.93
		MH2A	MH3A						0.0	44.0	3.66	0.52		0.00		0.00		0.00	0.06	0.00	0.48	0.16	0.74	34.22	12.82	200	1.00	1.055	33.47	97.83
Design Parameters:				Notes:								Designed: AG/RR						No.		Revision						Date				
Residential				1. Mannings coefficient (n) = 0.013														1		Issued for Review						2024-04-24				
SF 3.4 p/p/u				2. Demand (per capita): 280 L/day														2		Issued for Review						2024-08-01				
TH/SD 2.7 p/p/u				3. Infiltration allowance: 0.33 L/s/Ha																										
INST 28,000 L/Ha/day				4. Residential Peaking Factor:								Checked: FF																		
COM 28,000 L/Ha/day				Harmon Formula = $1 + (14 / (4 + P^{0.5}) * 0.8)$								Project No.: 000-19-0608																		
APT - 1 Bed 1.4 p/p/u				where P = population in thousands																										
APT - 2 Bed 2.1 p/p/u																														
																										Sheet No: 1 of 1				

APPENDIX E
PRE-DEVELOPMENT DRAINAGE PLAN



No.	Revisions	Date
6	ISSUED FOR REVIEW	NOV 14, 2024
5	ISSUED FOR REVIEW	AUG. 09, 2024
4	ISSUED FOR REVIEW	MAY 22, 2024
3	ISSUED FOR REVIEW	FEB. 16, 2024
2	REVISED PER CITY COMMENTS	APR. 14, 2021
1	ISSUED FOR REVIEW	NOV. 13, 2020

Check and verify all dimensions before proceeding with the work. Do not scale drawings.

SCALE 1:150

McINTOSH PERRY
 egis group
 115 Walgreen Rd. Carp, ON K0A 1L0
 Tel: 613-836-2184 Fax: 613-836-3742
 www.McIntoshPerry.com

Client: **INVERNESS HOMES**
 38 AURIGA DRIVE, SUITE 200
 OTTAWA, ON K2E8A5

Project: **MIXED USE DEVELOPMENT**
 1518-1526 STITTVILLE MAIN STREET

Drawing Title: **PRE-DEVELOPMENT DRAINAGE PLAN**

Scale: 1:150	Project Number: CP-19-0608
Drawn By: R.R.R.	Checked By: A.J.G.
Designed By: R.R.R.	Drawing Number: PRE

FILENAME: (U:\Other\01 Project - Proposed\2019\1518 Stittsville Main Street\CP-19-0608 Inverness Homes - The Station_1518 Stittsville Main Street\CP-19-0608 PRESENTATION.dwg
 DATE PLOTTED: Thursday, November 14, 2024 10:25:26 AM
 USER: R.R.R.

D07-12-24-0093

APPENDIX F
POST-DEVELOPMENT DRAINAGE PLAN

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CP-19-0608 - 1518-1526 Stittsville Main - Runoff Calculations

1 of 14

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious	C	Gravel	C	Pervious	C	C _{AVG} 5-Year	C _{AVG} 100-Year
		Area (m ²)		Area (m ²)		Area (m ²)			
A0	0.13	115.00	0.90	1,083.00	0.60	75.00	0.20	0.60	0.74
A1	0.35	235.00	0.90	895.00	0.60	2,356.80	0.20	0.35	0.43

Unrestricted to Trail

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 2/5-Year	C 100-Year	Tc (min)	I (mm/hr)			Q (L/s)		
					2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
A0	0.13	0.60	0.74	10	76.8	104.2	178.6	16.40	22.25	46.96
A1	0.35	0.35	0.43	10	76.8	104.2	178.6	26.05	35.33	74.23
Total	0.48							42.45	57.59	121.19

Unrestricted to Trail

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious	C	Gravel	C	Pervious	C	C _{AVG} 2/5-Year	C _{AVG} 100-Year
		Area (m ²)		Area (m ²)		Area (m ²)			
B0	0.100	589.00	0.90	0.00	0.60	410.69	0.20	0.61	0.69
B1	0.050	230.00	0.90	0.00	0.60	271.00	0.20	0.52	0.59
B2A	0.004	44.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B2B	0.022	221.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B2C	0.015	147.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B3	0.284	2,621.00	0.90	0.00	0.60	222.57	0.20	0.85	0.94

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C 2/5-Year	C 100-Year	Tc (min)	I (mm/hr)			Q (L/s)		
					2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
B0	0.100	0.61	0.69	10	76.8	104.2	178.6	13.07	17.73	34.33
B1	0.050	0.52	0.59	10	76.8	104.2	178.6	5.58	7.57	14.78
B2A	0.004	0.90	1.00	10	76.8	104.2	178.6	0.85	1.15	2.18
B2B	0.022	0.90	1.00	10	76.8	104.2	178.6	4.25	5.76	10.97
B2C	0.015	0.90	1.00	10	76.8	104.2	178.6	2.82	3.83	7.30
B3	0.284	0.85	0.94	10	76.8	104.2	178.6	51.32	69.62	132.87
Total	0.48							77.88	105.66	202.43

Unrestricted to Trail

Required Restricted Flow

Drainage Area	Area (ha)	C 5-Year	Tc (min)	I (mm/hr)	Q (L/s)
				5-Year	5-Year
A0 +A1	0.48	0.42	10	104.2	57.59
Total	0.48				57.59

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)			Restricted Flow (L/s)			Storage Required (m ³)			Storage Provided (m ³)		
	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year
B0	13.07	17.73	34.33	13.07	17.73	34.33	x	x	x	x	x	x
B1	5.58	7.57	14.78	5.58	7.57	14.78	x	x	x	x	x	x
B2A	0.85	1.15	2.18	0.19	0.25	0.50	0.46	0.63	1.16	2.95	2.95	2.95
B2B	4.25	5.76	10.97	0.32	0.44	0.76	3.74	4.98	9.66	15.79	15.79	15.79
B2C	2.82	3.83	7.30	0.32	0.44	0.76	2.14	2.85	5.57	10.78	10.78	10.78
B3	51.32	69.62	132.87	2.10	6.00	6.10	54.96	57.64	132.67	58.00	86.77	163.66
Total	77.88	105.66	202.43	21.58	32.43	57.23	61.31	66.10	149.05	87.52	116.29	193.18

McINTOSH PERRY

Storage Requirements for Area B2A

2-Year Storm Event

Tc (min)	I (mm/hr)	B2A Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	76.8	0.85	0.19	0.66	0.39
15	61.8	0.68	0.19	0.49	0.44
20	52.0	0.57	0.19	0.38	0.46
25	45.2	0.50	0.19	0.31	0.46
30	40.0	0.44	0.19	0.25	0.45
35	36.1	0.40	0.19	0.21	0.43
40	32.9	0.36	0.19	0.17	0.41
45	30.2	0.33	0.19	0.14	0.39
50	28.0	0.31	0.19	0.12	0.36
55	26.2	0.29	0.19	0.10	0.32

Maximum Storage Required 2-Year (m³) = 0.46

5-Year Storm Event

Tc (min)	I (mm/hr)	B2A Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	1.15	0.25	0.90	0.54
15	83.6	0.92	0.25	0.67	0.60
20	70.3	0.77	0.25	0.52	0.63
25	60.9	0.67	0.25	0.42	0.63
30	53.9	0.59	0.25	0.34	0.62
35	48.5	0.53	0.25	0.28	0.60
40	44.2	0.49	0.25	0.24	0.57
45	40.6	0.45	0.25	0.20	0.53
50	37.7	0.41	0.25	0.16	0.49
55	35.1	0.39	0.25	0.14	0.45

Maximum Storage Required 5-Year (m³) = 0.63

100-Year Storm Event

Tc (min)	I (mm/hr)	B2A Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	2.18	0.50	1.68	1.01
15	142.9	1.75	0.50	1.25	1.12
20	120.0	1.47	0.50	0.97	1.16
25	103.8	1.27	0.50	0.77	1.16
30	91.9	1.12	0.50	0.62	1.12
35	82.6	1.01	0.50	0.51	1.07
40	75.1	0.92	0.50	0.42	1.01
45	69.1	0.84	0.50	0.34	0.93
50	64.0	0.78	0.50	0.28	0.85
55	59.6	0.73	0.50	0.23	0.76

Maximum Storage Required 100-Year (m³) = 1.16

Storage Occupied In Area B2A

2-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.015	2.95
	Total	2.95

* Storage Available (m ³) =	2.95
Storage Required (m ³) =	0.46

5-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.020	2.95
	Total	2.95

* Storage Available (m ³) =	2.95
Storage Required (m ³) =	0.63

100-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.040	2.95
	Total	2.95

* Storage Available (m ³) =	2.95
Storage Required (m ³) =	1.16

* Roof storage available calculated in AutoCad using roof dimensions provided by Architect

McINTOSH PERRY

Roof Drain Flow (B2A)

Roof Drains Summary			
Type of Control Device	Watts Drainage - Accutrol Weir		
Number of Roof Drains	1		
	2-Year	5-Year	100-Year
Rooftop Storage (m ³)	2.95	2.95	2.95
Storage Depth (m)	0.015	0.020	0.040
Flow (Per Roof Drain) (L/s)	0.19	0.25	0.50
Total Flow (L/s)	0.19	0.25	0.50

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
15	0.19
20	0.25
25	0.32
30	0.38
35	0.44
40	0.50
45	0.57
50	0.63
55	0.69

Roof Drain Flow			
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
2-Year	0.19	15	0.19
	0.25	20	0.25
5-Year	0.32	25	0.32
	0.38	30	0.38
	0.44	35	0.44
	0.50	40	0.50
	0.57	45	0.57
100-Year	0.63	50	0.63
	0.69	55	0.69
	0.76	60	0.76
	0.82	65	0.82
	0.88	70	0.88
	0.95	75	0.95
	1.01	80	1.01
	1.07	85	1.07
	1.13	90	1.13
	1.20	95	1.20
	1.26	100	1.26
	1.32	105	1.32
	1.39	110	1.39
1.45	115	1.45	
1.51	120	1.51	
1.58	125	1.58	
1.64	130	1.64	
1.70	135	1.70	
1.76	140	1.76	
1.83	145	1.83	
1.89	150	1.89	

* Roof Drain model to be Adjustable Accutrol Weirs, Fully Exposed

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

2 roof drains during a 5 year storm
 elevation of water = 30mm
 Flow leaving 2 roof drains = (2 x 0.36 L/s) = 0.72 L/s

2 roof drains during a 100 year storm
 elevation of water = 45mm
 Flow leaving 2 roof drains = (2 x 0.54 L/s) = 1.08 L/s

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

McINTOSH PERRY

Storage Requirements for Area B2B

2-Year Storm Event

Tc (min)	I (mm/hr)	B2B Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
30	40.0	2.21	0.32	1.89	3.41
35	36.1	1.99	0.32	1.67	3.52
40	32.9	1.82	0.32	1.50	3.59
45	30.2	1.67	0.32	1.35	3.65
50	28.0	1.55	0.32	1.23	3.69
55	26.2	1.45	0.32	1.13	3.72
60	24.6	1.36	0.32	1.04	3.74
65	23.2	1.28	0.32	0.96	3.74
70	21.9	1.21	0.32	0.89	3.74
75	20.8	1.15	0.32	0.83	3.74

Maximum Storage Required 2-Year (m³) = 3.74

5-Year Storm Event

Tc (min)	I (mm/hr)	B2B Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
30	53.9	2.98	0.44	2.54	4.58
35	48.5	2.68	0.44	2.24	4.71
40	44.2	2.44	0.44	2.00	4.81
45	40.6	2.25	0.44	1.81	4.88
50	37.7	2.08	0.44	1.64	4.93
55	35.1	1.94	0.44	1.50	4.96
60	32.9	1.82	0.44	1.38	4.97
65	31.0	1.72	0.44	1.28	4.98
70	29.4	1.62	0.44	1.18	4.97
75	27.9	1.54	0.44	1.10	4.96

Maximum Storage Required 5-Year (m³) = 4.98

100-Year Storm Event

Tc (min)	I (mm/hr)	B2B Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
40	75.1	4.62	0.76	3.86	9.26
45	69.1	4.24	0.76	3.48	9.40
50	64.0	3.93	0.76	3.17	9.51
55	59.6	3.66	0.76	2.90	9.58
60	55.9	3.43	0.76	2.67	9.63
65	52.6	3.23	0.76	2.47	9.65
70	49.8	3.06	0.76	2.30	9.66
75	47.3	2.90	0.76	2.14	9.64
80	45.0	2.76	0.76	2.00	9.62
85	43.0	2.64	0.76	1.88	9.58

Maximum Storage Required 100-Year (m³) = 9.66

Storage Occupied In Area B2B

2-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.025	15.79
	Total	15.79

Storage Available* (m ³) =	15.79
Storage Required (m ³) =	3.74

5-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.035	15.79
	Total	15.79

Storage Available* (m ³) =	15.79
Storage Required (m ³) =	4.98

100-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.060	15.79
	Total	15.79

Storage Available* (m ³) =	15.79
Storage Required (m ³) =	9.66

* Roof storage available calculated in AutoCad using roof dimensions provided by Architect

McINTOSH PERRY

Roof Drain Flow (B2B)

Roof Drains Summary			
Type of Control Device	Watts Drainage - Accutrol Weir		
Number of Roof Drains	1		
	2-Year	5-Year	100-Year
Rooftop Storage (m ³)	15.79	15.79	15.79
Storage Depth (m)	0.025	0.035	0.060
Flow (Per Roof Drain) (L/s)	0.32	0.44	0.76
Total Flow (L/s)	0.32	0.44	0.76

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
15	0.19
20	0.25
25	0.32
30	0.38
35	0.44
40	0.50
45	0.57
50	0.63
55	0.69

Roof Drain Flow			
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	0.19
	0.25	20	0.25
2-Year	0.32	25	0.32
	0.38	30	0.38
5-Year	0.44	35	0.44
	0.50	40	0.50
	0.57	45	0.57
	0.63	50	0.63
100-Year	0.76	60	0.76
	0.82	65	0.82
	0.88	70	0.88
	0.95	75	0.95
	1.01	80	1.01
	1.07	85	1.07
	1.13	90	1.13
	1.20	95	1.20
	1.26	100	1.26
	1.32	105	1.32
	1.39	110	1.39
	1.45	115	1.45
	1.51	120	1.51
	1.58	125	1.58
	1.64	130	1.64
	1.70	135	1.70
	1.76	140	1.76
	1.83	145	1.83
	1.89	150	1.89

* Roof Drain model to be Adjustable Accutrol Weirs, Fully Exposed

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

2 roof drains during a 5 year storm
 elevation of water = 30mm
 Flow leaving 2 roof drains = (2 x 0.36 L/s) = 0.72 L/s

2 roof drains during a 100 year storm
 elevation of water = 45mm
 Flow leaving 2 roof drains = (2 x 0.54 L/s) = 1.08 L/s

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

McINTOSH PERRY

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Storage Requirements for Area B2C

2-Year Storm Event

Tc (min)	I (mm/hr)	B2B Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
30	40.0	1.47	0.32	1.15	2.07
35	36.1	1.33	0.32	1.01	2.11
40	32.9	1.21	0.32	0.89	2.13
45	30.2	1.11	0.32	0.79	2.14
50	28.0	1.03	0.32	0.71	2.13
55	26.2	0.96	0.32	0.64	2.12
60	24.6	0.90	0.32	0.58	2.10
65	23.2	0.85	0.32	0.53	2.07
70	21.9	0.81	0.32	0.49	2.04
75	20.8	0.77	0.32	0.45	2.00

Maximum Storage Required 2-Year (m³) = 2.14

5-Year Storm Event

Tc (min)	I (mm/hr)	B2B Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
30	53.9	1.98	0.44	1.54	2.78
35	48.5	1.78	0.44	1.34	2.82
40	44.2	1.63	0.44	1.19	2.84
45	40.6	1.49	0.44	1.05	2.85
50	37.7	1.38	0.44	0.94	2.83
55	35.1	1.29	0.44	0.85	2.81
60	32.9	1.21	0.44	0.77	2.78
65	31.0	1.14	0.44	0.70	2.74
70	29.4	1.08	0.44	0.64	2.69
75	27.9	1.03	0.44	0.59	2.64

Maximum Storage Required 5-Year (m³) = 2.85

100-Year Storm Event

Tc (min)	I (mm/hr)	B2B Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
40	75.1	3.07	0.76	2.31	5.55
45	69.1	2.82	0.76	2.06	5.57
50	64.0	2.61	0.76	1.85	5.56
55	59.6	2.44	0.76	1.68	5.53
60	55.9	2.28	0.76	1.52	5.49
65	52.6	2.15	0.76	1.39	5.43
70	49.8	2.03	0.76	1.27	5.35
75	47.3	1.93	0.76	1.17	5.27
80	45.0	1.84	0.76	1.08	5.18
85	43.0	1.76	0.76	1.00	5.08

Maximum Storage Required 100-Year (m³) = 5.57

Storage Occupied In Area B2C

2-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.025	10.78
	Total	10.78

Storage Available* (m ³) =	10.78
Storage Required (m ³) =	2.14

5-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.035	10.78
	Total	10.78

Storage Available* (m ³) =	10.78
Storage Required (m ³) =	2.85

100-Year Storm Event

Roof Storage		
Location	Depth	Volume (m ³)
Roof	0.060	10.78
	Total	10.78

Storage Available* (m ³) =	10.78
Storage Required (m ³) =	5.57

* Roof storage available calculated in AutoCad using roof dimensions provided by Architect

McINTOSH PERRY

Roof Drain Flow (B2C)

Roof Drains Summary			
Type of Control Device	Watts Drainage - Accutrol Weir		
Number of Roof Drains	1		
	2-Year	5-Year	100-Year
Rooftop Storage (m ³)	10.78	10.78	10.78
Storage Depth (m)	0.025	0.035	0.060
Flow (Per Roof Drain) (L/s)	0.32	0.44	0.76
Total Flow (L/s)	0.32	0.44	0.76

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
15	0.19
20	0.25
25	0.32
30	0.38
35	0.44
40	0.50
45	0.57
50	0.63
55	0.69

Roof Drain Flow			
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	0.19
	0.25	20	0.25
2-Year	0.32	25	0.32
	0.38	30	0.38
5-Year	0.44	35	0.44
	0.50	40	0.50
	0.57	45	0.57
	0.63	50	0.63
100-Year	0.76	60	0.76
	0.82	65	0.82
	0.88	70	0.88
	0.95	75	0.95
	1.01	80	1.01
	1.07	85	1.07
	1.13	90	1.13
	1.20	95	1.20
	1.26	100	1.26
	1.32	105	1.32
	1.39	110	1.39
	1.45	115	1.45
	1.51	120	1.51
	1.58	125	1.58
	1.64	130	1.64
	1.70	135	1.70
	1.76	140	1.76
	1.83	145	1.83
	1.89	150	1.89

* Roof Drain model to be Adjustable Accutrol Weirs, Fully Exposed

* Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

2 roof drains during a 5 year storm
 elevation of water = 30mm
 Flow leaving 2 roof drains = (2 x 0.36 L/s) = 0.72 L/s

2 roof drains during a 100 year storm
 elevation of water = 45mm
 Flow leaving 2 roof drains = (2 x 0.54 L/s) = 1.08 L/s

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

McINTOSH PERRY

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Storage Requirements for Area B3

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2-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
100	16.7	11.19	2.10	9.09	54.53
105	16.1	10.78	2.10	8.68	54.68
110	15.6	10.40	2.10	8.30	54.80
115	15.0	10.05	2.10	7.95	54.88
120	14.6	9.73	2.10	7.63	54.93
125	14.1	9.43	2.10	7.33	54.96
130	13.7	9.15	2.10	7.05	54.96

Maximum Storage Required 2-Year (m³) = 54.96

5-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
40	44.2	29.52	6.00	23.52	56.45
45	40.6	27.15	6.00	21.15	57.09
50	37.7	25.16	6.00	19.16	57.47
55	35.1	23.47	6.00	17.47	57.64
60	32.9	22.01	6.00	16.01	57.64
65	31.0	20.74	6.00	14.74	57.49
70	29.4	19.62	6.00	13.62	57.22

Maximum Storage Required 5-Year (m³) = 57.64

100-Year Storm Event

Tc (min)	I (mm/hr)	B3 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
90	41.1	30.59	6.10	24.49	132.25
95	39.4	29.34	6.10	23.24	132.49
100	37.9	28.20	6.10	22.10	132.62
105	36.5	27.16	6.10	21.06	132.67
110	35.2	26.19	6.10	20.09	132.62
115	34.0	25.30	6.10	19.20	132.50
120	32.9	24.48	6.10	18.38	132.32

Maximum Storage Required 100-Year (m³) = 132.67

McINTOSH PERRY

Storage Occupied In Area B3

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2-Year Storm Event Storage Summary

Water Elev. (m) =		119.44			
Structure(s)	T/G	** ICD Inv Elev.	Head (m)	Ponding Depth (m)	Volume (m ³)
CB1	121.55	118.92	0.33	N/A	0.0
CBMH1	121.55	118.92	0.33	N/A	0.0
OGS1	121.50	118.92	0.33	N/A	0.0
* Triton S-29	N/A	N/A	N/A	N/A	58.0

* Per manufacturers sheet, total S-29 storage = 58.0m³. Volume below tank service invert = 20.1m³.

** Tempest LMF65 ICD located at outlet of MH2 at invert of 118.92m. During 5 & 100-year storms, attenuated runoff ponds within parking lot above CB1, CBMH1 & OGS1 at T/G 121.55m.

Storage Available(m ³) =	58.0
Storage Required (m ³) =	55.0

5-Year Storm Event Storage Summary

Water Elev. (m) =		121.69			
Structure(s)	T/G	ICD Inv Elev.	Head (m)	Ponding	Volume (m ³)
CB1	121.55	118.92	2.58	0.14	5.9
CBMH1	121.55	118.92	2.58	0.14	7.5
OGS1	121.50	118.92	2.58	0.19	15.4
Triton S-29	N/A	N/A	N/A	N/A	58.0

Storage Available*** (m ³) =	86.8
Storage Required (m ³) =	57.6

100-Year Storm Event Storage Summary

Water Elev. (m) =		121.78			
Structure(s)	T/G	ICD Inv Elev.	Head (m)	Depth (m)	Volume (m ³)
CB1	121.55	118.92	2.67	0.23	23.8
CBMH1	121.55	118.92	2.67	0.23	31.5
OGS1	121.50	118.92	2.67	0.28	50.3
Triton S-29	N/A	N/A	N/A	N/A	58.0

Storage Available*** (m ³) =	163.7
Storage Required (m ³) =	132.7

*** Storage available equal to sum of Triton Storage Chamber and Parking Lot Storage above structures CB1, CBMH1, OGS1 (Calculated in AutoCAD).

Note: additional storage for 5 & 100-year storms has been provided to account for 20.1m³ storage below tank service invert. Note: Based on AutoCad analysis, a storage volume of 134.87m³ can be provided solely through parking lot surface storage at a WSEL of 121.80m.

INFILTRATION CALCULATION

Volume Required to be Infiltrated

Required Infiltration Rate:	230 mm/yr	(Moderate Recharge Area per Figure 9.3 - Carp River Watershed / Subwatershed Study)
Site Area:	0.48 ha	
Required Infiltration Volume:	1095 m ³ /yr	(Required Infiltration X Site Area)
Post-Dev Pervious Area:	0.09 ha	
Infiltration in Pervious Area:	208 m ³ /yr	(Required Infiltration Rate X Post-Dev Pervious Area)
Infiltration needed in Storage Chamber:	887 m ³ /yr	

Annual Rainfall Data (Up to 25mm Storm Event)

Number of events/yr 5mm-<x<25mm:	52.7	
Average Days Between Events:	6.93	
Average Depth 5mm-<x<25mm:	11.09 mm	
Site Area being collected	2843.57 m ²	
Cumulative Rainfall Depth 5mm-<x<25mm:	584.443 mm/yr	(Number of Events X Average Depth)
Maximum Volume of Runoff per year to Infiltrate:	1661.90 m ³ /yr	(Area X Cumulative Rainfall Depth)

Required Storage Volume (7mm Storm Event)

Required Storage Volume:	19.90 m ³	(Area x 7mm, required volume to infiltrate 7mm Storm Event)
Total Volume Infiltrated :	1048.99 m ³ /yr	7mm Event Volume X Number of Events Per Year)

Storage Chamber Area Sizing

Clear Stone Footprint Area	76.14 m ²
Porosity (n):	40%
Tank Bottom Elevation	118.2 m
Storm Service Invert Elevation	118.86 m
Infiltration Storage Volume Provided Below Service Invert	20.10 m ³

Infiltration Rate Through Soil - Storage Chamber

Percolation Rate:	30.0 mm/hr	(Per section 4.3 of the Geotechnical Investigation)
Infiltration Rate:	0.63 L/s	(Percolation Rate X Footprint Area of Infiltration Trench)

Ponding Area Sizing

Volume of Water during the 7mm event:	19.90 m ³
Depth of Ponding Area:	0.09 m
	0.36 days

McINTOSH PERRY

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Time of Concentration Pre-Development

Drainage Area ID	Sheet Flow Distance (m)	Slope of Land (%)	Tc (min) (5-Year)	Tc (min) (100-Year)
A1	66	1.50	8	6

Therefore, a Tc of 10 can be used

$$T_c = (3.26(1.1-c)L^{0.5}/S^{0.33})$$

c= Blanced Runoff Coefficient

L= Length of drainage area

S= Average slope of watershed

STORM SEWER DESIGN SHEET

PROJECT: Mixed Used Development
 LOCATION: 1518 Stittsville Main
 CLIENT: Krumac Holdings Inc.



LOCATION				CONTRIBUTING AREA (ha)				RATIONAL DESIGN FLOW										SEWER DATA									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
STREET	AREA ID	FROM MH	TO MH	C-VALUE	AREA (ha)	INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)	
																					DIA	W	H			(L/s)	(%)
	B2	Roof Drain	MH2	0.90	0.04													1.13	15.89	12.60	150			1.00	0.871	14.76	92.89%
	B3	CB1	CBMH1	0.85	0.07	0.06	0.06	10.00	0.33	10.33	104.19			17.14				17.14	62.04	24.29	250			1.00	1.224	44.90	72.38%
		CBMH1	OGS1	0.85	0.11	0.09	0.15	10.33	0.77	11.10	102.48			42.14				42.14	129.34	52.21	375			0.50	1.134	87.20	67.42%
		OGS1	MH2	0.85	0.11	0.09	0.24	11.10	0.05	11.15	98.73			64.96				64.96	129.34	3.59	375			0.50	1.134	64.38	49.78%
		MH2	MH3			0.00	0.24	11.15	0.37	11.52	98.49			64.79			1.13	65.92	129.34	25.06	375			0.50	1.134	63.41	49.03%
		MH3	EX 750mm			0.00	0.24	11.52	0.15	11.67	96.80			63.69				64.82	129.34	10.24	375			0.50	1.134	64.52	49.89%
Definitions: Q = 2.78QA, where: Q = Peak Flow in Litres per Second (L/s) A = Area in Hectares (ha) i = Rainfall intensity in millimeters per hour (mm/hr) [i = 998.071 / (TC+6.053)^0.814] 5 YEAR [i = 1174.184 / (TC+6.014)^0.816] 10 YEAR [i = 1735.688 / (TC+6.014)^0.820] 100 YEAR				Notes: 1. Mannings coefficient (n) = 0.013			Designed: R.R.R. Checked: R.D.F. Project No.: CP-19-0608				No. Revision Date						Sheet No: 1 of 1										

Volume III: TEMPEST INLET CONTROL DEVICES

Municipal Technical
Manual Series



SECOND EDITION

LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

MHF (Medium to High Flow) ICD



IPEX

by aliaxis

IPEX Tempest™ Inlet Control Devices

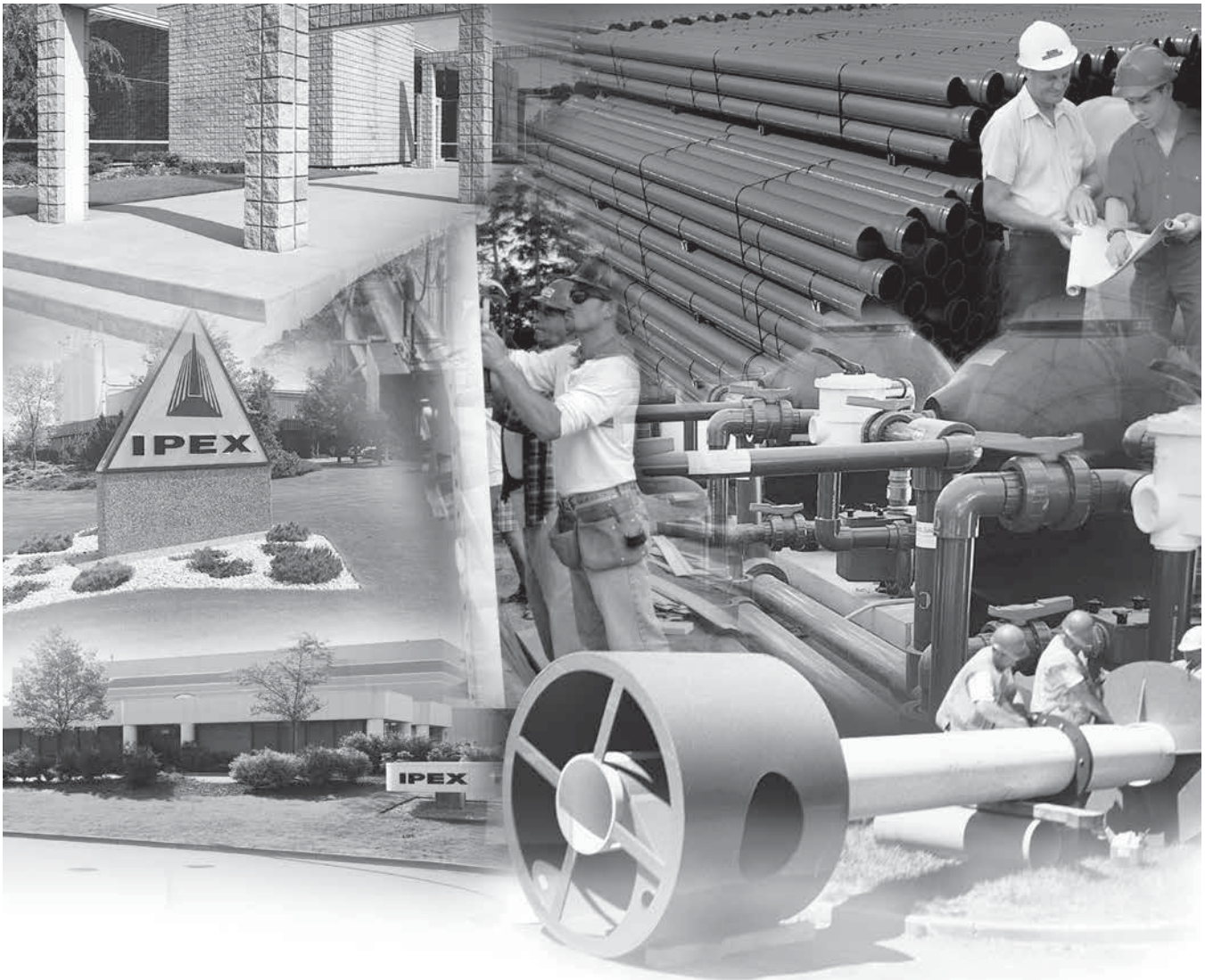
Municipal Technical Manual Series

Vol. I, 2nd Edition

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

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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.

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TEMPEST INLET CONTROL DEVICES Technical Manual

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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

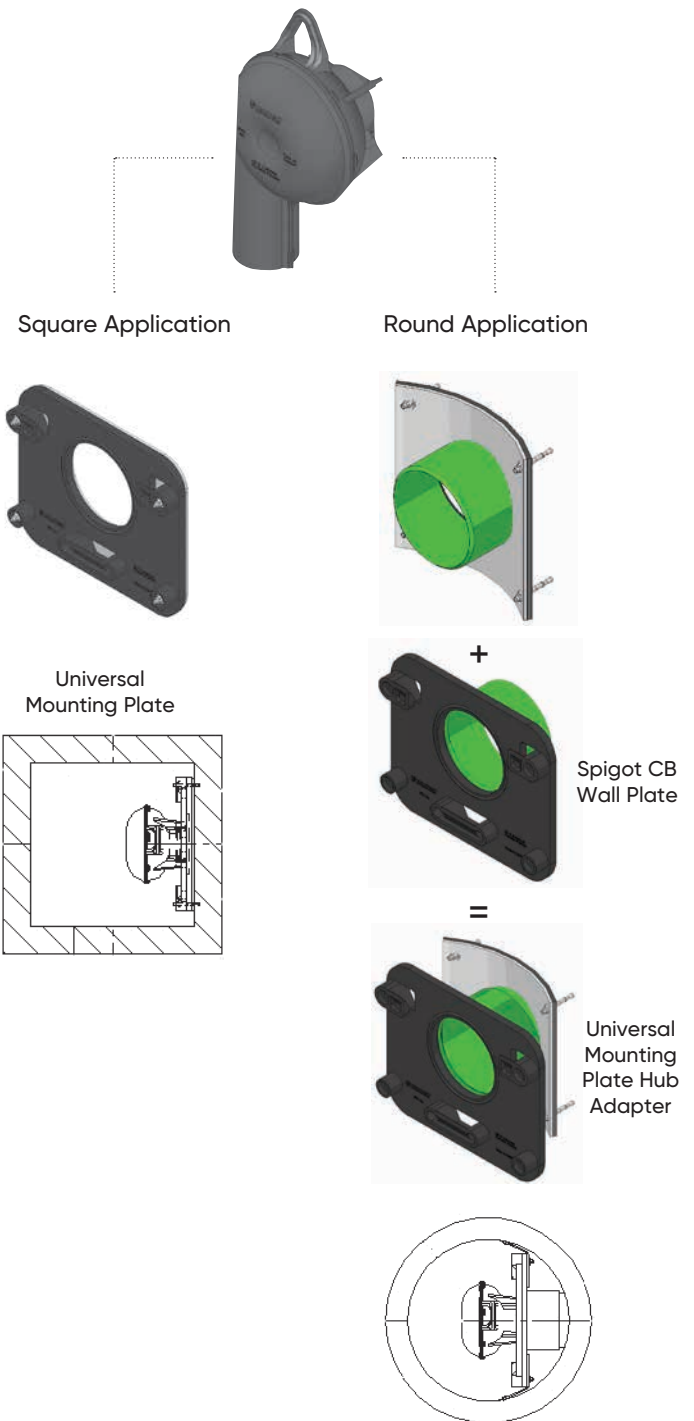
The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during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

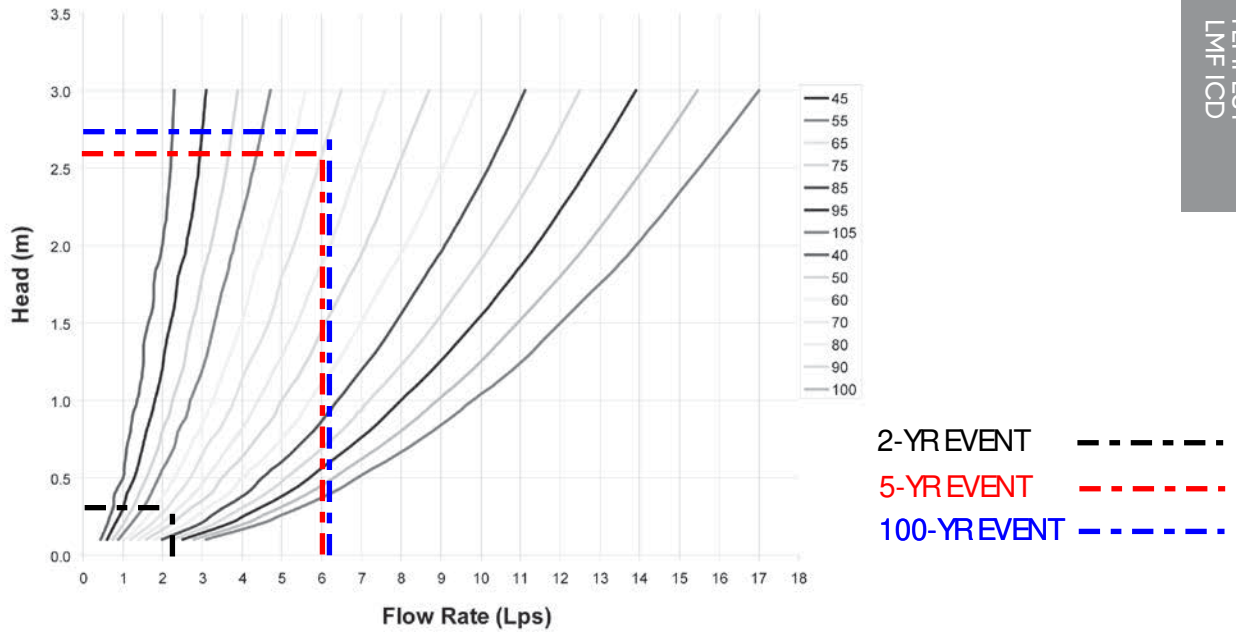
Product Applications

Will accommodate both square and round applications:



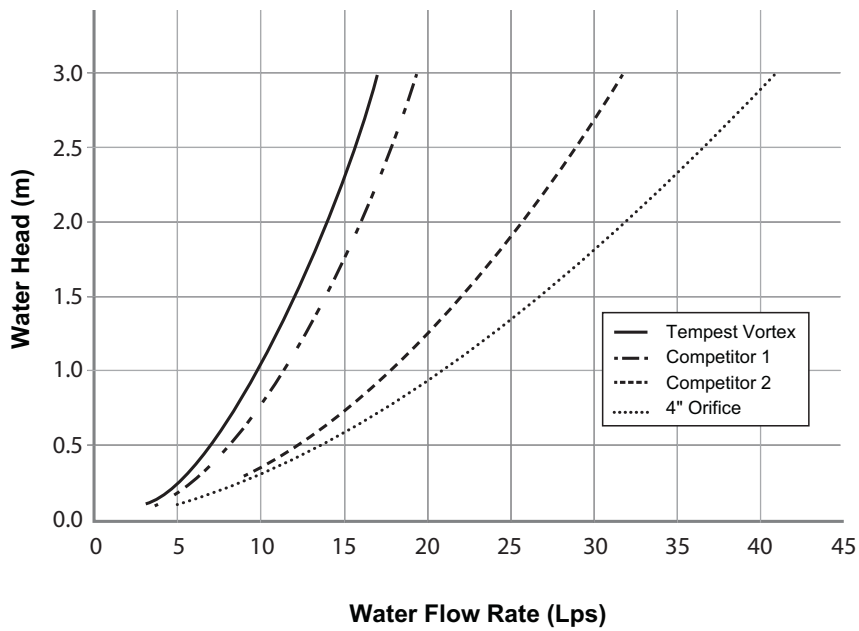
AREA B3 - ICD SIZING

Chart 1: LMF 14 Preset Flow Curves



TEMPEST
LMF ICD

Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

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

STEPS:

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



WARNING

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

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

STEPS:

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



WARNING

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

PRODUCT TECHNICAL SPECIFICATION

General

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

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

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

ICD's shall have no moving parts.

Materials

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

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

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

All hardware will be made from 304 stainless steel.

Dimensioning

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

Installation

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

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

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

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

Product Function

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



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



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



Product Construction

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

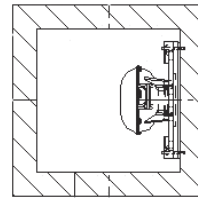
Product Applications

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



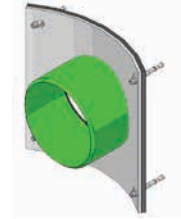
Square Application

Universal Mounting Plate



Round Application

Spigot CB Wall Plate

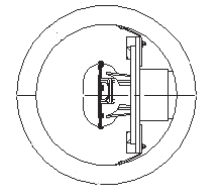


Universal Mounting Plate Hub Adapter

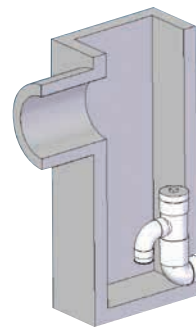


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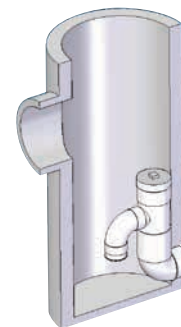
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The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:

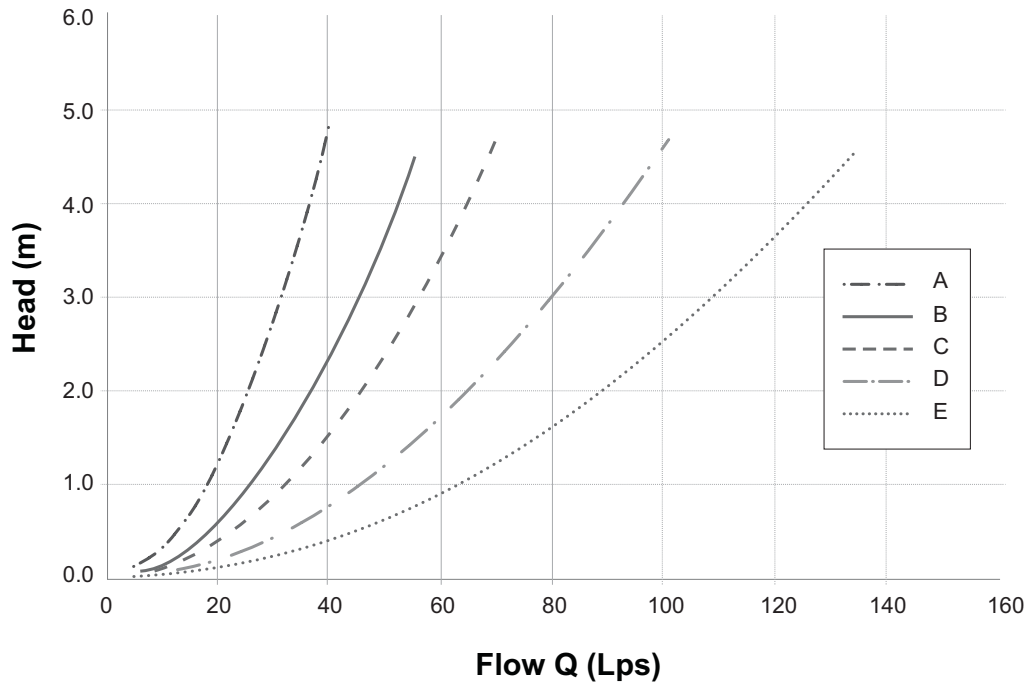


Square Catch Basin



Round Catch Basin

Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

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

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



WARNING

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

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

STEPS:

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



WARNING

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

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

STEPS:

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



WARNING

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

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

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



Parameters

Units: Metric

Storage Volume: 50 Cu m

Chamber Selection: S-29B

Header Row Position: Left

Fill Over Embedment Stone: 300 mm

Controlled By: width 13.72 m

Embedment Stone mm:

Over: 150 Under: 150 Porosity: 0.4

Min 150mm over and under

Double Stacked

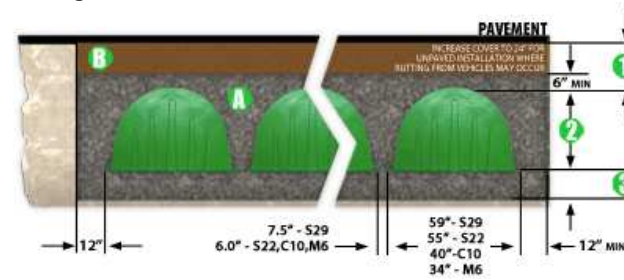
Double Stacked?: No

Stone Between:

Note: After making an input change you must hit calculate to update the Field Diagram and Project Results.

* The image generation will not save if using MicroSoft Edge

Project Results



- 1 Total Cover Over Chambers: 301 mm
- 2 Height Of Chamber: 947 mm
- 3 Embedment Stone Under Chambers: 151 mm
- A Volume of Embedment Stone Required: 62 Cu. m
- B Volume of Fill Material Required: 23 Cu. m

Total Storage Provided: 58 Cu. m

Type Of Chambers: S-29B

Of Chambers Required: 41

Of End Caps Required: 16

Required Bed Size: 77 Sq. m

Volume of Excavation: 95 Cu. m

* Area of Filter Fabric: 123 Sq. m

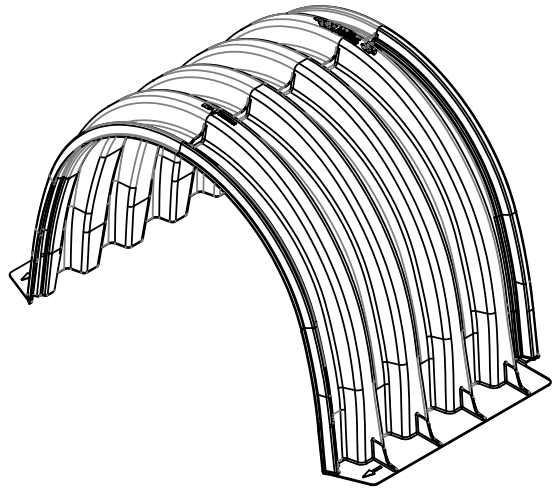
of Chambers Long: 4

of rows: 7

Actual Trench Length: 6.16 m

Actual Trench Width: 12.36 m

* Filter Fabric quantity for Fabric on Top and Sides of System Only, does not include overlap

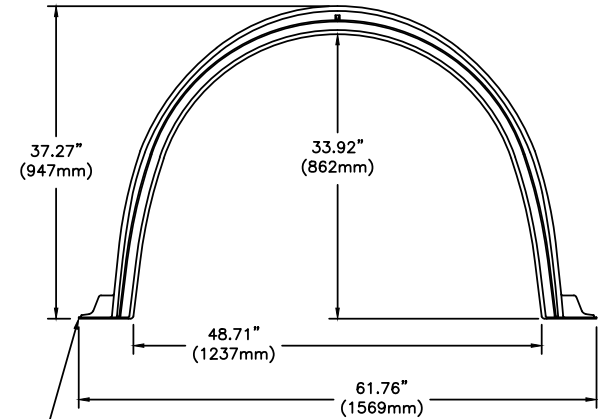


S-29-B CHAMBER SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	33.35" x 61.76" x 37.27" [847mm x 1569mm x 947mm]
BARE CHAMBER STORAGE	27.80 ft ³ [0.787 m ³]
*MIN INSTALLED STORAGE	42.52 ft ³ [1.204 m ³]
CHAMBER WEIGHT	34 lbs [15.42 kg]
STORAGE PER LINEAR UNIT WITHOUT STONE	10.0 ft ³ /ft [0.929 m ³ /m]
STORAGE PER LINEAR UNIT WITH STONE	15.3 ft ³ /ft [1.421 m ³ /m]

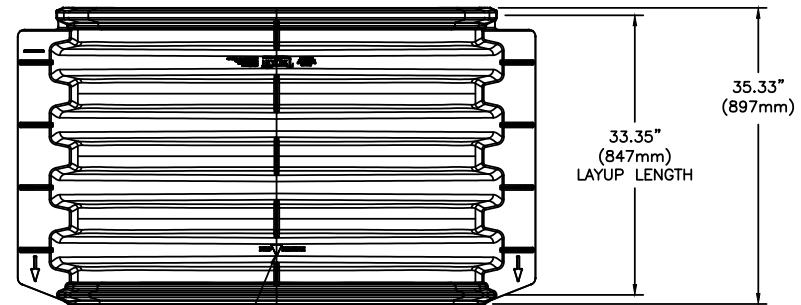
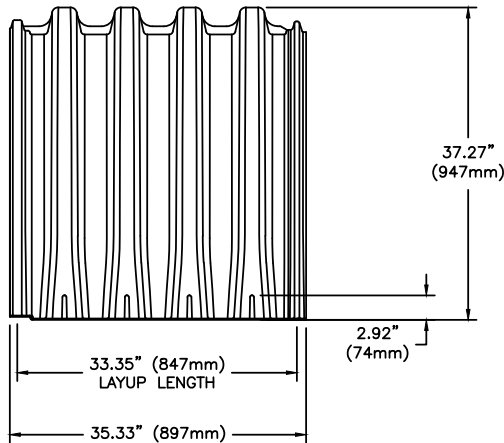
*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 5" (127mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)

NOTE: S-29-B CHAMBER DETAILS TESTED AND RATED TO EXCEED HS-25 LOAD CONDITIONS WITH 18" (457mm) OF COVER AND NO PAVEMENT.

EACH S29-B CHAMBER HAS A TOTAL FLANGE SURFACE CONTACT AREA OF 294 IN² (1896 CM²) OR 147 IN² (948 CM²) PER FLANGE



PART THICKNESS
0.118" - 0.177"
[3.0mm - 4.5mm]



CHAMBERS TO BE INSTALLED IN THIS DIRECTION. FOLLOW DIRECTION ARROW ON THE PART.

CONCEPTUAL PLAN DISCLAIMER
THIS GENERIC DETAIL DOES NOT ENCOMPASS THE SIZING, FIT, AND APPLICABILITY OF THE TRITON CHAMBER SYSTEM FOR THIS SPECIFIC PROJECT. IT IS THE ULTIMATE RESPONSIBILITY OF THE DESIGN ENGINEER TO ASSURE THAT THE STORMWATER SYSTEM DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. TRITON PRODUCTS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH TRITON'S MINIMUM REQUIREMENTS. TRITON STORMWATER SOLUTIONS DOES NOT APPROVE PLANS, SIZING, OR SYSTEM DESIGNS. THE DESIGN ENGINEER IS RESPONSIBLE FOR ALL DESIGN DECISIONS.



7600 EAST GRAND RIVER, STE. 195
BRIGHTON, MI 48114
PHONE: (810) 222-7652 • FAX: (810) 222-1769
WWW.TRITONSW.COM

S-29-B CHAMBER DETAIL

TRITON - STANDARD DETAILS

REVISED:

01-24-23 JWM

Stormceptor® EF Sizing Report

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/30/2024

Province:	Ontario	Project Name:	1518-1526 Stittsville Main
City:	Ottawa	Project Number:	CP-19-0608
Nearest Rainfall Station:	OTTAWA CDA RCS	Designer Name:	Ryan Robineau
Climate Station Id:	6105978	Designer Company:	Egis Canada Ltd.
Years of Rainfall Data:	20	Designer Email:	r.robineau@mcintoshperry.com
Site Name:		Designer Phone:	613-714-6611
Drainage Area (ha):	0.28	EOR Name:	
Runoff Coefficient 'c':	0.94	EOR Company:	
Particle Size Distribution:	Fine	EOR Email:	
Target TSS Removal (%):	80.0	EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	8.49
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	132.87
Influent TSS Concentration (mg/L):	100
Estimated Average Annual Sediment Load (kg/yr):	158
Estimated Average Annual Sediment Volume (L/yr):	129

Net Annual Sediment (TSS) Load Reduction Sizing Summary	
Stormceptor Model	TSS Removal Provided (%)
EFO4	90
EFO6	96
EFO8	99
EFO10	100
EFO12	100

Recommended Stormceptor EFO Model: EFO4
Estimated Net Annual Sediment (TSS) Load Reduction (%): 90
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 waterways.

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

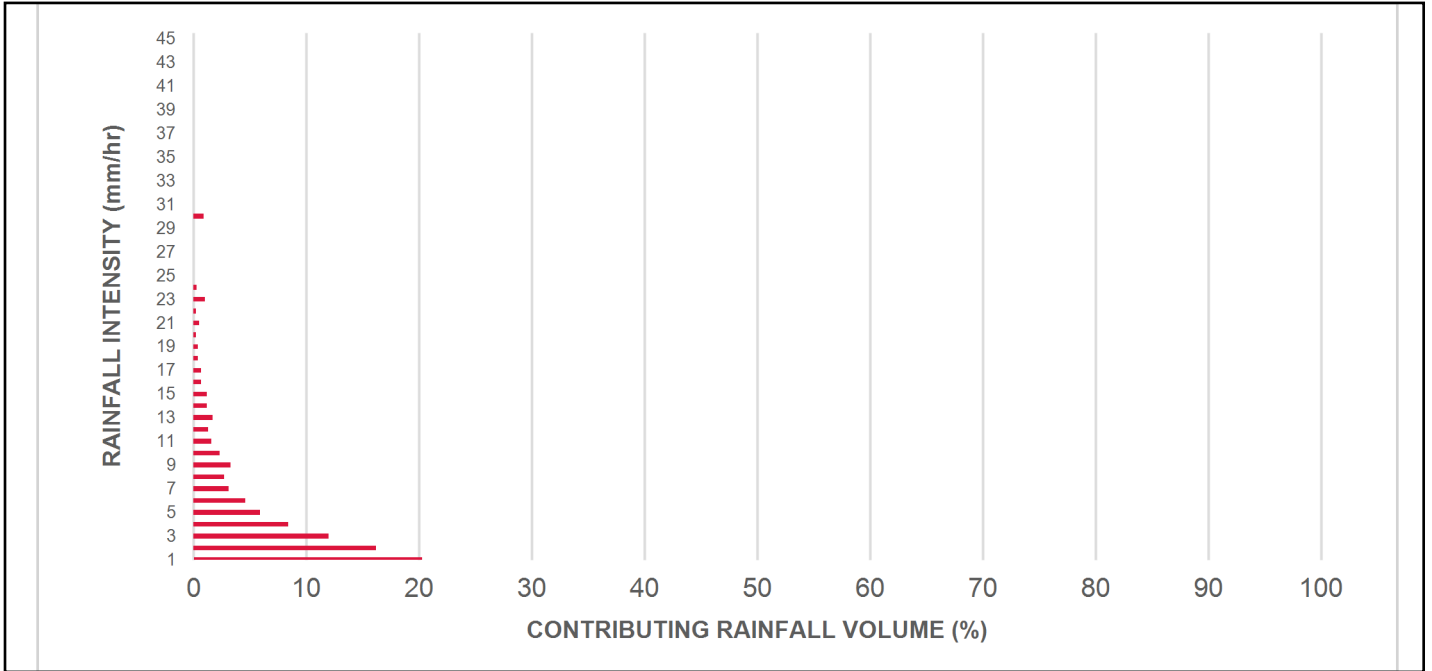
Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.37	22.0	18.0	100	8.6	8.6
1.00	20.3	29.0	0.73	44.0	37.0	100	20.3	29.0
2.00	16.2	45.2	1.46	88.0	73.0	100	16.2	45.2
3.00	12.0	57.2	2.20	132.0	110.0	95	11.4	56.5
4.00	8.4	65.6	2.93	176.0	146.0	91	7.7	64.2
5.00	5.9	71.6	3.66	220.0	183.0	86	5.1	69.3
6.00	4.6	76.2	4.39	263.0	220.0	82	3.8	73.1
7.00	3.1	79.3	5.12	307.0	256.0	81	2.5	75.6
8.00	2.7	82.0	5.85	351.0	293.0	79	2.2	77.7
9.00	3.3	85.3	6.59	395.0	329.0	77	2.6	80.3
10.00	2.3	87.6	7.32	439.0	366.0	76	1.7	82.0
11.00	1.6	89.2	8.05	483.0	402.0	74	1.2	83.2
12.00	1.3	90.5	8.78	527.0	439.0	72	1.0	84.1
13.00	1.7	92.2	9.51	571.0	476.0	71	1.2	85.4
14.00	1.2	93.5	10.24	615.0	512.0	69	0.8	86.2
15.00	1.2	94.6	10.98	659.0	549.0	67	0.8	87.0
16.00	0.7	95.3	11.71	702.0	585.0	66	0.5	87.4
17.00	0.7	96.1	12.44	746.0	622.0	64	0.5	87.9
18.00	0.4	96.5	13.17	790.0	659.0	64	0.3	88.2
19.00	0.4	96.9	13.90	834.0	695.0	64	0.3	88.4
20.00	0.2	97.1	14.63	878.0	732.0	64	0.1	88.6
21.00	0.5	97.5	15.37	922.0	768.0	63	0.3	88.9
22.00	0.2	97.8	16.10	966.0	805.0	63	0.2	89.0
23.00	1.0	98.8	16.83	1010.0	841.0	63	0.6	89.6
24.00	0.3	99.1	17.56	1054.0	878.0	63	0.2	89.8
25.00	0.0	99.1	18.29	1098.0	915.0	62	0.0	89.8
30.00	0.9	100.0	21.95	1317.0	1098.0	59	0.6	90.4
35.00	0.0	100.0	25.61	1537.0	1280.0	55	0.0	90.4
40.00	0.0	100.0	29.27	1756.0	1463.0	50	0.0	90.4
45.00	0.0	100.0	32.93	1976.0	1646.0	45	0.0	90.4
Estimated Net Annual Sediment (TSS) Load Reduction =								90 %

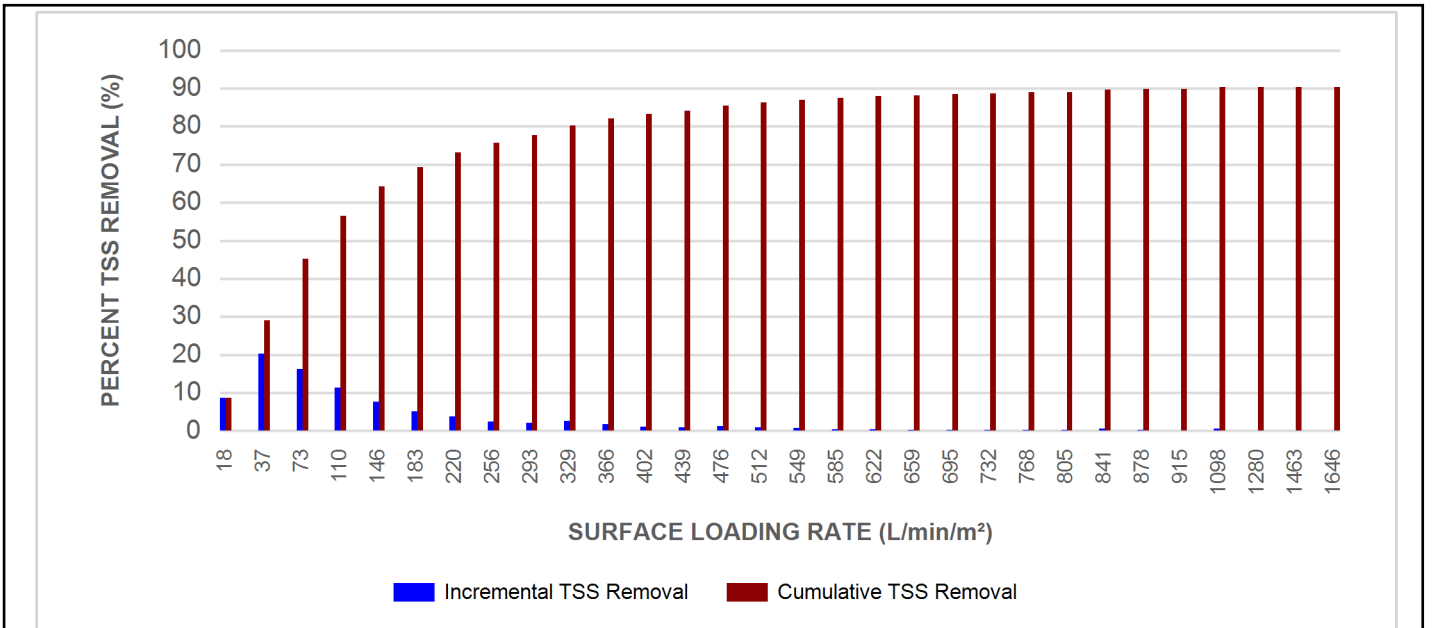
Climate Station ID: 6105978 Years of Rainfall Data: 20

Stormceptor® EF Sizing Report

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

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

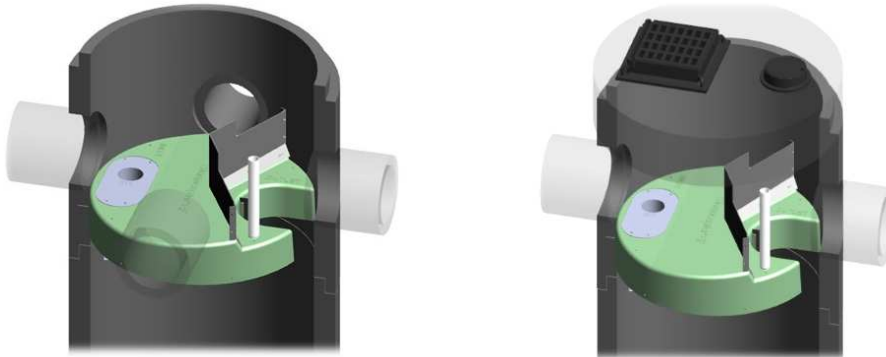
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance 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

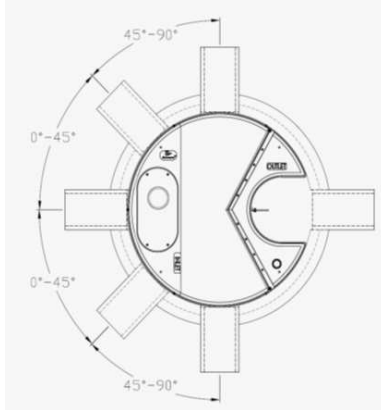
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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



Stormceptor® EF Sizing Report



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)	(ft³)	(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/ft³)

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>

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 Separators**

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

Stormceptor[®] EF Sizing Report

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/m² to 1400 L/min/m², 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/m² and 1400 L/min/m² 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/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² 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/m².

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/m².

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

Stormceptor® EF Sizing Report

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

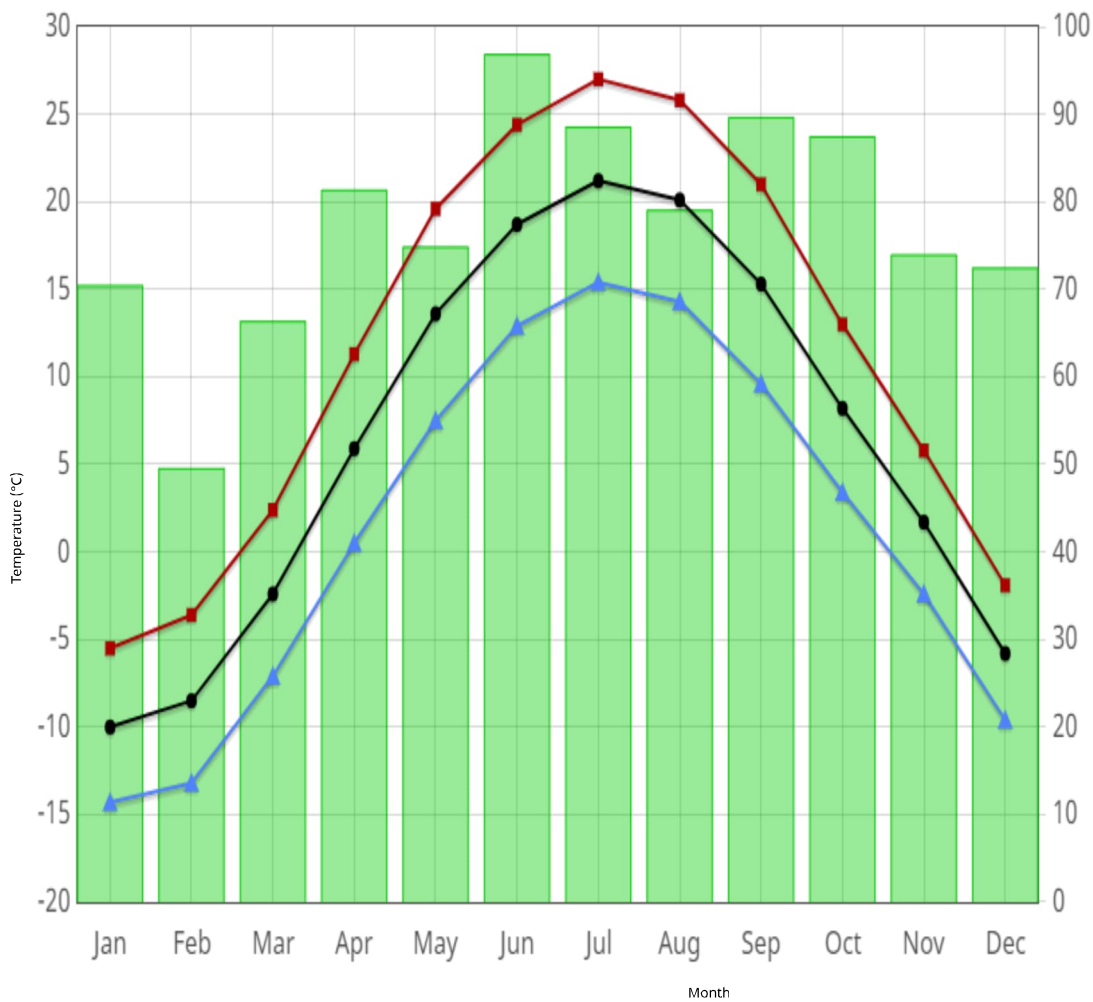
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) 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.



Canadian Climate Normals 1991-2020 Data

Temperature and Precipitation Graph

Temperature and Precipitation Graph for 1991 to 2020 Canadian Climate Normals OTTAWA (AIRPORT)



	Daily Maximum Temperature (°C)
	Daily Average Temperature (°C)
	Daily Minimum Temperature (°C)
	Precipitation (mm)

Normals Data

The minimum number of years used to calculate these Normals is indicated by a code for each element. A "+" beside an extreme date indicates that this date is the first occurrence of the extreme value. Values and dates in bold indicate all-time extremes for the location.

Data used in the calculation of these Normals may be subject to further quality assurance checks. This may result in minor changes to some values presented here.

OTTAWA (AIRPORT)

ONTARIO

► Temperature

► Precipitation

► Days With ...

► Days with Maximum Temperature

► Days with Minimum Temperature

► Days with Rainfall

► Days with Snowfall

▼ Days with Precipitation

<u>Days with Precipitation</u>														
	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Year</u>	<u>Code</u>
>= 0.2 mm	16.7	13.0	12.6	12.1	13.4	13.9	12.1	11.2	12.4	14.1	14.4	16.7	162.7	☐
>= 1 mm	11.2	8.8	9.1	9.8	9.9	10.3	9.5	8.7	9.8	10.4	9.9	11.1	118.4	☐
>= 5 mm	4.6	3.2	4.5	5.1	4.8	6.0	5.3	4.5	5.3	5.1	4.7	4.5	57.7	☐
>= 10 mm	2.0	1.4	1.9	2.8	2.4	2.8	3.2	2.5	3.3	2.9	2.2	2.1	29.6	☐
>= 25 mm	0.24	0.12	0.29	0.38	0.35	0.67	0.63	0.54	0.44	0.61	0.44	0.29	5.0	☐
>= 50 mm	0.0	0.0	0.0	0.0	0.0	0.21	0.08	0.04	0.04	0.09	0.0	0.0	0.46	☐
>= 100 mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.04	☐

► Days with Snow Depth

► Wind

► Degree Days

► Quintiles

FLOW CONTROL ROOF DRAINAGE DECLARATION

THIS FORM TO BE COMPLETED BY THE MECHANICAL AND STRUCTURAL ENGINEERS RESPONSIBLE FOR DESIGN

Permit Application No.
D07-12-20-0167

Project Name:
1518, 1524 & 1526 Stittsville Main Street

Building Location:
1518, 1524 & 1526 Stittsville Main Street, Ottawa, ON, K2S 1N9

Municipality:

The roof drainage system has been designed in accordance with the following criteria: (please check one of the following).

- M1.** Conventionally drained roof (no flow control roof drains used).
- M2.** Flow control roof drains meeting the following conditions have been incorporated in this design:
- (a) the maximum drain down time does not exceed 24h,
 - (b) one or more scuppers are installed so that the maximum depth of water on the roof cannot exceed 150mm,
 - (c) drains are located not more than 15m from the edge of roof and not more than 30m from adjacent drains, and
 - (d) there is at least one drain for each 900 sq.m.
- M3.** A flow control drainage system that does not meet the minimum drainage criteria described in M2 has been incorporated in this design.

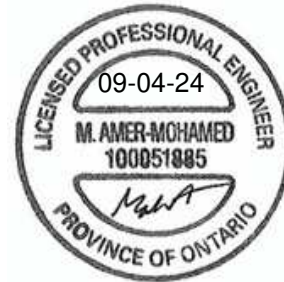
PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: Mohamed Amer, P.Eng.

Firm: Wisdom Engineering Limited

Phone#: 613-366-8101

City: Nepean Province: ONTARIO



Mechanical Engineer's Seal

- S1.** The design parameters incorporated into the overall structural design are consistent with the information provided by the Mechanical Engineer in M2. Loads due to rain are not considered to act simultaneously with loads due to snow as per Sentence 4.1.7.3 (3) OBC.
- S2.** The structure has been designed incorporating the additional structural loading due to rain acting simultaneously with the snow load. The design parameters are consistent with the control flow drainage system designed by the mechanical engineer.

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: Terence Cain, P.Eng.

Firm: BPA

Phone#: 613-591-1533

City: Kanata Province: Ontario



Structural Engineer's Seal



Adjustable Accutrol Weir
 Tag: _____

**Adjustable Flow Control
 for Roof Drains**

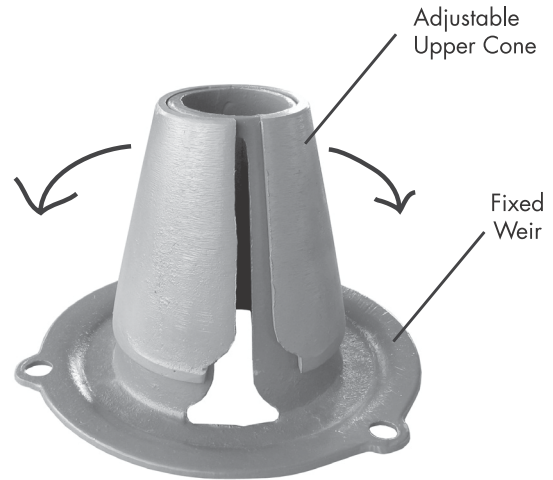
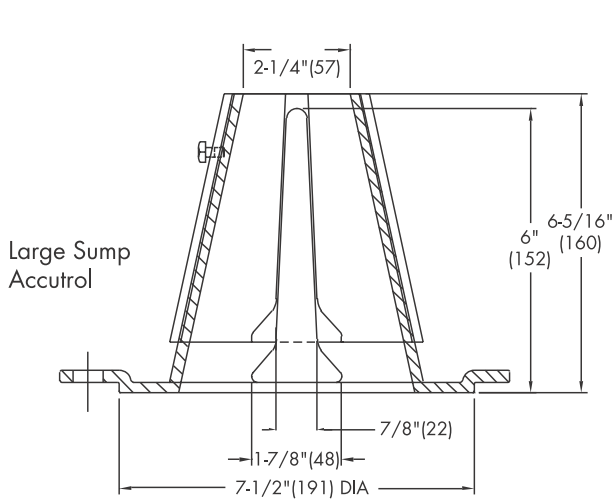
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
 Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2" of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3" of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
 [5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.



1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____
 Job Location _____
 Engineer _____

Contractor _____
 Contractor's P.O. No. _____
 Representative _____

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.

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A Watts Water Technologies Company

GENERAL DESCRIPTION

Vegetated filter strips (a.k.a. buffer strips and grassed filter strips) are gently sloping, densely vegetated areas that treat runoff as sheet flow from adjacent impervious areas. They slow runoff velocity and filter out suspended sediment and associated pollutants, and provide some infiltration into underlying soils. Originally used as an agricultural treatment practice, filter strips have evolved into an urban SWM practice. Vegetation may be comprised of a variety of trees, shrubs and native plants to add aesthetic value as well as water quality benefits. With proper design and maintenance, filter strips can provide relatively high pollutant removal benefits. Maintaining sheet flow into the filter strip through the use of a level spreading device (e.g., pea gravel diaphragm) is essential. Using vegetated filter strips as pretreatment practices to other best management practices is highly recommended. They also provide a convenient area for snow storage and treatment, and are particularly valuable due to their capacity for snowmelt infiltration.



DESIGN GUIDANCE

GEOMETRY AND SITE LAYOUT

The maximum contributing flow path length across adjacent impervious surfaces should not exceed 25 metres. The impervious surfaces draining to a filter strip should not have slopes greater than 3%.

The filter strip should have a flow path length of at least five (5) metres to provide substantial water quality benefits; however, some pollutant removal benefits are realized with three (3) metres of flow path length.

PRETREATMENT

A pea gravel diaphragm at the top of the slope is recommended to act as a pretreatment device and level spreader to maintain sheet flow into the filter strip.

CONVEYANCE AND OVERFLOW

Level spreaders are recommended to ensure runoff draining into the filter strip does so as sheet flow (e.g., pea gravel diaphragms, concrete curbs with cutouts). When filter strip slopes are greater than 5%, a series of level spreaders should be used to help maintain sheet flow.

When designed as a stand alone water quality BMP (i.e., not pretreatment to another BMP) the vegetated filter strip should be designed with a pervious berm at the toe of the slope for shallow ponding of runoff. The berm should be 150 to 300 millimetres in height above the bottom of the depression and should contain a perforated pipe underdrain connected to the storm sewer. The volume ponded behind the berm should be equal to the water quality storage requirement. During larger storms, runoff overtops the berm and flows directly into a storm sewer inlet.

SOIL AMENDMENTS

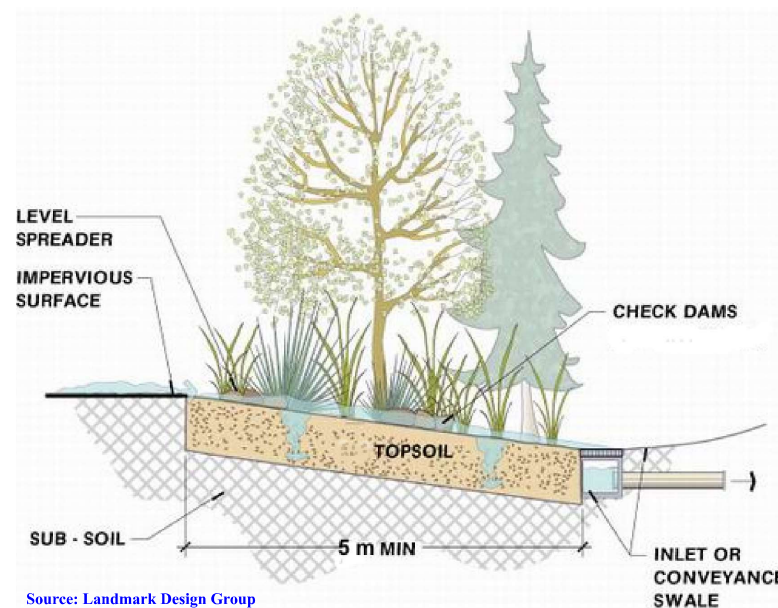
If soils on the filter strip site are highly compacted, or of such low fertility that vegetation cannot become established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.

OPERATION AND MAINTENANCE

Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Regular watering may be required during the first two years until vegetation is established. Routine inspection is very important to ensure that dense vegetation cover is maintained and inflowing runoff does not become concentrated and short circuit the practice. Vehicles should not be parked or driven on filter strips. For routine mowing of grassed filter strips, the lightest possible mowing equipment should be used to prevent soil compaction.

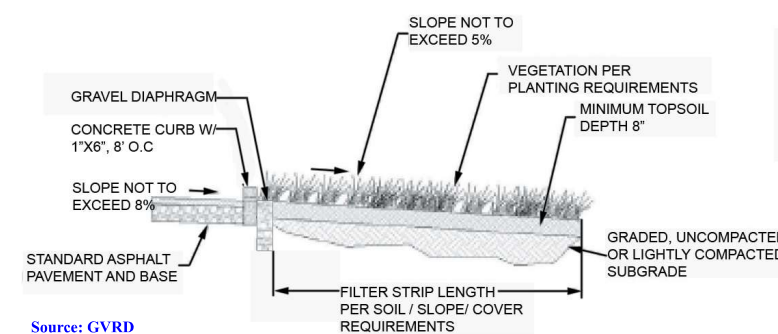
For the first two years following construction the filter strip should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, channelization, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices and the filter strip surface at least twice annually. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded areas, dethatching and aerating as needed. Remove accumulated sediment on the filter strip surface when dry and exceeding 25 mm depth

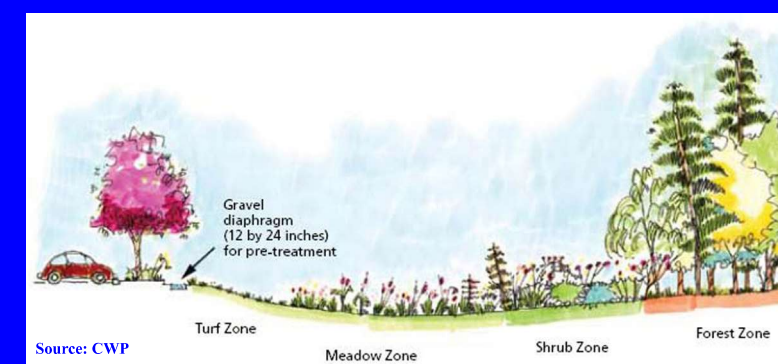


Source: Landmark Design Group

VEGETATED FILTER STRIPS



Source: GVRD



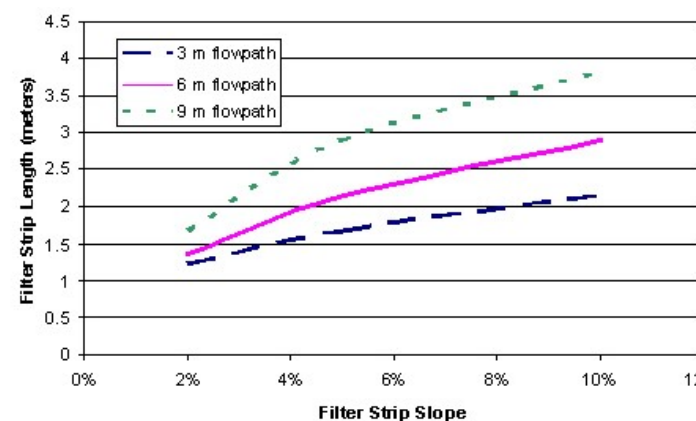
Source: CWP

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefit
Vegetated Filter Strips	Partial - depends on soil infiltration rate	Partial - depends on soil infiltration rate and flow path length	Partial - depends on soil infiltration rate

GENERAL SPECIFICATIONS

Material	Specification	Quantity
Gravel Diaphragm	Washed 3 to 10 mm diameter stone	Diaphragm should be a minimum of 300 mm wide and 600 mm deep (MDE, 2000).
Gravel/ Earthen Berm	Berm should be composed of sand (35 to 60%), silt (30 to 55%), and gravel (10 to 25%) (MDE, 2000) Gravel should be 15 to 25 mm in diameter.	N/A



Source: Pennsylvania Department of Environmental Protection

CONSTRUCTION CONSIDERATIONS

Soil Disturbance and Compaction
The limits of disturbance should be clearly shown on all construction drawings. Before site work begins, areas for filter strips should be clearly marked and protected by acceptable signage and silt fencing. Only vehicular traffic used for construction should be allowed within three metres of the filter strip.

Erosion and Sediment Control
Construction runoff should be directed away from the proposed filter strip site. If used for sediment control during construction, it should be re-graded and revegetated after construction is finished.

SITE CONSIDERATIONS

Available Space
The flow path length across the vegetated filter strip should be at least 5 metres to provide substantial water quality benefits. Vegetated filter strips incorporated as pretreatment to another BMP may be designed with shorter flow path lengths.

Site Topography
Filter strips are best used to treat runoff from ground-level impervious surfaces that generate sheet flow (e.g., roads and parking areas). The recommended filter strip slope is between 1 to 5%.

Flow Path Length Across Impermeable Surface
The maximum flow path length across the contributing impermeable surface should be less than 25 metres.

Soil
Filter strips are a suitable practice on all soil types. If soils are highly compacted, or of such low fertility that vegetation cannot become established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.

Pollution Hot Spot Runoff
To protect groundwater from possible contamination, source areas where land uses or human activities have the potential to generate highly contaminated runoff (e.g., vehicle fueling, servicing and demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites) should not be treated by vegetated filter strips.

Water table
Filter strips should only be used where depth to the seasonally high water table is at least one (1) metre below the ground surface.

CVC/TRCA LOW IMPACT DEVELOPMENT PLANNING AND DESIGN GUIDE - FACT SHEET

VEGETATED FILTER STRIPS

GENERAL DESCRIPTION

Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff (also referred to as enhanced vegetated swales). Check dams and vegetation in the swale slows the water to allow sedimentation, filtration through the root zone and soil matrix, evapotranspiration, and infiltration into the underlying native soil. Simple grass channels or ditches have long been used for stormwater conveyance, particularly for roadway drainage. Enhanced grass swales incorporate design features such as modified geometry and check dams that improve the contaminant removal and runoff reduction functions of simple grass channel and roadside ditch designs.

Where development density, topography and depth to water table permit, enhanced grass swales are a preferred alternative to both curb and gutter and storm drains as a stormwater conveyance system. When incorporated into a site design, they can reduce impervious cover, accent the natural landscape, and provide aesthetic benefits.



DESIGN GUIDANCE

GEOMETRY AND SITE LAYOUT

- **Shape:** Should be designed with a trapezoidal or parabolic cross section. Trapezoidal swales will generally evolve into parabolic swales over time, so the initial trapezoidal cross-section design should be checked for capacity and conveyance assuming it is a parabolic cross-section. Swale length between culverts should be 5 metres or greater.
- **Bottom Width:** Should be designed with a bottom width between 0.75 and 3.0 metres. Should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies.
- **Longitudinal Slope:** Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%.
- **Length:** When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to, or greater than the contributing roadway length.
- **Flow Depth:** A maximum flow depth of 100 mm is recommended during a 4 hour, 25 mm Chicago storm event.
- **Side Slopes:** Should be as flat as possible to aid in providing pretreatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion gullying from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.

PRE-TREATMENT

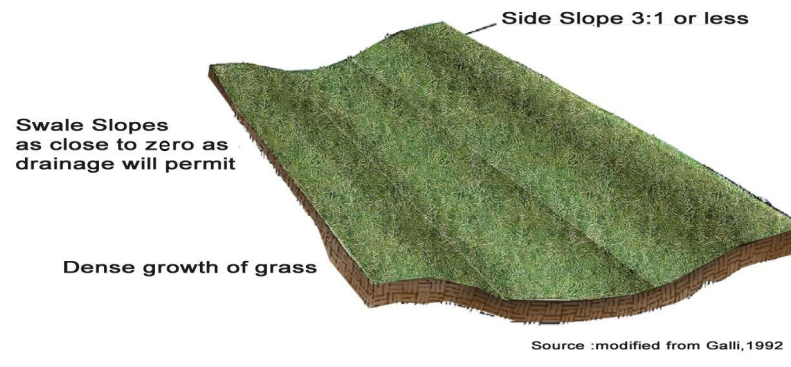
A pea gravel diaphragm located along the top of each bank can be used to provide pretreatment of any runoff entering the swale laterally along its length. Vegetated filter strips or mild side slopes (3:1) also provide pretreatment for any lateral sheet flow entering the swale. Sedimentation forebays at inlets to the swale are also a pretreatment option.

CONVEYANCE AND OVERFLOW

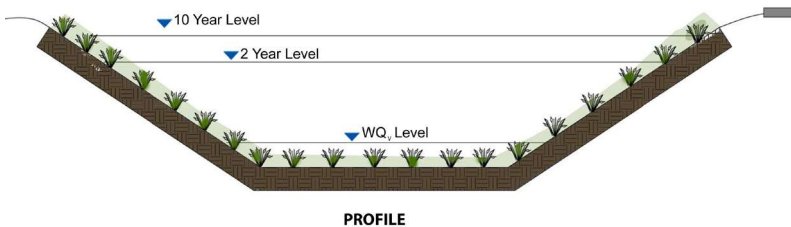
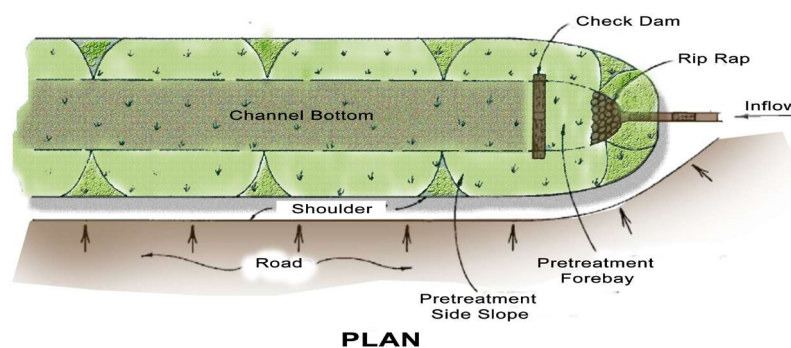
Grass swales must be designed for a maximum velocity of 0.5 m/s or less for the 4 hour 25 mm Chicago storm event. The swale should also convey the locally required design storm (usually the 10 year storm) at non-erosive velocities.

SOIL AMENDMENTS

If soils along the location of the swale are highly compacted, or of such low fertility that vegetation cannot become established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.



PLAN VIEW OF A GRASS SWALE



PLAN AND PROFILE VIEWS

OPERATION AND MAINTENANCE

Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Grassed swales should be mown at least twice yearly to maintain grass height between 75 and 150 mm. The lightest possible mowing equipment should be used to prevent soil compaction. Routine roadside ditch maintenance practices such as scraping and re-grading should be avoided. Regular watering may be required during the first two years until vegetation is established. Routine inspection is very important to ensure that dense vegetation cover is maintained and inlets and pretreatment devices are free of debris.

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefit
Enhanced Grass Swale	Partial - depends on soil infiltration rate	Yes, if design velocity is 0.5 m/s or less for a 4 hour, 25 mm Chicago storm	Partial - depends on soil infiltration rate

GENERAL SPECIFICATIONS

Component	Specification	Quantity
Check Dams	Constructed of a non-erosive material such as suitably sized aggregate, wood, gabions, riprap, or concrete. All check dams should be underlain with geotextile filter fabric. Wood used for check dams should consist of pressure treated logs or timbers, or water-resistant tree species such as cedar, hemlock, swamp oak or locust.	Spacing should be based on the longitudinal slope and desired ponding volume.
Gravel Diaphragm	Washed stone between 3 and 10 mm in diameter.	Minimum of 300 mm wide and 600 mm deep.

CONSTRUCTION CONSIDERATIONS

Grass swales should be clearly marked before site work begins to avoid disturbance during construction. No vehicular traffic, except that specifically used to construct the facility, should be allowed within the swale site. Any accumulation of sediment that does occur within the swale must be removed during the final stages of grading to achieve the design cross-section. Final grading and planting should not occur until the adjoining areas draining into the swale are stabilized. Flow should not be diverted into the swale until the banks are stabilized.

Preferably, the swale should be planted in the spring so that the vegetation can become established with minimal irrigation. Installation of erosion control matting or blanketing to stabilize soil during establishment of vegetation is highly recommended. If sod is used, it should be placed with staggered ends and secured by rolling the sod. This helps to prevent gullies.

For the first two years following construction the swale should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices and the surface of the swale at least twice annually. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded areas, dethatching and aerating as needed. Remove accumulated sediment on the swale surface when dry and exceeding 25 mm depth.

SITE CONSIDERATIONS

Available Space
Grass swales usually consume about 5 to 15% of their contributing drainage area. A width of at least 2 metres is needed.

Site Topography
Site topography constrains the application of grass swales. Longitudinal slopes between 0.5 and 6% are allowable. This prevents ponding while providing residence time and preventing erosion. On slopes steeper than 3%, check dams should be used.

Drainage Area & Runoff Volume
The conveyance capacity should match the drainage area. Sheet flow to the grass swale is preferable. If drainage areas are greater than 2 hectares, high discharge through the swale may not allow for filtering and infiltration, and may create erosive conditions. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 10:1.

Soil
Grass swales can be applied on sites with any type of soils.

Pollution Hot Spot Runoff
To protect groundwater from possible contamination, source areas where land uses or human activities have the potential to generate highly contaminated runoff (e.g., vehicle fueling, servicing and demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites) should not be treated by grass swales.

Proximity to Underground Utilities
Utilities running parallel to the grass swale should be offset from the centerline of the swale. Underground utilities below the bottom of the swale are not a problem.

Water Table
The bottom of the swale should be separated from the seasonally high water table or top of bedrock elevation by at least one (1) metre.

Setback from Buildings
Should be located a minimum of four (4) metres from building foundations to prevent water damage.

CVC/TRCA LOW IMPACT DEVELOPMENT
PLANNING AND DESIGN GUIDE - FACT SHEET

ENHANCED GRASS SWALES



**re: Geotechnical Investigation – Responses to City Comments
Proposed Mixed-Use Development
1518-1526 Stittsville Main Street
Ottawa, Ontario**

to: Inverness Homes - Mr. Joshua Laginski – joshua@invernesshomes.ca

date: July 24, 2024

file: PG5418-MEMO.04

Further to your request and authorization, Paterson Group (Paterson) prepared this memorandum to provide responses to the geotechnical-related comments from the City of Ottawa listed in the letter dated June 20, 2024 (File No. PC2024-0216). This memorandum should be read in conjunction with the updated Geotechnical Investigation Report (Paterson Group Report PG5418-1 Revision 3 dated July 24, 2024).

Geotechnical Investigation Comments

Comment a: *The report should discuss the results obtained for the grain size distribution test. Additionally, please confirm why only one sample has been tested for grain size distribution analysis, when the entire site is mostly made of sand.*

Response: A sub-heading has been added under Section 4.2 of the updated Geotechnical Investigation Report, referenced above, to provide and discuss the results of the grain size distribution test.

In summary, the native sand deposit was observed to be fairly consistent across the site, therefore one grain size distribution test was considered sufficient in order identify this soil and determine its percolation rate.

Comment b: *It is Development Review's understanding that the geotechnical engineer should comment on the percolation rate introduced in the infiltration calculations of the stormwater management report, as it is selected based on the type of soil for this site. The geotechnical consultant is encouraged to consult pages 77 and 99-100 of the servicing and stormwater management report for reference. This percolation should be discussed in the geotechnical report.*

Response: A sub-heading has been added under Section 4.3 of the updated Geotechnical Investigation Report, referenced above, to provide the percolation rate. In summary, a conservative percolation rate of 30 mm/hr is suitable for the subsurface soils at the subject site. It is understood that this is the value that has been used in the Stormwater Management Report, by others.





We trust that this information satisfies your immediate requirements.

Paterson Group Inc.

Scott S. Dennis, P.Eng.



APPENDIX H
CITY OF OTTAWA DESIGN CHECKLIST

City of Ottawa

4. Development Servicing Study Checklist

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

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

4.1 General Content

Criteria	Location (if applicable)
<input type="checkbox"/> Executive Summary (for larger reports only).	N/A
<input type="checkbox"/> Date and revision number of the report.	On Cover
<input type="checkbox"/> Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix E
<input type="checkbox"/> Plan showing the site and location of all existing services.	Site Servicing Plan (C102)
<input type="checkbox"/> Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
<input type="checkbox"/> Summary of pre-consultation meetings with City and other approval agencies.	Appendix A
<input type="checkbox"/> Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
<input type="checkbox"/> Statement of objectives and servicing criteria.	3.0 Pre-Consultation Summary

<input type="checkbox"/> Identification of existing and proposed infrastructure available in the immediate area.	N/A
<input type="checkbox"/> Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
<input type="checkbox"/> Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
<input type="checkbox"/> Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
<input type="checkbox"/> Proposed phasing of the development, if applicable.	N/A
<input type="checkbox"/> Reference to geotechnical studies and recommendations concerning servicing.	Section 2.0 Background Studies
<input type="checkbox"/> All preliminary and formal site plan submissions should have the following information: <ul style="list-style-type: none"> ○ Metric scale ○ North arrow (including construction North) ○ Key plan ○ Name and contact information of applicant and property owner ○ Property limits including bearings and dimensions ○ Existing and proposed structures and parking areas ○ Easements, road widening and rights-of-way ○ Adjacent street names 	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)

4.2 Development Servicing Report: Water

Criteria	Location (if applicable)
<input type="checkbox"/> Confirm consistency with Master Servicing Study, if available	N/A
<input type="checkbox"/> Availability of public infrastructure to service proposed development	N/A
<input type="checkbox"/> Identification of system constraints	N/A
<input type="checkbox"/> Identify boundary conditions	N/A
<input type="checkbox"/> Confirmation of adequate domestic supply and pressure	N/A
<input type="checkbox"/> Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Appendix B
<input type="checkbox"/> Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
<input type="checkbox"/> Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
<input type="checkbox"/> Address reliability requirements such as appropriate location of shut-off valves	N/A
<input type="checkbox"/> Check on the necessity of a pressure zone boundary modification.	N/A
<input type="checkbox"/> Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	N/A

<input type="checkbox"/> Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
<input type="checkbox"/> Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
<input type="checkbox"/> Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Appendix B
<input type="checkbox"/> Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Criteria	Location (if applicable)
<input type="checkbox"/> Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	N/A
<input type="checkbox"/> Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
<input type="checkbox"/> Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
<input type="checkbox"/> Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 5.2 Sanitary Sewer

<input type="checkbox"/> Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	N/A
<input type="checkbox"/> Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N/A
<input type="checkbox"/> Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 5.2 Sanitary Sewer
<input type="checkbox"/> Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
<input type="checkbox"/> Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
<input type="checkbox"/> Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
<input type="checkbox"/> Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
<input type="checkbox"/> Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Criteria	Location (if applicable)
<input type="checkbox"/> Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 6.0 Stormwater Management
<input type="checkbox"/> Analysis of available capacity in existing public infrastructure.	N/A
<input type="checkbox"/> A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Pre & Post-Development Plans
<input type="checkbox"/> Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5-year event (dependent on the receiving sewer design) to 100-year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 6.0 Stormwater Management
<input type="checkbox"/> Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 6.0 Stormwater Management
<input type="checkbox"/> Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 6.0 Stormwater Management
<input type="checkbox"/> Set-back from private sewage disposal systems.	N/A
<input type="checkbox"/> Watercourse and hazard lands setbacks.	N/A
<input type="checkbox"/> Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A
<input type="checkbox"/> Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
<input type="checkbox"/> Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5-year return period) and major events (1:100-year return period).	Appendix F

<input type="checkbox"/> Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Site Grading, Drainage, Sediment & Erosion Control Plan
<input type="checkbox"/> Calculate pre-and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 6.0 Stormwater Management Appendix F
<input type="checkbox"/> Any proposed diversion of drainage catchment areas from one outlet to another.	Section 6.0 Stormwater Management
<input type="checkbox"/> Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 6.0 Stormwater Management
<input type="checkbox"/> If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	Appendix A
<input type="checkbox"/> Identification of potential impacts to receiving watercourses	N/A
<input type="checkbox"/> Identification of municipal drains and related approval requirements.	N/A
<input type="checkbox"/> Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 6.0 Stormwater Management
<input type="checkbox"/> 100-year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
<input type="checkbox"/> Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A

<input type="checkbox"/> Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0 Sediment & Erosion Control
<input type="checkbox"/> Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
<input type="checkbox"/> Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Criteria	Location (if applicable)
<input type="checkbox"/> Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
<input type="checkbox"/> Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
<input type="checkbox"/> Changes to Municipal Drains.	N/A
<input type="checkbox"/> Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

Criteria	Location (if applicable)
<input type="checkbox"/> Clearly stated conclusions and recommendations	Section 8.0 Summary Section 9.0 Recommendations
<input type="checkbox"/> Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	All are stamped
<input type="checkbox"/> All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped