

SERVICING & STORMWATER MANAGEMENT REPORT MYERS BARRHAVEN – 4149 STRANDHERD DRIVE



Project No.: CCO-22-2933

City File No.: D07-12-XX-XXXX

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1.0 PROJECT DESCRIPTION

1.1 Purpose

McIntosh Perry (MP) has been retained by BBS Construction to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control Amendment process for the proposed development located at 4149 Strandherd Drive within the City of Ottawa.

The main purpose of this report is to present a servicing and stormwater management design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Rideau Valley Conservation Authority (RVCA), 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. In addition, the report will discuss the amendment to the previously approved site servicing design.

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

- CCO-22-2933, C101 – Grading Plan
- CCO-22-2933, C102 – Servicing Plan
- CCO-22-2933, C103 – Erosion & Sediment Control Plan
- CCO-22-2933, SAN – Sanitary Drainage Plan (**Appendix 'E'**)
- CCO-22-2933, POST – Post Development Drainage Area Plan (**Appendix 'F'**)

1.2 Site Description



Figure 1: Site Map

The subject property, herein referred to as the site, is located at 4149 Strandherd Drive within the Barrhaven Ward. The site covers approximately **3.38 ha** and is located at the northwest corner of Dealership Drive and Strandherd Drive. The site is zoned for Business Park Industrial Zone use (IP). See Site Location Plan in **Appendix 'A'** for more details.

1.3 Proposed Development and Statistics

A Site Plan Control application was previously submitted by Novatech Engineering (File No. #117148) with a phased development approach including a dealership, hotel, and office building. This design was approved on November 16th, 2020. The first phase, including the dealership (Building A) and above-ground parking areas, is currently under development.

The proposed amendment includes a revision to the phase two and phase three developments, which contemplated a hotel and an office building. As per the Site Plan, included in **Appendix B**, two additional dealerships (Building B & C) are now proposed for a total of three dealerships on site. Parking and drive aisles will continue to be provided throughout the site with access from Dealership Drive and Strandherd Drive.

1.4 Existing Conditions and Infrastructures

As noted in *Section 1.3*, the site is currently being developed with the phase one dealership and associated above-ground parking areas. The remainder of the site contains landscaped areas. The O'Keefe stormwater drain is located west of the site.

Sewer and watermain mapping collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal rights-of-way(s):

- ❖ Dealership Drive
 - 254 mm diameter PVC watermain,
 - 450 mm diameter concrete sanitary sewer, tributary to the South Nepean Collector sewer, and a
 - 300/375 mm diameter concrete storm sewer tributary to the O'Keefe Drain.

- ❖ Strandherd Drive
 - 406 mm diameter PVC watermain,
 - 525 mm diameter concrete sanitary sewer, tributary to the South Nepean Collector sewer, and a
 - 1350 mm diameter concrete storm sewer, tributary to the Jock River.

1.5 Approvals

The proposed development is subject to the City of Ottawa site plan control approval process. Site plan control requires the City to review, provide concurrence and approve the engineering design package. Permits to construct can be requested once the City has issued a site plan agreement.

An Environmental Compliance Approval (**ECA**) Amendment through the Ministry of Environment, Conservation and Parks (**MECP**) may be required due to the outlet to the watercourse and industrial zoning. Requirements to be further discussed with City staff.

2.0 BACKGROUND STUDIES, STANDARDS, AND REFERENCES

2.1 Background Reports / Reference Information

As-built drawings of existing services, provided by the City of Ottawa Information centre, within the vicinity of the proposed site were reviewed in order to identify infrastructure available to service the proposed development.

A topographic survey (19966-19) of the site was completed by Annis, O’Sullivan, Vollebekk Ltd and dated 2019.

The Site Plan (A010A) was prepared by KWC Architects Inc and dated February 8th, 2022 (*Site Plan*).

2.2 Applicable Guidelines and Standards

City of Ottawa:

- ◆ Ottawa Sewer Design Guidelines, City of Ottawa, SDG002, October 2012. (*Ottawa Sewer Guidelines*)
 - Technical Bulletin ISTB-2014-01 City of Ottawa, February 2014. (*ISTB-2014-01*)
 - Technical Bulletin PIEDTB-2016-01 City of Ottawa, September 2016. (*PIEDTB-2016-01*)
 - Technical Bulletin ISTB-2018-01 City of Ottawa, January 2018. (*ISTB-2018-01*)
 - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. (*ISTB-2018-03*)
 - Technical Bulletin ISTB-2019-01 City of Ottawa, January 2019. (*ISTB-2019-01*)
 - Technical Bulletin ISTB-2019-02 City of Ottawa, February 2019. (*ISTB-2019-02*)
- ◆ Ottawa Design Guidelines – Water Distribution City of Ottawa, July 2010. (*Ottawa Water Guidelines*)
 - Technical Bulletin ISD-2010-2 City of Ottawa, December 15, 2010. (*ISD-2010-2*)
 - Technical Bulletin ISDTB-2014-02 City of Ottawa, May 2014. (*ISDTB-2014-02*)
 - Technical Bulletin ISTB-2018-03 City of Ottawa, March 2018. (*ISTB-2018-03*)

Ministry of Environment, Conservation and Parks:

- ◆ Stormwater Planning and Design Manual, Ministry of the Environment, March 2003. (*MECP Stormwater Design Manual*)
- ◆ Design Guidelines for Sewage Works, Ministry of the Environment, 2008. (*MECP Sewer Design Guidelines*)

Other:

- ◆ Servicing and Stormwater Management Report – 4149 Strandherd Drive, Novatech, dated November 16th, 2020. (*Previously Approved Design*)
- ◆ Citi Gate Highway 416 Corporate Campus, Detailed Servicing Study and Stormwater Management Report (Phase 1), Novatech, dated January 9th, 2015. (*Citi Gate Phase 1 Report*)

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation email was provided by City staff on December 22nd, 2021, regarding the proposed site servicing. Specific design parameters to be incorporated within this design include the following:

- Develop the site in accordance with the Citi Gate Development (Citi Gate 416 Corporate Campus, Detailed Servicing and Stormwater Management Report (Phase 1), prepared by Novatech, dated January 9th, 2015).
- An ECA amendment may be required if the properties are all under the same ownership.
- Provide the following Reports and Plans:
 - Site Servicing Plan,
 - Grading Plan,
 - Erosion and Sediment Control Plan,
 - Storm Drainage / Ponding Plan,
 - Stormwater Management and Site Servicing Report, and a
 - Geotechnical Investigation Report.

4.0 WATERMAIN

4.1 Existing Watermain

The site is located within the BARR pressure zone, as per the Water Distribution System mapping included in **Appendix C**. There are three municipal fire hydrants along Dealership Drive that are available to service the development. In accordance with the **Previously Approved Design**, three private hydrants are proposed within the site.

4.2 Proposed Watermain

The 203 mm diameter watermain network proposed in the **Previously Approved Design**, will be maintained. No changes are proposed to the internal 203 mm diameter watermain network nor the connection to Building A. Fire hydrants are proposed to be adjusted to accommodate the current **Site Plan**. The servicing strategy adheres to the **Citi Gate Phase 1 Report**.

In accordance with Section 4.3.1 of the **Ottawa Water Guidelines**, service areas with a basic day demand greater than 50 m³/day require a dual connection to the municipal system. The total site demand exceeds 50 m³/day, therefore a dual connection to the 254 mm diameter watermain within Dealership Drive and to the 406 mm diameter watermain within Strandherd Drive is proposed to provide a redundant connection to the site. The demands of Building B & C do not exceed 50 m³/day independently, therefore, a single connection is proposed to each. Refer to drawing **C102** for a detailed servicing layout.

The Fire Underwriters Survey 1999 (FUS) method was utilized to estimate the required fire flow for the site. Fire flow requirements were calculated per City of Ottawa Technical Bulletin **ISTB-2018-03**. The following parameters were coordinated with the architect.

- ❖ Type of construction – Non-Combustible Construction
- ❖ Occupancy Type – Limited Combustibility
- ❖ Sprinkler Protection – Supervised Sprinkler System

The results of the calculations yielded a required fire flow of **4,000 L/min** (66.7 L/s) for Building B and **5,000 L/min** (83.3 L/s) for Building C. Per the **Previously Approved Design**, a fire flow of 7,000 L/min (116.7 L/s) was estimated for Building A. The detailed calculations for the FUS can be found in **Appendix C**.

Table 1, below, summarizes the previously proposed and amendment fire flow demands.

Table 1: Fire Flow Demand Comparison

Building	Fire Flow Demand Previously Proposed * (L/min)	Fire Flow Demand Currently Proposed (L/min)
Building A (Existing Dealership)	7,000	7,000 *
Building B (Current Dealership, Previously Proposed Hotel)	8,000	4,000
Building C (Current Dealership, Previously Proposed Office)	12,000	5,000

Per **Previously Approved Design prepared by Novatech and Dated November 2020.*

As noted by **Table 1**, the proposed fire demands have been reduced since the **Previously Approved Design** which was designed to accommodate a maximum fire flow of 12,000 L/min. Therefore, the internal network is sufficient sized to accommodate the proposed amendment for fire fighting purposes. Refer to **Appendix C** for the approved water model.

The water demands for the development, as per the **Previously Approved Design**, have been summarized below for reference. Calculations and accompanying water model included in the **Previously Approved Design** has been included in **Appendix C** for reference.

Table 2: Water Demand Summary – Previously Approved

Building	Building A	Building B	Building C
Average Daily Demand (L/s)	0.321	0.732	0.731
Maximum Day Demand (L/s)	0.482	1.098	1.096
Peak Hour Demand (L/s)	0.867	1.977	1.973

The water demands for the proposed building have been calculated to adhere to the **Ottawa Water Guidelines** and can be found in **Appendix C**. The criteria and results have been summarized below in **Table 3** and **Table 4**.

Table 3: Water Supply Design Criteria

Site Area	3.38 ha
Dealership – Car Wash	400 L/vehicle/day
Dealership – Employees	75 L/person/day
Dealership – Cars Serviced	40 L/car serviced/day
Commercial Maximum Daily Peaking Factor	1.5 x avg day
Commercial Maximum Hour Peaking Factor	1.8 x max day
Employee Maximum Daily Peaking Factor	9.5 x avg day
Employee Maximum Hour Peaking Factor	14.3 x max day

Table 4: Water Demand Summary

Building	Building A	Building B	Building C
Average Daily Demand (L/s)	0.321*	0.18	0.29
Maximum Day Demand (L/s)	0.482*	0.27	0.43
Maximum Day Demand + Fire Flow (L/s)	117.148*	66.937	83.763
Peak Hour Demand (L/s)	0.867*	0.49	0.78

*Per *Previously Approved Design* prepared by Novatech and Dated November 2020.

The *Previously Approved Design* included a water model based on the demands and fire flow conditions summarized in **Table 1** and **Table 2**, above. As per Table 4, the demands for Building B and C are proposed to be reduced from the original design. As a result, it is anticipated that the internal watermain network was sufficiently sized for the amendment development.

Boundary Conditions have been requested from the City, however, were not available at the time of submission. The boundary condition request included the amendment water demands from the development. Once boundary conditions are provided by the City, the minimum and maximum water pressures will be compared to those proposed to ensure they fall within the required range identified by in the City of Ottawa Water Supply Guidelines and to confirm the system has adequate capacity for the proposed development.

To confirm the adequacy of fire flow to protect the proposed development, public and private 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 below.

Table 5: Fire Protection Confirmation

Building	Fire Flow Demand (L/min.)	Fire Hydrant(s) within 75m	Fire Hydrant(s) within 150m	Combined Fire Flow (L/min.)
Building A	7,000	1 Private 1 Public	2 Private 1 Public	22,800
Building B	4,000	2 Private 1 Public	1 Private 2 Public	28,500
Building C	5,000	1 Private	2 Private	13,300

Based on City guidelines (*ISTB-2018-03*), the existing and proposed hydrants can provide adequate fire protection to the proposed development.

5.0 SANITARY DESIGN

5.1 Existing Sanitary Sewer

There is an existing 450 mm diameter sanitary sewer within Dealership Drive and an existing 525/600 mm diameter sanitary sewer within Strandherd, fronting the site. Both sanitary sewers converge at the Dealership Drive and Strandherd Drive intersection and are tributary to the South Nepean Collector sewer.

5.2 Proposed Sanitary Sewer

In accordance with the *Citi Gate Phase 1 Report* and *Previously Approved Design*, the site (Block 4) was contemplated to direct wastewater drainage towards Dealership Drive. The approved and current designs will maintain the connection to the 450 mm diameter sanitary sewer within Dealership Drive. In addition, flows for the site were contemplated to be **3.89 L/s**, based on the following design criteria:

- Commercial Wastewater Flow = 50,000 L/ha/day
- Commercial Peaking Factor = 1.5
- Site Area = 3.39 ha
- Infiltration Allowance = 0.28 L/s/ha

As noted above, the 200 mm diameter sanitary sewer network within the site is proposed to be maintained. The sewer system is tributary to the 450 mm diameter sanitary sewer within Dealership Drive. No changes are proposed to the 200 mm diameter sanitary service to Building A. Minor changes are proposed to the Building B and C sanitary services in order to accommodate the *Site Plan*. Refer to drawing C102 for a detailed servicing layout.

Table 6, below, summarizes the wastewater design criteria identified by the *Ottawa Sewer Guidelines*.

Table 6: Sanitary Design Criteria

Design Parameter	Value
Site Area	1.18 ha (Building A)* 1.11 ha (Building B) 1.145 ha (Building C)
Dealership – Car Wash	400 L/vehicle/day
Dealership – Employees	75 L/person/day
Dealership – Cars Serviced	40 L/car serviced/day
Commercial Peaking Factor	1.5

Table 7, below, summarizes the estimated wastewater flow from the proposed development. Refer to **Appendix D** for detailed calculations.

Table 7: Summary of Estimated Sanitary Flow

Design Parameter	Building A (L/s)	Building B (L/s)	Building C (L/s)	Total Flow (L/s)
Total Estimated Average Dry Weather Flow	0.38	0.24	0.34	0.96
Total Estimated Peak Dry Weather Flow	0.54	0.33	0.49	1.36
Total Estimated Peak Wet Weather Flow	0.85	0.65	0.80	2.31

Per **Table 7**, above, the total peak wet weather flow leaving the site is estimated as **2.31 L/s**. Therefore, the proposed amendment adheres to the sanitary servicing requirements indicated in the **Citi Gate Phase 1 Report**.

6.0 STORM SEWER DESIGN

6.1 Existing Storm Sewers

Stormwater runoff from the site is currently tributary to the O’Keefe Drain within the Jock River sub-watershed. The ***Previously Approved Design*** contemplated an internal storm sewer system which outlets directly to the O’Keefe drain.

6.2 Proposed Storm Sewers

A dry pipe was installed within the site as part of the Phase 1 development (***Previously Approved Design***), including the storm sewer system surrounding Building A. Stormwater flows within the dry pipe and outlets to the O’Keefe Drain at the north-west corner of the site.

There are six catchment areas within the site which propose independent controls and storages. Water is restricted using inlet control devices (ICD) and will release to the dry pipe within the site.

Runoff collected on the roof of the proposed buildings will be stored and controlled internally using roof drains. Roof drains will be used to limit the flow from the roof to the specified allowable release rate. For calculation purposes a Watts Accutrol roof drain was used estimate a reasonable roof flow. Other products maybe specified at detailed building design so long as release rates and storage volumes are respected. Drainage from the roof will be directed to the dry pipe within the site.

Foundation drainage is proposed to be conveyed via the storm service provided to each building. Water will be directed to the internal dry pipe without flow attenuation.

See CCO-22-2933 - *POST* include in ***Appendix F*** of this report for more details. The Stormwater Management design for the subject property will be outlined in *Section 7.0* of this report.

7.0 PROPOSED STORMWATER MANAGEMENT

7.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through two methods. The first will store and control runoff collected on the roof of the proposed buildings. The second will control stormwater via an underground sewer system and will collect runoff from the at-grade areas within the site. The flow will be directed to the existing 900 mm diameter storm sewer at the north-west corner of the site, tributary to the O’Keefe Drain.

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

Quality Control

- Based on coordination with the RVCA, quality controls are required for the development due to the distance to the outlet, up to an enhanced level of treatment.

Quantity Control

- Any storm events greater than 5-year, up to 100-year, and including 100-year storm event must be detained on site.
- Post-development to be restricted to the stormwater release rate assigned to the site via the **Citigate Phase 1 Report**. The site, which was designated as Block 4, assigned a stormwater release rate based on a 3.41 ha area and an imperviousness of 85%. The site’s allowable release rates identified by the **Previously Approved Design** are summarized below.

Design Event	Target Release Rate	
	L/s/ha	L/s
2-year	20	68
5-year	35	119
10-year	45	153
25-year	64	218
50-year	75	256
100-year	126	430

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
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.

7.3 Post-Development Drainage

To meet the stormwater objectives the development will contain a combination of flow attenuation with rooftop controls and subsurface storage. A dry pipe, between STM MH01 and STM MH08 is provided for footing drainage and to ensure all catchment areas are controlled independently.

Based on the criteria listed in *Section 7.2.1*, the development will be required to restrict flow based on a site area of 3.41 ha, an imperviousness of 85%, and the per hectare release rates specified by the ***Citigate Phase 1 Report***. It is estimated that the target release rate during the 100-year event will be **430 L/s**.

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See CCO-22-2933 - *POST* in **Appendix F** of this report for more details. A summary of the post-development runoff calculations can be found below and within **Appendix G**.

Table 8: Post-Development Runoff Summary

Drainage Area	Area (ha)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)	100-year Storage Required (m ³)	100-year Storage Available (m ³)
B1	0.083	1.90	3.45	34.19	34.37
B2	0.278	7.98	14.14	161.80	166.29
B3	0.473	16.44	17.02	190.78	190.93
B4	0.447	20.51	24.50	156.07	156.56
B5	0.607	10.30	16.27	253.18	255.03
B6	0.277	4.90	5.00	143.78	152.48
B7*	0.130	7.60	11.40	39.30	48.80
B8	0.732	14.00	18.20	334.07	334.55
B9	0.218	25.66	26.15	49.32	49.77
B10	0.139	8.03	17.21	-	-
Total	3.384	117.32	153.34	1,362.47	1,389.38

**Per Previously Approved Report by Novatech.*

Runoff for area B1 will be stored on the roof of Building B (**B1**) and restricted using five Watts Accutrol roof drains (or equivalent product) to a maximum release rate of **3.45 L/s** and will provide up to **34.4 m³** of storage.

Runoff for area B2 will be stored on the roof of Building C (**B2**) and restricted using fourteen Watts Accutrol roof drains (or equivalent product) to a maximum release rate of **14.14 L/s** and will provide up to **166.3 m³** of storage.

Runoff for area B3 will be restricted before discharging to the existing storm system north of Building A. Changes to this area include minor updates to the catchment areas, ponding volumes, and the ICD size. It is proposed to restrict flow to a maximum release rate of **17.02 L/s** using a Tempest LMF90 ICD (or equivalent product) on the outlet side of CBMH113. This area contains up to **190.9 m³** of surface and subsurface storage, including the existing 72 m³ STC 740 chamber system (or equivalent product). Existing tank details are included in **Appendix G** for further details.

Runoff for area B4 will be restricted before discharging to the existing storm system south of Building A. Changes to this area include minor updates to the catchment areas, ponding volumes, and the ICD size. It is proposed to restrict flow to a maximum release rate of **24.50 L/s** using a Tempest LMF100 ICD (or equivalent product) on the outlet side of CBMH119. This area contains up to **156.6 m³** of surface and subsurface storage, including the existing 67 m³ STC 740 chamber system (or equivalent product). Existing tank details are included in **Appendix G** for further details.

Runoff for area B5, north of Building C, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH103) installed with a 78 mm plug style ICD. Drainage from B5 will be controlled to a maximum release rate of **16.27 L/s** and will contain **255.03 m³** of storage, including a new **126 m³** Triton S-29 chamber system (or approved equivalent).

Runoff for area B6, south of Building C, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH108) installed with a Tempest LMF70 ICD (or equivalent product). Drainage from B6 will be controlled to a maximum release rate of **5.0 L/s** and will contain **152.5 m³** of surface storage.

Runoff for area B7 will be stored on the roof of existing Building A (**B7**) and restricted using six fully open Watts Accutrol roof drains to a maximum release rate of **11.4 L/s** and will provide up to **48.8 m³** of storage. This design is in accordance with the ***Previously Approved Design***. No changes are proposed to the building controls.

Runoff for area B8, north of Building B, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH101) installed with a 75 mm plug style ICD. Drainage from B8 will be controlled to a maximum release rate of **18.20 L/s** and will contain **334.6 m³** of storage, including a new **163 m³** Triton S-29 chamber system (or approved equivalent).

Runoff for area B9, south of Building B, will be restricted before discharging to the internal dry pipe, noted above. The flow will be controlled within a catch basin (CBMH117) installed with a 90 mm plug style ICD. Drainage from B9 will be controlled to a maximum release rate of **26.15 L/s** and will contain **49.77 m³** of surface storage.

The flow from Area B10 directed to either the O'Keefe Drain or towards municipal ROWs without restriction and will be compensated for in areas with attenuation.

7.4 Quality Control

In accordance with the ***Previously Approved Design***, the development will treatment stormwater drainage via an existing STC4000 oil/grit separator (OGS) located at the north-west corner of the site. Stormwater falling on impervious areas will be collected by a series of catchbasin structures upstream of the OGS.

7.5 Thermal Mitigation

Based on coordination with the RVCA, thermal mitigation best management practices need to be incorporated into the stormwater management design. The following design elements were incorporated in order to cool water before discharging to the O'Keefe Drain:

- Underground chamber systems,
- Sections of perforated pipes, and
- High Albedo Rooftops

Refer to drawing **C102** for a detailed servicing layout.

8.0 EROSION AND SEDIMENT CONTROL

8.1 Temporary Measures

Before construction begins, temporary silt fence, straw bale or rock flow check dams 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 rock flow, straw bale & silt fence check dams and barriers shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and check dams as required. Fibre roll barriers are to be installed at all existing curb inlet catch basins and filter fabric is to be placed under the grates of all existing catch basins 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 Grading, Drainage and 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

- The proposed amendment includes a revision to the phase two and phase three developments, which contemplated a hotel and an office building. As per the Site Plan, two additional dealerships are now proposed for a total of three dealerships on site.
- An extension to the 200 mm internal watermain network is proposed to provide a redundant service to the site by connecting to the municipal infrastructure within Strandherd Drive and Dealership Drive. Minor adjustments are required to the service lateral lengths for Building B, Building C, and two on-site fire hydrants.
- An extension to the 200 mm diameter sanitary sewer network is proposed to service Building C. Minor updates are required to the service lateral lengths for Building B and Building C. The sewer system is connected to municipal infrastructure within Dealership Drive.
- The proposed storm sewer, ranging in diameter from 250 mm to 900 mm, will be installed throughout the site and drain to the O’Keefe Drain at the north-west corner.
- Storage for the 5- through 100-year storm events will be provided within the parking lot areas via surface and subsurface storage and on the proposed flat rooves.
- In accordance with the ***Previously Approved Design***, the development will treatment stormwater drainage via an existing STC4000 oil/grit separator (OGS) located at the north-west corner of the site.

10.0 RECOMMENDATION

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 development at 4149 Strandherd Drive.

This report is respectfully being submitted for approval.

Regards,

McIntosh Perry Consulting Engineers Ltd.



Alison J. Gosling, P.Eng.

Project Engineer, Land Development

T: 613.714.4629

E: a.gosling@mcintoshperry.com

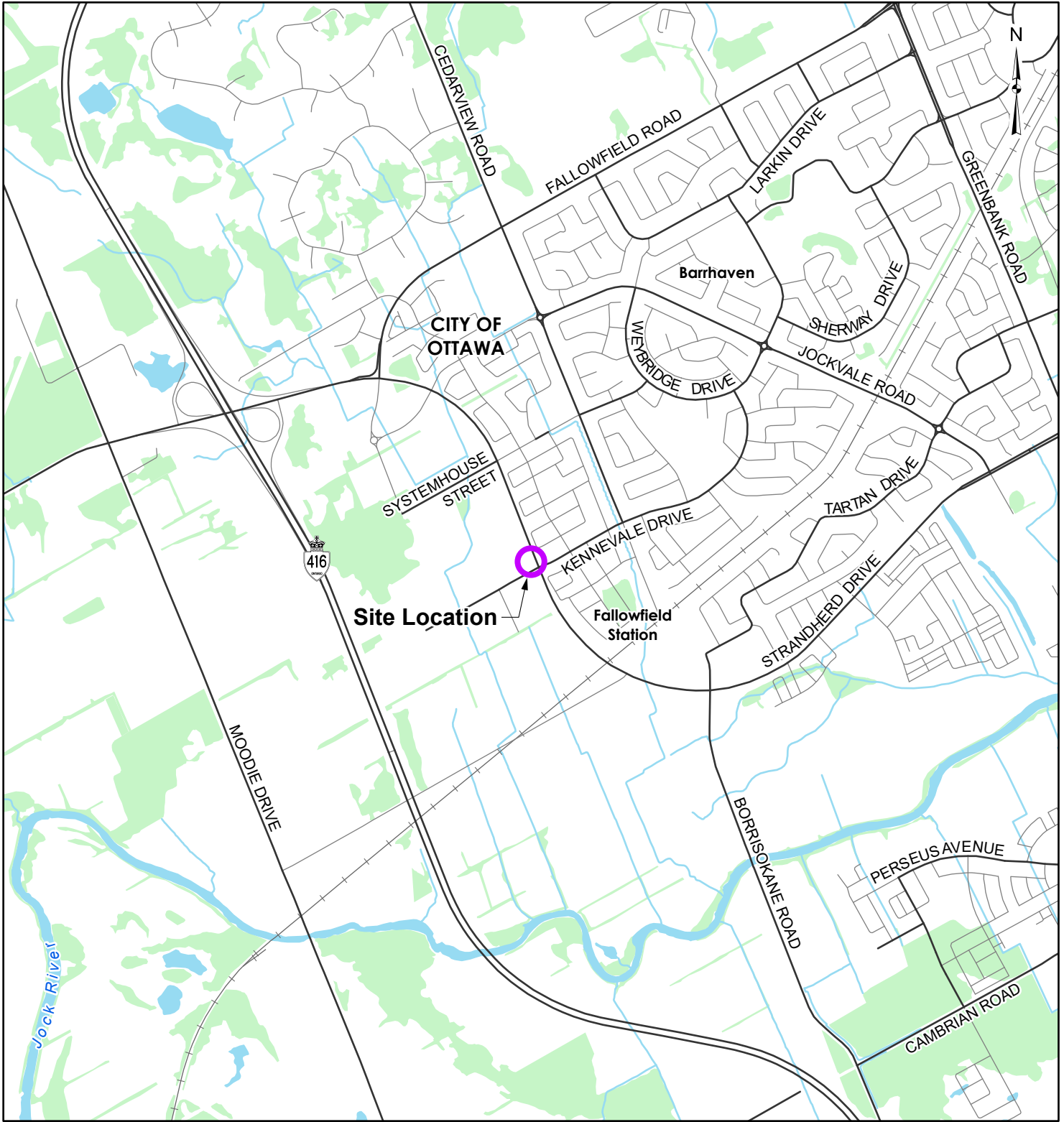
11.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of BBS Construction Ltd. 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, Parks and Climate Change, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry 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. McIntosh Perry accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

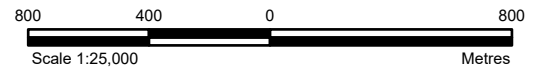
The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, McIntosh Perry should be requested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

**APPENDIX A
KEY PLAN**



LEGEND

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



REFERENCE

GIS data provided by the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2022.

CLIENT:	FRITS BOSMAN BBS CONSTRUCTION LTD.	
PROJECT:	MYERS NISSAN & SUBARU	
TITLE:	SITE LOCATION PLAN	
McINTOSH PERRY <small>115 Walgreen Road, RR3, Carp, ON K0A1L0 Tel: 613-836-2184 Fax: 613-836-3742 www.mcintoshperry.com</small>	PROJECT NO: CCO-22-2933	FIGURE:
	Date	Feb., 08, 2022
	GIS	EU
	Checked By	MS
		00

C:\Users\stunum\Documents\Projects\2022\CCO\CCO-22-2933_BBS_Nissan and Subaru_4149 Strandherd D\Mapa\Key\Mapa\LandDevelopment\CCO-22-2933_OptionD_SiteLocation.aprx

**APPENDIX B
BACKGROUND DOCUMENTS**

Formal Pre-Application Consultation Meeting Minutes
PC2021-0440
4149 Strandherd Drive
Wednesday, December 22, 2021 at 2:00 pm to 3:00 pm

Attendees

City of Ottawa

Urja Modi, File Lead – Planner I

Kelsey Charie, Engineering Intern

Eric Harrold, Infrastructure Project Manager

Christopher Moise, Urban Design

Eric Lalande, Rideau Valley Conservation Area

Katie O’Callaghan, Planner I

Applicant Team

Adam Thompson

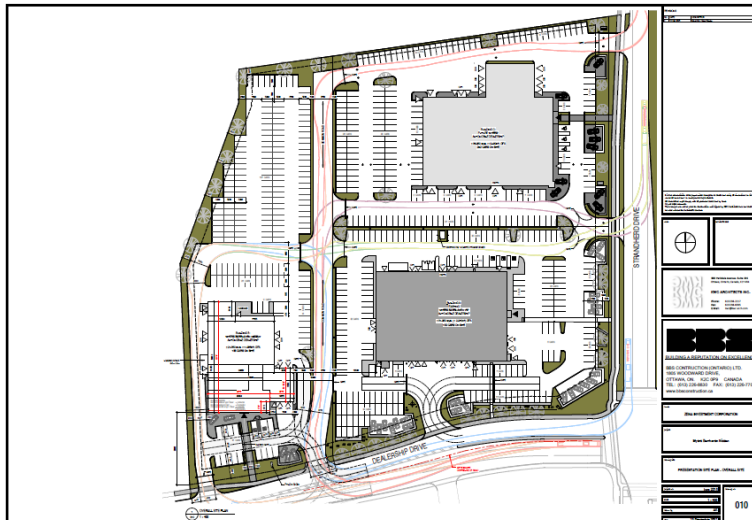
Geoff Publow

Curtis Melanson

Please note the City’s Environmental Planner, Sami Rehman, the Transportation Project Manager, Mike Giampa, the City’s Forester, Mark Richardson, and the City’s Parks Planner, Jeannete Krabicka, were not able to attend the meeting; their comments have been added to the meeting notes.

Proposal Overview

Proposal to revise a recently approved Site Plan to remove approved hotel and office buildings and replace them with two additional mobile dealerships on the site. This will result in three automobile dealerships being located on the site.



Notes & Comments

Urja Modi, File Lead

1. In the current Official Plan and as per the Official Plan Amendment adopted in 2020, the south east corner of the site (location of approved automobile dealership) is designated as Business Park, however the portion of the site impacted by this application is

designated Prestige Business Park. The site is also located South Nepean Secondary Plan Areas 9 and 10.

- a. The proposed use is not permitted in the relevant Secondary Plan.
2. In the New Official Plan, the site is located in the Southwest Suburban Transect, and designated as Mixed Industrial on Schedule 6.
 - a. This designation permits automotive sales and services.
3. The portion of the site that is impacted by this application is currently zoned Business Park Industrial Zone, Exception 2636 with a Height Restriction of 22 metres ("IP[2636] H(22)").
 - a. Exception 2636 specifically prohibits automobile dealerships.
 - b. A **Major Zoning By-Law Amendment** will be required to permit the development of automobile dealerships on the site. Please ensure your proposal highlights and discusses the relevant policies of the current Official Plan and New Official Plan for review.
 - c. Additionally, a **Complex Site Plan Control Revision** application will need to be submitted as well.
4. Please note: At this time the more restrictive policies, being the South Nepean Areas 9 & 10 Secondary Plan policies, would apply. However once the Ministry approves the New Official Plan, the policies of the Mixed Industrial designation would apply to this site and an automobile dealership would be a permitted use in the New Official Plan. Amongst other criteria, the approval of the Zoning By-Law Amendment is subject to the approval of the New Official Plan, AND specifically, the clauses of the New Official Plan that are relevant to your proposal; This includes the site being designated as Mixed-Industrial and that designation permitting automotive sales and services as primary uses.
5. As the proposed development is larger than 1,860 square metres, the application triggers a **Complex Site Plan Control Revision**.

Kelsey Charie, Engineering Intern

1. *The site should be developed in accordance with the design criteria and information provided in the Citi Gate 416 Corporate Campus, Detailed Servicing and Stormwater Management Report. If modification(s) to the servicing arrangement approved for the previous Site Plan application are proposed, please consult with the City's Infrastructure Approvals Project Manager, Kelsey Charie, for concurrence*
2. *Please also update the following List of Reports and Plans (Site Plan Control):*
 - a. Site Servicing Plan
 - b. Grading Plan
 - c. Erosion and Sediment Control Plan
 - d. Storm Drainage / Ponding Plan
 - e. Stormwater Management and Site Servicing Report
 - f. Geotechnical Investigation Report
3. A new ECA will be required, unless all the properties are under the same ownership then they could amend the existing ECA.

If a phased construction of the two buildings is proposed, then interim and final conditions should be covered in the updated reports and separate drawings should be prepared.

Christopher Moise, *Urban Design*

1. This proposal does not run along one of the City's Design Priority Areas and need not attend the City's UDRP. Staff will be responsible for evaluating the proposal and providing design direction;
2. **Landscaping:** Although we appreciate that some landscaping has been proposed internal to the site, maximizing the amount of soft surface will benefit the permeability and the heat island impact of the proposal;
3. **Trees:** We recommend that new trees are proposed in all areas internal to the site and wherever possible to help moderate the heat island effect of so much asphalt. We recommend that the entire perimeter of the site is treed as much as possible;
4. **Pedestrian access and mobility:** Safe and clear access from the public right of way to the various buildings and between the buildings should be fully considered;
5. A scoped Design Brief is a required submittal for all Site Plan/Re-zoning applications and can be combined with the Planning Rationale. Please see the Design Brief Terms of Reference provided.

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

Jeanette Krabicka, *Parks Planner*

1. Parkland Dedication:
 - a. The amount of parkland dedication that is required is to be calculated as per the City of Ottawa Parkland Dedication By-law No 2009-95 (as amended or superseded).
 - b. Section 14 (2) (b) of the By-law states that no conveyance of land or payment of money in-lieu is required for a change of use from commercial or industrial to another commercial or industrial use, or for the alteration of an existing building resulting in a change of use from commercial or industrial to another commercial or industrial use.
 - c. The site is currently developed with a commercial use which includes an automobile dealership.
 - d. The proposed development maintains the existing commercial use and includes an additional two automobile dealership buildings.
 - e. **Therefore, this proposal would be considered exempt from a parkland dedication requirement.**
 - f. Please note that the park comments are preliminary and will be finalized (and subject to change) upon receipt of the development application. Additionally, if the proposed land use changes, then the parkland dedication requirement be re-evaluated accordingly.

Mike Giampa, *Transportation Project Manager*

1. If a TIA is warranted proceed to scoping. The application will not be deemed complete until the submission of the draft step 2-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Although a full review of the TIA Strategy report (Step 4) is not required prior to an application, it is strongly recommended. Synchro files are required at Step 4.
2. ROW protection on Strandherd is 44.5 m.

3. **No loading/unloading operations will be permitted on Dealership nor Strandherd. Ensure that the gated access on Strandherd doesn't cause any on-road queuing.**

Sami Rehman, *Environmental Planner*

1. Please note an upstream part of the adjacent watercourse (O'Keefe drain to the east of the property) has been deemed significant habitat for threatened or endangered species. It is recommended that wildlife exclusion fencing be erected along the O'Keefe Drain, which should be built to the satisfaction of the MECF's standards. At the same time, this fencing should be consulted with the City's Drain Team to ensure their access is not restricted.
2. Please include a greater setback from the adjacent watercourse and the setback should be enhanced with locally appropriate native species of trees, shrubs and perennials. In general, it is recommended more locally appropriate native vegetation be planted along the western property boundary along the watercourse. This will not only contribute to the urban canopy but also contribute to local biological diversity, reduce impacts of the urban heat island effect, offer shading for the parking spots along the western property edge, improve the local air quality by removing particulate matter and reduce the energy demands for cooling.
3. Please review and draw design elements from the City's Bird-Safe Design Guidelines into their design to reduce bird collisions. The City's bird-safe design guidelines address glass reflectivity, transparency, lighting and landscaping, which are all common to dealership's design.
https://documents.ottawa.ca/sites/documents/files/birdsafedesign_guidelines_en.pdf
4. Please consult with the local Conservation Authority to determine if any permits or approvals are required under their regulations.

Mark Richardson, *Forester*

1. IF trees are present on the site, a Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
 - a. an approved TCR is a requirement of Site Plan approval.
 - b. The TCR may be combined with the LP provided all information is supplied
2. As of January 1 2021, any removal of privately-owned trees 10cm or larger in diameter, or publicly (City) owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
 - a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
 - b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
4. the TCR must list all trees on site within the developable area, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition
5. please identify trees by ownership – private onsite, private on adjoining site, city owned, co-owned (trees on a property line)
6. the TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site
7. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained

8. All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at [Tree Protection Specification](#) or by searching Ottawa.ca
 - a. the location of tree protection fencing must be shown on a plan
 - b. show the critical root zone of the retained trees
 - c. if excavation will occur within the critical root zone, please show the limits of excavation
9. 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.
10. For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca or on [City of Ottawa](#)

LP tree planting requirements:

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

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
- Adhere to Ottawa Hydro’s planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

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

Hard surface planting

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

Soil Volume

- Please ensure adequate soil volumes are met:

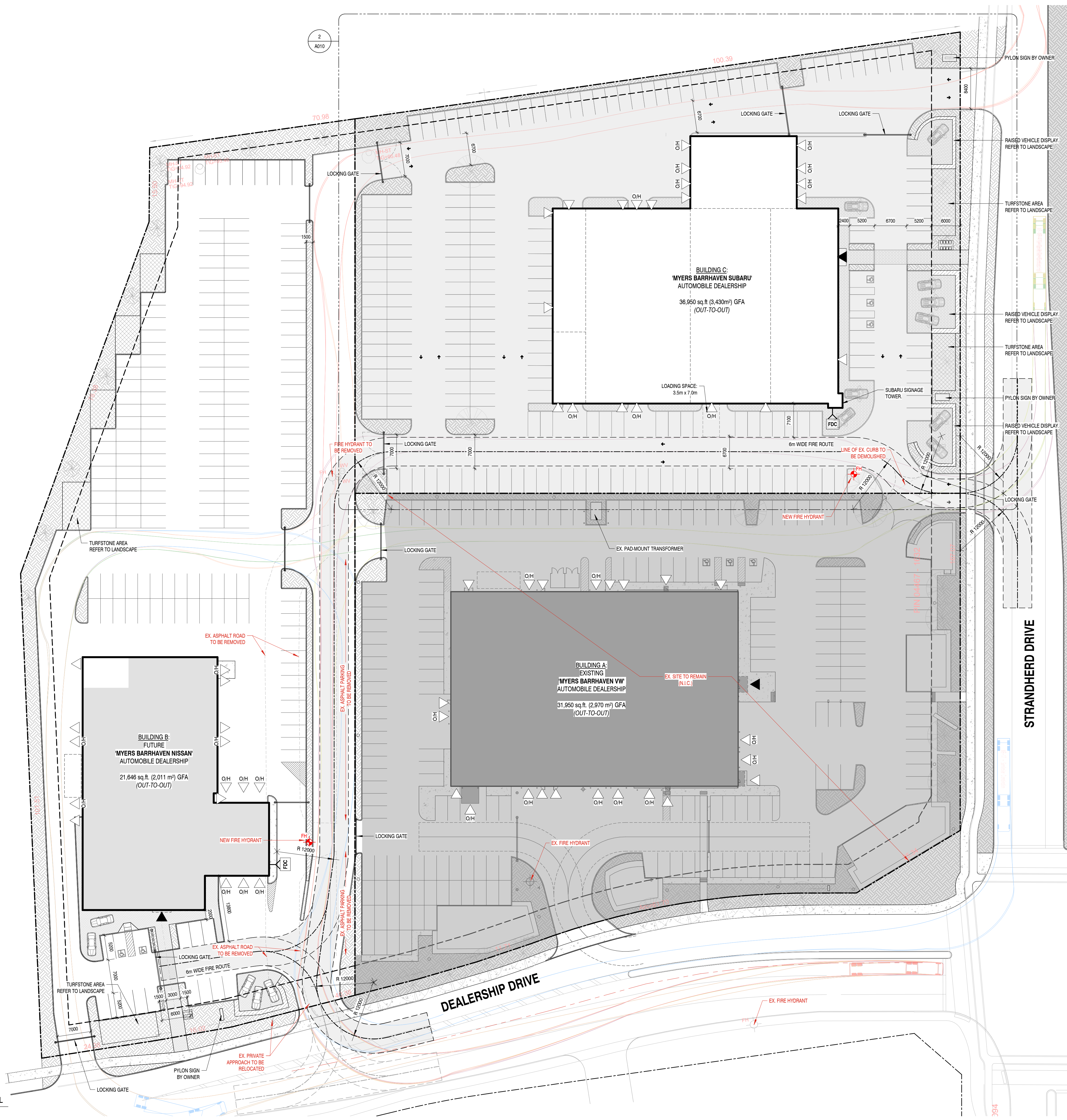
Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15

Large	30	18
Conifer	25	15

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

Sensitive Marine Clay

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



SITE / BUILDING / PARKING SUMMARY:

TOTAL SITE AREA = 33,784 m² (8.35 acres)
 VW SITE = 11,259 m² (2.78 acres)
 SUBARU SITE = 11,071 m² (2.74 acres)
 NISSAN SITE = 11,453 m² (2.83 acres)
= 33,784 m² (8.35 acres)

BUILDING AREAS: (OUT-TO-OUT)
 VW SITE = 2,970 m²
 SUBARU SITE = 3,430 m²
 NISSAN SITE = 2,011 m²
= 8,411 m²

OVERALL FLOOR SPACE INDEX = 0.25

LOT COVERAGE:
 VW SITE = 2,448 m²
 SUBARU SITE = 2,781 m²
 NISSAN SITE = 1,525 m²
= 6,754 m²

TOTAL LOT COVERAGE = 20.0%

MINIMUM WIDTH OF LANDSCAPING:
 ABUTTING STRANDHERD DR. = 6.0m
 ABUTTING STREET = 3.2m
 ABUTTING O'KEEFE DRAINAGE CORRIDOR = 3.0m
 OTHER CASES = 0.0m

TOTAL LANDSCAPE AREA:
 VW SITE = 9,105 m²
 SUBARU SITE = 1,128 m²
 NISSAN SITE = 1,743 m²
= 11,976 m²

% LANDSCAPE AREA = 35.4%

PARKING ON SITE:

	REQ'D	PROVD
VW SITE	59 spaces	183 spaces
SUBARU SITE	xx	203 spaces
NISSAN SITE	30 spaces	185 spaces
	= xx	571 spaces

BARRIER-FREE PARKING:

	REQ'D	PROVD
VW SITE	1x 'A', 2x 'B'	3x 'A'
SUBARU SITE	xx	2x 'A', 1x 'B'
NISSAN SITE	1x 'A', 1x 'B'	1x 'A', 1x 'B'

'A' = 3.4m x 5.2m
 'B' = 2.6m x 5.2m

SITE PLAN SYMBOLS

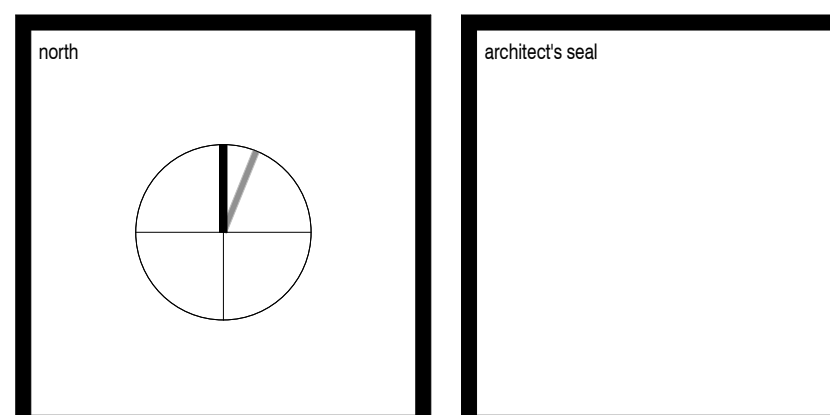
ICON	DESCRIPTION
[Symbol]	Existing Buildings
[Symbol]	Proposed Buildings
[Symbol]	Property Lines
[Symbol]	Setback Lines
[Symbol]	Fence
[Symbol]	Road Lanes
[Symbol]	Existing Concrete Curb
[Symbol]	Proposed Concrete Curb
[Symbol]	Degraded Concrete Curb
[Symbol]	Concrete Sidewalk
[Symbol]	Proposed Concrete Pavers
[Symbol]	Sawcut Asphalt
[Symbol]	Existing Landscape Area
[Symbol]	Proposed Landscape Area
[Symbol]	Proposed Turfstone Area
[Symbol]	Barrier Free Parking Space
[Symbol]	Exterior Bicycle Parking Spot with Boltard Style Bike Rack
[Symbol]	Two Way Vehicle Circulation
[Symbol]	Principal Entrance Door
[Symbol]	Exterior Door ('OH' indicates Overhead Door)
[Symbol]	Exterior 6m Wide Fire Route (15m centerline radius on all turns, TYP)
[Symbol]	Fire Department Connection
[Symbol]	Fire Hydrant

TOPOGRAPHICAL SKETCH OF ELEVATIONS OVER PART OF BLOCK 4 REGISTERED PLAN 4M-1538 CITY OF OTTAWA
 ANNIS, OSULLIVAN, VOLLEBEKK Ltd.
 E.H. Herweyer O.L.S.
 Field Work Completed: Sept. 2019

REVISIONS

No.	DATE	DESCRIPTION
0	11 Jan 2022	Issued for Coordination

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and / or omissions to the Architect. All contractors must comply with all pertinent codes and by-laws. Do not scale drawings. This drawing may not be used for construction until signed by KWC Architects Inc. and shall not be used without the Architect's consent.



383 Parkdale Avenue, Suite 201
 Ottawa, Ontario, Canada, K1Y 4R4

KWC ARCHITECTS INC.

Phone: 613 238-2217
 Fax: 613 238-6595
 E-Mail: kwc@kwc-arch.com

BBS

BUILDING A REPUTATION ON EXCELLENCE

BBS CONSTRUCTION (ONTARIO) LTD.
 1805 WOODWARD DRIVE,
 OTTAWA, ON. K2C 0P9 CANADA
 TEL: (613) 226-8830 FAX: (613) 226-7709
 www.bbsconstruction.ca

owner

ZENA INVESTMENT CORPORATION

project

MYERS BARRHAVEN SUBARU AUTOMOBILE DEALSHIP
 4149 Strandherd Drive

drawing title

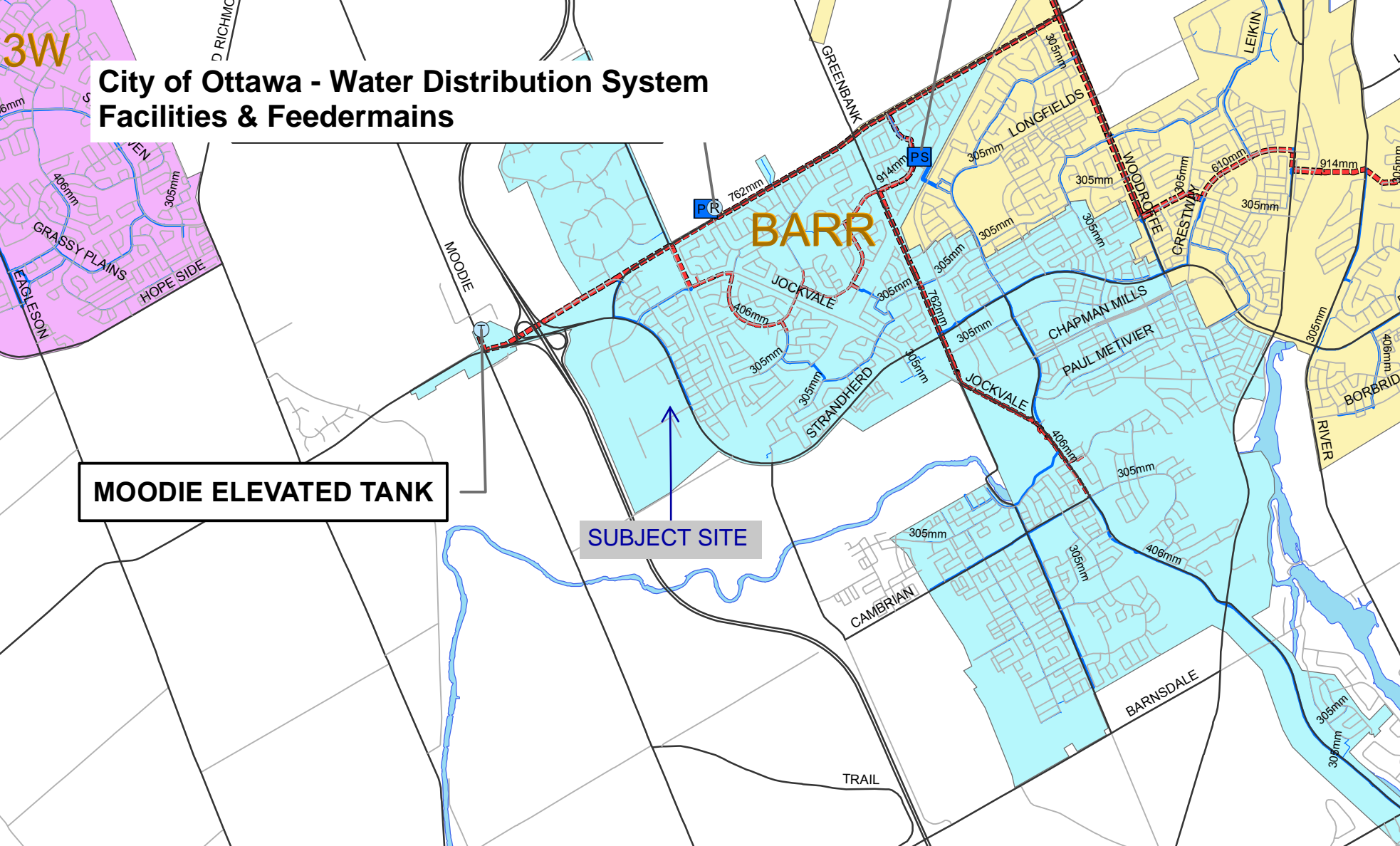
SITE PLAN - OVERALL COMPOSITE PLAN

project no.	KWC 2174	drawing no.	A010A
scale	As indicated		
drawn by	CM / AK		
date	11 JANUARY 2022		

APPENDIX C
WATERMAIN CALCULATIONS

3W

City of Ottawa - Water Distribution System Facilities & Feeder mains



McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 2 - BUILDING C - WATER DEMANDS

Project:	MYERS - PHASE 2 - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	February 11, 2022
Site Area:	1.11 gross ha

COMMERCIAL	UNIT RATE
Employees	40 persons/day
Total Population	40 persons
<u>Commercial</u>	ha
<u>Car Wash</u>	50 Veh
<u>Car Service</u>	50 Car Serviced
<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)	
Hospital	900	L/(bed/day)	
Schools	70	L/(Student/d)	
Car wash	400	L/Veh/d	
Car Service	40	L/Car Serviced/d	
Employees	75	L/Person/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	
AVERAGE DAILY DEMAND	Commercial Employees	0.03	L/s
	Commercial	0.25	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 2 - BUILDING C - WATER DEMANDS

Project:	MYERS - PHASE 2 - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	February 11, 2022
Site Area:	1.11 gross ha

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	Commerical Employees	0.05	L/s
	Commerical	0.38	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	Commerical Employees	0.09	L/s
	Commerical	0.69	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.29	L/s
MAXIMUM DAILY DEMAND	0.43	L/s
MAXIMUM HOUR DEMAND	0.78	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - FUTURE PHASE - BUILDING B - WATER DEMANDS

Project:	MYERS - FUTURE PHASE - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	February 11, 2022
Site Area:	1.15 gross ha

COMMERCIAL	UNIT RATE
Employees	35 persons/day
Total Population	35 persons
<u>Commercial</u>	ha
<u>Car Wash</u>	30 Veh
<u>Car Service</u>	30 Car Serviced
<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)	
Hospital	900	L/(bed/day)	
Schools	70	L/(Student/d)	
Car wash	400	L/Veh/d	
Car Service	40	L/Car Serviced/d	
Employees	75	L/Person/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	
AVERAGE DAILY DEMAND	Commercial Employees	0.03	L/s
	Commercial	0.15	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - FUTURE PHASE - BUILDING B - WATER DEMANDS

Project:	MYERS - FUTURE PHASE - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	February 11, 2022
Site Area:	1.15 gross ha

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	Commerical Employees	0.05	L/s
	Commerical	0.23	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	Commerical Employees	0.08	L/s
	Commerical	0.41	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

AVERAGE DAILY DEMAND	0.18	L/s
MAXIMUM DAILY DEMAND	0.27	L/s
MAXIMUM HOUR DEMAND	0.49	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 2 - BUILDING C - FIRE UNDERWRITERS SURVEY

Project: MYERS - PHASE 2 - BUILDING C
 Project No.: CCO-22-2933
 Designed By: M.M.
 Checked By: A.G.
 Date: February 11, 2022

From the Fire Underwriters Survey (1999)

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

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 Non-Combustible Construction

C 0.8

A 3,183.0 m²

Calculated Fire Flow

9,929.6 L/min

10,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From note 2, Page 18 of the Fire Underwriter Survey:

Limited Combustible -15%

Fire Flow

8,500.0 L/min

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Fully Supervised Sprinklered -50%

Reduction

-4,250.0 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	>45	Wood frame	15	2	30.0	0%
Exposure 2	>45	Wood frame	15	2	30.0	0%
Exposure 3	30.1 to 45	Non-Combustible	60	1	60.0	5%
Exposure 4	>45	Non-Combustible	30	1	30.0	0%
% Increase*						5%

Increase*

425.0 L/min

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

Fire Flow

4,675.0 L/min

Fire Flow Required**

5,000.0 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

CCO-22-2933 - MYERS - FUTURE PHASE - BUILDING B - FIRE UNDERWRITERS SURVEY

Project: MYERS - FUTURE PHASE - BUILDING B
 Project No.: CCO-22-2933
 Designed By: M.M.
 Checked By: A.G.
 Date: February 11, 2022

From the Fire Underwriters Survey (1999)

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

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 Non-Combustible Construction

C 0.8

A 2,011.0 m²

Calculated Fire Flow

7,892.6 L/min
 8,000.0 L/min

B. REDUCTION FOR OCCUPANCY TYPE (No Rounding)

From note 2, Page 18 of the Fire Underwriter Survey:

Limited Combustible -15%

Fire Flow

6,800.0 L/min

C. REDUCTION FOR SPRINKLER TYPE (No Rounding)

Fully Supervised Sprinklered -50%

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	>45	Non-Combustible	40	1	40.0	0%
Exposure 2	30.1 to 45	Non-Combustible	40	1	40.0	5%
Exposure 3	>45	Non-Combustible	80	2	160.0	0%
Exposure 4	>45	Non-Combustible	30	1	30.0	0%
% Increase*						5%

Increase*

340.0 L/min

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

Fire Flow

3,740.0 L/min

Fire Flow Required**

4,000.0 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

**Appendix A:
Water Servicing Information**

Proposed Development Conditions

	Office	Hotel	Dealership	Totals
Total Floor Area (m ²)	7830	N/A	N/A	
No. Beds	N/A	170	N/A	
Restaurant Seats	N/A	200	N/A	
Carwash	N/A	N/A	55	
Car Service	N/A	N/A	50	
Employees	N/A	N/A	50	
Lot Area (ha)			1.19	
Total Daily Volume (Liters)	63145.2	63250.0	27750	154145.2
Avg Day Demand (L/s)	0.731	0.732	0.321	1.78
Max Day Demand (L/s)	1.096	1.098	0.482	2.68
Peak Hour Demand (L/s)	1.973	1.977	0.867	4.82

Establishment	Daily Demand Volume		Source
Office:	75	l/9.3m ² /day	Daily Demands from OBC Table 8.2.1.3
Hotel:	225	l/bed/day	City of Ottawa Sewer Design Guidelines
	125	l/restaurant seat/day	
Industrial/Commercial:	28000	l/ha/day	
Car Wash	400	l/veh/day	(Truck wash of 400 l/vehicle/d to achieve a conservative value)
Car Service:	40	l/car serviced/day	
Employee	75	l/person/day	
Retail:	6	l/parking space/day	
	40	l/employee/day	
	2000	l/toilet room/day	

Commercial / Industrial Peaking Factors City of Ottawa Water Distribution Guidelines

Conditions	Peaking Factor	
Maximum Day	1.5	x avg day
Peak Hour	1.8	x max day

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines



Engineers, Planners & Landscape Architects

Novatech Project #: 117148
 Project Name: 4149 Strandherd
 Date: 2/28/2020
 Input By: Anthony Mestwarp
 Reviewed By: Cara Ruddle

Legend

Input by User

No Information or Input Required

Building Description: Dealership
 Non-combustible construction

Step	Input		Value Used	Total Fire Flow (L/min)		
Base Fire Flow						
1	Construction Material		Multiplier	0.8		
	Coefficient related to type of construction C	Wood frame			1.5	
		Ordinary construction			1	
		Non-combustible construction	Yes		0.8	
		Modified Fire resistive construction (2 hrs)			0.6	
Fire resistive construction (> 3 hrs)			0.6			
2	Floor Area			11,000		
	A	Building Footprint (m ²)	3583			
		Number of Floors/Storeys	1			
		Area of structure considered (m ²)			3,583	
F	Base fire flow without reductions					
Reductions or Surcharges						
3	Occupancy hazard reduction or surcharge		Reduction/Surcharge	11,000		
	(1)	Non-combustible			-25%	
		Limited combustible			-15%	
		Combustible	Yes		0%	
		Free burning			15%	
Rapid burning			25%			
4	Sprinkler Reduction		Reduction	-4,400		
	(2)	Adequately Designed System (NFPA 13)	Yes		-30%	
		Standard Water Supply	Yes		-10%	
		Fully Supervised System	No		-10%	
Cumulative Total			-40%			
5	Exposure Surcharge (cumulative %)		Surcharge	550		
	(3)	North Side	30.1- 45 m		5%	
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
Cumulative Total			5%			
Results						
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	7,000	
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	117
				or	USGPM	1,849
7	Storage Volume	Required Duration of Fire Flow (hours)		Hours	2	
		Required Volume of Fire Flow (m ³)		m ³	840	

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines



Engineers, Planners & Landscape Architects

Novatech Project #: 117148
 Project Name: 4149 Strandherd
 Date: 2/28/2020
 Input By: Anthony Mestwarp
 Reviewed By: Cara Ruddle

Legend

Input by User

No Information or Input Required

Building Description: 6 Storey Hotel
 Non-combustible construction

Step	Input		Value Used	Total Fire Flow (L/min)		
Base Fire Flow						
1	Construction Material		Multiplier	0.8		
	Coefficient related to type of construction C	Wood frame			1.5	
		Ordinary construction			1	
		Non-combustible construction	Yes		0.8	
		Modified Fire resistive construction (2 hrs)			0.6	
Fire resistive construction (> 3 hrs)			0.6			
2	Floor Area			14,000		
	A	Building Footprint (m ²)	1013		6,078	
		Number of Floors/Storeys	6			
		Area of structure considered (m ²)				
F	Base fire flow without reductions					
Reductions or Surcharges						
3	Occupancy hazard reduction or surcharge		Reduction/Surcharge	14,000		
	(1)	Non-combustible			-25%	
		Limited combustible			-15%	
		Combustible	Yes		0%	
		Free burning			15%	
Rapid burning			25%			
4	Sprinkler Reduction		Reduction	-5,600		
	(2)	Adequately Designed System (NFPA 13)	Yes		-30%	
		Standard Water Supply	Yes		-10%	
		Fully Supervised System	No		-10%	
Cumulative Total			-40%			
5	Exposure Surcharge (cumulative %)		Surcharge	0		
	(3)	North Side	> 45.1m		0%	
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
Cumulative Total			0%			
Results						
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	8,000	
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	133
				or	USGPM	2,114
7	Storage Volume	Required Duration of Fire Flow (hours)		Hours	2	
		Required Volume of Fire Flow (m ³)		m ³	960	

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines



Engineers, Planners & Landscape Architects

Novatech Project #: 117148
 Project Name: 4149 Strandherd
 Date: 2/28/2020
 Input By: Anthony Mestwarp
 Reviewed By: Cara Ruddle

Legend

Input by User

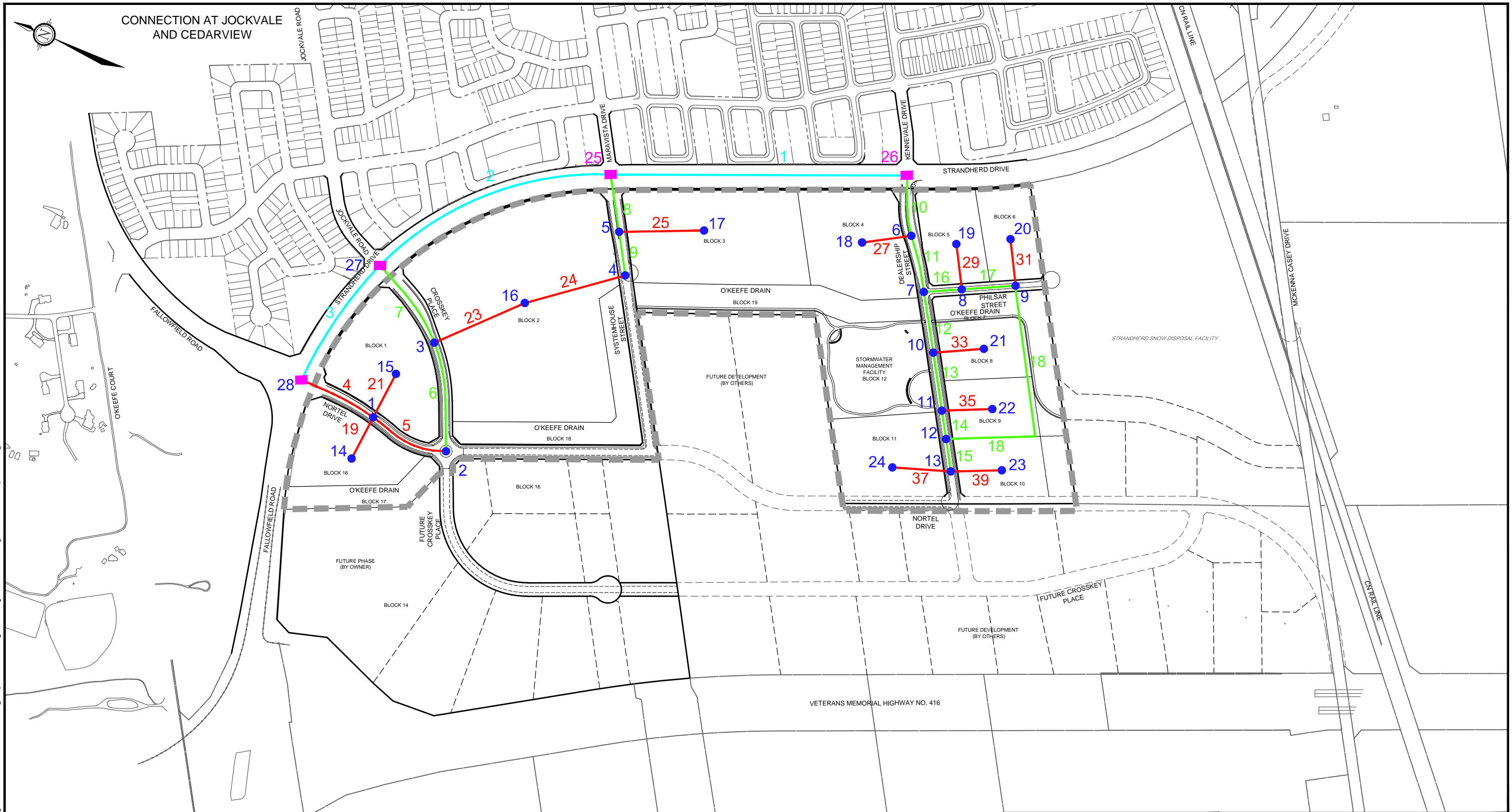
No Information or Input Required

Building Description: 5 Storey Office Building

Non-combustible construction

Step	Input		Value Used	Total Fire Flow (L/min)		
Base Fire Flow						
1	Construction Material		Multiplier	0.8		
	Coefficient related to type of construction C	Wood frame			1.5	
		Ordinary construction			1	
		Non-combustible construction	Yes		0.8	
		Modified Fire resistive construction (2 hrs)			0.6	
Fire resistive construction (> 3 hrs)			0.6			
2	Floor Area			16,000		
	A	Building Footprint (m ²)	1566			
		Number of Floors/Storeys	5			
		Area of structure considered (m ²)			7,830	
F	Base fire flow without reductions					
Reductions or Surcharges						
3	Occupancy hazard reduction or surcharge		Reduction/Surcharge	16,000		
	(1)	Non-combustible			-25%	
		Limited combustible			-15%	
		Combustible	Yes		0%	
		Free burning			15%	
Rapid burning			25%			
4	Sprinkler Reduction		Reduction	-6,400		
	(2)	Adequately Designed System (NFPA 13)	Yes		-30%	
		Standard Water Supply	Yes		-10%	
		Fully Supervised System	No		-10%	
Cumulative Total			-40%			
5	Exposure Surcharge (cumulative %)		Surcharge	2,400		
	(3)	North Side	20.1 - 30 m		10%	
		East Side	> 45.1m		0%	
		South Side	30.1- 45 m		5%	
		West Side	> 45.1m		0%	
Cumulative Total			15%			
Results						
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	12,000	
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	200
				or	USGPM	3,170
7	Storage Volume	Required Duration of Fire Flow (hours)		Hours	2.5	
		Required Volume of Fire Flow (m ³)		m ³	1800	

M:\2009\109203\Citi Gate\CAD\Design\Figures\Design Brief\2014\March\31-Servicing Report\109203-Figure-D.dwg, FIGURE-D, Aug 08, 2014 - 4:39pm, cstang



LEGEND

- 9 PROPOSED FEEDERMAIN (250mm dia) AND PIPE NUMBER
- 6 PROPOSED DISTRIBUTION WATERMAIN (200mm dia) AND PIPE NUMBER
- 5 PROPOSED BACKBONE WATERMAIN (400mm dia) BY OTHERS AND PIPE NUMBER
- 6 WATERMAIN NODE AND NUMBER
- 2 RESERVOIR AND NUMBER (BOUNDARY CONDITION LOCATION)
- 3 EXISTING DISTRIBUTION / FEEDERMAIN (300mm dia) AND PIPE NUMBER
- PHASE LINE (PHASE 1)

NOVATECH
ENGINEERING CONSULTANTS LTD.
 ENGINEERS & PLANNERS
 Suite 200, 240 Michael Cowpland Drive
 Ottawa, Ontario, Canada
 K2M 1P6
 Telephone (613) 254-9643
 Facsimile (613) 254-5867
 Email: novainfo@novatech-eng.com

CITI GATE 416 CORPORATE CAMPUS		
Water Servicing (Phase 1)		
SCALE	N.T.S	
DATE	JOB	FIGURE
AUG 2014	109203-CG	FIG D1

Table 2 Phase 1 Water Demand					
Node	Block #	Area (ha)	Demand (L/s)		
			High Pressure (Average Day)	Max. Daily	Peak Hour
14	16	2.2	0.89	1.34	1.60
15	1	3.7	1.50	2.25	2.70
16	2	12.2	4.94	7.41	8.90
17	3	6.2	2.51	3.77	4.52
18	4	3.2	1.30	1.94	2.33
19	5	1.8	0.73	1.09	1.31
20	6	1.6	0.65	0.97	1.17
21	8	1.3	0.53	0.79	0.95
22	9	1.3	0.53	0.79	0.95
23	10	3.0	1.22	1.82	2.19
24	11	3.0	1.22	1.82	2.19
			16.00	24.00	28.80

Notes:

1. All water demand calculations based on the City of Ottawa Design Guidelines for Water Distribution Table 4.2.
2. Water Demand is based assuming all lands to be Industrial - Light with a demand of 35,000L/gross ha/d.
3. Peaking Factors: Maximum Daily Demand = 1.5 average daily demand (High Pressure); Peak Hour = 1.8 average daily

Table 3 Phase 1 Peak Hour Check						
Node	Block #	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m) (PSI)	
1		95.0	0.0	148.1	53.1	75.3
2		96.0	0.0	148.0	52.1	73.8
3		96.2	0.0	148.0	51.8	73.4
4		95.7	0.0	147.7	52.0	73.7
5		96.1	0.0	147.7	51.7	73.2
6		94.1	0.0	147.5	53.4	75.8
7		93.9	0.0	147.5	53.6	76.0
8		93.5	0.0	147.5	54.1	76.7
9		92.4	0.0	147.5	55.1	78.1
10		94.0	0.0	147.5	53.5	75.9
11		94.0	0.0	147.5	53.5	75.9
12		93.8	0.0	147.5	53.7	76.1
13		94.0	0.0	147.5	53.5	75.9
14	16	96.0	1.6	148.1	52.1	73.9
15	1	96.0	2.7	148.1	52.1	73.9
16	2	97.2	8.9	147.7	50.5	71.7
17	3	97.1	4.5	147.7	50.6	71.8
18	4	95.1	2.3	147.5	52.4	74.4
19	5	94.5	1.3	147.5	53.0	75.2
20	6	93.5	1.2	147.5	54.0	76.6
21	8	95.0	1.0	147.5	52.5	74.5
22	9	95.0	1.0	147.5	52.5	74.4
23	10	95.0	2.2	147.5	52.5	74.4
24	11	95.3	2.2	147.5	52.2	74.0
25*		147.7	28.4	147.7	0.0	0.0
26*		147.6	18.2	147.6	0.0	0.0
27*		148.0	22.8	148.0	0.0	N/A
28*		148.2	-98.2	148.2	0.0	N/A

*** Boundary Condition**

 Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: July 18, 2014
Rev: August 6, 2014

Table 4 Phase 1 High Pressure Check (Average Day)							
Node	Block #	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m) (PSI)		Age (hrs)
1		95.0	0.0	154.6	59.6	84.5	1.2
2		96.0	0.0	154.7	58.7	83.3	0.9
3		96.2	0.0	154.7	58.5	82.9	0.3
4		95.7	0.0	154.7	59.0	83.6	0.5
5		96.1	0.0	154.7	58.6	83.2	0.3
6		94.1	0.0	154.7	60.6	85.9	0.4
7		93.9	0.0	154.7	60.8	86.2	0.7
8		93.5	0.0	154.7	61.2	86.8	1.4
9		92.4	0.0	154.7	62.3	88.3	2.4
10		94.0	0.0	154.7	60.7	86.0	1.2
11		94.0	0.0	154.7	60.7	86.0	2.0
12		93.8	0.0	154.7	60.9	86.3	4.8
13		94.0	0.0	154.7	60.7	86.0	5.0
14	16	96.0	0.9	154.6	58.6	83.1	2.3
15	1	96.0	1.5	154.6	58.6	83.1	2.6
16	2	97.2	4.9	154.7	57.5	81.5	1.1
17	3	97.1	2.5	154.7	57.6	81.7	1.4
18	4	95.1	1.3	154.7	59.6	84.5	1.7
19	5	94.5	0.7	154.7	60.2	85.3	3.3
20	6	93.5	0.7	154.7	61.2	86.7	4.5
21	8	95.0	0.5	154.7	59.7	84.6	3.9
22	9	95.0	0.5	154.7	59.7	84.6	4.6
23	10	95.0	1.2	154.7	59.7	84.6	6.2
24	11	95.3	1.2	154.7	59.4	84.2	6.2
25*		154.7	-5.5	154.7	0.0	0.0	N/A
26*		154.7	-6.2	154.7	0.0	0.0	N/A
27*		154.7	-66.9	154.7	0.0	N/A	N/A
28*		154.6	62.6	154.6	0.0	N/A	N/A

*** Boundary Condition**

Maximum Pressure
Maximum Time

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5E Phase 1 Max Daily Demand and Fire at Node 18 - Block 4					
Node	Elevation (m)	Demand (LPS)	Head (m)	Pressure (m) (PSI)	
1	95.0	0.0	145.3	50.3	71.3
2	96.0	0.0	144.9	49.0	69.5
3	96.2	0.0	144.8	48.6	68.9
4	95.7	0.0	143.3	47.6	67.4
5	96.1	0.0	143.2	47.1	66.8
6	94.1	0.0	132.1	38.0	53.8
7	93.9	0.0	132.0	38.1	54.1
8	93.5	0.0	132.0	38.6	54.7
9	92.4	0.0	132.0	39.6	56.2
10	94.0	0.0	132.0	38.0	53.9
11	94.0	0.0	132.0	38.0	53.9
12	93.8	0.0	132.0	38.2	54.2
13	94.0	0.0	132.0	38.0	53.9
14	96.0	1.3	145.3	49.3	69.8
15	96.0	2.3	145.3	49.3	69.8
16	97.2	7.4	143.9	46.7	66.2
17	97.1	3.8	143.2	46.1	65.4
18	95.1	166.2	127.6	32.5	46.0
19	94.5	1.1	132.0	37.5	53.2
20	93.5	1.0	132.0	38.5	54.6
21	95.0	0.8	132.0	37.0	52.5
22	95.0	0.8	132.0	37.0	52.5
23	95.0	1.8	132.0	37.0	52.5
24	95.3	1.8	132.0	36.7	52.1
25*	143.1	37.8	143.1	N/A	N/A
26*	141.5	-42.7	141.5	N/A	N/A
27*	144.9	-8.2	144.9	N/A	N/A
28*	145.5	-175.2	145.5	N/A	N/A
* Boundary Condition					
					Minimum Pressure

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Table 5 Phase 1 Max Daily Demand and Fire Flow Summary					
Fire Location	Node		Fire Flow (LPS)	Pressure	
	Block #	Min Pressure		(m)	(PSI)
14	16	14	164.3	39.2	55.6
15	1	15	164.3	36.2	51.4
16	2	16	164.3	36.4	51.6
17	3	17	164.3	35.0	49.7
18	4	18	164.3	32.5	46.0
19	5	19	164.3	23.1	32.8
20	6	20	164.3	22.2	31.5
21	8	21	164.3	22.9	32.4
22	9	22	164.3	20.8	29.5
23	10	23	164.3	18.1	25.7
24	11	24	164.3	17.8	25.2

Prepared By:
NOVATECH ENGINEERING CONSULTANTS LTD.
Date: August 9, 2012
Rev: November 20, 2012
Rev: August 9, 2013
Rev: March 31, 2014
Rev: August 6, 2014

Melanie Riddell

From: Melanie Riddell
Sent: July-16-14 10:10 AM
To: Mark Bowen
Subject: FW: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Melanie E. Riddell, P.Eng.
Project Manager

NOVATECH

Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa ON K2M 1P6

Tel: 613.254.9643 Cel: 613.276.7240 Fax: 613.254.5867

The information contained in this email message is confidential and is for exclusive use of the addressee.

From: Shillington, Jeffrey [mailto:jeff.shillington@ottawa.ca]
Sent: May-26-14 4:02 PM
To: Melanie Riddell
Subject: FW: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Attached are the updated boundary conditions that should be used in the Citi Gate design.

Regards,

Jeff Shillington, P.Eng.
Project Manager, Infrastructure Approvals, Suburban West
Planning and Growth Management Department
City of Ottawa
tel: 580-2424 x 16960
email: jeff.shillington@ottawa.ca

From: Rogers, Christopher
Sent: January 28, 2014 11:00 AM
To: Shillington, Jeffrey; Diduch, Roman
Subject: RE: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Jeff,

Here are boundary conditions, based on existing system plus proposed Strandherd 406mm watermain, from Fallowfield/O'Keefe to Kennevale only, with connections at Fallowfield, Jockvale, Maravista and Kennevale.

Regards,

Chris

Strandherd at Kennevale

PKHR = 147.6m

Max HGL = 154.7m

MXDY+Fire (125 L/s) = 143.7m

MXDY+Fire (165 L/s) = 141.5m

Strandherd at Marivista

PKHR = 147.7m

Max HGL = 154.7m

MXDY+Fire (125 L/s) = 144.9m

MXDY+Fire (165 L/s) = 143.1m

Strandherd at Jockvale

PKHR = 148.0m

Max HGL = 154.7m

MXDY+Fire (125 L/s) = 146.3m

MXDY+Fire (165 L/s) = 144.9m

Strandherd at Fallowfield

PKHR = 148.2m

Max HGL = 154.6m

MXDY+Fire (125 L/s) = 146.7m

MXDY+Fire (165 L/s) = 145.5m

From: Shillington, Jeffrey

Sent: 2014/01/07 11:57

To: Diduch, Roman

Cc: Rogers, Christopher

Subject: FW: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Roman,

Please see the email from Novatech. Could you please confirm that the previously provided boundary conditions are still applicable.

Thanks,

Jeff Shillington, P.Eng.

Project Manager, Infrastructure Approvals, Suburban West

Planning and Growth Management Department

City of Ottawa

tel: 580-2424 x 16960

email: jeff.shillington@ottawa.ca

From: Drew Blair [<mailto:D.Blair@novatech-eng.com>]
Sent: December 18, 2013 1:04 PM
To: Shillington, Jeffrey
Cc: Marc St.Pierre
Subject: Strandherd Drive - 416 Lands Watermain Boundary Conditions

Hi Jeff,

Can you please confirm the watermain boundary conditions that will be utilized for the Strandherd Drive - 416 Lands project we are currently working on. Roman had provided watermain boundary conditions in 2012 (see below) however there may be some changes to the system since then. As per the attached plan, there will be four connection points for the proposed 400mm backbone watermain on Strandherd Drive:

- 1) Strandherd at Kennevale (stub size from Kennevale to be confirmed)
- 2) Strandherd at Maravista (stub size from Maravista to be confirmed)
- 3) Strandherd at Jockvale (400mm stub from Claridge Lands to be confirmed)
- 4) Strandherd at Fallowfield (400mm watermain will have to extend up Fallowfield to connect to 400mm stub at O'Keefe Court entrance)

We appreciate your help in providing this boundary condition information in order that we can update the hydraulic analysis for the Strandherd Drive project.

Regards,

Drew

Drew D. Blair, P.Eng.
Project Engineer

Novatech Engineering Consultants Ltd.
200 - 240 Michael Cowpland Drive
Kanata, Ontario K2M 1P6

Tel: 613.254.9643
Fax: 613.254.5867

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From: Diduch, Roman [<mailto:Roman.Diduch@ottawa.ca>]
Sent: November-21-12 8:55 AM
To: Mark Bowen
Subject: RE: 416 Business Park Required Boundary Conditions

Mark

The boundary locations for the 2012 condition should be for Cobble Hill instead of Strandherd. The Cobble Hill @ Kennevale HGL for 165l/s fire for current conditions should have been 137.5 not 147.5 m. For the future condition the locations were at Strandherd because of the proposed 406mm watermain.

Fire flows were located at Strandherd @ Marvista.

The corrected table is shown below.

	HGL (Meter)		
Current			
	Cedarview @ Jockvale	Cobble Hill @ Marvista	Cobble Hill@ Kennevale
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.0	139.0	141.6
Max Day & 165 l/s fire	149.0	133.0	137.5
	Cedarview @ Jockvale	Strandherd@ Marvista	Strandherd@ Kennevale
Future			
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.1	148.1	148.2
Max Day & 165 l/s fire	149.0	147.0	147.5

Watermain sizes for the business park are governed by fire flow conditions. A 250mm pipe is an acceptable size.

I apologize for any confusion created.

Roman Diduch, P.Eng

Program Manager
Infrastructure Policy Unit
Planning and Growth Management
110 Laurier Ave. W, 4th Floor, Ontario K1P 1J1

tel: 613-580-2424 ext 22625
fax: 613-580-2459

From: Mark Bowen [<mailto:M.Bowen@novatech-eng.com>]
Sent: November 19, 2012 3:18 PM
To: Diduch, Roman
Cc: Mike Petepiece; John Riddell
Subject: RE: 416 Business Park Required Boundary Conditions

Hi Roman,

Reviewing the boundary conditions of the "Peak Hr" and "Max Day & 165 l/s fire" conditions for the "current" and "future" watermain conditions listed below, the HGL at Cedar/Jockville and Strandherd/Kennevale is exactly the same and the Strandherd/Marvista boundary is similar. Currently there is no watermain on Strandherd between Kennevale and Marvista. Can you please confirm the conditions provided below are accurate? In addition can you please confirm the City will accept the design of a business park with a maximum proposed watermain size of 250mm, assuming the watermain meets all design criteria for performance (i.e. operating pressures)?

Mark Bowen
Junior Engineer

Novatech Engineering Consultants Ltd.

Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

Tel: (613) 254-9643 x 231

Fax: (613) 254-5867

<http://www.novatech-eng.com>

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From: Diduch, Roman [<mailto:Roman.Diduch@ottawa.ca>]
Sent: Thursday, August 09, 2012 1:05 PM
To: Mark Bowen
Subject: RE: 416 Business Park Required Boundary Conditions

These boundary conditions were created with a different model and updated conditions from that previously provided to IBI

Current	HGL (Meter)		
	Cedarview @ Jockvale	Strandherd@ Marvista	Strandherd@ Kennevale
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.0	139.0	141.6
Max Day & 165 l/s fire	149.0	133.0	147.5
Future			
Peak Hr	151.5	150.8	150.6
Max Day & 125 l/s fire	149.1	148.1	148.2
Max Day & 165 l/s fire	149.0	147.0	147.5

Roman Diduch, P.Eng

Program Manager
Infrastructure Policy Unit
Planning and Growth Management
110 Laurier Ave. W, 4th Floor, Ontario K1P 1J1

tel: 613-580-2424 ext 22625

fax: 613-580-2459

From: Mark Bowen [<mailto:M.Bowen@novatech-eng.com>]
Sent: August 08, 2012 2:57 PM
To: Diduch, Roman
Cc: Tremblay, Marc (PGM); John Riddell
Subject: 416 Business Park Required Boundary Conditions
Importance: High

Hi Roman,

Marc Tremblay and John Riddell have requested that I contact you directly for the required watermain boundary conditions for the proposed 416 Business Park in Barrhaven. The attached NECL PDF highlights the limits of the proposed site and connection points to the existing watermain.

For your reference I've attached the previously issued watermain boundary conditions to IBI for the Conceptual Site Servicing Report for the Tartan Lands in west Barrhaven (IBI.pdf). The first page of the IBI.pdf shows the location of IBI's site in relation to the proposed site and Standherd Drive. The second page shows the proposed watermain within IBI's site and the connections to the existing watermain. The third page highlights the City provided watermain boundary conditions.

The proposed site will be construction in phases over several years; therefore, can you please provide the existing and future (400mm w/m) boundary conditions for the proposed connection points to Strandherd Drive.

FYI – preliminary fire flow calculations range from 125L/s to 165L/s.

We are working towards submitting to the City this Friday so a quick response would be greatly appreciated. Don't hesitate to call if you have questions.

Regards,

Mark Bowen
Junior Engineer

Novatech Engineering Consultants Ltd.

Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

Tel: (613) 254-9643 x 231

Fax: (613) 254-5867

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APPENDIX D
SANITARY CALCULATIONS

McINTOSH PERRY

CCO-22-2933 - MYERS - PHASE 1 - EXISTING BUILDING - SANITARY DEMANDS

Project:	MYERS - PHASE 1 - EXISTING BUILDING
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	March 1, 2022

Site Area	1.13 Gross ha	*Area revised from 1.18 ha (Previously Approved Design)
Employee	50 Persons	*Per Previously Approved Design
Total Population	50 Persons	
Car Wash	55 Cars/day	
Car Service	50 Cars/day	

DESIGN PARAMETERS

Institutional/Commercial Peaking Factor	1.5	
Residential Peaking Factor	3.65	* 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	0.06
Wet	0.32
Total	0.37

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d		0
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)		0
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Car wash	400	L/Veh/d	55	0.255
Car Service	40	L/Car Serviced/d	50	0.023
Employees	75	L/Person/d	50	0.043
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	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	0.00	L/s
PEAK RESIDENTIAL FLOW	0.00	L/s
AVERAGE ICI FLOW	0.32	L/s
PEAK INSTITUTIONAL/COMMERCIAL FLOW	0.48	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK ICI FLOW	0.48	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.38	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.54	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.85	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - BUILDING C - SANITARY DEMANDS

Project:	MYERS - BUILDING C
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	March 1, 2022

Site Area	1.11 Gross ha	*Area revised from 1.44 ha (Previously Approved Design)
Employee	40 Persons	
Total Population	40 Persons	
Car Wash	50 Cars/day	
Car Service	50 Cars/day	

DESIGN PARAMETERS

Institutional/Commercial Peaking Factor	1.5	
Residential Peaking Factor	3.67	* 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	0.06
Wet	0.31
Total	0.37

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d		0
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)		0
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Car wash	400	L/Veh/d	50	0.231
Car Service	40	L/Car Serviced/d	50	0.023
Employees	75	L/Person/d	40	0.035
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	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	0.00	L/s
PEAK RESIDENTIAL FLOW	0.00	L/s
AVERAGE ICI FLOW	0.29	L/s
PEAK INSTITUTIONAL/COMMERCIAL FLOW	0.43	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK ICI FLOW	0.43	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.34	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.49	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.80	L/s

McINTOSH PERRY

CCO-22-2933 - MYERS - BUILDING B - SANITARY DEMANDS

Project:	MYERS - BUILDING B
Project No.:	CCO-22-2933
Designed By:	M.M.
Checked By:	A.G.
Date:	March 1, 2022

Site Area	1.145 Gross ha	*Area revised from 0.75 ha (Previously Approved Design)
Employee	35 Persons	
Total Population	35 Persons	
Car Wash	30 Cars/day	
Car Service	30 Cars/day	

DESIGN PARAMETERS

Institutional/Commercial Peaking Factor	1.5	
Residential Peaking Factor	3.67	* Using Harmon Formula =
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	0.06
Wet	0.32
Total	0.38

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS	POPULATION / AREA	Flow (L/s)
Residential	280	L/c/d		0
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)		0
Hospital	900	L/(bed/day)		0
Schools	70	L/(Student/d)		0
Car wash	400	L/Veh/d	30	0.139
Car Service	40	L/Car Serviced/d	30	0.014
Employees	75	L/Person/d	35	0.030
Mobile Home Parks	1,000	L/(Space/d)		0
Motels	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	0.00	L/s
PEAK RESIDENTIAL FLOW	0.00	L/s
AVERAGE ICI FLOW	0.18	L/s
PEAK INSTITUTIONAL/COMMERCIAL FLOW	0.27	L/s
PEAK INDUSTRIAL FLOW	0.00	L/s
TOTAL PEAK ICI FLOW	0.27	L/s

TOTAL SANITARY DEMAND

TOTAL ESTIMATED AVERAGE DRY WEATHER FLOW	0.24	L/s
TOTAL ESTIMATED PEAK DRY WEATHER FLOW	0.33	L/s
TOTAL ESTIMATED PEAK WET WEATHER FLOW	0.65	L/s

SANITARY SEWER DESIGN SHEET

PROJECT: CCO-22-2933 - MYERS
 LOCATION: 4149 STRANDHERD DRIVE, OTTAWA
 CLIENT: BBS



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	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 FACTOR	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			INSTITUTIONAL IND	COMMERCIAL CUM	INDUSTRIAL IND		IND	CUM								IND	CUM	L/s	(%)	L/s	(%)
BUILDING C	A	BLDG C	MH1					0.00	0.0	0.0	3.80	0.00		0.00	1.11	1.11		0.43	1.11	1.11	0.37	0.80	34.22	18.41	200	1.00	1.055	33.42	97.68		
BUILDING C	A	MH1	MH2					0.00	0.0	0.0	3.80	0.00		0.00				0.43	0.00	1.11	0.37	0.80	48.39	21.70	200	2.00	1.492	47.59	98.36		
BUILDING C	A	MH2	MH3					0.00	0.0	0.0	3.80	0.00		0.00				0.43	0.00	1.11	0.37	0.80	24.19	85.10	200	0.50	0.746	23.40	96.71		
EXISTING BUILDING A	B	BLDG A	MH3					0.00	0.0	0.0	3.80	0.00		0.00	1.13	1.13		0.48	1.13	1.13	0.37	0.85	83.81	19.10	200	6.00	2.584	46.30	98.98		
BUILDING B	C	BLDG B	MH128					0.00	0.0	0.0	3.80	0.00		0.00	1.15	1.15		0.27	1.15	1.15	0.38	0.65	34.22	13.06	200	1.00	1.055	33.57	98.11		
BUILDING B	C	MH128	MH3					0.00	0.0	0.0	3.80	0.00		0.00				0.27	0.00	1.15	0.38	0.65	34.22	15.00	200	1.00	1.055	33.57	98.11		
DEALERSHIP DRIVE		MH3	MH4					0.00	0.0	0.0	3.80	0.00		0.00	0.00	3.38		1.18	0.00	3.38	1.12	2.30	24.19	58.97	200	0.50	0.746	21.90	90.51		
DEALERSHIP DRIVE		MH4	T.V.S. CONC.					0.00	0.0	0.0	3.80	0.00		0.00		3.38		1.18	0.00	3.38	1.12	2.30	34.22	12.50	200	1.00	1.055	31.92	93.29		
Design Parameters:				Notes:									Designed: M.M.						No. 0			Revision ISSUED FOR REVIEW							Date 2022-03-01		
Residential				ICI Areas									Checked: A.G.						Project No.: CCO-22-2933										Sheet No: 1 of 1		
SF	3.4	p/p/u																													
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day																										
APT	2.3	p/p/u	COM	28,000	L/Ha/day																										
Other	60	p/p/Ha	IND	35,000	L/Ha/day																										

**APPENDIX E
SANITARY DRAINAGE PLAN**

APPENDIX F
POST-DEVELOPMENT DRAINAGE PLAN

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CCO-22-2933 - 4149 Standherd - Runoff Calculations

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m ²)	C	Gravel Area (m ²)	C	Pervious Area (m ²)	C	C _{AVG} 5-Year	C _{AVG} 100-Year
A1	3.070	0.00	0.90	0.00	0.60	30,700.00	0.20	0.20	0.25

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	3.070	0.20	0.25	10	104.2	178.6	177.85	380.98
Total	3.070						177.85	380.98

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m ²)	C	Gravel Area (m ²)	C	Pervious Area (m ²)	C	C _{AVG} 5-Year	C _{AVG} 100-Year
B1	0.083	833.19	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B2	0.278	2,781.45	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B3	0.473	4,429.43	0.90	0.00	0.60	305.20	0.20	0.85	0.95
B4	0.447	4,222.68	0.90	0.00	0.60	251.84	0.20	0.86	0.96
B5	0.607	5,334.91	0.90	0.00	0.60	732.17	0.20	0.82	0.91
B6	0.277	2,698.08	0.90	0.00	0.60	75.00	0.20	0.88	0.98
B7	0.130	1,300.00	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B8	0.732	6,901.68	0.90	0.00	0.60	415.22	0.20	0.86	0.96
B9	0.218	1,963.85	0.90	0.00	0.60	211.96	0.20	0.83	0.93
B10	0.139	0.00	0.90	0.00	0.60	1,386.45	0.20	0.20	0.25

Nissan Flat Roof Area
 Subaru Flat Roof Area
 VW North Parking Lot
 VW South Parking Lot
 Subaru North Parking Lot
 Subaru South Parking Lot
 VW Roof
 Nissan North Parking Lot
 Nissan South Parking Lot
 Uncontrolled Area

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C 5-Year	C 100-Year	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
B1	0.083	0.90	1.00	10	104.2	178.6	21.72	41.36
B2	0.278	0.90	1.00	10	104.2	178.6	72.51	138.07
B3	0.473	0.85	0.95	10	104.2	178.6	117.24	223.66
B4	0.447	0.86	0.96	10	104.2	178.6	111.54	212.74
B5	0.607	0.82	0.91	10	104.2	178.6	143.32	273.91
B6	0.277	0.88	0.98	10	104.2	178.6	70.77	134.86
B7	0.130	0.90	1.00	10	104.2	178.6	33.89	64.53
B8	0.732	0.86	0.96	10	104.2	178.6	182.33	347.75
B9	0.218	0.83	0.93	10	104.2	178.6	52.42	100.11
B10	0.139	0.20	0.25	10	104.2	178.6	8.03	17.21
Total	3.384						813.77	1,554.20

Nissan Flat Roof Area
 Subaru Flat Roof Area
 VW North Parking Lot
 VW South Parking Lot
 Subaru North Parking Lot
 Subaru South Parking Lot
 VW Roof
 Nissan North Parking Lot
 Nissan South Parking Lot
 Uncontrolled Area

Required Restricted Flow

Drainage Area	Area (ha)	Q 5-Year		Q 100-Year	
		L/s/ha	L/s	L/s/ha	L/s
A1	3.384	35	118.5	126	426.4

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m ³)		Storage Provided (m ³)	
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year
B1	21.72	41.36	1.90	3.45	17.88	34.19	18.75	34.37
B2	72.51	138.07	7.98	14.14	86.14	162.54	93.87	166.89
B3	117.24	223.66	16.44	17.02	79.86	190.78	82.41	190.93
B4	111.54	212.74	20.51	24.50	67.00	156.07	67.00	156.56
B5	143.32	273.91	10.30	16.27	126.42	253.18	127.00	255.03
B6	70.77	134.86	4.90	5.00	63.21	143.03	68.85	152.48
B7	33.89	64.53	7.60	11.40	18.40	39.30	48.80	48.80
B8	182.33	347.75	14.00	18.20	157.13	334.07	163.00	334.55
B9	52.42	100.11	25.66	26.15	16.06	49.32	20.89	49.77
B10	8.03	17.21	8.03	17.21				
Total	813.77	1,554.20	117.32	153.34	632.11	1,362.47	690.57	1,389.38

Nissan Flat Roof Area
Subaru Flat Roof Area
VW North Parking Lot
VW South Parking Lot
Subaru North Parking Lot
Subaru South Parking Lot
VW Roof
Nissan North Parking Lot
Nissan South Parking Lot
Uncontrolled Area

McINTOSH PERRY

CCO-22-2933 - 4149 Standherd - Runoff Calculations

Nissan

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Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	21.72	1.90	19.82	11.89
20	70.3	14.64	1.90	12.74	15.29
30	53.9	11.24	1.90	9.34	16.82
40	44.2	9.21	1.90	7.31	17.55
50	37.7	7.85	1.90	5.95	17.85
60	32.9	6.87	1.90	4.97	17.88
70	29.4	6.12	1.90	4.22	17.74
80	26.6	5.54	1.90	3.64	17.46
90	24.3	5.06	1.90	3.16	17.08
100	22.4	4.67	1.90	2.77	16.63

Maximum Storage Required 5-Year (m³) = 17.88

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	41.36	3.45	37.91	22.75
20	120.0	27.78	3.45	24.33	29.20
30	91.9	21.28	3.45	17.83	32.09
40	75.1	17.41	3.45	13.96	33.49
50	64.0	14.81	3.45	11.36	34.09
60	55.9	12.95	3.45	9.50	34.19
70	49.8	11.53	3.45	8.08	33.95
80	45.0	10.42	3.45	6.97	33.46

Maximum Storage Required 100-Year (m³) = 34.19

Storage Occupied In Area B1

5-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m ³)
Roof	624.90	0.030	18.75
Total			18.75

Storage Available (m³) = 18.75

Storage Required (m³) = 17.88

100-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m ³)
Roof	624.90	0.055	34.37
Total			34.37

Storage Available (m³) = 34.37

Storage Required (m³) = 34.19

*Storage area is 75% of the total roof area

McINTOSH PERRY

CCO-22-2933 - 4149 Standherd - Runoff Calculations

Nissan

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Roof Drain Flow (B1)

Roof Drains Summary		
Type of Control Device	Watts Drianage - Accutrol Weir	
Number of Roof Drains	5	
	5-Year	100-Year
Rooftop Storage (m ³)	18.75	34.37
Storage Depth (m)	0.030	0.055
Flow (Per Roof Drain) (L/s)	0.38	0.69
Total Flow (L/s)	1.90	3.45

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 model to be Accutrol Weirs, See attached sheets

*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

Roof Drain Flow			
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	0.95
	0.25	20	1.25
	0.32	25	1.60
5-Year	0.38	30	1.90
	0.44	35	2.20
	0.50	40	2.50
	0.57	45	2.85
100-Year	0.69	55	3.45
	0.76	60	3.80
	0.82	65	4.10
	0.88	70	4.40
	0.95	75	4.75
	1.01	80	5.05
	1.07	85	5.35
	1.13	90	5.65
	1.20	95	6.00
	1.26	100	6.30
	1.32	105	6.60
	1.39	110	6.95
	1.45	115	7.25
	1.51	120	7.55
	1.58	125	7.90
	1.64	130	8.20
	1.70	135	8.50
	1.76	140	8.80
	1.83	145	9.15
	1.89	150	9.45

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

McINTOSH PERRY

CCO-22-2933 - 4149 Standherd - Runoff Calculations

Subaru

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Storage Requirements for Area B2

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	72.51	1.90	70.61	42.37
40	44.2	30.75	1.90	28.85	69.24
70	29.4	20.44	1.90	18.54	77.87
100	22.4	15.59	1.90	13.69	82.16
130	18.3	12.73	1.90	10.83	84.49
160	15.6	10.83	1.90	8.93	85.68
190	13.6	9.46	1.90	7.56	86.14
220	12.1	8.42	1.90	6.52	86.08
250	10.9	7.61	1.90	5.71	85.64
280	10.0	6.95	1.90	5.05	84.89

Maximum Storage Required 5-Year (m³) = 86.14

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	138.07	3.45	134.62	80.77
50	64.0	49.45	3.45	46.00	138.01
90	41.1	31.79	3.45	28.34	153.03
130	30.9	23.89	3.45	20.44	159.45
170	25.0	19.34	3.45	15.89	162.07
210	21.1	16.35	3.45	12.90	162.54
250	18.4	14.22	3.45	10.77	161.60
290	16.3	12.63	3.45	9.18	159.69

Maximum Storage Required 100-Year (m³) = 162.54

Storage Occupied In Area B2

5-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m ³)
Roof	2086.09	0.045	93.87
Total			93.87

Storage Available (m³) = 93.87
Storage Required (m³) = 86.14

100-Year Storm Event

Roof Storage			
Location	Area*	Depth	Volume (m ³)
Roof	2086.09	0.080	166.89
Total			166.89

Storage Available (m³) = 166.89
Storage Required (m³) = 162.54

*Storage area is 75% of the total roof area

McINTOSH PERRY

CCO-22-2933 - 4149 Standherd - Runoff Calculations

Subaru

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Roof Drain Flow (B2)

Roof Drains Summary		
Type of Control Device	Watts Drianage - Accutrol Weir	
Number of Roof Drains	14	
	5-Year	100-Year
Rooftop Storage (m ³)	93.87	166.89
Storage Depth (m)	0.045	0.080
Flow (Per Roof Drain) (L/s)	0.57	1.01
Total Flow (L/s)	7.98	14.14

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 model to be Accutrol Weirs, See attached sheets

*Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

3 roof drains during a 5 year storm

elevation of water = 25mm

Flow leaving 3 roof drains = (3 x 0.32 L/s) = 0.96L/s

3 roof drains during a 100 year storm

elevation of water = 50mm

Flow leaving 3 roof drains = (3 x 0.54 L/s) = 1.89L/s

Roof Drain Flow			
	Flow (l/s)	Storage Depth (mm)	Drains Flow (l/s)
	0.19	15	2.66
	0.25	20	3.50
	0.32	25	4.48
	0.38	30	5.32
	0.44	35	6.16
	0.50	40	7.00
5-Year	0.57	45	7.98
	0.63	50	8.82
	0.69	55	9.66
	0.76	60	10.64
	0.82	65	11.48
	0.88	70	12.32
	0.95	75	13.30
100-Year	1.01	80	14.14
	1.07	85	14.98
	1.13	90	15.82
	1.20	95	16.80
	1.26	100	17.64
	1.32	105	18.48
	1.39	110	19.46
	1.45	115	20.30
	1.51	120	21.14
	1.58	125	22.12
	1.64	130	22.96
	1.70	135	23.80
	1.76	140	24.64
	1.83	145	25.62
	1.89	150	26.46

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

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B3

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VW North Parking Lot

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)
10	104.2	117.24	16.44	100.80	60.48
20	70.3	79.05	16.44	62.61	75.13
30	53.9	60.68	16.44	44.24	79.63
40	44.2	49.72	16.44	33.28	79.86
50	37.7	42.37	16.44	25.93	77.78
60	32.9	37.07	16.44	20.63	74.26
70	29.4	33.05	16.44	16.61	69.76
80	26.6	29.89	16.44	13.45	64.55
90	24.3	27.33	16.44	10.89	58.80
100	22.4	25.21	16.44	8.77	52.64

Maximum Storage Required 5-Year (m³) = 79.86

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)
30	91.9	115.07	17.02	98.05	176.50
40	75.1	94.13	17.02	77.11	185.06
50	64.0	80.11	17.02	63.09	189.27
60	55.9	70.01	17.02	52.99	190.78
70	49.8	62.37	17.02	45.35	190.45
80	45.0	56.36	17.02	39.34	188.81
90	41.1	51.50	17.02	34.48	186.17
100	37.9	47.48	17.02	30.46	182.74

Maximum Storage Required 100-Year (m³) = 190.78

Storage Occupied In Area B3

5-Year Storm Event

Water Elev. (m) =			95.62		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM113	95.50	93.77	0.12	1.63	10.41
Tank					72.00
Total					82.41

Storage Available (m³) = 82.41

Storage Required (m³) = 79.86

100-Year Storm Event

Water Elev. (m) =			95.75		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM113	95.50	93.77	0.25	1.76	118.93
Tank					72.00
Total					190.93

Storage Available (m³) = 190.93

Storage Required (m³) = 190.78

McINTOSH PERRY

4149 Strandherd Storage Requirements for Area B3

For Orifice Flow, C= 0.60
 For Weir Flow, C= 1.84

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	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.77	X	X	X
center of crest elevation	93.81	X		X
orifice width / weir length	77 mm	X	X	X
weir height	N/A			X
orifice area (m ²)	0.005	X	x	X

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total Q [L/s]	
	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]		
93.77	x	x	x	x	x	x	x	x	0	
93.78	x	x	x	x	x	x	x	x	0.00	
95.60	1.79	0.02	x	x	x	x	x	x	16.35	
95.61	1.80	0.02	x	x	x	x	x	x	16.40	
95.62	1.81	0.02	x	x	x	x	x	x	16.44	5-Year
95.63	1.82	0.02	x	x	x	x	x	x	16.49	
95.64	1.83	0.02	x	x	x	x	x	x	16.53	
95.65	1.84	0.02	x	x	x	x	x	x	16.58	
95.66	1.85	0.02	x	x	x	x	x	x	16.62	
95.67	1.86	0.02	x	x	x	x	x	x	16.67	
95.68	1.87	0.02	x	x	x	x	x	x	16.71	
95.69	1.88	0.02	x	x	x	x	x	x	16.76	
95.70	1.89	0.02	x	x	x	x	x	x	16.80	
95.71	1.90	0.02	x	x	x	x	x	x	16.85	
95.72	1.91	0.02	x	x	x	x	x	x	16.89	
95.73	1.92	0.02	x	x	x	x	x	x	16.93	
95.74	1.93	0.02	x	x	x	x	x	x	16.98	
95.75	1.94	0.02	x	x	x	x	x	x	17.02	100-Year

- Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
 2. Orifice Equation: $Q = cA(2gh)^{1/2}$
 3. Weir Equation: $Q = CLH^{3/2}$
 4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
 5. H for orifice equations is depth of water above the centroid of the orifice.
 6. H for weir equations is depth of water above the weir crest.

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B4

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VW South Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	111.54	20.51	91.03	54.62
20	70.3	75.20	20.51	54.69	65.63
30	53.9	57.73	20.51	37.22	67.00
40	44.2	47.30	20.51	26.79	64.30
50	37.7	40.31	20.51	19.80	59.40
60	32.9	35.27	20.51	14.76	53.12
70	29.4	31.44	20.51	10.93	45.92
80	26.6	28.44	20.51	7.93	38.04
90	24.3	26.00	20.51	5.49	29.65
100	22.4	23.99	20.51	3.48	20.86

Maximum Storage Required 5-Year (m³) = 67.00

100-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	212.74	24.50	188.24	112.94
20	120.0	142.91	24.50	118.41	142.09
30	91.9	109.45	24.50	84.95	152.91
40	75.1	89.53	24.50	65.03	156.07
50	64.0	76.20	24.50	51.70	155.09
60	55.9	66.59	24.50	42.09	151.54
70	49.8	59.32	24.50	34.82	146.24
80	45.0	53.60	24.50	29.10	139.69

Maximum Storage Required 100-Year (m³) = 156.07

Storage Occupied In Area B4

5-Year Storm Event

Water Elev. (m) =			95.21		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM119	95.43	93.93	-	1.05	0.00
Tank					67.00
Total					67.00

Storage Available (m³) = 67.00

Storage Required (m³) = 67.00

100-Year Storm Event

Water Elev. (m) =			95.73		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM119	95.43	93.93	0.30	1.58	89.56
Tank					67.00
Total					156.56

Storage Available (m³) = 156.56

Storage Required (m³) = 156.07

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B4

For Orifice Flow, C= 0.60
 For Weir Flow, C= 1.84

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	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.93	X	X	X
center of crest elevation	93.98	X		X
orifice width / weir length	94 mm	X	X	X
weir height	N/A			X
orifice area (m ²)	0.007	X	x	X

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total Q [L/s]	
	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]		
93.93	x	x	x	x	x	x	x	x	0	
95.21	1.23	0.02	x	x	x	x	x	x	20.51	5-Year
95.33	1.35	0.02	x	x	x	x	x	x	21.48	
95.49	1.51	0.02	x	x	x	x	x	x	22.72	
95.50	1.52	0.02	x	x	x	x	x	x	22.79	
95.51	1.53	0.02	x	x	x	x	x	x	22.86	
95.52	1.54	0.02	x	x	x	x	x	x	22.94	
95.69	1.71	0.02	x	x	x	x	x	x	24.17	
95.70	1.72	0.02	x	x	x	x	x	x	24.24	
95.71	1.73	0.02	x	x	x	x	x	x	24.31	
95.72	1.74	0.02	x	x	x	x	x	x	24.38	
95.73	1.75	0.02	x	x	x	x	x	x	24.45	100-Year

- Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
 2. Orifice Equation: $Q = cA(2gh)^{3/2}$
 3. Weir Equation: $Q = CLH^{3/2}$
 4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
 5. H for orifice equations is depth of water above the centroid of the orifice.
 6. H for weir equations is depth of water above the weir crest.

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B5

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Subaru North Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	143.32	10.30	133.02	79.81
20	70.3	96.63	10.30	86.33	103.60
30	53.9	74.18	10.30	63.88	114.98
40	44.2	60.78	10.30	50.48	121.14
50	37.7	51.79	10.30	41.49	124.48
60	32.9	45.31	10.30	35.01	126.05
70	29.4	40.40	10.30	30.10	126.42
80	26.6	36.54	10.30	26.24	125.93
90	24.3	33.41	10.30	23.11	124.79
100	22.4	30.82	10.30	20.52	123.13

Maximum Storage Required 5-Year (m³) = 126.42

100-Year Storm Event

Tc (min)	I (mm/hr)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
20	120.0	184.00	16.27	167.73	201.28
30	91.9	140.92	16.27	124.65	224.38
40	75.1	115.27	16.27	99.00	237.61
50	64.0	98.10	16.27	81.83	245.50
60	55.9	85.74	16.27	69.47	250.10
70	49.8	76.38	16.27	60.11	252.45
80	45.0	69.02	16.27	52.75	253.18
90	41.1	63.06	16.27	46.79	252.69

Maximum Storage Required 100-Year (m³) = 253.18

Storage Occupied In Area B5

5-Year Storm Event

Water Elev. (m) =			94.82		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM103	95.60	94.12	-	0.40	0.00
Tank					127.00
Total					127.00

Storage Available (m³) = 127.00
Storage Required (m³) = 126.42

100-Year Storm Event

Water Elev. (m) =			95.8		
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM103	95.60	94.12	0.20	1.38	128.03
Tank					127.00
Total					255.03

Storage Available (m³) = 255.03
Storage Required (m³) = 253.18

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B5

For Orifice Flow, C= 0.60
 For Weir Flow, C= 1.84

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	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	94.12	X	X	X
center of crest elevation	94.16	X		X
orifice width / weir length	78 mm	X	X	X
weir height	N/A			X
orifice area (m ²)	0.005	X	x	X

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total Q [L/s]	
	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]		
94.12	x	x	x	x	x	x	x	x	0	
94.82	0.66	0.01	x	x	x	x	x	x	10.30	5-Year
95.61	1.45	0.02	x	x	x	x	x	x	15.30	
95.62	1.46	0.02	x	x	x	x	x	x	15.35	
95.63	1.47	0.02	x	x	x	x	x	x	15.40	
95.64	1.48	0.02	x	x	x	x	x	x	15.45	
95.65	1.49	0.02	x	x	x	x	x	x	15.51	
95.66	1.50	0.02	x	x	x	x	x	x	15.56	
95.67	1.51	0.02	x	x	x	x	x	x	15.61	
95.68	1.52	0.02	x	x	x	x	x	x	15.66	
95.69	1.53	0.02	x	x	x	x	x	x	15.71	
95.70	1.54	0.02	x	x	x	x	x	x	15.76	
95.71	1.55	0.02	x	x	x	x	x	x	15.82	
95.72	1.56	0.02	x	x	x	x	x	x	15.87	
95.73	1.57	0.02	x	x	x	x	x	x	15.92	
95.74	1.58	0.02	x	x	x	x	x	x	15.97	
95.75	1.59	0.02	x	x	x	x	x	x	16.02	
95.76	1.60	0.02	x	x	x	x	x	x	16.07	
95.77	1.61	0.02	x	x	x	x	x	x	16.12	
95.78	1.62	0.02	x	x	x	x	x	x	16.17	
95.79	1.63	0.02	x	x	x	x	x	x	16.22	
95.80	1.64	0.02	x	x	x	x	x	x	16.27	100-Year

- Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
 2. Orifice Equation: $Q = cA(2gh)^{1/2}$
 3. Weir Equation: $Q = CLH^{3/2}$
 4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
 5. H for orifice equations is depth of water above the centroid of the orifice.
 6. H for weir equations is depth of water above the weir crest.

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B6

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Subaru South Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B6 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	70.77	4.90	65.87	39.52
20	70.3	47.72	4.90	42.82	51.38
30	53.9	36.63	4.90	31.73	57.11
40	44.2	30.01	4.90	25.11	60.27
50	37.7	25.58	4.90	20.68	62.03
60	32.9	22.38	4.90	17.48	62.91
70	29.4	19.95	4.90	15.05	63.21
80	26.6	18.04	4.90	13.14	63.08
90	24.3	16.50	4.90	11.60	62.63
100	22.4	15.22	4.90	10.32	61.92

Maximum Storage Required 5-Year (m³) = 63.21

100-Year Storm Event

Tc (min)	I (mm/hr)	B6 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
100	37.9	28.63	5.00	23.63	141.76
110	35.2	26.59	5.00	21.59	142.48
120	32.9	24.84	5.00	19.84	142.88
130	30.9	23.34	5.00	18.34	143.03
140	29.2	22.02	5.00	17.02	142.95
150	27.6	20.85	5.00	15.85	142.68
160	26.2	19.82	5.00	14.82	142.25
170	25.0	18.89	5.00	13.89	141.68

Maximum Storage Required 100-Year (m³) = 143.03

Storage Occupied In Area B6

5-Year Storm Event

Water Elev. (m) =		95.73			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM108	95.50	94.12	0.23	1.31	68.85
Total					68.85

Storage Available (m³) = 68.85

Storage Required (m³) = 63.21

100-Year Storm Event

Water Elev. (m) =		95.8			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM108	95.50	94.12	0.30	1.38	152.48
Total					152.48

Storage Available (m³) = 152.48

Storage Required (m³) = 143.03

*Storage Calculated in AutoCAD

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B8

14 of 17

Nissan North Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B8 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	182.33	14.00	168.33	101.00
20	70.3	122.93	14.00	108.93	130.72
30	53.9	94.37	14.00	80.37	144.66
40	44.2	77.32	14.00	63.32	151.96
50	37.7	65.89	14.00	51.89	155.67
60	32.9	57.65	14.00	43.65	157.13
70	29.4	51.40	14.00	37.40	157.07
80	26.6	46.48	14.00	32.48	155.91
90	24.3	42.50	14.00	28.50	153.91
100	22.4	39.21	14.00	25.21	151.26

Maximum Storage Required 5-Year (m³) = 157.13

100-Year Storm Event

Tc (min)	I (mm/hr)	B8 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
70	49.8	96.97	18.20	78.77	330.82
80	45.0	87.62	18.20	69.42	333.22
90	41.1	80.06	18.20	61.86	334.07
100	37.9	73.82	18.20	55.62	333.70
110	35.2	68.56	18.20	50.36	332.36
120	32.9	64.06	18.20	45.86	330.22
130	30.9	60.18	18.20	41.98	327.41
140	29.2	56.77	18.20	38.57	324.02

Maximum Storage Required 100-Year (m³) = 334.07

Storage Occupied In Area B8

5-Year Storm Event

Water Elev. (m) =		94.66			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM101	95.35	93.20	-	1.16	0.00
Tank					163.00
Total					163.00

Storage Available (m³) = 163.00
Storage Required (m³) = 157.13

100-Year Storm Event

Water Elev. (m) =		95.64			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM101	95.35	93.20	0.29	2.14	171.55
Tank					163.00
Total					171.55

Storage Available (m³) = 334.55
Storage Required (m³) = 334.07

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B8

For Orifice Flow, C= 0.60
 For Weir Flow, C= 1.84

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	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	93.20	X	X	X
center of crest elevation	93.24	X		X
orifice width / weir length	75 mm	X	X	X
weir height	N/A			X
orifice area (m ²)	0.004	X	x	X

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total Q [L/s]
	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	H [m]	Q [m ³ /s]	
93.20	x	x	x	x	x	x	x	x	0
94.66	1.42	0.01	x	x	x	x	x	x	14.00
95.36	2.12	0.02	x	x	x	x	x	x	17.11
95.37	2.13	0.02	x	x	x	x	x	x	17.15
95.38	2.14	0.02	x	x	x	x	x	x	17.19
95.39	2.15	0.02	x	x	x	x	x	x	17.23
95.40	2.16	0.02	x	x	x	x	x	x	17.27
95.41	2.17	0.02	x	x	x	x	x	x	17.31
95.42	2.18	0.02	x	x	x	x	x	x	17.35
95.43	2.19	0.02	x	x	x	x	x	x	17.39
95.44	2.20	0.02	x	x	x	x	x	x	17.42
95.45	2.21	0.02	x	x	x	x	x	x	17.46
95.46	2.22	0.02	x	x	x	x	x	x	17.50
95.47	2.23	0.02	x	x	x	x	x	x	17.54
95.48	2.24	0.02	x	x	x	x	x	x	17.58
95.49	2.25	0.02	x	x	x	x	x	x	17.62
95.50	2.26	0.02	x	x	x	x	x	x	17.66
95.51	2.27	0.02	x	x	x	x	x	x	17.70
95.52	2.28	0.02	x	x	x	x	x	x	17.74
95.53	2.29	0.02	x	x	x	x	x	x	17.78
95.54	2.30	0.02	x	x	x	x	x	x	17.82
95.55	2.31	0.02	x	x	x	x	x	x	17.85
95.56	2.32	0.02	x	x	x	x	x	x	17.89
95.57	2.33	0.02	x	x	x	x	x	x	17.93
95.58	2.34	0.02	x	x	x	x	x	x	17.97
95.59	2.35	0.02	x	x	x	x	x	x	18.01
95.60	2.36	0.02	x	x	x	x	x	x	18.05
95.61	2.37	0.02	x	x	x	x	x	x	18.08
95.62	2.38	0.02	x	x	x	x	x	x	18.12
95.63	2.39	0.02	x	x	x	x	x	x	18.16
95.64	2.40	0.02	x	x	x	x	x	x	18.20

5-Year

100-Year

- Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
 2. Orifice Equation: $Q = cA(2gh)^{1/2}$
 3. Weir Equation: $Q = CLH^{3/2}$
 4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
 5. H for orifice equations is depth of water above the centroid of the orifice.
 6. H for weir equations is depth of water above the weir crest.

McINTOSH PERRY

4149 Standherd - Storage Requirements for Area B9

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Nissan South Parking Lot

5-Year Storm Event

Tc (min)	I (mm/hr)	B9 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	104.2	52.42	25.66	26.76	16.06
20	70.3	35.35	25.66	9.69	11.62
30	53.9	27.13	25.66	1.47	2.65
40	44.2	22.23	25.66	0.00	0.00
50	37.7	18.94	25.66	0.00	0.00
60	32.9	16.58	25.66	0.00	0.00
70	29.4	14.78	25.66	0.00	0.00
80	26.6	13.36	25.66	0.00	0.00
90	24.3	12.22	25.66	0.00	0.00
100	22.4	11.27	25.66	0.00	0.00

Maximum Storage Required 5-Year (m³) = 16.06

100-Year Storm Event

Tc (min)	I (mm/hr)	B9 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m ³)
10	178.6	100.11	26.15	73.96	44.38
20	120.0	67.25	26.15	41.10	49.32
30	91.9	51.51	26.15	25.36	45.65
40	75.1	42.13	26.15	15.98	38.36
50	64.0	35.86	26.15	9.71	29.12
60	55.9	31.34	26.15	5.19	18.68
70	49.8	27.92	26.15	1.77	7.42
80	45.0	25.23	26.15	0.00	0.00

Maximum Storage Required 100-Year (m³) = 49.32

Storage Occupied In Area B9

5-Year Storm Event

Water Elev. (m) =		95.60			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM117	95.40	93.96	0.20	1.42	20.89
Total					20.89

Storage Available (m³) = 20.89

Storage Required (m³) = 16.06

100-Year Storm Event

Water Elev. (m) =		95.65			
Structure	T/G (m)	INV. (out)	Depth (m)	Head (m)	Volume (m ³)
CBHM117	95.40	93.96	0.25	1.47	49.77
Total					49.77

Storage Available (m³) = 49.77

Storage Required (m³) = 49.32

*Storage Calculated in AutoCAD

Site Area	33779.3	m2
10 mm storm	337.79	m3

Existing Storage Unit - CBMH113	72	m3	<i>*Per Previously Approved Design</i>
Existing Storage Unit - CBMH119	67	m3	<i>*Per Previously Approved Design</i>
Existing Roof Storage	18.4	m3	<i>*5 Yr Storage Required Storage Utilized</i>

Remaining (Below Grade) Storage Required	180.39	m3
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Proposed Building B Roof Storage	17.88	m3	<i>*5 Yr Storage Required Storage Utilized</i>
Proposed Building C Roof Storage	85.76	m3	<i>*5 Yr Storage Required Storage Utilized</i>
Proposed Storage Unit - CBMH103	126	m3	
Proposed Storage Unit - CBMH101	163	m3	

CBMH 118

Pipe Diameter	375	mm
	0.375	m
Pipe Radius	0.1875	m
Pipe Length	19	m
Pipe Volume	2.10	m3
Stone Storage Below	0.5	m
Stone Storage Side 1	0.5	m
Stone Storage Above	0.15	m
Stone Area (per m)	1.41	m2
Area Including Void Space (40%)	0.56	m2
Stone and Pipe Volume	10.71	m3
Total Stone Storage	8.61	m3

Total Stone Storage Volume 8.61 m3

Total Storage Provided to Collect the First 10 mm 558.65 m3

STORM SEWER DESIGN SHEET

PROJECT: CCO-22-2933 - MYERS
 LOCATION: 4149 STRANDHERD DRIVE, OTTAWA
 CLIENT: BBS



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	INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5)	i (10)	i (100)	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)	(%)					
BUILDING C	B9	CB13	CMBH118	0.81	0.077	0.06	0.06	10.00	0.40	10.40	104.19	122.14	178.56	18.07				18.07	43.87	20.80	250			0.50	0.866	25.80	58.82%
BUILDING C	B9	CMBH118	CBMH117	0.73	0.042	0.03	0.09	10.40	0.47	10.87	102.12	119.70	174.98	26.31				26.31	91.46	22.40	375			0.25	0.802	65.15	71.23%
BUILDING C	B9	CBMH117	STMMH08	0.89	0.099	0.09	0.18	10.87	0.32	11.18	99.83	117.00	171.01	50.17				50.17	148.72	17.20	450			0.25	0.906	98.55	66.26%
BUILDING A	B4	CB10	CBMH122	0.89	0.100	0.09	0.09	10.00	0.37	10.37	104.19	122.14	178.56	25.78				25.78	43.87	19.30	250			0.50	0.866	18.09	41.23%
BUILDING A	B4	CBMH122	CBMH121	0.81	0.040	0.03	0.12	10.37	0.43	10.80	102.27	119.88	175.23	34.52				34.52	133.02	20.90	450			0.20	0.810	98.50	74.05%
BUILDING A	B4	CBMH121	CBMH120	0.90	0.050	0.05	0.17	10.80	0.61	11.41	100.14	117.37	171.55	46.32				46.32	133.02	29.60	450			0.20	0.810	86.69	65.17%
BUILDING A	B4	CBMH120	CBMH119	0.80	0.070	0.06	0.22	11.41	0.77	12.18	97.29	114.01	166.62	60.15				60.15	133.02	37.40	450			0.20	0.810	72.86	54.78%
BUILDING A	B4	CB11	CBMH119	0.85	0.039	0.03	0.03	10.00	0.45	10.45	104.19	122.14	178.56	9.60				9.60	43.87	23.40	250			0.50	0.866	34.27	78.11%
BUILDING A	B4	CBMH119	STMMH08	0.89	0.108	0.10	0.35	12.18	0.11	12.29	93.94	110.06	160.82	91.84				91.84	133.02	5.50	450			0.20	0.810	41.18	30.96%
		STMMH08	STMMH06			0.00	0.53	12.29	0.60	12.90	93.46	109.51	160.00	138.34				138.34	392.18	38.50	675			0.20	1.062	253.83	64.72%
BUILDING A	B7	BLDG A	STMH06	0.90	0.130	0.12	0.12	10.00	0.18	10.18	104.19	122.14	178.56	33.89				33.89	48.39	16.50	200			2.00	1.492	14.50	29.96%
BUILDING B	B1	BLDG B	STMMH07	0.90	0.083	0.07	0.07	10.00	0.20	10.20	104.19	122.14	178.56	21.64				21.64	34.22	12.85	200			1.00	1.055	12.58	36.76%
BUILDING A		STMMH07	STMMH06			0.00	0.07	10.20	0.33	10.53	103.13	120.89	176.72	21.42				21.42	43.87	17.10	250			0.50	0.866	22.45	51.18%
		STMMH06	STMMH05			0.00	0.72	12.90	0.55	13.45	91.03	106.64	155.80	183.25				183.25	392.18	35.30	675			0.20	1.062	208.92	53.27%
BUILDING A	B3	CB09	CBMH116	0.87	0.100	0.09	0.09	10.00	0.41	10.41	104.19	122.14	178.56	25.20				25.20	43.87	21.10	250			0.50	0.866	18.67	42.55%
BUILDING A	B3	CBMH116	CBMH115	0.78	0.080	0.06	0.15	10.41	0.82	11.23	102.10	119.67	174.93	42.40				42.40	133.02	40.10	450			0.20	0.810	90.61	68.12%
BUILDING A	B3	CBMH115	CBMH114	0.82	0.070	0.06	0.21	11.23	0.67	11.91	98.11	114.98	168.04	56.40				56.40	133.02	32.80	450			0.20	0.810	76.61	57.60%
BUILDING A	B3	CBMH114	CBMH113	0.85	0.060	0.05	0.26	11.91	0.55	12.45	95.10	111.43	162.83	68.16				68.16	133.02	26.50	450			0.20	0.810	64.86	48.76%
BUILDING A	B3	CB12	CBMH113	0.86	0.053	0.05	0.05	10.00	0.37	10.37	104.19	122.14	178.56	13.20				13.20	62.04	27.00	250			1.00	1.224	48.84	78.72%
BUILDING A	B3	CBM113	STMMH05	0.85	0.119	0.10	0.40	12.45	0.07	12.52	92.81	108.74	158.88	104.38				104.38	162.91	3.90	450			0.30	0.992	58.53	35.93%
		STMMH05	STMH04			0.00	1.13	13.45	0.47	13.92	88.92	104.16	152.15	279.00				279.00	367.27	22.60	750			0.10	0.805	88.27	24.03%
BUILDING C	B6	CB06	CBMH110	0.87	0.062	0.05	0.05	10.00	0.45	10.45	104.19	122.14	178.56	15.62				15.62	43.87	23.30	250			0.50	0.866	28.24	64.38%
BUILDING C	B6	CBMH110	CBMH109	0.90	0.044	0.04	0.09	10.45	0.57	11.02	101.88	119.42	174.56	26.49				26.49	59.68	27.80	300			0.35	0.818	33.19	55.61%
BUILDING C	B6	CBMH109	CBMH108	0.88	0.075	0.07	0.16	11.02	0.56	11.57	99.12	116.17	169.78	43.96				43.96	91.46	26.90	375			0.25	0.802	47.49	51.93%
BUILDING C	B6	CBMH108	STMMH04	0.83	0.097	0.08	0.24	11.57	0.26	11.83	96.55	113.15	165.35	64.43				64.43	91.46	12.30	375			0.25	0.802	27.02	29.55%
		STMMH04	STMMH 02			0.00	1.37	13.92	0.76	14.67	87.22	102.16	149.22	331.88				331.88	669.70	55.00	825			0.20	1.214	337.82	50.44%
BUILDING C	B2	BLDG C	STMMH02/TEE	0.90	0.278	0.25	0.25	10.00	0.36	10.36	104.19	122.14	178.56	72.47				72.47	87.74	37.60	250			2.00	1.731	15.26	17.40%
BUILDING C	B5	CB04	CBMH107	0.79	0.095	0.08	0.08	10.00	0.42	10.42	104.19	122.14	178.56	21.74				21.74	62.04	31.00	250			1.00	1.224	40.30	64.96%
BUILDING C	B5	CBMH107	CBMH106	0.79	0.098	0.08	0.15	10.42	0.72	11.14	102.02	119.58	174.79	43.24				43.24	81.80	31.00	375			0.20	0.717	38.56	47.14%
BUILDING C	B5	CBMH106	CBMH105	0.77	0.078	0.06	0.21	11.14	0.88	12.02	98.52	115.47	168.75	58.21				58.21	81.80	38.00	375			0.20	0.717	23.59	28.84%
BUILDING C	B5	CBMH105	CBMH104	0.86	0.088	0.08	0.29	12.02	0.89	12.92	94.59	110.83	161.95	75.79				75.79	115.20	37.60	450			0.15	0.702	39.41	34.21%
BUILDING C	B5	CBMH103A	CBMH103 / PIPE TEE	0.88	0.116	0.10	0.10	10.00	0.51	10.51	104.19	122.14	178.56	29.57				29.57	43.87	26.70	250			0.50	0.866	14.30	32.60%
BUILDING C	B5	CBMH104	CBMH103	0.83	0.059	0.05	0.15	12.92	0.67	13.58	90.95	106.55	155.66	38.19				38.19	115.20	28.00	450			0.15	0.702	77.00	66.85%
BUILDING C	B5	CBMH103	STMMH02	0.73	0.072	0.05	0.20	13.58	0.06	13.64	88.43	103.59	151.31	50.06				50.06	200.65	3.30	525			0.20	0.898	150.59	75.05%
		STMMH02	STMMH01			0.00	1.57	14.67	0.46	15.14	84.62	99.11	144.74	369.90				369.90	844.60	35.60	900			0.20	1.286	474.70	56.20%
BUILDING B	B8	CB07	CBMH112	0.86	0.088	0.08	0.08	10.00	0.38	10.38	104.19	122.14	178.56	22.03				22.03	62.04	28.10	250			1.00	1.224	40.01	64.49%
BUILDING B	B9	CBMH112	CBMH111	0.87	0.113	0.10	0.17	10.38	0.44	10.82	102.21	119.81	175.14	49.64				49.64	71.33	25.60	300			0.50	0.978	21.69	30.41%
BUILDING B	B9	CBMH111	STMMH 03	0.90	0.095	0.09	0.26	10.82	0.29	11.11	100.06	117.27	171.40	72.36				72.36	129.34	20.00	375			0.50	1.134	56.98	44.06%
BUILDING B	B9	CB08	STMMH 03	0.90	0.085	0.08	0.08	10.00	0.18	10.18	104.19	122.14	178.56	22.26				22.26	62.04	13.30	250			1.00	1.224	39.78	64.12%
BUILDING B	B9	CB01	STMMH 03	0.88	0.080	0.07	0.07	10.00	0.27	10.27	104.19	122.14	178.56	20.34				20.34	62.04	19.50	250			1.00	1.224	41.69	67.21%
BUILDING B	B9	CB02	STMMH 03	0.88	0.101	0.09	0.09	10.00	0.20	10.20	104.19	122.14	178.56	25.87				25.87	62.04	14.68	250			1.00	1.224	36.17	58.31%
BUILDING B	B9	STMMH 03	STMMH 07			0.00	0.50	11.11	1.23	12.35	98.66	115.63	168.99	136.18				136.18	173.76	57.60	525			0.15	0.778	37.59	21.63%

BUILDING B	B9	STMMH 07	CBMH101			0.00	0.50	12.35	0.25	12.60	93.24	109.24	159.61	128.69				128.69	173.76	11.80	525			0.15	0.778	45.07	25.94%
BUILDING B	B9	CBMH101	STMMH 01	0.73	0.088	0.06	0.56	12.60	0.28	12.88	92.21	108.03	157.83	143.79				143.79	173.76	12.90	525			0.15	0.778	29.98	17.25%
		STMMH01	OGS			0.00	2.13	15.14	0.05	15.19	83.12	97.34	142.14	492.95				492.95	844.60	4.20	900			0.20	1.286	351.65	41.64%
Definitions: Q = 2.78CIA, 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: MSM				No. 1.				Revision Issued for Municipal Review				Date 2022-03-02							
								Checked: AJG																			
								Project No.: 22-2933																			
												Date: 2022-03-02				Sheet No: 1 of 1											

CBMH113 ICD Sizing

LMF90

Chart 1: LMF 14 Preset Flow Curves

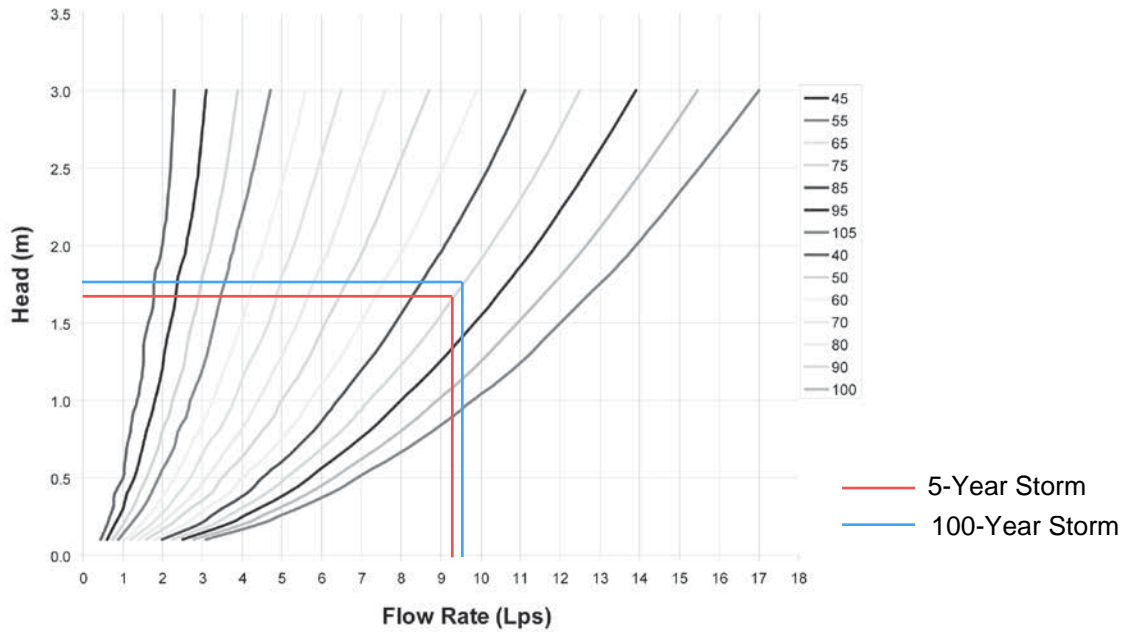
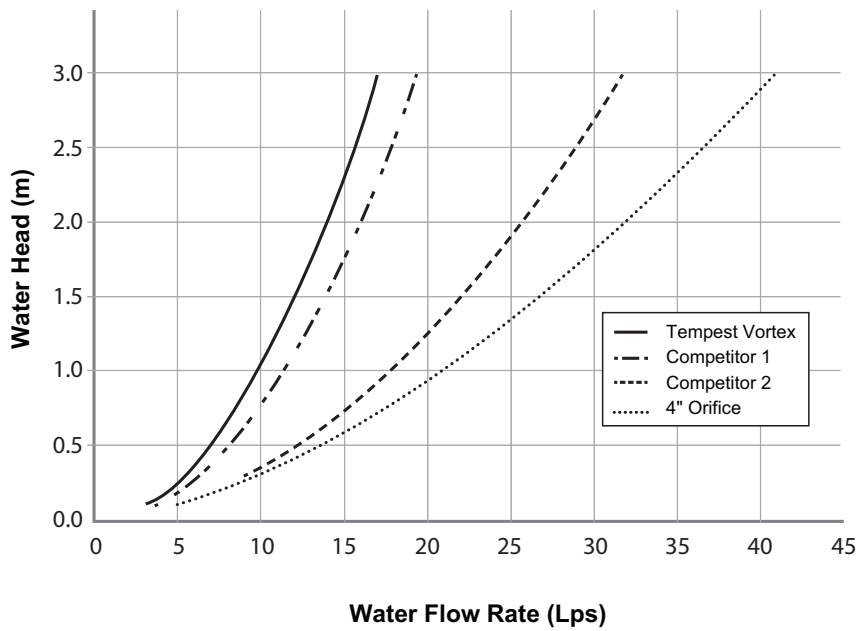


Chart 2: LMF Flow vs. ICD Alternatives



CBMH119 ICD Sizing

LMF100

Chart 1: LMF 14 Preset Flow Curves

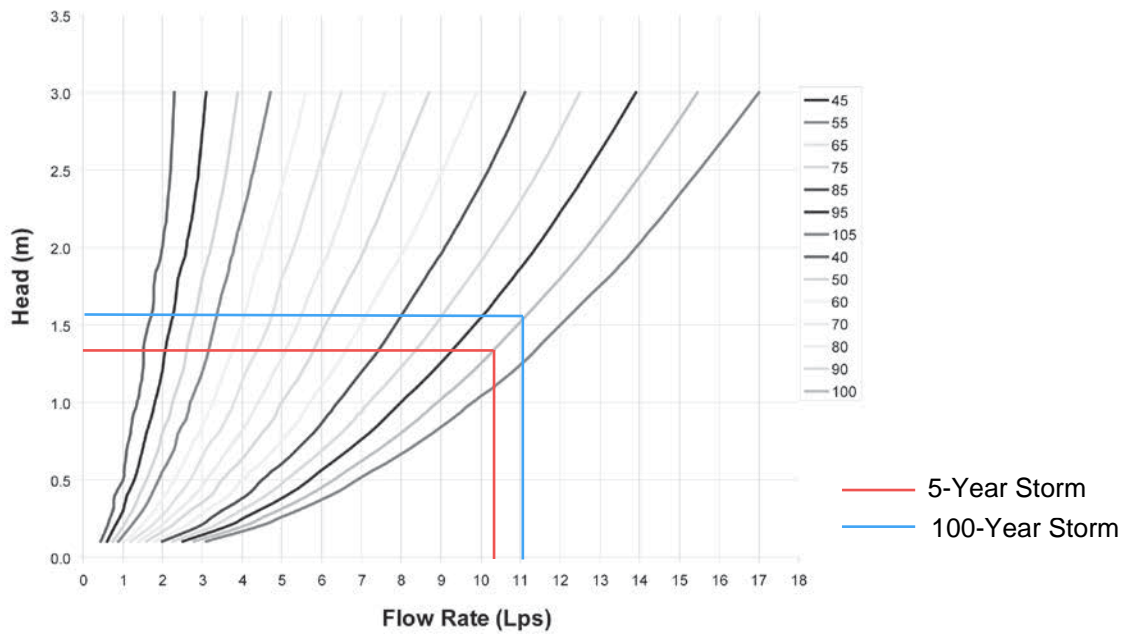
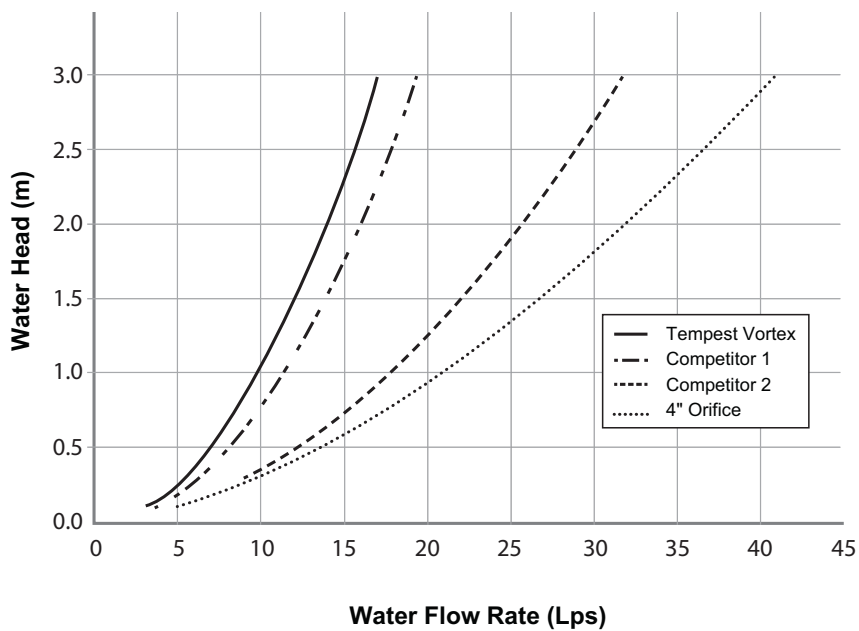


Chart 2: LMF Flow vs. ICD Alternatives



CBMH108 ICD Sizing

LMF70

Chart 1: LMF 14 Preset Flow Curves

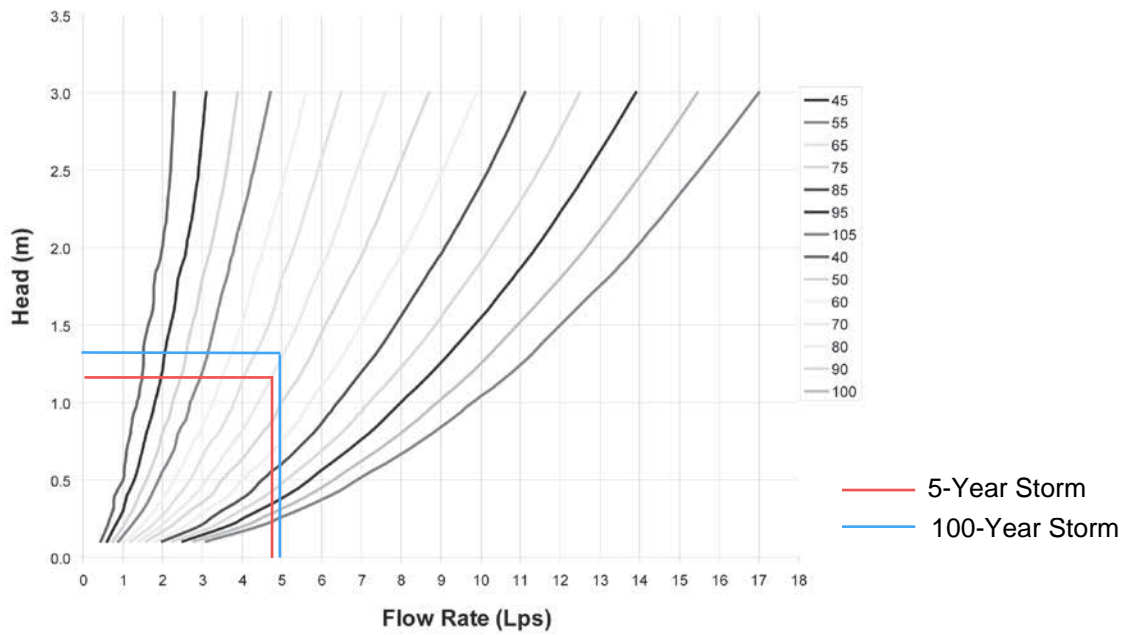
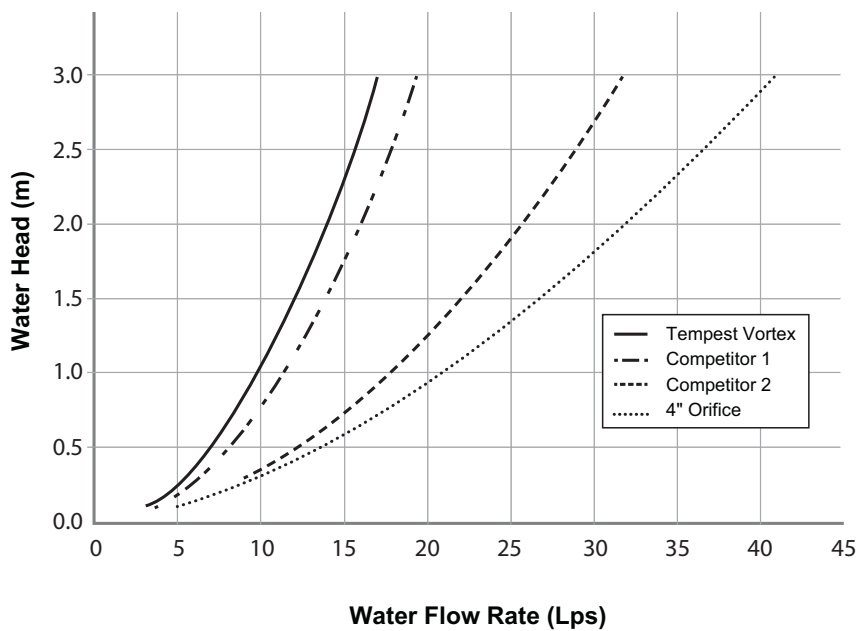


Chart 2: LMF Flow vs. ICD Alternatives



Units: **Metric**

Project: 4149 Strandherd Drive (117148) - ST-CBMH113

By: Conrad Stang

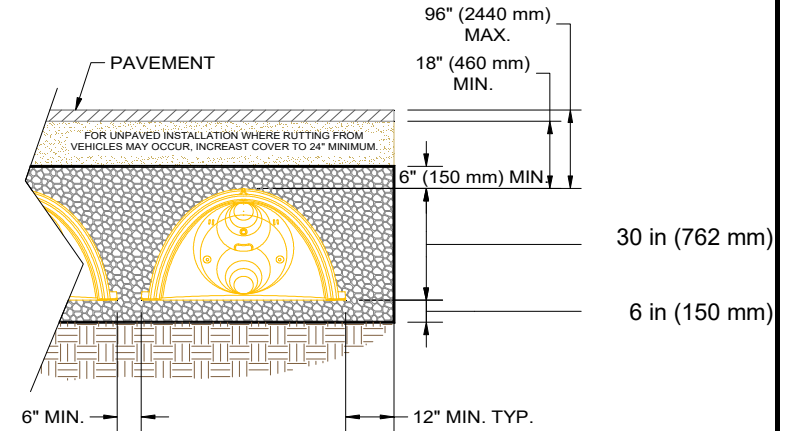
Point of Contact

Date:

22-Oct-20

System Requirements

Required Storage Volume	72	cubic meters
Select Stormtech Chamber System	SC-740	
Stone Porosity (Industry Standard = 40%)	40%	
Stone Foundation Depth	150	mm
Storage Volume Per Chamber	2.12	cubic meters
Avg Cover over Chambers (460mm min. & 2440mm max.)	700	mm



Number of Chambers Required - 34

Approximate Bed Size Required	127	square meters
Tons of Stone Required	151	Tonnes
Volume of Excavation	205	cubic meters
Area of Filter Fabric	393	square meters
# of End Caps Required	4	Each
Length of ISOLATOR ROW	36.89	m
ISOLATOR FABRIC	55	square meters

Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)

Controlled by Length

Width	4	m
# of Chambers Long	17	EA
# of Rows	2	EA
Actual Length	37.99	m
Actual Width	3.35	m

Length	50	m
# of Chambers long	-	EA
# of Rows	-	EA
Actual Length	-	m
Actual Width	-	m

Material Estimate

To use this sheet: Please enter data into the blue and green cells. If switching between Imperial and Metric units please check the correct units and data is input in the green cells.

Please call StormTech @ 888-892-2694 for conceptual cost estimates.



Units: **Metric**

Project: 4149 Strandherd Drive (117148) - ST-CBMH119

By: Conrad Stang

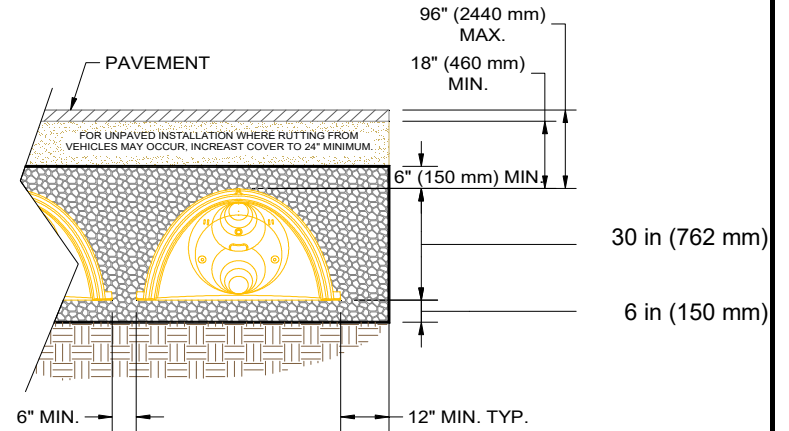
Point of Contact

Date:

22-Oct-20

System Requirements

Required Storage Volume	67	cubic meters
Select Stormtech Chamber System	SC-740	
Stone Porosity (Industry Standard = 40%)	40%	
Stone Foundation Depth	150	mm
Storage Volume Per Chamber	2.12	cubic meters
Avg Cover over Chambers (460mm min. & 2440mm max.)	700	mm



Number of Chambers Required - 32

Approximate Bed Size Required	120	square meters
Tons of Stone Required	142	Tonnes
Volume of Excavation	193	cubic meters
Area of Filter Fabric	371	square meters
# of End Caps Required	4	Each
Length of ISOLATOR ROW	34.72	m
ISOLATOR FABRIC	52	square meters

Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)

Controlled by Length

Width	4	m
# of Chambers Long	16	EA
# of Rows	2	EA
Actual Length	35.82	m
Actual Width	3.35	m

Length	50	m
# of Chambers long	-	EA
# of Rows	-	EA
Actual Length	-	m
Actual Width	-	m

Material Estimate

To use this sheet: Please enter data into the blue and green cells. If switching between Imperial and Metric units please check the correct units and data is input in the green cells.

Please call StormTech @ 888-892-2694 for conceptual cost estimates.

Parameters

Units: Metric

Storage Volume: 126 Cu m

Chamber Selection: S-29

Header Row Position: Left

Fill Over Embedment Stone: 300 mm

Controlled By: width 10 m

Embedment Stone mm:

Over: 150 Under: 150 Porosity: 0.4

Min 150mm over and under

Double Stacked

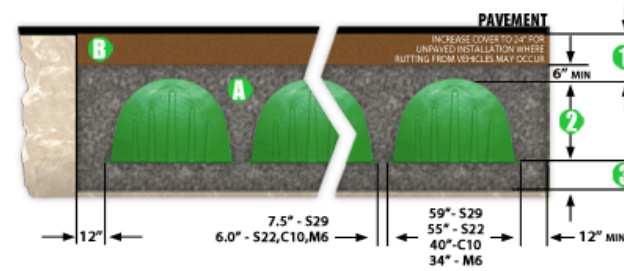
Double Stacked?: No

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

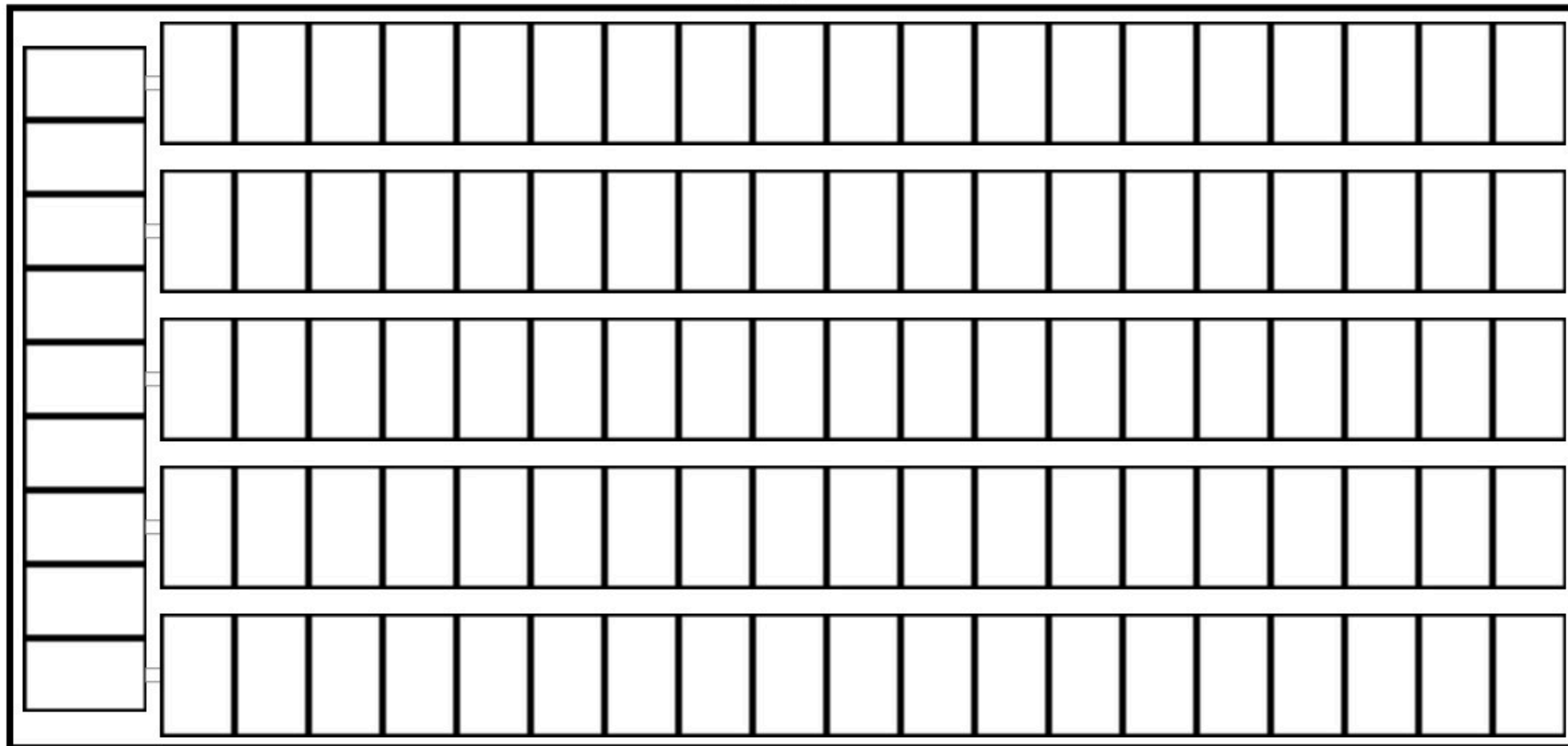


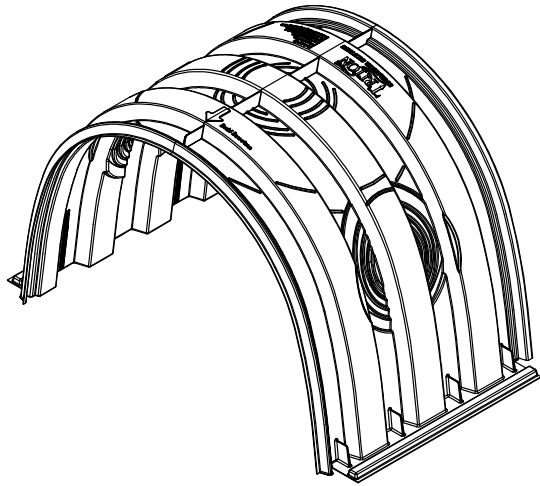
1	Total Cover Over Chambers: 301 mm
2	Height Of Chamber: 915 mm
3	Embedment Stone Under Chambers: 151 mm
A	Volume of Embedment Stone Required: 121 Cu. m
B	Volume of Fill Material Required: 50 Cu. m
	Total Storage Provided: 130 Cu. m
	Type Of Chambers: S-29
	# Of Chambers Required: 104
	# Of End Caps Required: 12
	Required Bed Size: 167 Sq. m
	Volume of Excavation: 203 Cu. m
	* Area of Filter Fabric: 234 Sq. m
	# of Chambers Long: 19
	# of rows: 5
	Actual Trench Length: 18.79 m
	Actual Trench Width: 8.86 m

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

18.79 m

8.86 m

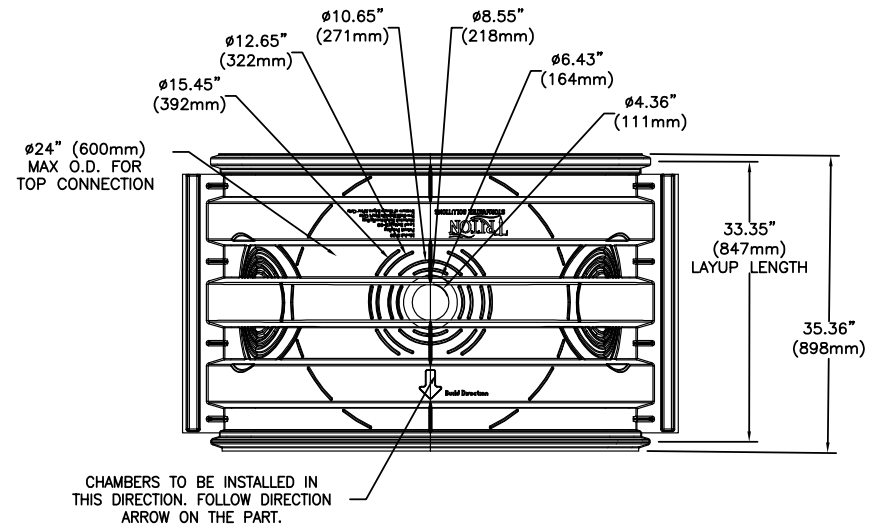
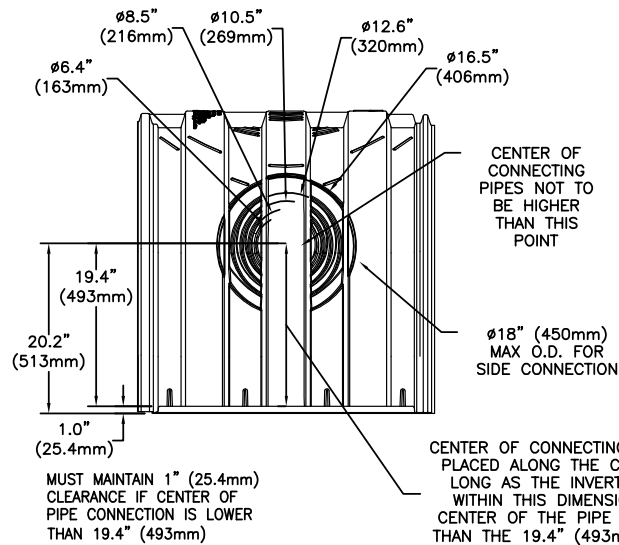
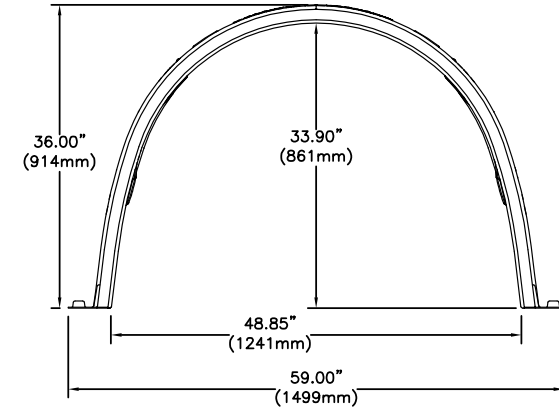




S-29 CHAMBER SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	33.35" X 59.00" X 36.00" (847mm X 1499mm X 914mm)
BARE CHAMBER STORAGE	27.35 CUBIC FEET (0.774 CUBIC METERS)
*MIN INSTALLED STORAGE	41.05 CUBIC FEET (1.162 CUBIC METERS)
CHAMBER WEIGHT	32 lbs (14.515 kg)
STORAGE PER LINEAR FOOT WITHOUT STONE	9.84 CUBIC FEET (0.279 CUBIC METERS)
STORAGE PER LINEAR FOOT WITH STONE	14.77 CUBIC FEET (0.418 CUBIC METERS)

*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)

NOTE: S-29 CHAMBER DETAILS TESTED AND RATED FOR H-30 LOAD CONDITIONS WITH 18" (457mm) OF COVER AND NO PAVEMENT.



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.

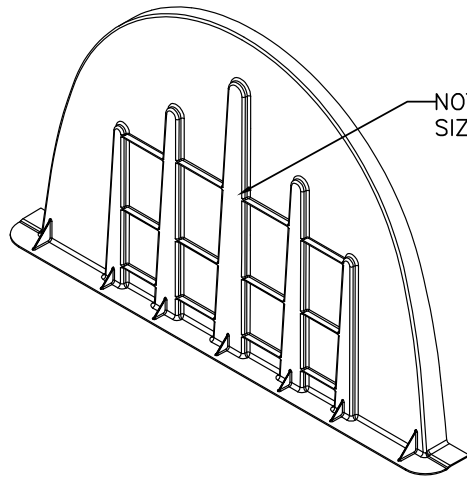


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S-29 CHAMBER DETAIL

TRITON - STANDARD DETAILS

REVISED:
02-26-16 JWM

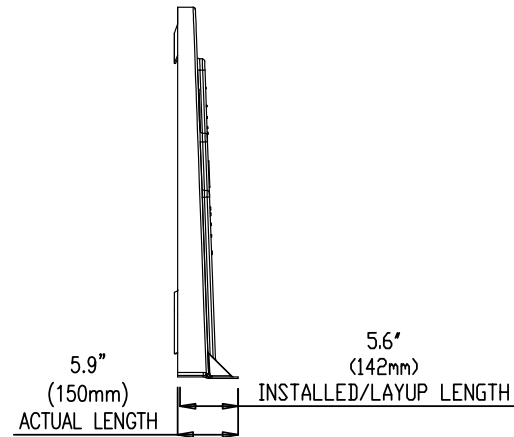
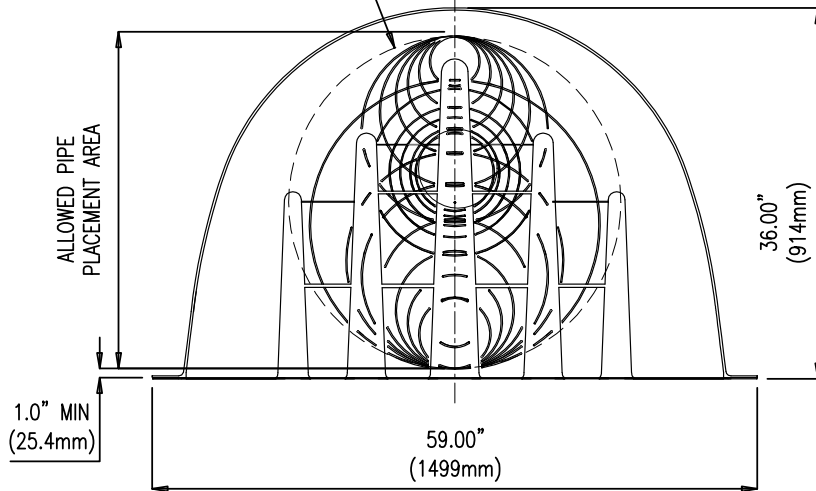


S-29 END CAP SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	5.90" X 59.00" X 36.00" (150mm X 1499mm X 914mm)
BARE END CAP STORAGE	1.031 CUBIC FEET (0.029 CUBIC METERS)
*MIN INSTALLED STORAGE	4.98 CUBIC FEET (0.141 CUBIC METERS)

*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)

Ø32" (810mm) MAX O.D.
FOR END CONNECTION
(see page 2 for guide diameters)

ALL PIPE CONNECTIONS
MUST BE INSTALLED ALONG
CHAMBER CAP CENTERLINE.



THE END CAP FITS UP ON THE OUTSIDE
OF THE S-29 CHAMBER. REFER TO
INSTALLATION MANUAL FOR FURTHER DETAIL.

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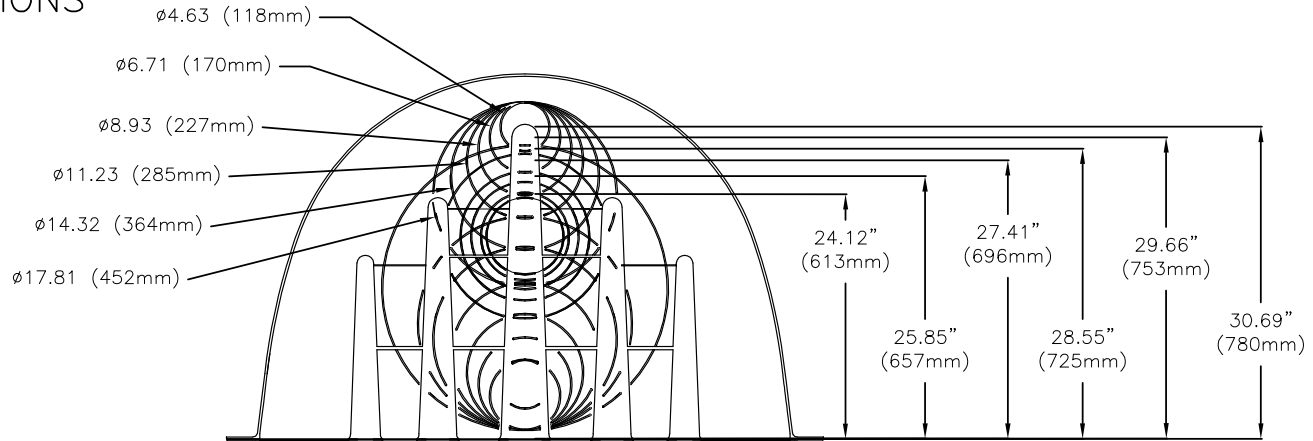
S-29 CHAMBER END CAP DETAIL

TRITON - STANDARD DETAILS

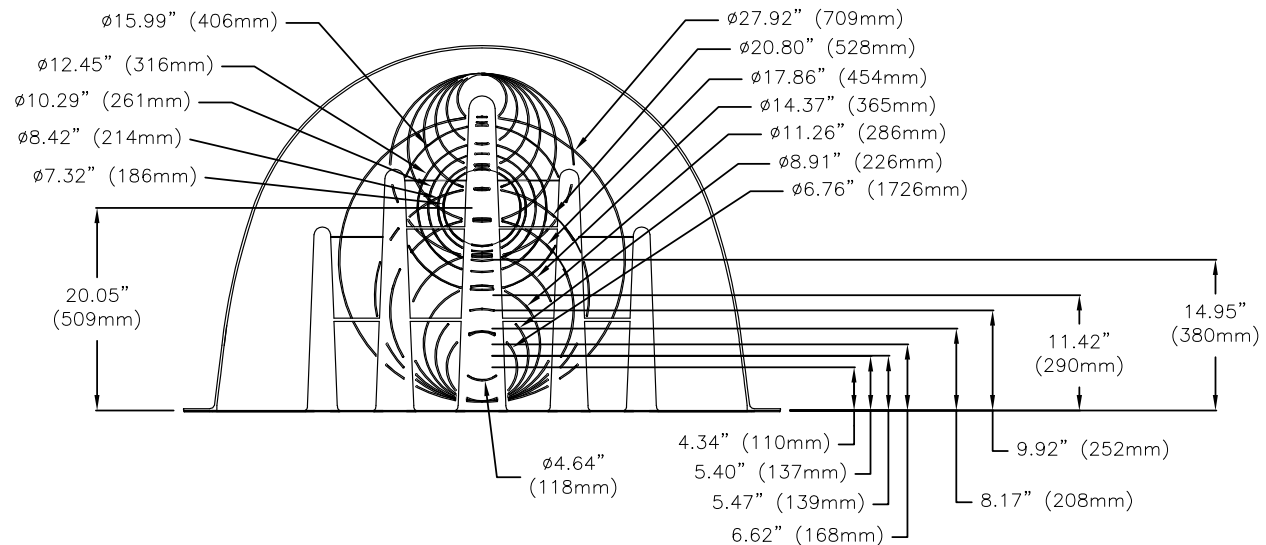
PAGE 1 OF 2

REVISED:
02-26-16 JWM

S-29 END CAP:
TOP HOLE DIMENSIONS



S-29 END CAP:
CENTER AND BOTTOM HOLE DIMENSIONS



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S-29 CHAMBER END CAP DETAIL

TRITON - STANDARD DETAILS

PAGE 2 OF 2

REVISED:

02-26-16 JWM

TRITON S-29 PRODUCT SPECIFICATIONS

1.0 General

1.1 Triton chambers are designed to control stormwater runoff. As a subsurface retention or detention system, Triton chambers retain and allow effective infiltration of water into the soil. As a subsurface detention system, Triton chambers detain and allow for the metered flow of water to an outfall.

2.0 Chamber Parameters

2.1 The chamber shall be injection compression molded of a structural grade 1010 green soy resin composite to be inherently resistant to environmental stress cracking (ESCR), creep, and to maintain proper stiffness through temperature ranges of -40 degrees F to 180 degrees F.

2.2 The material property for the chamber and end cap must meet or exceed the following:

Tensile Strength- Ultimate: 21,755 PSI

Tensile Strength-Yield: 17,404 PSI

Tensile Modulus: 1,750-2,240 PSI

Flex Modulus: 1,600 KSI

Flex Yield Strength: 33,100 PSI

Compressive Strength: 30,457,000 PSI

Shear Strength: 11,500 PSI

2.3 The nominal chamber dimensions of the Triton S-29 shall be 36.0 inches tall, 59.0 inches wide and 35.0 inches long. Lay-up length is 33.35"

2.4 The chamber shall have an elliptical curved section profile.

2.5 The chamber shall be open-bottomed.

2.6 The chamber shall incorporate an overlapping corrugation joint system to allow chamber rows to be constructed.

2.7 The nominal storage volume of a Triton S-29 chamber shall be 41.06 cubic feet per chamber when installed per Triton's typical details. This equates to 2.67 cubic feet of storage/square foot of bed. This does not include perimeter stone.

2.8 The chamber shall have both of its ends open to allow for unimpeded hydraulic flows and visual inspections down a row's entire length.

2.9 The chamber shall have five corrugations to achieve strengths defined above.

2.10 The chamber shall have five circular and elliptical, indented and raised, surfaces on the top to the chamber for a maximum of 33 inch diameter optional top feed inlets, inspection ports and or clean-out access ports.

2.11 The chamber shall have 5 elliptical, indented, surfaces on either side of the chamber for optional feed inlets, outlets. Capable of accepting pipe O.D. up to 18 inches.

2.12 The chamber shall be analyzed, designed and field tested using AASHTO LRFD bridge design specifications 1. Design live load shall meet or exceed the AASHTO HS30 or a rear axle load of 48,000 pounds. Design shall consider earth and live loads without pavement as appropriate for the minimum of 18" of total cover to a maximum total cover of 50'.

2.13 The chamber shall be manufactured in an ISO 9001:2008 certified facility

2.14 The service life of the product is over 60 years under a constant sustained load of 10,000 PSI which is equal to the H-20 loading condition. Under typical loading conditions the Chamber and End Cap has a useful lifespan of 120 years from date of when manufactured.

2.15 Designed to exceed ASTM F2418, F2787, F2922 standard and AASHTO LRFD Bridge specifications. Validated through independent third party performance testing.

3.0 End Cap Parameters

3.1 The end cap shall be Injection Compression molded of 1010 green soy resin to be inherently resistant to environmental stress cracking (ESCR), creep and to maintain proper stiffness through temperature ranges of -40 degrees F to 180 degrees F.

3.2 The end cap shall be designed to fit over the last corrugation of a chamber, which allows: the capping of each end of the chamber row.

3.3 The end cap shall have six upper saw guides capable of accepting pipe O.D. up to 18.2" Six middle saw guides and eight lower saw guides capable of accepting pipe O.D. up to 28.2" to allow easy cutting for various diameters of pipe that may be used to inlet or outlet the system.

3.4 The end cap shall have excess structural adequacies to allow cutting an orifice of any size at any invert elevation.

3.5 The primary face of an end cap shall have 5 corrugations and be angled outward to resist horizontal loads generated near the edges of beds.

3.6 The end cap shall be manufactured in an ISO 9001:2008 certified facility.

3.7 The service life of the product to be over 60 years under a sustained load of 10,000 PSI which is equal to the H-20 loading condition.

4.0 Installation

4.1 Installation shall be in accordance with the latest Triton Installation manual that can be downloaded from the Triton website:
www.tritonsws.com/support/downloads

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S-29 PRODUCT SPECIFICATIONS

TRITON - STANDARD DETAILS

REVISED:

05-25-17 JWM

Parameters

Units: Metric

Storage Volume: 163 Cu m

Chamber Selection: S-29

Header Row Position: Left

Fill Over Embedment Stone: 300 mm

Controlled By: width 10 m

Embedment Stone mm:

Over: 150 Under: 150 Porosity: 0.4

Min 150mm over and under

Double Stacked

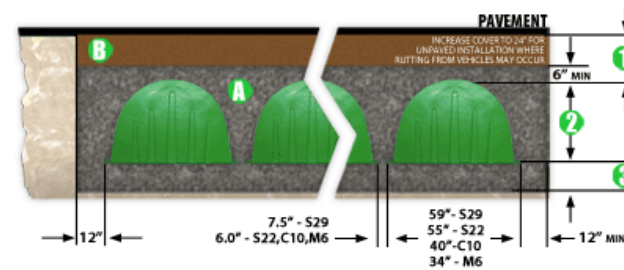
Double Stacked?: No

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: 915 mm

③ Embedment Stone Under Chambers: 151 mm

Ⓐ Volume of Embedment Stone Required: 153 Cu. m

Ⓑ Volume of Fill Material Required: 64 Cu. m

Total Storage Provided: 166 Cu. m

Type Of Chambers: S-29

Of Chambers Required: 134

Of End Caps Required: 12

Required Bed Size: 212 Sq. m

Volume of Excavation: 258 Cu. m

* Area of Filter Fabric: 292 Sq. m

of Chambers Long: 25

of rows: 5

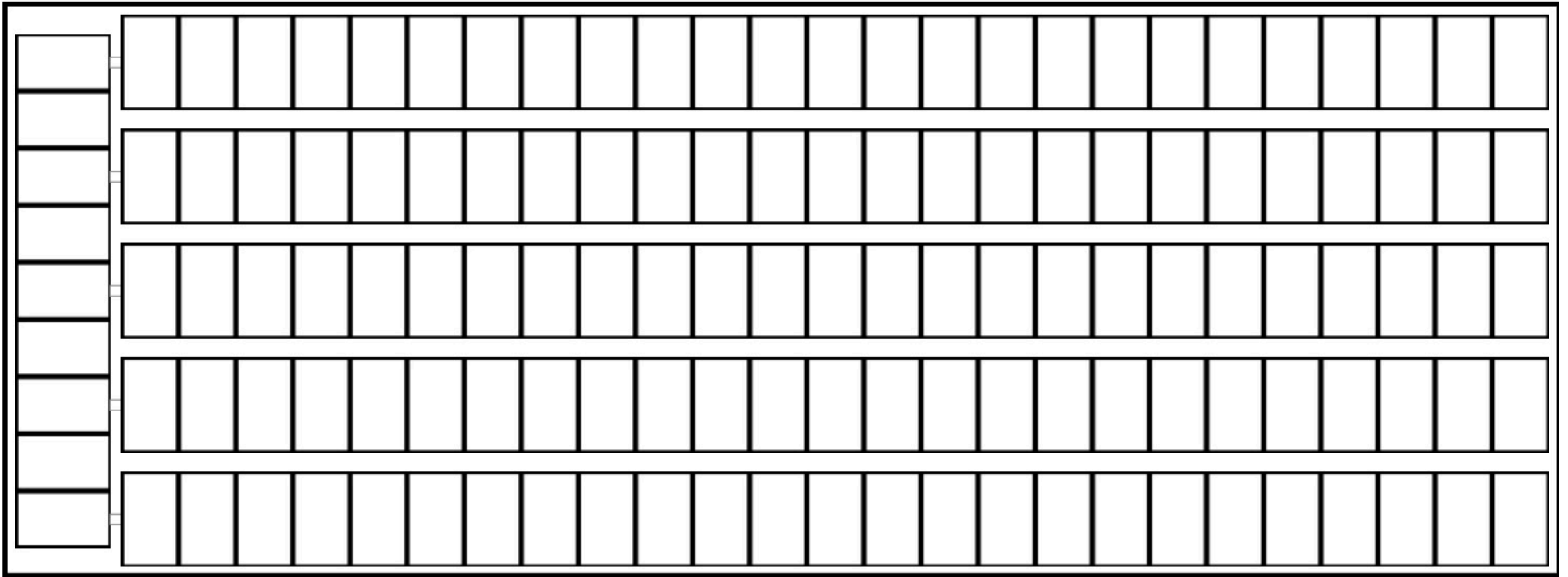
Actual Trench Length: 23.87 m

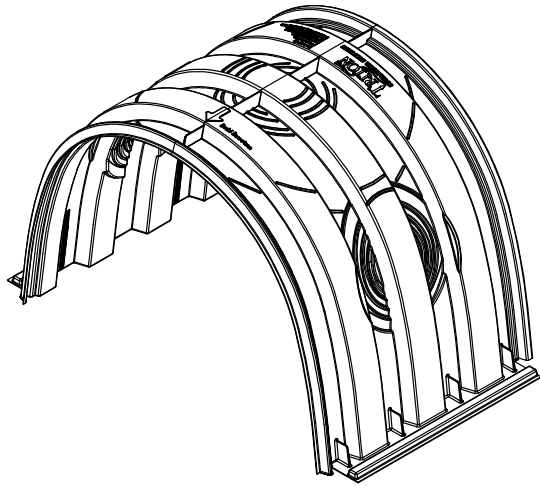
Actual Trench Width: 8.86 m

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

23.87 m

8.86 m

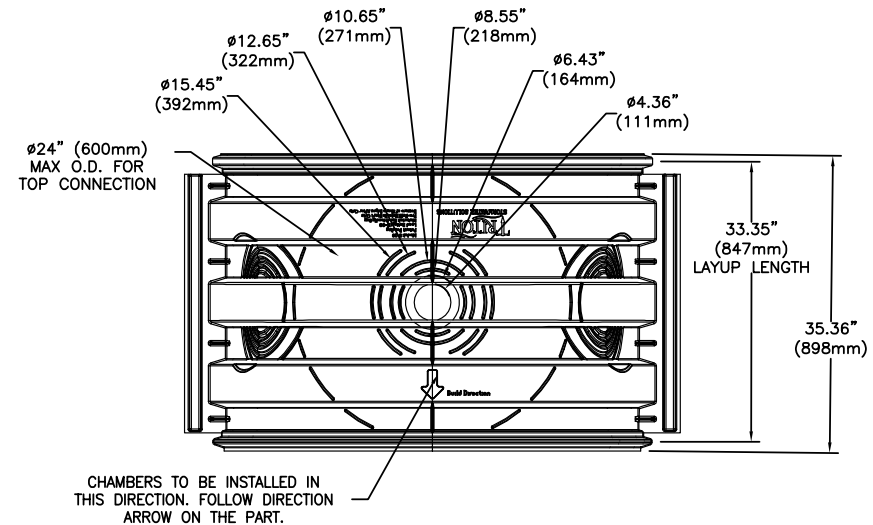
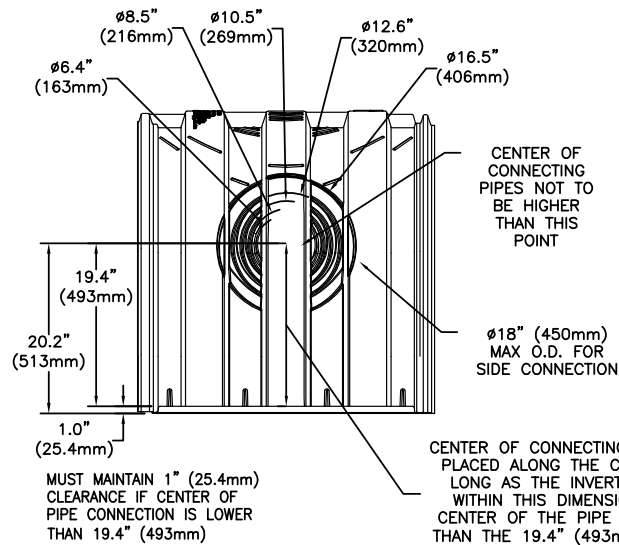
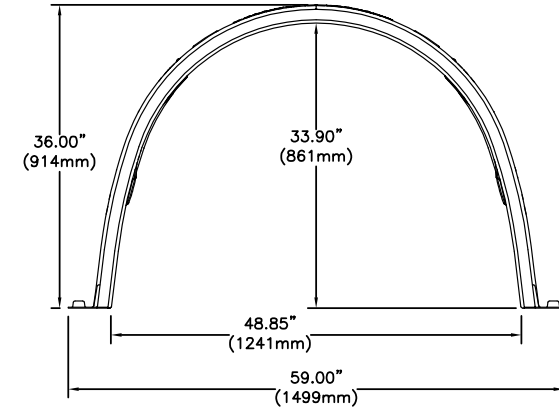




S-29 CHAMBER SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	33.35" X 59.00" X 36.00" (847mm X 1499mm X 914mm)
BARE CHAMBER STORAGE	27.35 CUBIC FEET (0.774 CUBIC METERS)
*MIN INSTALLED STORAGE	41.05 CUBIC FEET (1.162 CUBIC METERS)
CHAMBER WEIGHT	32 lbs (14.515 kg)
STORAGE PER LINEAR FOOT WITHOUT STONE	9.84 CUBIC FEET (0.279 CUBIC METERS)
STORAGE PER LINEAR FOOT WITH STONE	14.77 CUBIC FEET (0.418 CUBIC METERS)

*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)

NOTE: S-29 CHAMBER DETAILS TESTED AND RATED FOR H-30 LOAD CONDITIONS WITH 18" (457mm) OF COVER AND NO PAVEMENT.



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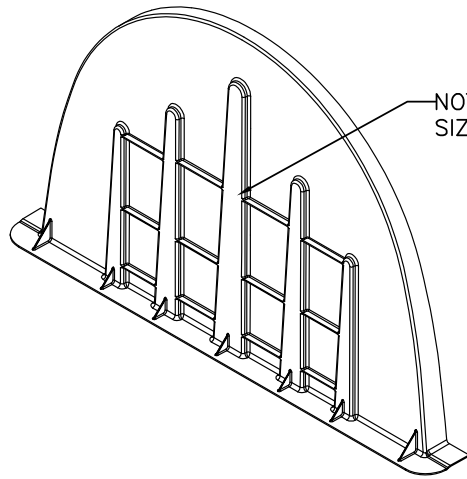


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S-29 CHAMBER DETAIL

TRITON - STANDARD DETAILS

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02-26-16 JWM

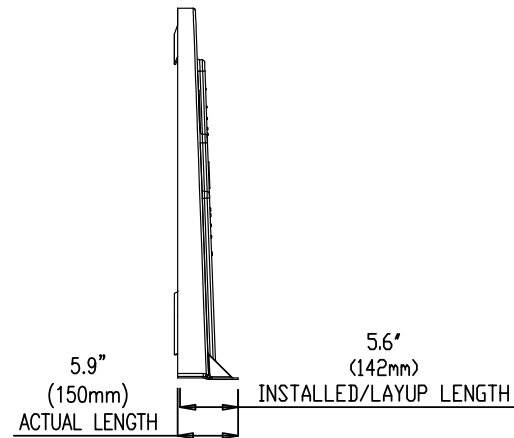
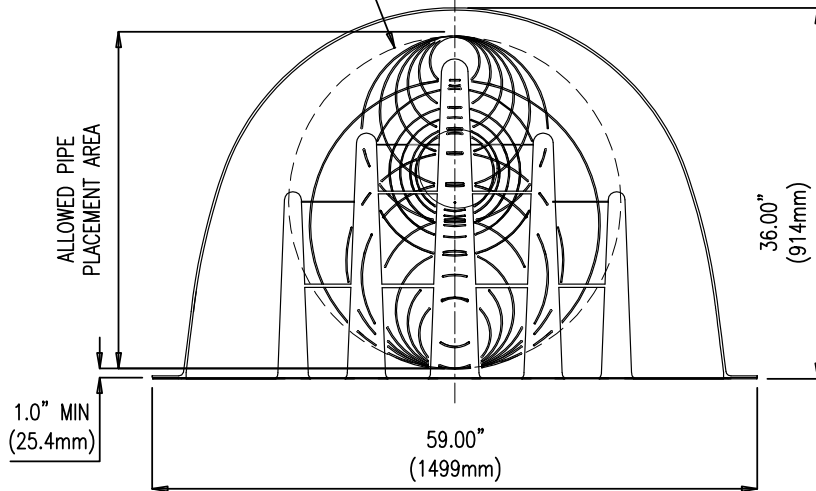


S-29 END CAP SPECS	
NOMINAL DIMENSIONS (LAYUP LENGTH X WIDTH X HEIGHT)	5.90" X 59.00" X 36.00" (150mm X 1499mm X 914mm)
BARE END CAP STORAGE	1.031 CUBIC FEET (0.029 CUBIC METERS)
*MIN INSTALLED STORAGE	4.98 CUBIC FEET (0.141 CUBIC METERS)

*ASSUMING A MIN OF 6" (152mm) STONE ABOVE AND BELOW AND 7.5" (191mm) BETWEEN ROWS WITH 40% STONE POROSITY (DOES NOT INCLUDE 12" (305mm) PERIMETER STONE VOLUME)

Ø32" (810mm) MAX O.D.
FOR END CONNECTION
(see page 2 for guide diameters)

ALL PIPE CONNECTIONS
MUST BE INSTALLED ALONG
CHAMBER CAP CENTERLINE.



THE END CAP FITS UP ON THE OUTSIDE
OF THE S-29 CHAMBER. REFER TO
INSTALLATION MANUAL FOR FURTHER DETAIL.

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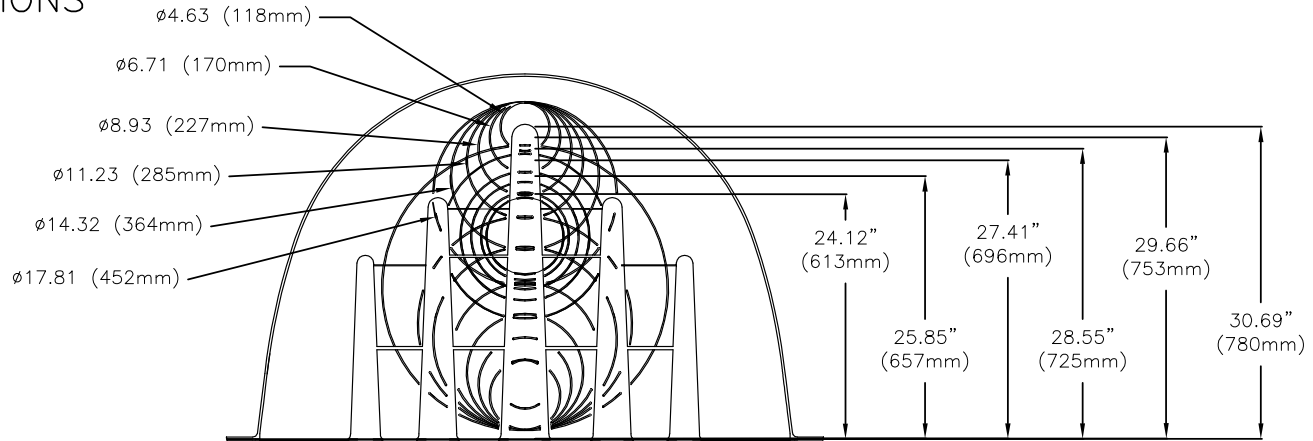
S-29 CHAMBER END CAP DETAIL

TRITON - STANDARD DETAILS

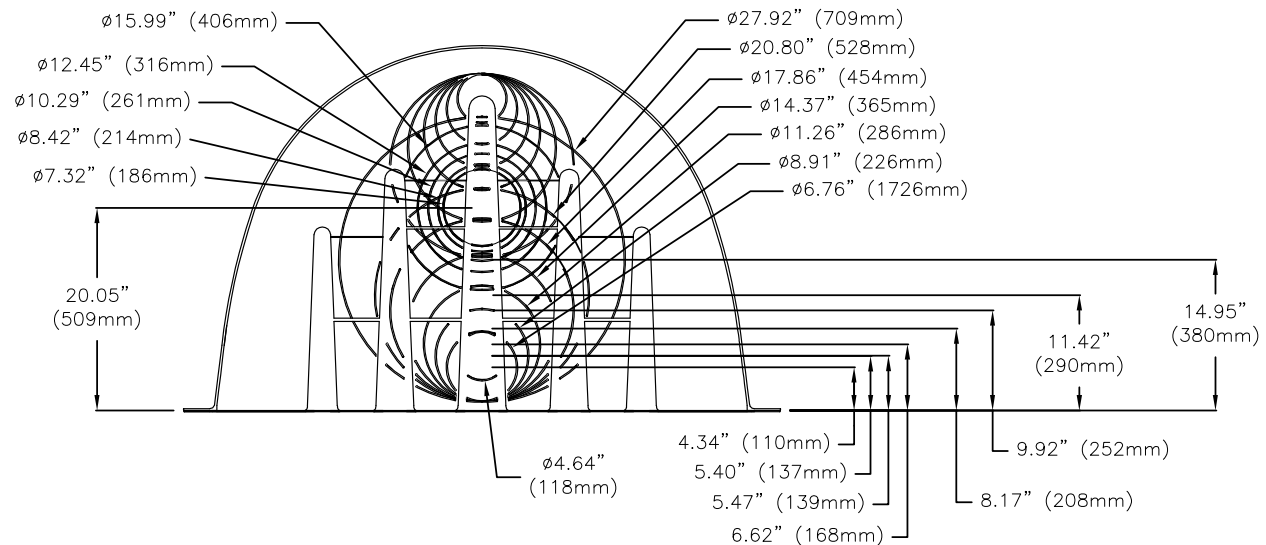
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S-29 END CAP:
TOP HOLE DIMENSIONS



S-29 END CAP:
CENTER AND BOTTOM HOLE DIMENSIONS



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S-29 CHAMBER END CAP DETAIL

TRITON - STANDARD DETAILS

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TRITON S-29 PRODUCT SPECIFICATIONS

1.0 General

1.1 Triton chambers are designed to control stormwater runoff. As a subsurface retention or detention system, Triton chambers retain and allow effective infiltration of water into the soil. As a subsurface detention system, Triton chambers detain and allow for the metered flow of water to an outfall.

2.0 Chamber Parameters

2.1 The chamber shall be injection compression molded of a structural grade 1010 green soy resin composite to be inherently resistant to environmental stress cracking (ESCR), creep, and to maintain proper stiffness through temperature ranges of -40 degrees F to 180 degrees F.

2.2 The material property for the chamber and end cap must meet or exceed the following:

Tensile Strength- Ultimate: 21,755 PSI

Tensile Strength-Yield: 17,404 PSI

Tensile Modulus: 1,750-2,240 PSI

Flex Modulus: 1,600 KSI

Flex Yield Strength: 33,100 PSI

Compressive Strength: 30,457,000 PSI

Shear Strength: 11,500 PSI

2.3 The nominal chamber dimensions of the Triton S-29 shall be 36.0 inches tall, 59.0 inches wide and 35.0 inches long. Lay-up length is 33.35"

2.4 The chamber shall have an elliptical curved section profile.

2.5 The chamber shall be open-bottomed.

2.6 The chamber shall incorporate an overlapping corrugation joint system to allow chamber rows to be constructed.

2.7 The nominal storage volume of a Triton S-29 chamber shall be 41.06 cubic feet per chamber when installed per Triton's typical details. This equates to 2.67 cubic feet of storage/square foot of bed. This does not include perimeter stone.

2.8 The chamber shall have both of its ends open to allow for unimpeded hydraulic flows and visual inspections down a row's entire length.

2.9 The chamber shall have five corrugations to achieve strengths defined above.

2.10 The chamber shall have five circular and elliptical, indented and raised, surfaces on the top of the chamber for a maximum of 33 inch diameter optional top feed inlets, inspection ports and or clean-out access ports.

2.11 The chamber shall have 5 elliptical, indented, surfaces on either side of the chamber for optional feed inlets, outlets. Capable of accepting pipe O.D. up to 18 inches.

2.12 The chamber shall be analyzed, designed and field tested using AASHTO LRFD bridge design specifications 1. Design live load shall meet or exceed the AASHTO HS30 or a rear axle load of 48,000 pounds. Design shall consider earth and live loads without pavement as appropriate for the minimum of 18" of total cover to a maximum total cover of 50'.

2.13 The chamber shall be manufactured in an ISO 9001:2008 certified facility

2.14 The service life of the product is over 60 years under a constant sustained load of 10,000 PSI which is equal to the H-20 loading condition. Under typical loading conditions the Chamber and End Cap has a useful lifespan of 120 years from date of when manufactured.

2.15 Designed to exceed ASTM F2418, F2787, F2922 standard and AASHTO LRFD Bridge specifications. Validated through independent third party performance testing.

3.0 End Cap Parameters

3.1 The end cap shall be Injection Compression molded of 1010 green soy resin to be inherently resistant to environmental stress cracking (ESCR), creep and to maintain proper stiffness through temperature ranges of -40 degrees F to 180 degrees F.

3.2 The end cap shall be designed to fit over the last corrugation of a chamber, which allows: the capping of each end of the chamber row.

3.3 The end cap shall have six upper saw guides capable of accepting pipe O.D. up to 18.2" Six middle saw guides and eight lower saw guides capable of accepting pipe O.D. up to 28.2" to allow easy cutting for various diameters of pipe that may be used to inlet or outlet the system.

3.4 The end cap shall have excess structural adequacies to allow cutting an orifice of any size at any invert elevation.

3.5 The primary face of an end cap shall have 5 corrugations and be angled outward to resist horizontal loads generated near the edges of beds.

3.6 The end cap shall be manufactured in an ISO 9001:2008 certified facility.

3.7 The service life of the product to be over 60 years under a sustained load of 10,000 PSI which is equal to the H-20 loading condition.

4.0 Installation

4.1 Installation shall be in accordance with the latest Triton Installation manual that can be downloaded from the Triton website:
www.tritonsws.com/support/downloads

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S-29 PRODUCT SPECIFICATIONS

TRITON - STANDARD DETAILS

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05-25-17 JWM

**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 A
<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 B
<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 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 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, Standards and References
<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 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	Appendix C
<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 C
<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	Appendix C, Section 4.2

<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.	Site Servicing Plan (C101)
<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 C
<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 Proposed 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)	Section 5.3 Proposed Sanitary Design
<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 Proposed 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 Sewer Design & Section 7.0 Proposed 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 Sewer Design & Section 7.0 Proposed 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 Sewer Design & Section 7.0 Proposed 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 Sewer Design & Section 7.0 Proposed 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 G

<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 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 7.0 Proposed Stormwater Management Appendix G
<input type="checkbox"/> Any proposed diversion of drainage catchment areas from one outlet to another.	Section 6.0 Stormwater Sewer Design & Section 7.0 Proposed 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 Sewer Design & Section 7.0 Proposed 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.	N/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 Sewer Design & Section 7.0 Proposed 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 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 8.0 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 9.0 Summary Section 10.0 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