**PROPOSED RESIDENTIAL DEVELOPMENT**

**12717 NINTH LINE**

**TOWN OF WHITCHURCH-STOUFFVILLE, ONTARIO**

# SERVICING & STORM WATER MANGEMNT REPORT

**September 17, 2026**

**PREMIER ENGINEER SOLUTIONS**

**CIVIL ENGINEERS AND CAD SPECIALISTS**

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## 1.0 Introduction

The intent of this report is to present functional servicing and storm water management design strategy for a proposed townhouse development at 12717 Ninth line in the town of Whitchurch-Stouffville, Ontario.

The subject site is about 0.30 hectares and located on east side of Ninth line and North of Bayberry Street in town of Stouffville. The site location is shown in Figure 1.




Figure 1 - Site Location Plan

Under existing conditions, the site contains one single-storey building, asphalt access driveway, wood deck, frame shed and a swimming pool surrounded by chain link fence.

It is proposed to redevelop the site with 40 apartment units with visitor parking, with proposed Building Area 1,519.2m$^2$. The total Ground Floor Area (GFA) will be 4,991.59m2. The existing drainage pattern is sheet flow towards the west side. The site gradient falls from 280.00 on the north east property limit to 278.50 at the south west corner. The existing grades around the site are proposed to be matched at the boundary limits.

The proposed grading of the area is to allow the runoff discharge to the existing ditch located along east of the Ninth line. The existing ditch will be re-graded for this purpose. The proposed sanitary system will be connected with existing sanitary plug dia 200mm available on the north side of the site. The proposed water main will be connected with the existing 400mm dia water main at Ninth Line.

A storm water management (SWM) study was carried out and all the services are designed based on the guidelines as stipulated by the city of Whitchurch-Stouffville, May 2020.

## 2.0 Storm Water Management Criteria

Quantity

Post Development Flows from 5 to 100 years of rainfall will be controlled to Pre-Development flows of respective year of storms.

The storm network shall be sized to convey the 5-year storm flow

Quality

Water quality enhancement has to be achieved (80% TSS removal, MOE Level 1) through the use of best management practices and TSS removal with an oil/grit separator.

Water Balance

5mm of rainfall be retained by infiltration, Green Roof, evapotranspiration on any other method.

Erosion and Sediment Control

Adequate measures are to be implemented to minimize the transportation of sediments out of the new construction area.

Storm Water Management Plan

The Rainfall intensities shall be calculated in accordance with the values for the 3-parameter equation:
Intensity = A / (t+B) ^C, where:

- A, B and C parameters are provided in Table below, and
- "t" is the Time of Concentration. = 10 min

The nearest long-term Environment and Climate Change Canada station to **Whitchurch-Stouffville** that has commonly been used for IDF development is **Toronto Buttonville Airport (Markham)**.

**TABLE 1 Intensity-Duration-Frequency Parameters, City of Whitchurch-Stouffville**

| Return Period | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
|---|---|---|---|---|---|---|
| A | 812 | 1004 | 1135 | 1308 | 1452 | 1605 |
| B | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| C | 0.77 | 0.77 | 0..77 | 0.77 | 0.77 | 0..77 |
| Intensity (mm/hr) | 89.62 | 110.81 | 125.27 | 144.37 | 160.26 | 177.15 |

The "Modified Rational Method" is used to estimate the flow from the drainage areas. The method calculates the flow Q in $m^3$/sec as

Q = 2.778 (ACi)

Where,
Q = Run-off quantity in m3/sec.
`
C = Run-off coefficient
i = Average rainfall intensity in mm/hr

## 2.1 Land Use Breakdown and Composite Ruoff Coefficients

### 2.1.1 Pre-Development and Post Development Conditions

The Pre and Post Development Drainage Plans are shown **Appendix 'A1'** and **Appendix 'A2'** The land use and runoff co-efficient area shown in **Table 2** and **Table3** below. There is no existing storm system, and the drainage is sheet flow, from East direct to the West direction towards the existing ditch along ninth line.

**LAND USE BREAKDOWN AND COMPOSITE RUNOFF COEFFICIENT**
**EXISTING AND PROPOSED CONDITION**

**TABLE 2 PRE-DEVELOPMENT RUNOFF COEFFICIENT**
**Runoff Coefficient Drainage(AREA 101)**

| **Existing Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Existing Building | 174 | 0.9 | 156.6 |
| Paved Driveway | 183 | 0.9 | 164.7 |
| Deck | 18 | 0.9 | 16.2 |
| Swimming Pool | 197 | 0.9 | 177.3 |
| Concrete Pad | 274 | 0.9 | 246.6 |
| Grass | 2154 | 0.25 | 538.5 |
| Total | 3000 | | 1299.9 |

**Pre-Development Composite Runoff Coefficient(R)** **=** 1299.9/3000
0.43

**TABLE 3 POST-DEVELOPMENT RUNOFF COEFFICIENT WHOLE SITE**

| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Proposed Buiding | 1519 | 0.9 | 1367.1 |
| Paved/Sidewalk | 744 | 0.9 | 669.6 |
| Grass | 737 | 0.25 | 184.25 |
| Total | 3000 | | 2220.95 |

**Post-Development Composite Runoff Coefficient(R)** =2221/3000
0.74

As the Post-Development cumulative drainage area is greater than the pre-development cumulative area, we need to do **Quantity Control** to bring down the runoff less or equal to pre-development runoff flows.

### 2.1.2 Post-Development Catchment Areas

The Drainage area are divided into four zones, **AREA 201, AREA 202, AREA 203 and AREA 204.** The land use and the runoff co-efficient are shown in **Table 4, Table 5, Table 6 and Tabl**

**TABLE 4 POST-DEVELOPMENT RUNOFF COEFFICIEN AREA 201**

**Runoff Coefficient Drainage Area 201**

| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Asphalt Pavement | 513 | 0.9 | 461.7 |
| Sidewalk | 103 | 0.9 | 92.7 |
| Grass | 107 | 0.25 | 26.75 |
| Total | 723 | | 581.15 |

**Pre-Development Composite Runoff Coefficient(R) = 581.5/723**
**0.80**

**TABLE 5 POST-DEVELOPMENT RUNOFF COEFFICIEN AREA 202**

**Runoff Coefficient Drainage Area 202**

| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Roof | 1519 | 0.9 | 1367.1 |
| Total | 1519 | | 1367.1 |

**Pre-Development Composite Runoff Coefficient(R) =** 1367.1/1519
0.90

**TABLE 6 POST-DEVELOPMENT RUNOFF COEFFICIEN AREA 203**

**Runoff Coefficient Drainage Area 203**

| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Landscape | 270 | 0.25 | 67.5 |
| Paved/Sidewalk | 42 | 0.9 | 37.8 |
| Total | 312 | | 105.3 |

**Post-Development Composite Runoff Coefficient(R)** **=** 105.3/312
0.34

**TABLE 7 POST-DEVELOPMENT RUNOFF COEFFICIEN AREA 204**

**Runoff Coefficient Drainage Area 204**

| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Landscape | 264 | 0.25 | 66 |
| Paved/Sidewalk | 136 | 0.9 | 122.4 |
| Total | 400 | | 188.4 |

**Post-Development Composite Runoff Coefficient(R)** 188.4/400
=0.47

The Pre and Post-Development Drainage Plans are shown in **Appendix A1 and Appendix A2**.

## 3.0 Quantity Control

The Pre-Development and post development flows are calculated using Modified Rational formula. We are proposing rainwater flow from areas AREA 201 and AREA 202 to be controlled.

The parking area is on the ground covered by the ceiling of the first floor. To ensure that only allowable 2-year predevelopment flow to be released from the north side. The roof rainwater will be stored on the roof temporarily and discharged slowly by Zurn Control Roof Drains. The Parking area rainwater will be stored on the open asphalt parking. The rainwater will be controlled by an orifice. The total rainwater discharging to the existing ditch will be such that 2-Year Post-Development flow will be less than the 2-Year and storms up to 100Year will be less than the Pre-Development Flow.

### 3.1 ROOF STORAGE (AREA 201)

Part of the detention storage required to control the post development peak flows can be obtained by using roof top ponding. Controlled flow drains (Zurn-Z-105 or equivalent) will be installed on roof tops. Three Zurn Drain Z105 are being proposed with total flow **13.41 $m^3$/sec** control flow. The calculated total storage volume for the new roof is **49.83 $m^3$**. The storage volume calculations are shown in **Appendix A3**. The storage provided for the building is **70.00$m^3$**.

### 3.2 PARKING LOT STORAGE (AREA 202)

For this purpose spreadsheet calculations have been used to determine the detention volume requirements. We are proposing Vertical Vortex Flow Regulator, **75 VHV-1, with 6 L/sec flow** for head of 1.0525m (279.91-278.82-0.0375). The Graph showing the head and flow will be done at Site Plan Stage. Required detention volume has been computed as 24.06cu.m. A storage volume of 3533 cu. m. has been provided in the proposed SWM detention facility located within the south parking area . Calculations for detention volume requirement are shown in **Appendix A4**

Storage Volume Provided:

| | |
|---|---|
| Surface Area | = 530$m^3$ |
| Maximum Water Depth | =0.20m |
| Storage | =530 x 0.2/3 |
| | 35.3$m^3$ |

## 4.0 Pre-Development and Post Development Flows

Pre-Development and Post-Development Flows from **AREA 101**, **AREA 202** and **AREA 204** calculations are shown in **Appendix A5** and summarized below

**RUNOFF FLOWS TO PRE-DEVELOPMENT FLOWS(WITHOUT CONTROL)**

**TABLE 8**
**Post Development Flows from the Site**

| **Year** | **2** | **5** | **10** | **25** | **50** | **100** |
|---|---|---|---|---|---|---|
| **AREA 101 PRE** | 32.4 | 40.0 | 45.27 | 57.39 | 69.50 | 80.02 |

**RUNOFF FLOWS TO POST-DEVELOPMENT FLOWS(WITHOUT CONTROL)**

**TABLE 9**
**Post Development Flows from the Site**

| **Year** | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| **AREA 201 POST** | 14.4 | 17.8 | 20.14 | 25.53 | 30.92 | 35.61 |
| **AREA 202 POST** | 34.1 | 42.1 | 47.61 | 60.35 | 0.00 | 84.16 |
| **AREA 203 POST** | 2.6 | 3.3 | 3.69 | 4.68 | 5.67 | 6.53 |
| **AREA 204 POST** | 4.9 | 6.0 | 6.83 | 8.65 | 10.48 | 12.07 |
| **TOTAL** | **56.0** | **69.2** | **78.27** | **99.22** | **47.07** | **138.36** |

**RUNOFF FLOWS TO POST-DEVELOPMENT FLOWS( CONTROL)**

**TABLE 10**
**Post Development Flows from the Site**

| **Year** | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **AREA 201 POST** | 6.0 | 6.0 | 6.00 | 6.00 | 6.00 | 6.00 |
| **AREA 202 POST** | 13.40 | 13.40 | 13.40 | 13.40 | 13.40 | 13.40 |
| **AREA 203 POST** | 2.6 | 3.3 | 3.69 | 4.68 | 5.67 | 6.53 |
| **AREA 204 POST** | 4.9 | 6.0 | 6.83 | 8.65 | 10.48 | 12.07 |
| **TOTAL** | **26.9** | **28.7** | **29.92** | **32.74** | **35.55** | **38.00** |

### 4.1 Comparison of Pre-Development and Post Development Flows

**COMPARISION OF PRE-DEVELOPMENT AND POST-DEVELOPMENT FLOWS**

**TABLE 11**
**Post Development Flows from the Site**

| **Year** | **2** | **5** | **10** | **25** | **50** | **100** |
|---|---|---|---|---|---|---|
| **PRE-DEVELOPMENT** | **32.4** | **40.0** | **45.27** | **57.39** | **69.50** | **80.02** |
| **POST-DEVELOPMENT** | **26.9** | **28.7** | **29.92** | **32.74** | **35.55** | **38** |

It can be seen that Post-Development Flows are substantially reduced and less than the respective Storm Events, thus fulfilling that the Post Development Flows should be less than the respective storm flows from the Pre-Development Flows.

## 5.0 WATER BALANCE MANAGEMET

The primary objective of water balance management is to maintain, as much as practicable, the pre-development hydrologic conditions of the site by managing annual rainfall through a combination of infiltration, evapotranspiration, landscaping, rainwater reuse, and other applicable low-impact development (LID) practices. The water balance assessment is intended to minimize changes in site runoff and infiltration characteristics resulting from the proposed development. To achieve the minimum on-site retention requirement, runoff from small design rainfall events is to be retained on site, with a minimum retention target of **5 mm of rainfall**.

**AS per the Town of Stouffville "All efforts should be made to match pre- and post-development infiltration volumes in order to maintain groundwater recharge."**
It also identifies a **minimum 5 mm retention for all storm events**, through infiltration, evapotranspiration and/or rainwater reuse.

**TABLE 12**

**WATER BALANCE**

| **Site Area** | **Area in $m^2$** | **Fraction of Total Area(%)** | **Initial Abstraction For Site Area** | **Initial Abstraction Over Total Site** |
|---|---|---|---|---|
| Extensive Green Roof ( 72%) | 1094 | 36.47% | 10mm | 3.65mm |
| Hard Surface+Roof(28%) | 1186 | 39.53% | 1.0mm | 0.39mm |
| Landscape | 720 | 24.00 | 5mm | 1.2mm |
| **Total** | 4343 | **100%** | | **5.24mm** |

We are proposing Extensive Green Roof to achieve minimum 5mm of rainwater. We have managed to achieve 5.24mm by the proposed system. Detail of Extensive Green Roof will be provided at the Site Plan Stage.

## 6.0 MINOR AND MAJOR DRAINAGE SYSTEM

A network of pipes with catch basins and manholes has been designed for a 5 year return period. The storm sewer design sheet is attached in **Appendix A6**. The site drainage network discharges to the existing ditch along Ninth Line.

Overland flow is towards Ninth Line as shown on drawing SG1, Appendix D The overland flow route shows that the site major flows will be carried safely through the site without causing adverse effects on the proposed development and neighbouring dwelling units.

# 7.0 QUALITY CONTROL

We are proposing Stormceptor Model EFO4 to achieve quality level as per Town's requirement. The unit will treat more than 92% of the annual rainfall volume and remove 90% of the TSS particles. Design Sheet is attached in **Appendix 'A7'.**

# 8.0 WATER SERVICING

## 8.1 Design Criteria

Water supply system is designed in accordance with the Town of Whitchurch-Stouffville design standards. The proposed development consists of a 40-unit apartment building.`

The water system shall be designed to convey the greater of the maximum daily demand plus fire flow or the maximum hourly demand.

The proposed apartment building population is based on 2.2 persons per apartment unit.

The average daily residential water demand is 350 L/person/day.

The maximum daily and maximum hourly demand peaking factors are 2.0 and 3.0, respectively.

## 8.2 Proposed Water Supply

A 200mm diameter private watermain is proposed to provide domestic and fire protection service to the apartment building. The proposed watermain will be connected to the existing 400 mm diameter watermain on Ninth Line, as shown on **Drawing SS1 Appendix D.**

A private fire hydrant is proposed within the site southwest side of the property. The private fire hydrant will be connected to the proposed 200 mm diameter private watermain and will provide fire protection for the proposed apartment building.

The design population is 40 apartment units × 2.2 persons/unit = 88 persons.

Average daily water demand = 88 × 350 / 86,400 = 0.356 L/s.

Maximum daily demand = 0.356 × 2.0 = 0.713 L/s.

Maximum hourly demand = 0.356 × 3.0 = 1.069 L/s.

## 8.3 Fire Demand

Fire demand has been calculated using the Fire Underwriters Survey (FUS) methodology. The detailed FUS fire-flow calculation is provided in the accompanying Excel calculation sheet.

The FUS calculation establishes a required fire flow of 150 L/s (9,000 L/min). The private fire hydrant proposed along the right-hand side of the property is intended to provide the required fire protection flow, subject to final Town and Fire Department approval.

A water flow test was conducted at 12717 Ninth Line on August 25, 2026. The test report indicates a static pressure of 60 psi and a total flow of 1,485 USgpm at 52 psi. The projected flow at 20 psi is 3,541 USgpm. The required 150 L/s fire flow is approximately 2,378 USgpm and is below the reported projected flow at 20 psi. Final confirmation of available fire flow and pressure shall be based on the Town's hydraulic model and applicable fire-flow requirements.

## 8.4 Total Water Demand

The governing water demand is the maximum daily domestic demand plus the required fire flow.

Maximum daily domestic demand = 0.713 L/s.

Required fire flow = 150.000 L/s. Total maximum day plus fire flow demand = 150.713 L/s

# 9.0 SANITARY SYSTEM

## 9.1 Design Criteria

The proposed sanitary network is designed in accordance with the Town of Whitchurch-Stouffville sanitary sewer design criteria.

The following design criteria are used:

- Apartment population density = 2.2 persons/unit.
- Residential sanitary generation rate = 350 L/person/day.
- Harmon peaking factor: $M = 1 + 14/[4 + \sqrt{(P)}]$, where P is population in thousands; maximum M = 4.0.
- Peak infiltration allowance = 0.23 L/s/ha.
- Minimum sanitary sewer diameter = 200 mm.
- Minimum actual velocity = 0.60 m/s and maximum velocity = 3.0 m/s.

## 9.2 Proposed Sanitary Network

The proposed development contains 40 apartment units. Based on 2.2 persons per unit, the design population is 88 persons.

Average sanitary flow = 88 × 350 / 86,400 = 0.356 L/s.

Harmon peaking factor = 1 + 14/[4 + √(88/1000)] = 4.258; therefore, the Town maximum of 4.0 is adopted.

Peak domestic sanitary flow = 0.356 × 4.0 = 1.426 L/s.

Peak infiltration flow = 0.23 × 0.30 ha = 0.069 L/s.

Total design sanitary flow = 1.426 + 0.069 = 1.495 L/s.

A 200 mm diameter sanitary sewer and associated manholes are proposed to serve the apartment building. The proposed sanitary sewer will be connected to the existing 200 mm diameter sanitary plug available on the north side of the site, as shown **on Drawing SS1 Appendix D**.

The sanitary sewer design-sheet calculation is provided as a separate Excel sheet. A preliminary hydraulic capacity check using a 200 mm PVC sewer at 0.50% slope and Manning's n = 0.013 gives a full-flow capacity of approximately 23.19 L/s and a full-flow velocity of approximately 0.74 m/s, which is greater than the calculated total design flow of 1.495 L/s.

The 0.50% slope used for the preliminary hydraulic capacity check shall be confirmed against the final servicing and grading drawings. The design sheet shall be updated if the final sewer slope differs.

## 10.0 Erosion and Sediment Control During Construction

The following procedures are recommended to minimize the transportation of sediments out of the property, especially during construction time:

- During the construction period, total sediment loadings are much greater than for pre-development and post-development conditions. Also, with site regrading and removal of topsoil, water-borne sediment quantities will increase. As a consequence, sediment control will be required during the construction phase.
- During construction, a silt trap shall be installed at all the inlet points of the catch basins shall be maintained in place until the paving has been completed;
- Filter bags shall be attached to hoses where pumping is carried out from excavations and the filter bags shall be maintained on a regular basis;
- A silt fence shall be installed to eliminate the sediment transportation from the site.
- During the construction period, a mud mat shall be provided at the construction area limit to eliminate the sediment transportation from the site to the municipal road. Erosion and Sediment Control Plan will be provided at The Site Plan Stage.

## 11.0 Summary

- The post-development flows from the site have been controlled to less than the pre-development levels through flow control device and on site storage.
- Quality control will be achieved through a stormceptor unit sized for 90% TSS removal
- Overland flow route through the site ensures that major overland flows are safely carried through the site;
- Erosion control such as installation of temporary silt fence, mud matt & rock check dams are recommended to minimize off-site sediment transport.
- New water and sanitary service connections are being proposed. The water demand and sewage flows are presented for City's review and approval.
- Water Balance is achieved with the help of Extensive Green Roof and landscaping.

Report Prepared by:

Muhammad Ismail P.Eng.
Principal



**PROPOSED TOWN HOUSE DEVELOPMENT**

**12717 NINTH LINE**

**TOWN OF WHITCHURCH-STOUFFVILLE, ONTARIO**

# SERVICING & STORM WATER MANGEMNT REPORT

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The subject site is about 0.30 hectares and located on east side of ninth line and south of Bayberry Street in town of Stouffville. The site location is shown in Figure 1.




Figure 1 - Site Location Plan

Under existing conditions, the site contains one single-storey building, asphalt access driveway, wood deck, frame shed and a swimming pool surrounded by chain link fence.

It is proposed to redevelop the site with 40 apartment units with visitor parking, with proposed Building Area 1,519.2m$^2$. The total Ground Floor Area (GFA) will be 4,690.4m$^2$The existing drainage pattern is sheet flow towards the west side. The site gradient falls from 280.00 on the north east property limit to 278.50 at the south west corner. The existing grades around the site are proposed to be matched at the boundary limits.

The proposed grading of the area is to allow the runoff discharge to the existing ditch located along east of the Ninth line. The existing ditch will be re-graded for this purpose. The proposed sanitary system will be connected with existing sanitary plug dia 200mm available on the north side of the site. The proposed water main will be connected with the existing 300mm dia water main at Steam Whistle Drive.

Proposed site servicing, grading and storm drainage plans are submitted in

A storm water management (SWM) study was carried out and all the services are designed based on the guidelines as stipulated by the city of Whitchurch-Stouffville, May 2020.

## 2.0 Storm Water Management Criteria

Quantity

Post Development Flows from 5 to 100 years of rainfall will be controlled to Pre-Development flows of respective year of storms.

The storm network shall be sized to convey the 5-year storm flow

Quality

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Water Balance

25mm of rainfall be retained by infiltration, evapotranspiration on any other menthods. Details will be provided in the final report

Erosion and Sediment Control

Adequate measures are to be implemented to minimize the transportation of sediments out of the new construction area.

## Storm Water Management Plan

The Rainfall intensities shall be calculated in accordance with the values for the 3-parameter equation:
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Q = 2.778 (ACi)

Where,
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| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
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| Roof | 1519 | 0.9 | 1367.1 |
| Total | 1519 | | 1367.1 |

**Pre-Development Composite Runoff Coefficient(R) =** 1367.1/1519
0.90

**TABLE 6 POST-DEVELOPMENT RUNOFF COEFFICIEN AREA 203**

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| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
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| Landscape | 270 | 0.25 | 67.5 |
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| Total | 312 | | 105.3 |

**Post-Development Composite Runoff Coefficient(R)** **=** 105.3/312
0.34

**TABLE 7 POST-DEVELOPMENT RUNOFF COEFFICIEN AREA 204**

**Runoff Coefficient Drainage Area 204**

| **Proposed Land Use** | **Area($m^2$)** | **Runoff Coefficient** | **Area x Runoff Coefficient** |
|---|---|---|---|
| Landscape | 264 | 0.25 | 66 |
| Paved/Sidewalk | 136 | 0.9 | 122.4 |
| Total | 400 | | 188.4 |

**Post-Development Composite Runoff Coefficient(R)** 188.4/400
=0.47

The Pre and Post-Development Drainage Plans are shown in **Appendix A1 and Appendix A2**.

### 2.1.3 Quantity Control

The Pre-Development and post development flows are calculated using Modified Rational formula. We are proposing rainwater flow from areas AREA 201 and AREA 202 to be controlled.

The parking area is on the ground covered by the ceiling of the first floor. To ensure that only allowable 2-year predevelopment flow to be released from the north side. The roof rainwater will be stored on the roof temporarily and discharged slowly by Zurn Control Roof Drains. The Parking area rainwater will be stored on the open asphalt parking. The rainwater will be controlled by an orifice. The total rainwater discharging to the existing ditch will be such that 2-Year Post-Development flow will be less than the 2-Year and storms up to 100Year will be less than the Pre-Development Flow.

#### 4.3.4 ROOF STORAGE (AREA 201)

Part of the detention storage required to control the post development peak flows can be obtained by using roof top ponding. Controlled flow drains (Zurn-Z-105 or equivalent) will be installed on roof tops. Three Zurn Drain Z105 are being proposed with total flow **13.41 $m^3$/sec** control flow. The calculated total storage volume for the new roof is **49.83 $m^3$**. The storage volume calculations are shown in **Appendix A3**. The storage provided for the building is **70.00$m^3$**.

#### 4.3.5 PARKING LOT STORAGE (AREA 202)

For this purpose spreadsheet calculations have been used to determine the detention volume requirements. We are proposing Vertical Vortex Flow Regulator, **75 VHV-1, with 6 L/sec flow** for head of 1.0525m (279.91-278.82-0.0375). The Graph showing the head and flow will be done at Site Plan Stage. Required detention volume has been computed as 24.06cu.m. A storage volume of 3533 cu. m. has been provided in the proposed SWM detention facility located within the south parking area . Calculations for detention volume requirement are shown in **Appendix A4**

Storage Volume Provided:

| | |
|---|---|
| Surface Area | = 530$m^3$ |
| Maximum Water Depth | =0.20m |
| Storage | =530 x 0.2/3 |

35.3m$^3$

### 4.3.6 Pre-Development and Post Development Flows

Pre-Development and Post-Development Flows from **AREA 101**, **AREA 202** and **AREA 204** calculations are shown in **Appendix A5** and summarized below

**RUNOFF FLOWS TO PRE-DEVELOPMENT FLOWS(WITHOUT CONTROL)**

**TABLE 8**
**Post Development Flows from the Site**

| **Year** | **2** | **5** | **10** | **25** | **50** | **100** |
|---|---|---|---|---|---|---|
| **AREA 101 PRE** | 32.4 | 40.0 | 45.27 | 57.39 | 69.50 | 80.02 |

**RUNOFF FLOWS TO POST-DEVELOPMENT FLOWS(WITHOUT CONTROL)**

**TABLE 9**
**Post Development Flows from the Site**

| **Year** | 2 | 5 | 10 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|
| **AREA 201 POST** | 14.4 | 17.8 | 20.14 | 25.53 | 30.92 | 35.61 |
| **AREA 202 POST** | 34.1 | 42.1 | 47.61 | 60.35 | 0.00 | 84.16 |
| **AREA 203 POST** | 2.6 | 3.3 | 3.69 | 4.68 | 5.67 | 6.53 |
| **AREA 204 POST** | 4.9 | 6.0 | 6.83 | 8.65 | 10.48 | 12.07 |
| **TOTAL** | **56.0** | **69.2** | **78.27** | **99.22** | **47.07** | **138.36** |

**RUNOFF FLOWS TO POST-DEVELOPMENT FLOWS( CONTROL)**

| **TABLE 10**<br>**Post Development Flows from the Site** | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | 2 | 5 | 10 | 25 | 50 | 100 |
| **AREA 201 POST** | 6.0 | 6.0 | 6.00 | 6.00 | 6.00 | 6.00 |
| **AREA 202 POST** | 13.40 | 13.40 | 13.40 | 13.40 | 13.40 | 13.40 |
| **AREA 203 POST** | 2.6 | 3.3 | 3.69 | 4.68 | 5.67 | 6.53 |
| **AREA 204 POST** | 4.9 | 6.0 | 6.83 | 8.65 | 10.48 | 12.07 |
| **TOTAL** | **26.9** | **28.7** | **29.92** | **32.74** | **35.55** | **38.00** |

### 4.3.7 Comparision of Pre-Development and Post Development Flows

**COMPARISION OF PRE-DEVELOPMENT AND POST-DEVELOPMENT FLOWS**

| **TABLE 11**<br>**Post Development Flows from the Site** | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **2** | **5** | **10** | **25** | **50** | **100** |
| **PRE-DEVELOPMENT** | **32.4** | **40.0** | **45.27** | **57.39** | **69.50** | **80.02** |
| **POST-DEVELOPMENT** | **26.9** | **28.7** | **29.92** | **32.74** | **35.55** | **38** |

It can be seen that Post-Development Flows are substantially reduced and less than the respective Storm Events, thus fulfilling that the Post Development Flows should be less than the respective storm flows from the Pre-Development Flows.

## 5.0 WATER BALANCE MANAGEMET

The primary objective of the water balance Targets/Criteria is to capture and manage annual rainfall on the development site itself to preserve the pre-development hydrology ( or "water balance", which typically consists of three components: runoff, infiltration and e through a combination of infiltration, evatranspiration, landscaping rainwater reuse or other low impact development practices. To achieve the minimum on-site retention requires proponent to retain all runoff from small design rainfall event-typically 5mm.

**AS per the Town of Stouffville "All efforts should be made to match pre- and post-development infiltration volumes in order to maintain groundwater recharge."**
It also identifies a **minimum 5 mm retention for all storm events**, through infiltration, evapotranspiration and/or rainwater reuse.

**TABLE 12**

**WATER BALANCE**

| **Site Area** | **Area in $m^2$** | **Fraction of Total Area(%)** | **Initial Abstraction For Site Area** | **Initial Abstraction Over Total Site** |
|---|---|---|---|---|
| Extensive Green Roof ( 72%) | 1094 | 36.47% | 10mm | 3.65mm |
| Hard Surface+Roof(28%) | 1186 | 39.53% | 1.0mm | 0.39mm |
| Landscape | 720 | 24.00 | 5mm | 1.2mm |
| **Total** | 4343 | **100%** | | **5.24mm** |

We are proposing Extensive Green Roof to achieve minimum 5mm of rainwater. We have managed to achieve 5.24mm by the proposed system. Detail of Extensive Green Roof will be provided at the Site Plan Stage.

## 6.0 MINOR AND MAJOR DRAINAGE SYSTEM

A network of pipes with catch basins and manholes has been designed for a 5 year return period. The storm sewer design sheet is attached in **Appendix A6**. The site drainage network discharges to the existing ditch along Ninth Line.

Overland flow is towards Ninth Line as shown on drawing SG1, **Appendix 'D'** The overland flow route shows that the site major flows will be carried safely through the site without causing adverse effects on the proposed townhouses and neighbouring dwelling units.

# 7.0 QUALITY CONTROL

We are proposing Stormceptor Model EFO4 to achieve quality level as per Town's requirement. The unit will treat more than 92% of the annual rainfall volume and remove 90% of the TSS particles. Design Sheet is attached in **Appendix 'A7'.**

# 8.0 WATER SERVICING

## 8.1 Design Criteria

Water supply system is designed in accordance with the Town of Whitchurch-Stouffville design standards. The proposed development consists of a 40-unit apartment building.

The water system shall be designed to convey the greater of the maximum daily demand plus fire flow or the maximum hourly demand.

The proposed apartment building population is based on 2.2 persons per apartment unit.

The average daily residential water demand is 350 L/person/day.

The maximum daily and maximum hourly demand peaking factors are 2.0 and 3.0, respectively.

## 8.2 Proposed Water Supply

A 150 mm diameter private watermain is proposed to provide domestic and fire protection service to the apartment building. The proposed watermain will be connected to the existing 300 mm diameter watermain on Steam Whistle Drive, as shown on **Drawing SS1 Appendix D.**

A private fire hydrant is proposed within the site along the right-hand side of the property. The private fire hydrant will be connected to the proposed 150 mm diameter private watermain and will provide fire protection for the proposed apartment building.

The design population is 40 apartment units × 2.2 persons/unit = 88 persons.

Average daily water demand = 88 × 350 / 86,400 = 0.356 L/s.

Maximum daily demand = 0.356 × 2.0 = 0.713 L/s.

Maximum hourly demand = 0.356 × 3.0 = 1.069 L/s.

## 8.3 Fire Demand

Fire demand has been calculated using the Fire Underwriters Survey (FUS) methodology. The detailed FUS fire-flow calculation is provided in the accompanying Excel calculation sheet.

The FUS calculation establishes a required fire flow of 150 L/s (9,000 L/min). The private fire hydrant proposed along the right-hand side of the property is intended to provide the required fire protection flow, subject to final Town and Fire Department approval.

A water flow test was conducted at 12717 Ninth Line on August 25, 2026. The test report indicates a static pressure of 60 psi and a total flow of 1,485 USgpm at 52 psi. The projected flow at 20 psi is 3,541 USgpm. The required 150 L/s fire flow is approximately 2,378 USgpm and is below the reported projected flow at 20 psi. Final confirmation of available fire flow and pressure shall be based on the Town's hydraulic model and applicable fire-flow requirements. The Fire Hydrant Test and the Fire Water Demand calculations are attached in **Appendix 'B'**

## 8.4 Total Water Demand

The governing water demand is the maximum daily domestic demand plus the required fire flow.

Maximum daily domestic demand = 0.713 L/s.

Required fire flow = 150.000 L/s.Total maximum day plus fire flow demand = 150.713 L/s

# 9.0 SANITARY SYSTEM

## 9.1 Design Criteria

The proposed sanitary network is designed in accordance with the Town of Whitchurch-Stouffville sanitary sewer design criteria.

The following design criteria are used:

- Apartment population density = 2.2 persons/unit.
- Residential sanitary generation rate = 350 L/person/day.
- Harmon peaking factor: M = 1 + 14/[4 + √(P)], where P is population in thousands; maximum M = 4.0.
- Peak infiltration allowance = 0.23 L/s/ha.
- Minimum sanitary sewer diameter = 200 mm.
- Minimum actual velocity = 0.60 m/s and maximum velocity = 3.0 m/s.

## 9.2 Proposed Sanitary Network

The proposed development contains 40 apartment units. Based on 2.2 persons per unit, the design population is 88 persons.

Average sanitary flow = 88 × 350 / 86,400 = 0.356 L/s.

Harmon peaking factor = 1 + 14/[4 + √(88/1000)] = 4.258; therefore, the Town maximum of 4.0 is adopted.

Peak domestic sanitary flow = 0.356 × 4.0 = 1.426 L/s.

Peak infiltration flow = 0.23 × 0.30 ha = 0.069 L/s.

Total design sanitary flow = 1.426 + 0.069 = 1.495 L/s.

A 200 mm diameter sanitary sewer and associated manholes are proposed to serve the apartment building. The proposed sanitary sewer will be connected to the existing 200 mm diameter sanitary plug available on the north side of the site, as shown **on Drawing SS1 Appendix D**.

The sanitary sewer design-sheet calculation is provided in Appendix 'C'. A preliminary hydraulic capacity check using a 200 mm PVC sewer at 0.50% slope and Manning's n = 0.013 gives a full-flow capacity of approximately 23.19 L/s and a full-flow velocity of approximately 0.74 m/s, which is greater than the calculated total design flow of 1.495 L/s.

The 0.50% slope used for the preliminary hydraulic capacity check shall be confirmed against the final servicing and grading drawings. The design sheet shall be updated if the final sewer slope differs.

### 10.0 Erosion and Sediment Control During Construction

The following procedures are recommended to minimize the transportation of sediments out of the property, especially during construction time:

- During the construction period, total sediment loadings are much greater than for pre-development and post-development conditions. Also, with site regrading and removal of topsoil, water-borne sediment quantities will increase. As a consequence, sediment control will be required during the construction phase.
- During construction, a silt trap shall be installed at all the inlet points of the catch basins shall be maintained in place until the paving has been completed;
- Filter bags shall be attached to hoses where pumping is carried out from excavations and the filter bags shall be maintained on a regular basis;
- A silt fence shall be installed to eliminate the sediment transportation from the site.

- During the construction period, a mud mat shall be provided at the construction area limit to eliminate the sediment transportation from the site to the municipal road. Erosion and Sediment Control Plan will be provided at The Site Plan Stage.

## 11.0 Summary

- The post-development flows from the site have been controlled to less than the pre-development levels through flow control device and on site storage.
- Quality control will be achieved through a stormceptor unit sized for 90% TSS removal and 92% annual rainfall volume.
- Overland flow route through the site ensures that major overland flows are safely carried through the site;
- Erosion control such as installation of temporary silt fence, mud matt & rock check dams are recommended to minimize off-site sediment transport.
- New water and sanitary service connections are being proposed. The water demand and sewage flows are presented for City's review and approval.
- Water Balance is achieved with the help of Extensive Green Roof and landscaping.

Report Prepared by:

Muhammad Ismail P.Eng.
Principal



# Appendix A

**A1 Pre-Development Drainage Plan**

**A2 Post-Development Drainage Plan**

# APPENDIX A1
# PRE-DEVELOPMENT DRAINAGE PLAN

LEGENDS

Drainage Arae

0.0723ha | 201 | 0.80

Runoff Coefficient

Area Number

OVERLAND FLOW ROUTE

CATCHMENT BOUNDARY

0.30ha | 101 | 0.43

CENTRELINE OF ROAD

EDGE OF PAVEMENT

ASPHALT DRIVEWAY

No.12717
1 STOREY
ALUM. DWELLING
D.S.=279.67

WOOD DECK

WOOD SHED

SWIMMING POOL

C.L.F.

CHAIN LINK FENCE

FRAME SHED

PART 2, 65R-3119
PIN 03708 - 0624

PART 1, 65R-3119
PIN 03708

(ROAD ALLOWANCE BETWEEN CONCESSIONS 8 AND 9)
PIN 03708 - 0624

SUBJECT TO AN EASE

SOUTHWESTERLY CORNER OF LOT 4, CONCESSION 9

(REFERENCE BEARING) N8°55'10"W

SIB (1137)

SIB (1028)

SIB(1137) BENT 0.09 S 0.44 W

IB (1176)

N72°44'20"E (M)
N72°43'00"E (P1)

N72°46'05"E (M)
N72°43'00"E (P1)

N8°54'35"W (M)
N8°55'10"W (P1)

N72°44'00"E

(p1&m) 8.32

8.32 (P1&SET)

(RP&M) 27.90

(RP&M) 13.00

26.00 (RP)
26.02 (M)

86.47 (P1&M)

94.79 (P1&M)

35.05 (P1)
35.12 (M)

35.08 (M)
35.05 (P1)

13.05 (P1)
13.02 (M)
12.98

(P1&M) 11.80
11.75

B.F.
0.04 S

C.L.F. ON LINE N/S

C.L.F. 0.16 S

C.L.F. 0.40 S

C.L.F. 0.04 S

SIB (NI)

C.B.

W.V.

0.3 Dia.

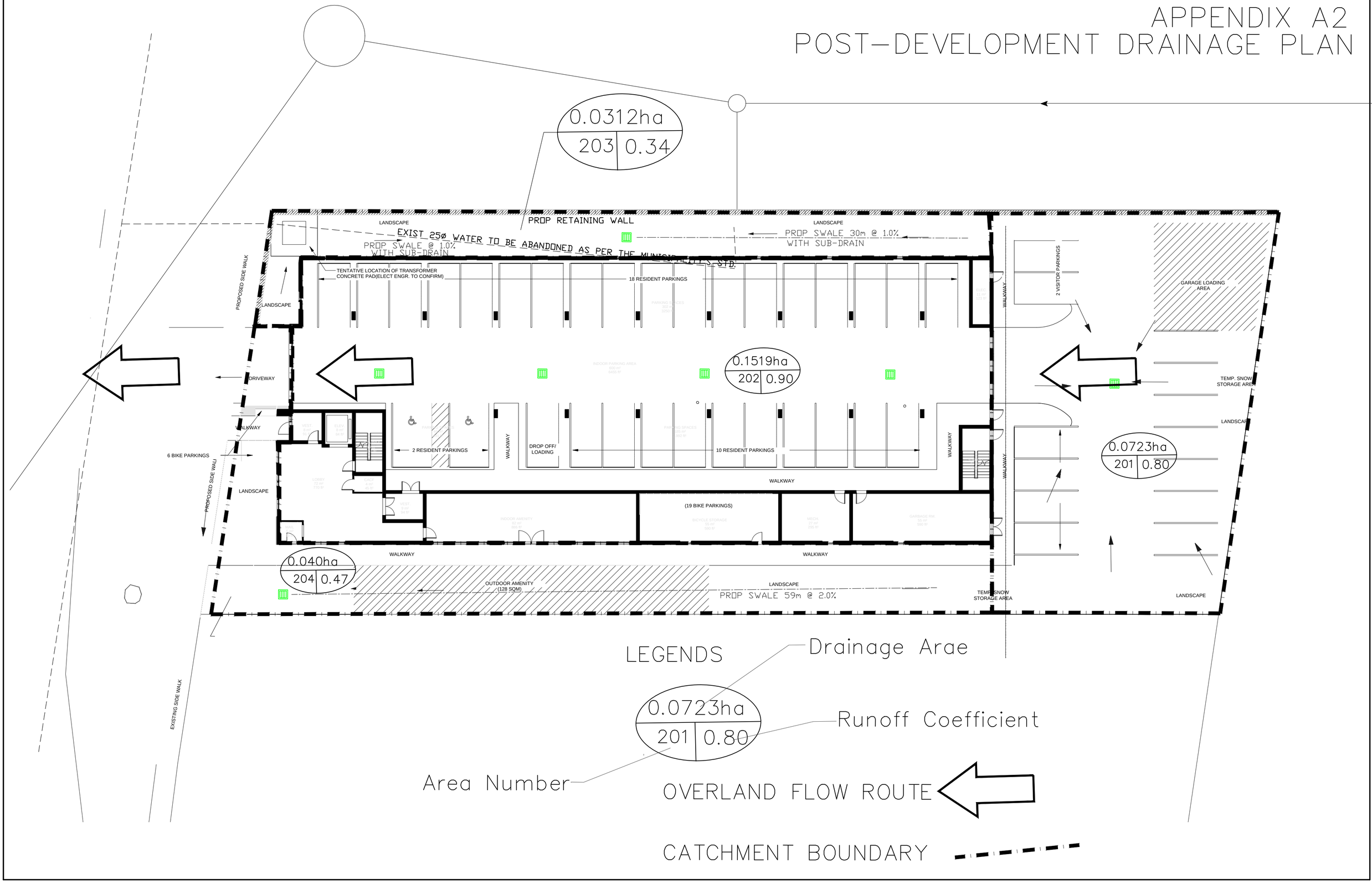
0.4 Dia.

0.5 Dia.

ø350 mm CONCRETE CULVERT

6.60

# APPENDIX A2
# POST-DEVELOPMENT DRAINAGE PLAN



# Appendix A3

# Roof Storage

**Appendix A3**

**Roof Storage Calculations**
**12717 Ninth Line**
**Stouffville, Ontario**
**100-Year**

| | | |
|---|---|---|
| Formula Used for Runoff Calculations: | Modified Rational Formula | |
| Runoff Flow= | 2.78CIA | |
| Return Period | 100 Year | |
| Rainfall Intensity: | $(1605)/(10+7.5)\ )^{0.77}$ | where $t_c$ is in hours |
| Roof Area | 0.1519 | ha |
| Roof area for storage= | 0.1400 | ha |
| Runoff Coefficient | 0.9 | |
| No. of Roof Drains | 3 | |
| Max Water Depth | 150 | mm |
| Flow per/mm depth | 0.0149 | Litres/sec |
| Discharge per drain | 13.41 | l/s (two notches) |
| Time of Concentration | 10 | min |

| Time (min.) | Rainfall Intensity mm/hr | Storm Runoff (l/s) | Runoff Volume ($m^3$) | Release Volume ($m^3$) | Storage Volume ($m^3$) |
|---|---|---|---|---|---|
| 10 | 250.32 | 95.14 | 57.08 | 8.05 | 49.04 |
| **15** | **180.98** | **68.78** | **61.90** | **12.07** | **49.83** |
| 20 | 143.77 | 54.64 | 65.57 | 16.09 | 49.48 |
| 25 | 120.27 | 45.71 | 68.56 | 20.12 | 48.45 |
| 30 | 103.94 | 39.50 | 71.11 | 24.14 | 46.97 |
| 35 | 91.88 | 34.92 | 73.33 | 28.16 | 45.17 |
| 40 | 82.57 | 31.38 | 75.32 | 32.18 | 43.13 |
| 45 | 75.15 | 28.56 | 77.11 | 36.21 | 40.91 |
| 50 | 69.07 | 26.25 | 78.76 | 40.23 | 38.53 |
| 55 | 64.00 | 24.32 | 80.27 | 44.25 | 36.02 |
| 60 | 59.70 | 22.69 | 81.68 | 48.28 | 33.41 |
| 65 | 56.00 | 21.28 | 83.00 | 52.30 | 30.70 |
| 70 | 52.77 | 20.06 | 84.24 | 56.32 | 27.92 |
| 75 | 49.94 | 18.98 | 85.41 | 60.35 | 25.06 |
| 80 | 47.43 | 18.02 | 86.52 | 64.37 | 22.15 |
| 85 | 45.18 | 17.17 | 87.57 | 68.39 | 19.18 |
| 90 | 43.16 | 16.40 | 88.58 | 72.41 | 16.17 |
| 95 | 41.33 | 15.71 | 89.54 | 76.44 | 13.11 |

Storage Provided = (1400x0.15/3)

= 70.00 > 49.83 $m^3$ O.K.

## Appendix A4

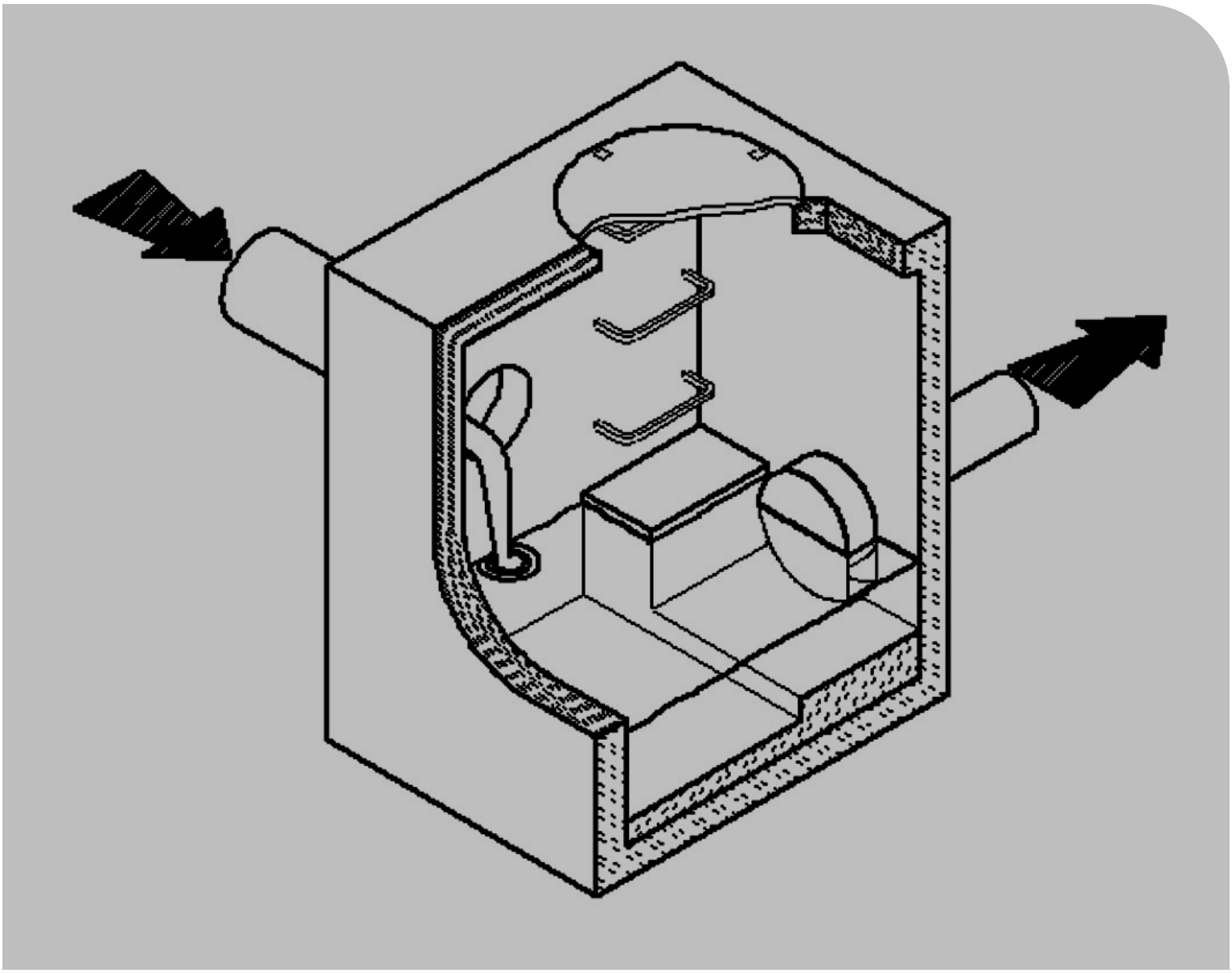
- **Open Asphalt Parking Space Storage Calculations**
- **Vortex Valve Selection Chart and Specfications**

# Appendix 4

**In Open Parking SpaceStorage Calculations**
**12717 Nnth Line**
**Stouffville, ON**
**100-Year**

| | | |
|---|---|---|
| Formula Used for Runoff Calculations: | Modified Rational Formula | |
| Runoff Flow= | 2.78CIA | |
| Return Period | 100 Year | |
| Rainfall Intensity: | $(1605)/(10+7.5)\ )^{0.77}$ | where $t_c$ is in hours |
| Roof Area | 0.0723 | ha |
| Catchment Area | 0.0723 | ha |
| Runoff Coefficient | 0.9 | |
| Discharge frm | 6.00 | l/s |
| Time of Concentration | 10 | min |

| Time (min.) | Rainfall Intensity mm/hr | Storm Runoff (l/s) | Runoff Volume ($m^3$) | Release Volume ($m^3$) | Storage Volume ($m^3$) |
|---|---|---|---|---|---|
| 10 | 250.32 | 45.28 | 27.17 | 3.60 | 23.57 |
| **15** | **180.98** | **32.74** | **29.46** | **5.40** | **24.06** |
| 20 | 143.77 | 26.01 | 31.21 | 7.20 | 24.01 |
| 25 | 120.27 | 21.76 | 32.63 | 9.00 | 23.63 |
| 30 | 103.94 | 18.80 | 33.85 | 10.80 | 23.05 |
| 35 | 91.88 | 16.62 | 34.90 | 12.60 | 22.30 |
| 40 | 82.57 | 14.94 | 35.85 | 14.40 | 21.45 |
| 45 | 75.15 | 13.59 | 36.70 | 16.20 | 20.50 |
| 50 | 69.07 | 12.50 | 37.49 | 18.00 | 19.49 |
| 55 | 64.00 | 11.58 | 38.21 | 19.80 | 18.41 |
| 60 | 59.70 | 10.80 | 38.88 | 21.60 | 17.28 |
| 65 | 56.00 | 10.13 | 39.51 | 23.40 | 16.11 |
| 70 | 52.77 | 9.55 | 40.10 | 25.20 | 14.90 |



VEOLIA

# HYDROVEX® VHV/SVHV
## Vertical Vortex Flow Regulator
*CSO, SSO, Stormwater Management*

WATER TECHNOLOGIES

# HYDROVEX® VHV / SVHV Vertical Vortex Flow Regulator

## Application

One of the major problems of urban wet weather flow management is the runoff generated by heavy rainfall. During a storm event, uncontrolled flows may overload the drainage system and cause flooding. Wear and deterioration on the network are increased dramatically as a result of increased flow velocities. In a combined sewer system, the wastewater treatment plant will experience a significant increase in flows during storms, thereby losing its treatment efficiency. A simple means of managing excessive storm water runoff is to control the flows at their point of origin, the manhole.

The HYDROVEX® VHV / SVHV line of vortex flow regulators is ideal for point source control of low to medium stormwater flows in manholes, catch basins and other retention structures. The HYDROVEX® VHV / SVHV design is based on the fluid mechanics principle of the forced vortex. The discharge is controlled by an air-filled vortex which reduces the effective water passage area without physically reducing orifice size. This effect grants precise flow regulation without the use of moving parts or electricity, and allows for larger inlet and outlet openings compared to the basic orifice. Although the concept is quite simple, many years of research and testing have been invested to optimize the performance of our vortex technology.

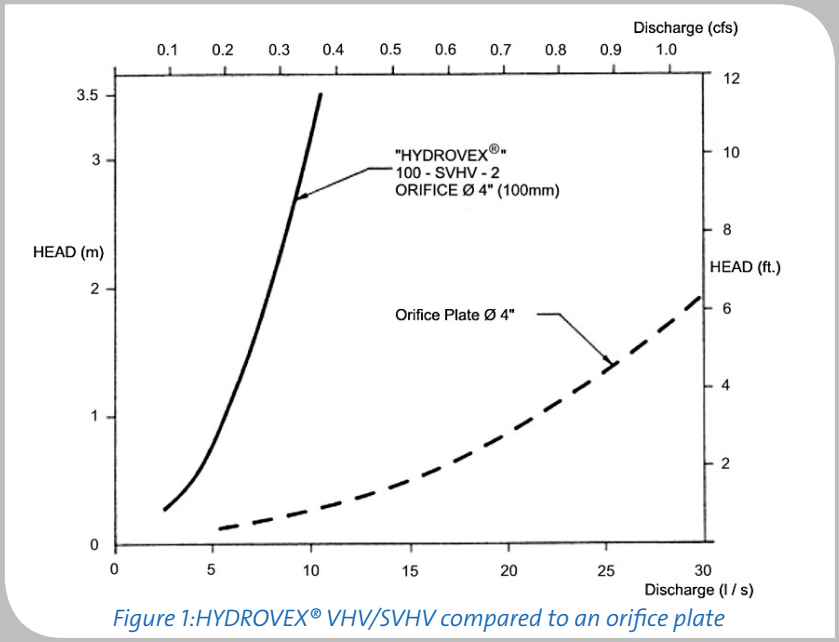



*Figure 1:HYDROVEX® VHV/SVHV compared to an orifice plate*

Vortex valves have openings typically 4 to 6 times larger than an orifice plate for the same design. Larger opening sizes decrease the chance of blockage caused by sediments and debris found in storm water flows. Figure 1 shows the discharge curve of a vortex regulator compared to an equally sized orifice plate. For an identical opening size, the flow is approximately four times smaller than the orifice plate for the same upstream water pressure.

## Advantages

- Large inlet/outlet openings reduce the chance of clogging
- Openings typically 4-6 times larger than the basic orifice (Figure 1)
- Outlet orifice always equal or larger than inlet
- Ideal for precise control of low to medium stormwater flow applications
- Submerged inlet for floatables control
- No moving parts or electricity required
- Durable and robust stainless steel construction
- Minimal maintenance
- Easy to install

# Selection

Selecting a VHV/SVHV regulator is easily achieved using Figure 3. Each selection is made using the maximum allowable flow rate and the maximum allowable upstream water pressure (head). The area in which the design point falls will designate the required model. The maximum design head is defined as the difference between the maximum upstream water level and the invert of the outlet pipe. All selections should be verified by a John Meunier Inc. representative prior to fabrication.

Design example:

- Maximum discharge: 6 L/s (0.2 cfs)*
- Maximum design head 2m (6.56 ft.)**
- Using Figure 3, model 75 VHV-1 is selected

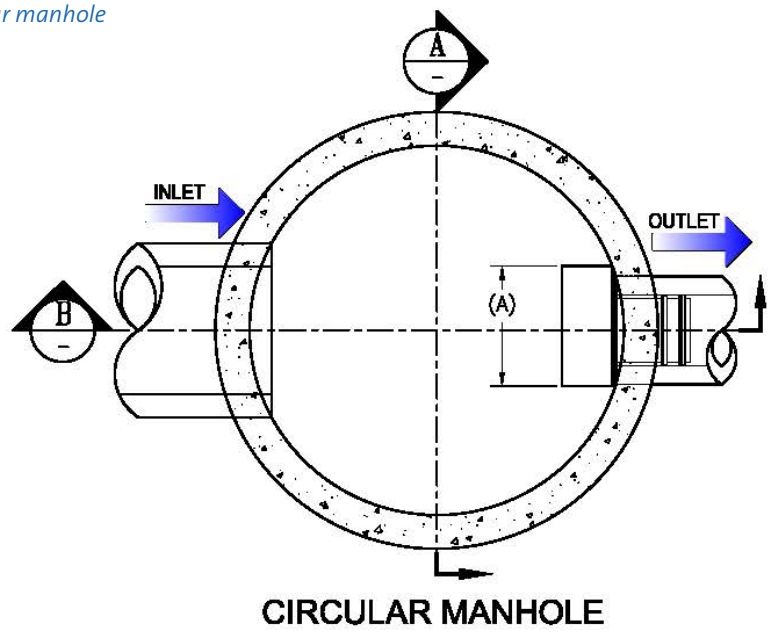
**The selection chart provided assumes free flowing downstream conditions. Should the outlet pipe be >80% full at design flow, a larger pipe diameter should be used. In the above example, the minimum outlet pipe diameter and slope would be 150mm (6in), 0.3%.*

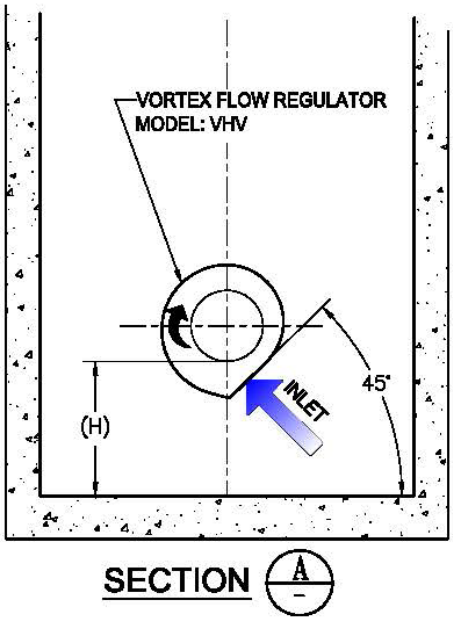
***The design head is defined as the difference between the maximum upstream water level and the outlet pipe invert.*

The HYDROVEX® VHV / SVHV vortex flow regulators can be installed in circular or square manholes. The table below lists the minimum dimensions and clearances required for each regulator model. It is imperative to respect the minimum clearances shown to ensure ease of installation and proper functioning of the regulator.

| Model | Regulator Diameter A (mm) [in] | CIRCULAR Minimum Manhole Diameter B (mm) [in] | SQUARE Minimum Chamber Width B (mm) [in] | Minimum Outlet Pipe Diameter C (mm) [in] | Minimum Clearance H (mm) [in] |
|---|---|---|---|---|---|
| 25 SVHV-1 | 125 [5] | 600 [24] | 600 [24] | 150 [6] | 150 [6] |
| 32 SVHV-1 | 150 [6] | 600 [24] | 600 [24] | 150 [6] | 150 [6] |
| 40 SVHV-1 | 200 [8] | 600 [24] | 600 [24] | 150 [6] | 150 [6] |
| 50 VHV-1 | 150 [6] | 600 [24] | 600 [24] | 150 [6] | 150 [6] |
| 75 VHV-1 | 250 [10] | 600 [24] | 600 [24] | 150 [6] | 150 [6] |
| 100 VHV-1 | 325 [13] | 900 [36] | 600 [24] | 150 [6] | 200 [8] |
| 125 VHV-2 | 275 [11] | 900 [36] | 600 [24] | 150 [6] | 200 [8] |
| 150 VHV-2 | 350 [14] | 900 [36] | 600 [24] | 150 [6] | 225 [9] |
| 200 VHV-2 | 450 [18] | 1200 [48] | 900 [36] | 200 [8] | 300 [12] |
| 250 VHV-2 | 575 [23] | 1200 [48] | 900 [36] | 250 [10] | 350 [14] |
| 300 VHV-2 | 675 [27] | 1600 [64] | 1200 [48] | 250 [10] | 400 [16] |
| 350 VHV-2 | 800 [32] | 1800 [72] | 1200 [48] | 300 [12] | 500 [20] |

*Figure 2a: Minimum dimensions and clearances, circular manhole*



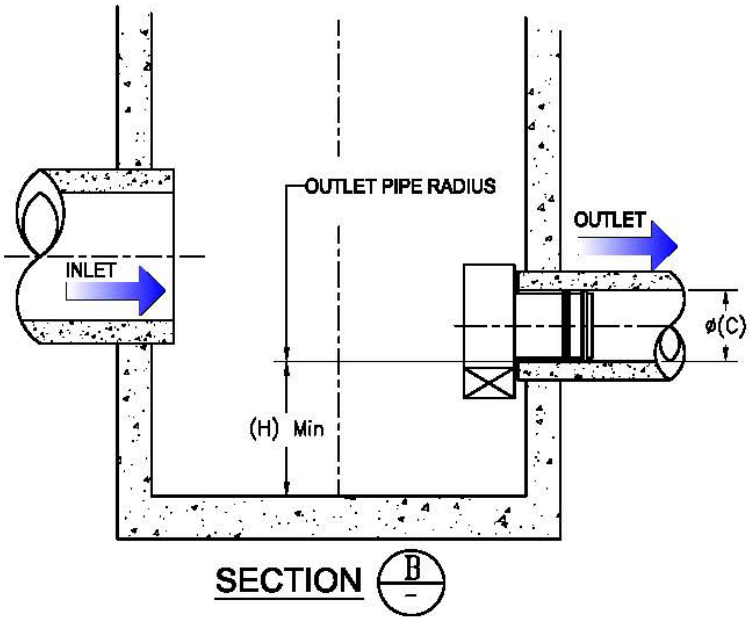
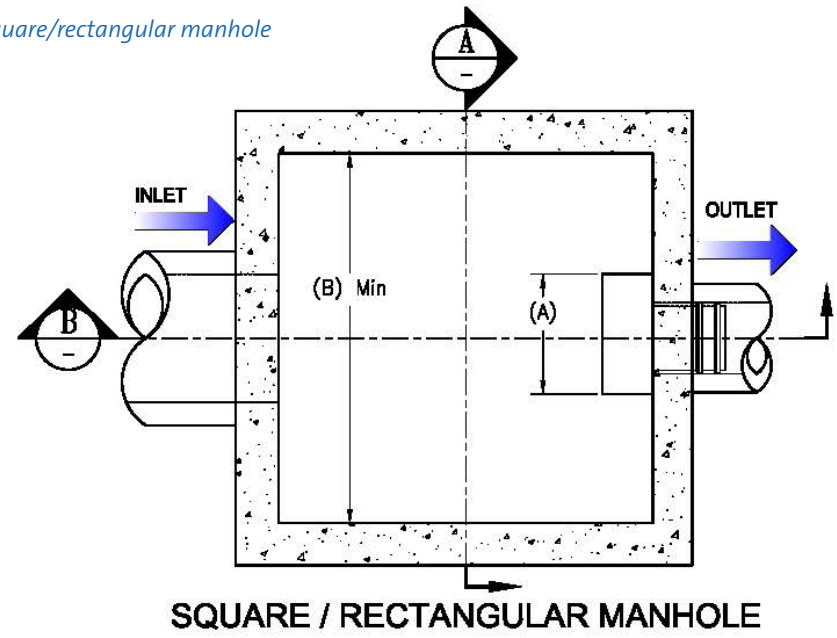
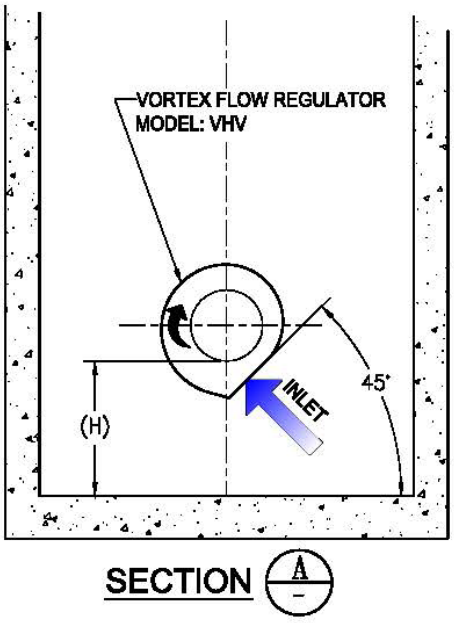
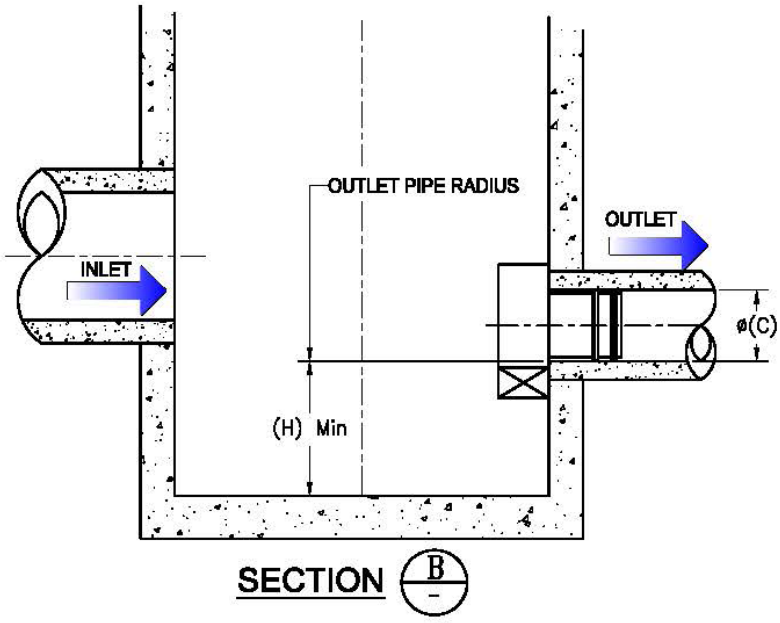



*Figure 2b: Minimum dimensions and clearances, square/rectangular manhole*



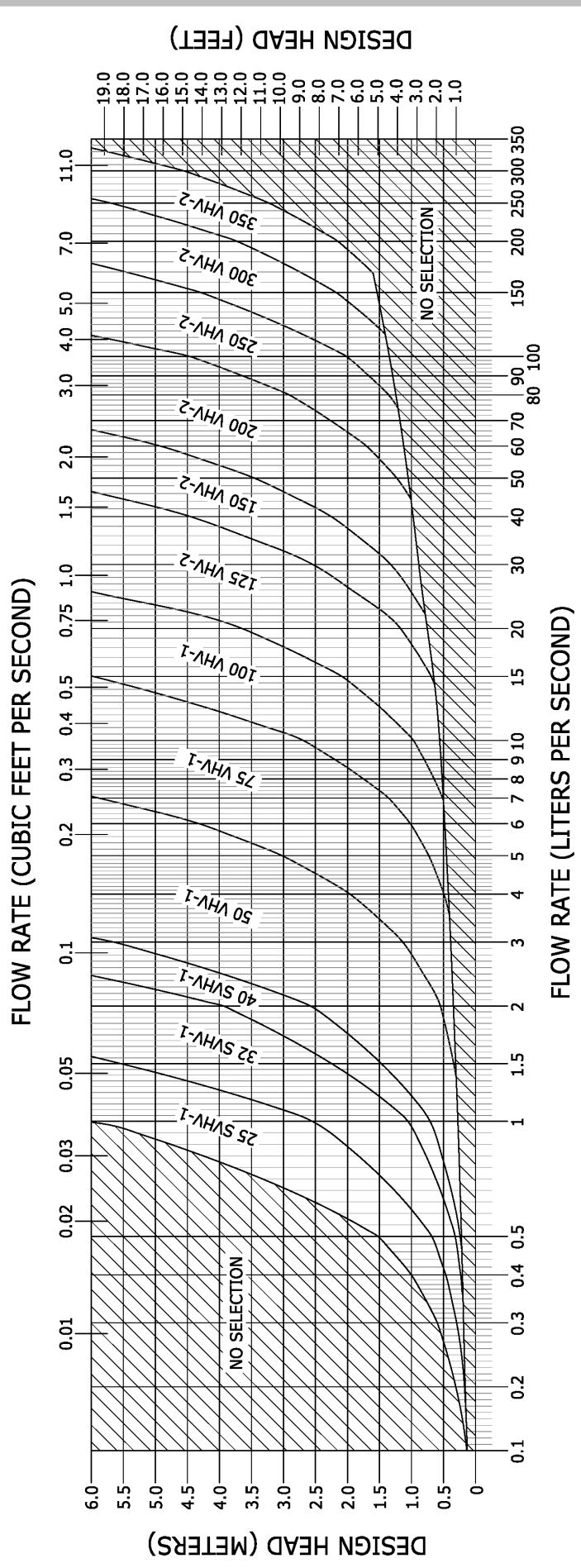



*Figure 3 : HYDROVEX® VHV/SVHV Selection Chart*

# Options

A variety of options are available for the HYDROVEX® VHV / SVHV vortex flow regulators, including:

- Type O: extended inlet for odor control
- FV-VHV: sliding plate mounted
- Gooseneck: for shallow or no sump installations
- Vent: for low slope applications

DT: roof drainage applications

# Specifications

In order to specify a HYDROVEX® VHV/SVHV flow regulator, the following parameters must be clearly indicated:

- Model number, ex: 75-VHV-1
- Outlet pipe diameter and type, ex: ø 150mm [6”], SDR 35
- Design discharge rate, ex: 6.0 L/s [0.21 CFS]
- Design head, ex: 2.0 m [6.56 ft] *
- Manhole diameter, ex: ø 900 mm [ø 36”]
- Minimum clearance “H”, ex: 150 mm [6 in]
- Construction material type (304 stainless steel standard)

**The design head is defined as the difference between the maximum upstream water level and the outlet pipe invert.*

# Installation

The installation of a HYDROVEX® VHV/SVHV flow regulator can be accomplished quickly and does not require any special tools. The sleeve of the vortex flow regulator is simply inserted into the outlet pipe of the manhole and the unit is then secured to the concrete wall using the supplied anchor.

# Maintenance

HYDROVEX® regulators are designed to minimize maintenance requirements. We recommend a periodic visual inspection in order to ensure that the unit is free of debris. The manhole sump beneath the unit should be inspected and cleaned with a vacuum truck periodically to remove accumulated sediments.

# Guaranty

The HYDROVEX® line of VHV / SVHV regulators are guaranteed against both design and manufacturing defects for a period of 5 years after sale. The unit will be modified or replaced should it be found to be defective within the guarantee period.

Resourcing the world

**Veolia Water Technologies**

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# Appendix A5

# Pre and Post Development Flows Calculations

## PRE-DEVELOPMENT FLOWS

**Peak Runoff- Pre-Development Condition**

| **Existing Condition** | **Area(Ha)** | **R** | **A xR** | | |
|---|---|---|---|---|---|
| **Area 101** | 0.3 | 0.43 | 0.12999 | | |
| $T_c$ = 15min. | | | | | |
| Storm Event | | | | | |
| 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
| **Intensity** | | | | | |
| 89.62 | 110.81 | 125.27 | 144.37 | 160.26 | 177.15 |
| Antecedent Precipitation Factor (Ca) | | | | | |
| 1.00 | 1.00 | 1.00 | 1.10 | 1.20 | 1.25 |
| **Peak Flows L/sec** | | | | | |
| 32.4 | 40.0 | 45.27 | 57.39 | 69.50 | 80.02 |

**POST DEVELOPMENT FLOW AREA 201 1ND 202 WITHOUT CONTROL**

**Peak Runoff- Post-Development Condition (Area 201)**

| **Proposed Condition** | **A** | **R** | **A xR** | | |
|---|---|---|---|---|---|
| Un-Controlled | 0.1519 | 0.9 | 0.13671 | | |
| $T_c$ = 15min. | | | | | |
| Storm Event | | | | | |
| 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
| **Intensity** | | | | | |
| 89.62 | 110.81 | 125.27 | 144.37 | 160.26 | 177.15 |
| Antecedent Precipitation Factor (Ca) | | | | | |
| 1.00 | 1.00 | 1.00 | 1.10 | 1.20 | 1.25 |
| **Peak Flows L/sec** | | | | | |
| 34.1 | 42.1 | 47.61 | 60.35 | 73.09 | 84.16 |

**Peak Runoff- Post-Development Condition (Area 202)**

| **Proposed Condition** | **A** | **R** | **A xR** | | |
|---|---|---|---|---|---|
| Un-Controlled | 0.0723 | 0.8 | 0.05784 | | |
| $T_c$ = 15min. | | | | | |
| Storm Event | | | | | |
| 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
| **Intensity** | | | | | |
| 89.62 | 110.81 | 125.27 | 144.37 | 160.26 | 177.15 |
| Antecedent Precipitation Factor (Ca) | | | | | |
| 1.00 | 1.00 | 1.00 | 1.10 | 1.20 | 1.25 |
| **Peak Flows L/sec** | | | | | |
| 14.4 | 17.8 | 20.14 | 25.53 | 30.92 | 35.61 |

**POST DEVELOPMENT FLOW AREA 203 1ND 204 WITHOUT CONTROL**

**Peak Runoff- Post-Development Condition (Area 203)**

| **Proposed Condition** | **A** | **R** | **A xR** | | |
|---|---|---|---|---|---|
| Un-Controlled Area | 0.0312 | 0.34 | 0.010608 | | |
| $T_c$ = 15min. | | | | | |
| Storm Event | | | | | |
| 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
| **Intensity** | | | | | |
| 89.62 | 110.81 | 125.27 | 144.37 | 160.26 | 177.15 |
| Antecedent Precipitation Factor (Ca) | | | | | |
| 1.00 | 1.00 | 1.00 | 1.10 | 1.20 | 1.25 |
| **Peak Flows L/sec** | | | | | |
| 2.6 | 3.3 | 3.69 | 4.68 | 5.67 | 6.53 |

**Peak Runoff- Post-Development Condition (Artea 204)**

| **Proposed Condition** | **A** | **R** | **A xR** | | |
|---|---|---|---|---|---|
| Un-Controlled Area | 0.04 | 0.49 | 0.0196 | | |
| $T_c$ = 15min. | | | | | |
| Storm Event | | | | | |
| 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year |
| **Intensity** | | | | | |
| 89.62 | 110.81 | 125.27 | 144.37 | 160.26 | 177.15 |
| Antecedent Precipitation Factor (Ca) | | | | | |
| 1.00 | 1.00 | 1.00 | 1.10 | 1.20 | 1.25 |
| **Peak Flows L/sec** | | | | | |

# Appendix A6

# Storm Design Sheet

## Appendix A6
## STORM SEWER DESIGN SHEET

Q= 2.78AIR

Where Q peak flow in litres per second (L/s)

A area in hectares

I rainfall in millimetres per hour (mm/hr)

= $1004/(tc+7.5)^{0.77}$ 5 Year Storm

where : tc is in hours

R runoff coefficient

| STREET | | | AREAS (ha) | | | | | | Rainfall | Peak | SEWER DATA | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM | TO | R= 0.25 | R= 0.5 | R= 0.9 | Indivi. 2.78AR | Accum 2.78AR | Time of Conc. | Intensity I | Flow Q (L/s) | Diameter (mm) | Slope % | Length (m) | Capacity (L/s) n= .013 | Velocity (m/s) m/s | Time of Flow (minutes) | Remarks |
| PROP | CONTR STM MH1 | PROP STM MH2 | | | 0.0723 | 0.181 | 0.18 | 10.00 | 110.81 | 20.0 | 250 | 0.70 | 34.0 | 32.3 | 0.66 | 0.86 | |
| Private | PROP CB3 | PROP STM MH3 | | 0.031 | | 0.043 | 0.04 | 10.00 | 110.81 | 4.8 | 200 | 1.00 | 21.0 | 33.2 | 2.04 | 0.17 | |
| Private | PROP STM MH3 | PROP STM MH2 | | | - | 0.00 | 0.04 | 10.86 | 106.79 | 4.6 | 200 | 1.00 | 13.0 | 33.2 | 1.06 | 0.20 | |
| Private | PROP STM MH2 | PROP STM MH4 | | | 0.0 | 0.00 | 0.22 | 11.07 | 105.88 | 23.7 | 250 | 0.90 | 10.0 | 57.2 | 1.17 | 0.14 | |
| Private | PROP STM MH4 | PROP STM MH5 | | | 0.0 | 0.00 | 0.22 | 11.21 | 105.26 | 23.6 | 250 | 0.90 | 5.0 | 57.2 | 1.17 | 0.07 | |
| Private | ROOF | PROP STM MH5 | | 0.152 | 0.0 | 0.211 | 0.21 | 10.00 | 110.81 | 23.4 | 200 | 2.00 | 3.0 | 47.0 | 1.50 | 0.03 | |
| Private | PROP STM MH5 | PROP STORMCEPTOR | | | 0.0 | 0.00 | 0.44 | 10.03 | 110.65 | 48.2 | 300 | 0.50 | 13.0 | 69.4 | 0.98 | 0.22 | |
| Private | PROP CB4 | PROP STORMCEPTOR | | 0.04 | 0.0 | 0.056 | 0.06 | 10.00 | 110.81 | 6.2 | 200 | 1.00 | 4.0 | 33.2 | 1.06 | 0.06 | |
| Private | PROP STORMCEPTOR | OUTFALL | | | 0.0 | 0.00 | 0.49 | 11.10 | 105.74 | 51.9 | 300 | 0.50 | 10.0 | 69.4 | 0.98 | 0.17 | |

| | | | |
|---|---|---|---|
| Calc by | MFI | Project: | Sheet No. |
| Checked | MFI | Apartment Building | |
| Date | 24-Apr-26 | 12717 Ninth Line, Stouffville | |

# Appendix A7

# Stormceptor Design Sheet

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

08/31/2026

| | |
|---|---|
| Province: | Ontario |
| City: | Stouffville |
| Nearest Rainfall Station: | TORONTO CITY |
| Climate Station Id: | 6158355 |
| Years of Rainfall Data: | 20 |

| | |
|---|---|
| Site Name: | OGS |

| | |
|---|---|
| Drainage Area (ha): | 0.30 |
| Runoff Coefficient 'c': | 0.72 |

| | |
|---|---|
| Particle Size Distribution: | Fine |
| Target TSS Removal (%): | 80.0 |

| | |
|---|---|
| Required Water Quality Runoff Volume Capture (%): | 90.00 |
| Estimated Water Quality Flow Rate (L/s): | 6.98 |
| Oil / Fuel Spill Risk Site? | Yes |
| Upstream Flow Control? | Yes |
| Upstream Orifice Control Flow Rate to Stormceptor (L/s): | 26.90 |
| Peak Conveyance (maximum) Flow Rate (L/s): | |
| Influent TSS Concentration (mg/L): | 200 |
| Estimated Average Annual Sediment Load (kg/yr): | 248 |
| Estimated Average Annual Sediment Volume (L/yr): | 202 |

| | |
|---|---|
| Project Name: | 12717 Ninth Line |
| Project Number: | - |
| Designer Name: | Jessica Steffler |
| Designer Company: | Rinker Materials |
| Designer Email: | jessica.steffler@RinkerPipe.com |
| Designer Phone: | 519-239-6958 |
| EOR Name: | Muhammad Ismail |
| EOR Company: | Premier Engineering Solutions Inc. |
| EOR Email: | mfi@p-engineeringsolutions.com |
| EOR Phone: | 416-268-4996 |

### Net Annual Sediment (TSS) Load Reduction Sizing Summary

| Stormceptor Model | TSS Removal Provided (%) |
|---|---|
| EFO4 | 92 |
| EFO5 | 95 |
| EFO6 | 97 |
| EFO8 | 99 |
| EFO10 | 100 |
| EFO12 | 100 |

| | |
|---|---|
| Recommended Stormceptor EFO Model: | EFO4 |
| Estimated Net Annual Sediment (TSS) Load Reduction (%): | 92 |
| Water Quality Runoff Volume Capture (%): | > 90 |

## THIRD-PARTY TESTING AND VERIFICATION

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

## PERFORMANCE

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

## PARTICLE SIZE DISTRIBUTION (PSD)

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

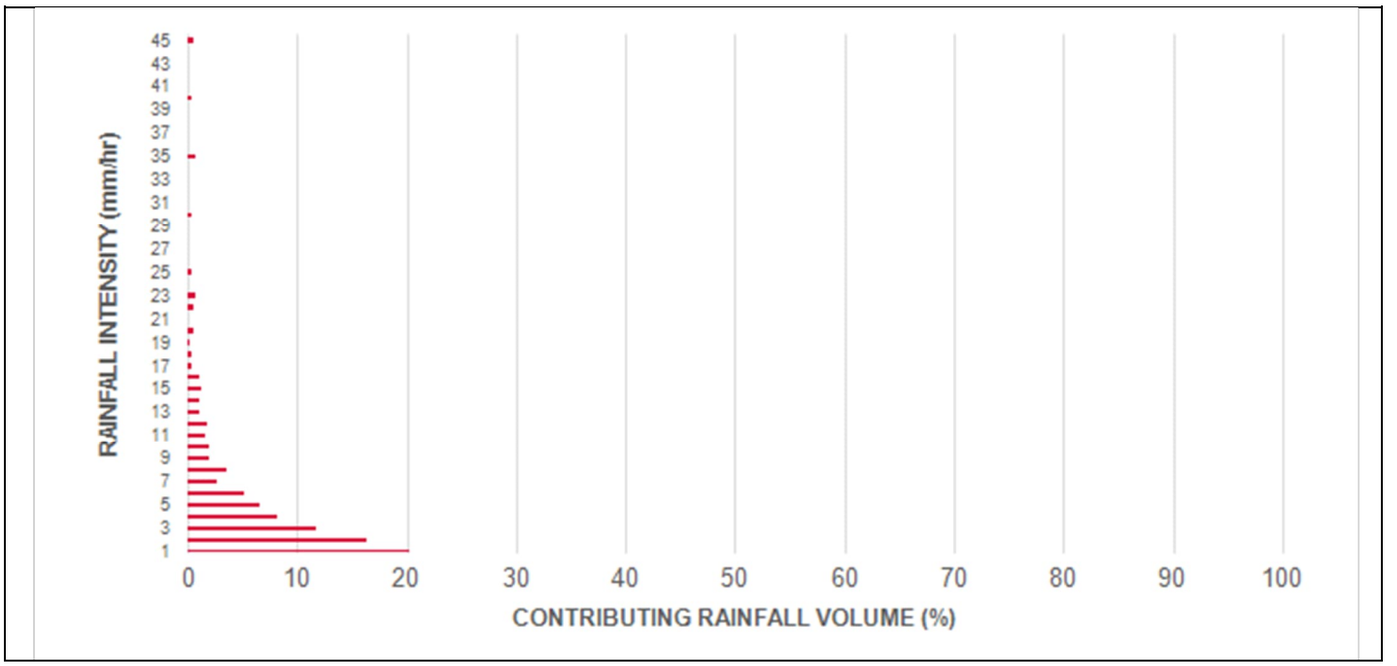
| Particle Size (µm) | Percent Less Than | Particle Size Fraction (µm) | Percent |
|---|---|---|---|
| 1000 | 100 | 500-1000 | 5 |
| 500 | 95 | 250-500 | 5 |
| 250 | 90 | 150-250 | 15 |
| 150 | 75 | 100-150 | 15 |
| 100 | 60 | 75-100 | 10 |
| 75 | 50 | 50-75 | 5 |
| 50 | 45 | 20-50 | 10 |
| 20 | 35 |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

## Upstream Flow Controlled Results

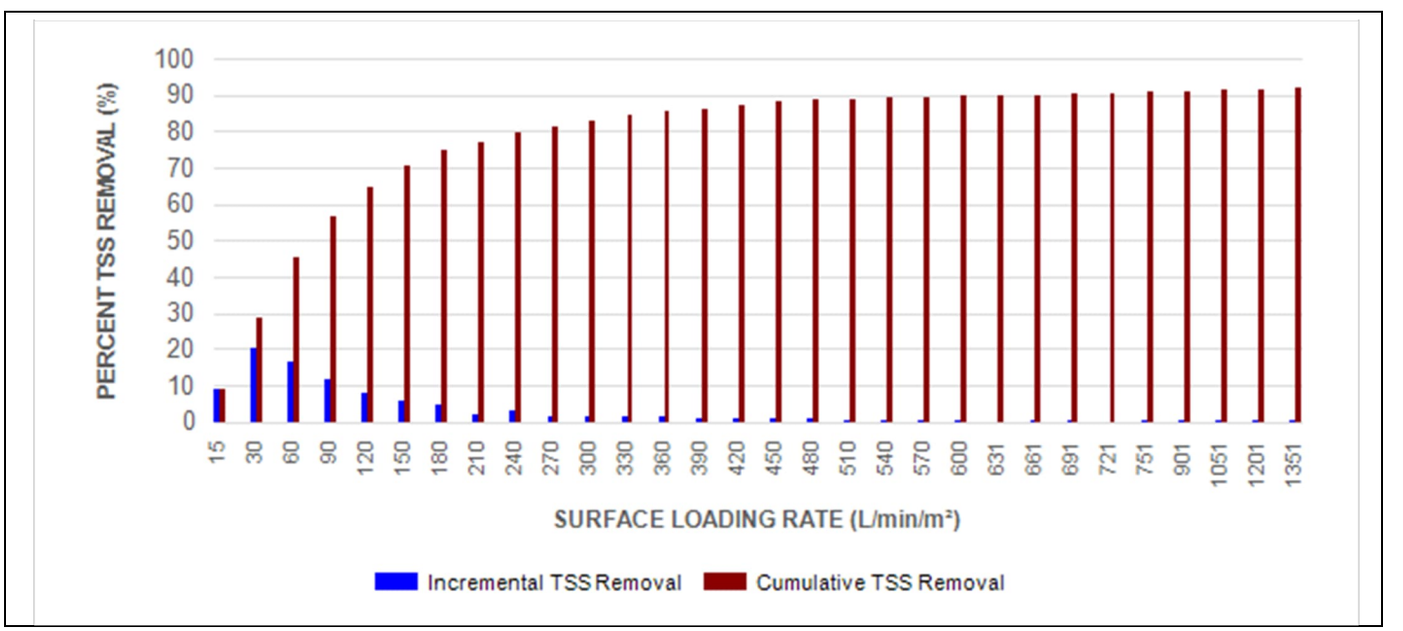
| Rainfall Intensity (mm / hr) | Percent Rainfall Volume (%) | Cumulative Rainfall Volume (%) | Flow Rate (L/s) | Flow Rate (L/min) | Surface Loading Rate (L/min/m²) | Removal Efficiency (%) | Incremental Removal (%) | Cumulative Removal (%) |
|---|---|---|---|---|---|---|---|---|
| 0.50 | 8.7 | 8.7 | 0.30 | 18.0 | 15.0 | 100 | 8.7 | 8.7 |
| 1.00 | 20.2 | 28.9 | 0.60 | 36.0 | 30.0 | 100 | 20.2 | 28.9 |
| 2.00 | 16.4 | 45.3 | 1.20 | 72.0 | 60.0 | 100 | 16.4 | 45.3 |
| 3.00 | 11.8 | 57.1 | 1.80 | 108.0 | 90.0 | 97 | 11.4 | 56.8 |
| 4.00 | 8.1 | 65.2 | 2.40 | 144.0 | 120.0 | 93 | 7.6 | 64.4 |
| 5.00 | 6.6 | 71.9 | 3.00 | 180.0 | 150.0 | 89 | 5.9 | 70.3 |
| 6.00 | 5.2 | 77.1 | 3.60 | 216.0 | 180.0 | 86 | 4.5 | 74.8 |
| 7.00 | 2.7 | 79.8 | 4.20 | 252.0 | 210.0 | 83 | 2.2 | 77.0 |
| 8.00 | 3.6 | 83.4 | 4.80 | 288.0 | 240.0 | 81 | 2.9 | 79.9 |
| 9.00 | 2.0 | 85.4 | 5.40 | 324.0 | 270.0 | 80 | 1.6 | 81.5 |
| 10.00 | 1.9 | 87.3 | 6.00 | 360.0 | 300.0 | 78 | 1.5 | 83.0 |
| 11.00 | 1.6 | 88.9 | 6.61 | 396.0 | 330.0 | 77 | 1.2 | 84.2 |
| 12.00 | 1.8 | 90.7 | 7.21 | 432.0 | 360.0 | 76 | 1.4 | 85.6 |
| 13.00 | 1.0 | 91.6 | 7.81 | 468.0 | 390.0 | 74 | 0.7 | 86.3 |
| 14.00 | 1.0 | 92.7 | 8.41 | 504.0 | 420.0 | 73 | 0.7 | 87.1 |
| 15.00 | 1.3 | 93.9 | 9.01 | 540.0 | 450.0 | 72 | 0.9 | 88.0 |
| 16.00 | 1.0 | 95.0 | 9.61 | 576.0 | 480.0 | 70 | 0.7 | 88.7 |
| 17.00 | 0.4 | 95.3 | 10.21 | 612.0 | 510.0 | 69 | 0.2 | 88.9 |
| 18.00 | 0.4 | 95.7 | 10.81 | 649.0 | 540.0 | 67 | 0.3 | 89.2 |
| 19.00 | 0.2 | 95.9 | 11.41 | 685.0 | 570.0 | 66 | 0.1 | 89.3 |
| 20.00 | 0.6 | 96.5 | 12.01 | 721.0 | 600.0 | 65 | 0.4 | 89.7 |
| 21.00 | 0.0 | 96.5 | 12.61 | 757.0 | 631.0 | 64 | 0.0 | 89.7 |
| 22.00 | 0.5 | 97.0 | 13.21 | 793.0 | 661.0 | 64 | 0.3 | 90.0 |
| 23.00 | 0.7 | 97.7 | 13.81 | 829.0 | 691.0 | 64 | 0.5 | 90.5 |
| 24.00 | 0.0 | 97.7 | 14.41 | 865.0 | 721.0 | 64 | 0.0 | 90.5 |
| 25.00 | 0.3 | 98.0 | 15.01 | 901.0 | 751.0 | 63 | 0.2 | 90.7 |
| 30.00 | 0.3 | 98.3 | 18.01 | 1081.0 | 901.0 | 62 | 0.2 | 90.9 |
| 35.00 | 0.8 | 99.1 | 21.02 | 1261.0 | 1051.0 | 60 | 0.5 | 91.3 |
| 40.00 | 0.9 | 100.0 | 24.02 | 1441.0 | 1201.0 | 57 | 0.5 | 91.9 |
| 45.00 | 0.0 | 100.0 | 27.00 | 1620.0 | 1350.0 | 53 | 0.0 | 91.9 |
| Estimated Net Annual Sediment (TSS) Load Reduction = | | | | | | | | 92 % |

*Climate Station ID*: 6158355 *Years of Rainfall Data*: 20

RAINFALL DATA FROM TORONTO CITY RAINFALL STATION




INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

| Stormceptor EF / EFO | Model Diameter | | Min Angle Inlet / Outlet Pipes | Max Inlet Pipe Diameter | | Max Outlet Pipe Diameter | | Peak Conveyance Flow Rate | |
|---|---|---|---|---|---|---|---|---|---|
| | (m) | (ft) | | (mm) | (in) | (mm) | (in) | (L/s) | (cfs) |
| EF4 / EFO4 | 1.2 | 4 | 90 | 609 | 24 | 609 | 24 | 425 | 15 |
| EF5 / EFO5 | 1.5 | 5 | 90 | 762 | 30 | 762 | 30 | 710 | 25 |
| EF6 / EFO6 | 1.8 | 6 | 90 | 914 | 36 | 914 | 36 | 990 | 35 |
| EF8 / EFO8 | 2.4 | 8 | 90 | 1219 | 48 | 1219 | 48 | 1700 | 60 |
| EF10 / EFO10 | 3.0 | 10 | 90 | 1828 | 72 | 1828 | 72 | 2830 | 100 |
| EF12 / EFO12 | 3.6 | 12 | 90 | 1828 | 72 | 1828 | 72 | 2830 | 100 |

## SCOUR PREVENTION AND ONLINE CONFIGURATION

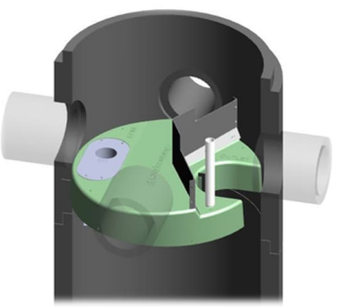
►Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance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

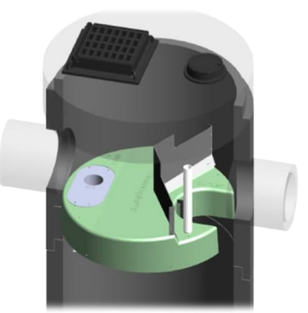
## DESIGN FLEXIBILITY

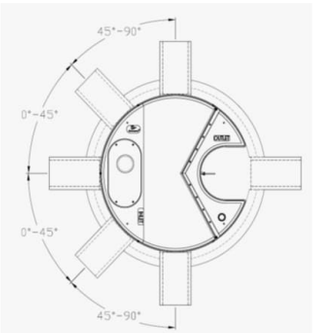
►Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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

## OIL CAPTURE AND RETENTION

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








INLET-TO-OUTLET DROP

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

HEAD LOSS

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

Pollutant Capacity

| Stormceptor EF / EFO | Model Diameter | | Depth (Outlet Pipe Invert to Sump Floor) | | Oil Volume | | Recommended Sediment Maintenance Depth * | | Maximum Sediment Volume * | | Maximum Sediment Mass ** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (m) | (ft) | (m) | (ft) | (L) | (Gal) | (mm) | (in) | (L) | ($ft^3$) | (kg) | (lb) |
| EF4 / EFO4 | 1.2 | 4 | 1.52 | 5.0 | 265 | 70 | 203 | 8 | 1190 | 42 | 1904 | 5250 |
| EF5 / EFO5 | 1.5 | 5 | 1.62 | 5.3 | 420 | 111 | 305 | 10 | 2124 | 75 | 2612 | 5758 |
| EF6 / EFO6 | 1.8 | 6 | 1.93 | 6.3 | 610 | 160 | 305 | 12 | 3470 | 123 | 5552 | 15375 |
| EF8 / EFO8 | 2.4 | 8 | 2.59 | 8.5 | 1070 | 280 | 610 | 24 | 8780 | 310 | 14048 | 38750 |
| EF10 / EFO10 | 3.0 | 10 | 3.25 | 10.7 | 1670 | 440 | 610 | 24 | 17790 | 628 | 28464 | 78500 |
| EF12 / EFO12 | 3.6 | 12 | 3.89 | 12.8 | 2475 | 655 | 610 | 24 | 31220 | 1103 | 49952 | 137875 |

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

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

## PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

## PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

| | | |
|---|---|---|
| 2.1.1 | 4 ft (1219 mm) Diameter OGS Units: | 1.19 $m^3$ sediment / 265 L oil |
| | 5 ft (1524 mm) Diameter OGS Units: | 1.95 $m^3$ sediment / 420 L oil |
| | 6 ft (1829 mm) Diameter OGS Units: | 3.48 $m^3$ sediment / 609 L oil |
| | 8 ft (2438 mm) Diameter OGS Units: | 8.78 $m^3$ sediment / 1,071 L oil |
| | 10 ft (3048 mm) Diameter OGS Units: | 17.78 $m^3$ sediment / 1,673 L oil |
| | 12 ft (3657 mm) Diameter OGS Units: | 31.23 $m^3$ sediment / 2,476 L oil |

## PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance

results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/$m^2$ to 2600 L/min/$m^2$) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

# STANDARD SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE WITH THIRD-PARTY VERIFIED LIGHT LIQUID RE-ENTRAINMENT SIMULATION PERFORMANCE TESTING RESULTS

## PART 1 – GENERAL

### 1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, designing, maintaining, and constructing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, **specifically an OGS device that has been third-party tested for oil and fuel retention capability using a protocol for light liquid re-entrainment simulation testing, with testing results and a Statement of Verification in accordance with all the provisions of ISO 14034 Environmental Management – Environmental Technology Verification (ETV)**. Work includes supply and installation of concrete bases, precast sections, and the appropriate precast section with OGS internal components correctly installed within the system, watertight sealed to the precast concrete prior to arrival to the project site.

### 1.2 REFERENCE STANDARDS

#### 1.2.1 For Canadian projects only, the following reference standards apply:

CAN/CSA-A257.4-14: Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets
CAN/CSA-A257.4-14: Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings
CAN/CSA-S6-00: Canadian Highway Bridge Design Code

#### 1.2.2 For ALL projects, the following reference standards apply:

ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 891: Standard Practice for Installation of Underground Precast Concrete Utility Structures
ASTM D2563: Standard Practice for Classification of Visual Defects in Reinforced Plastics

### 1.3 SHOP DRAWINGS

1.3.1 Shop drawings shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail the precast concrete components and OGS internal components prior to shipment, including the sequence for installation.

1.3.2 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record. Any and all changes to project cost estimates, bonding amounts, plan check fees for revision of approved documents, or design impacts due to regulatory requirements as a result of a product substitution shall be coordinated by the Contractor with the Engineer of Record.

### 1.4 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

1.4.1 OGS internal components supplied by the Manufacturer for attachment to the precast concrete vessel shall be pre-fabricated, bolted to the precast and watertight sealed to the precast vessel surface prior to site delivery to ensure Manufacturer's internal assembly process and quality control processes are fully adhered to, and to prevent materials damage on site.

1.4.2 Follow all instructions including the sequence for installation in the shop drawings during installation.

**PART 2 – PRODUCTS**

2.1 GENERAL

2.1.1 The OGS vessel shall be cylindrical and constructed from precast concrete riser and slab components.

2.1.2 The precast concrete OGS internal components shall include a fiberglass insert bolted and watertight sealed inside the precast concrete vessel, prior to site delivery. Primary internal components that are to be anchored and watertight sealed to the precast concrete vessel shall be done so only by the Manufacturer prior to arrival at the job site to ensure product quality.

2.1.3 The OGS shall be allowed to be specified and have the ability to function as a 240-degree bend structure in the stormwater drainage system, or as a junction structure.

2.1.4 The OGS to be specified shall have the capability to accept influent flow from an inlet grate and an inlet pipe.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be designed and manufactured to meet highway loading conditions per State/Provincial or local requirements.

2.3 GASKETS

Only profile neoprene or nitrile rubber gaskets that are oil resistant shall be accepted. For Canadian projects only, gaskets shall be in accordance to CSA A257.4-14. Mastic sealants, butyl tape/rope or Conseal CS-101 alone are not acceptable gasket materials.

2.4 JOINTS

The concrete joints shall be watertight and meet the design criteria according to ASTM C-990. For projects where joints require gaskets, the concrete joints shall be watertight and oil resistant and meet the design criteria according to ASTM C-443. Mastic sealants or butyl tape/rope alone are not an acceptable alternative.

2.5 FRAMES AND COVERS

Frames and covers shall be manufactured in accordance with State/Provincial or local requirements for inspection and maintenance access purposes. A minimum of one cover, at least 22-inch (560 mm) in diameter, shall be clearly embossed with the OGS manufacturer's product name to properly identify this asset's purpose is for stormwater quality treatment.

2.6 PRECAST CONCRETE

All precast concrete components shall conform to the appropriate CSA or ASTM specifications.

2.7 FIBERGLASS

The fiberglass portion of the OGS device shall be constructed in accordance with ASTM D2563, and in accordance with the PS15-69 manufacturing standard, and shall only be installed, bolted and watertight sealed to the precast concrete by the Manufacturer prior to arrival at the project site to ensure product quality.

2.8 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a fiberglass insert for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The total sediment storage capacity shall be a minimum 40 $ft^3$ (1.1 $m^3$). The total petroleum hydrocarbon storage capacity shall be a minimum 50 gallons (189 liters). The access opening to the sump of the OGS device for periodic inspection and maintenance purposes shall be a minimum 16 inches (406 mm) in diameter.

2.9 LADDERS

Ladder rungs shall be provided upon request or to comply with State/Provincial or local requirements.

2.10 INSPECTION

All precast concrete sections shall be level and inspected to ensure dimensions, appearance, integrity of internal components, and quality of the product meets State/Provincial or local specifications and associated standards.

**PART 3 – PERFORMANCE & DESIGN**

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 HYDROLOGY AND RUNOFF VOLUME

The OGS device shall be engineered, designed and sized to treat a minimum of 90 percent of the average annual runoff volume, unless otherwise stated by the Engineer of Record, using historical rainfall data. Rainfall data sets should be comprised of a minimum 15-years of rainfall data or a longer continuous period if available for a given location, but in all cases a minimum 5-year period of rainfall data.

3.3 ANNUAL (TSS) SEDIMIMENT LOAD AND STORAGE CAPACITY

The OGS device shall be capable of removing and have sufficient storage capacity for the calculated annual total suspended solids (TSS) mass load and volume without scouring previously captured pollutants prior to maintenance being required. The annual (TSS) sediment load and volume transported from the drainage area should be calculated and compared to the OGS device's available storage capacity by the specifying Engineer to ensure adequate capacity between maintenance cycles. Sediment loadings shall be determined by land use and defined as a minimum of 450 kg (992 lb) of sediment (TSS) per impervious hectare of drainage area per year, or greater based on land use, as noted in Table 1 below.

Annual sediment volume calculations shall be performed using the projected average annual treated runoff volume, a typical sediment bulk density of 1602 $kg/m^3$ (100 $lbs/ft^3$) and an assumed Event Mean Concentration (EMC) of 125 mg/L TSS in the runoff, or as otherwise determined by the Engineer of Record.

Example calculation for a 1.3-hectares parking lot site:

- 1.28 meters of rainfall depth, per year
- 1.3 hectares of 100% impervious drainage area
- EMC of 125 mg/L TSS in runoff
- Treatment of 90% of the average annual runoff volume
- Target average annual TSS removal rate of 60% by OGS

Annual Runoff Volume:

- 1.28 m rain depth x 1.3 ha x 10,000 $m^2$/ha= 16,640 $m^3$ of runoff volume
- 16,640 $m^3$ x 1000 L/$m^3$ = 16,640,000 L of runoff volume
- 16,640,000 L x 0.90 = 14,976,000 L to be treated by OGS unit

Annual Sediment Mass and Sediment Volume Load Calculation:

- 14,976,000 L x 125 mg/L x kg/1,000,000 mg = 1,872 kg annual sediment mass
- 1,872 kg x $m^3$/1602 kg = 1.17 $m^3$ annual sediment volume
- 1.17 $m^3$ x 60% TSS removal rate by OGS = 0.70 $m^3$ minimum expected annual storage requirement in OGS

As a guideline, the U.S. EPA has determined typical annual sediment loads per drainage area for various sites by land use (see Table 1). Certain States, Provinces and local jurisdictions have also established such guidelines.

Table 1 – Annual Mass Sediment Loading by Land Use

| | Commercial | Parking Lot | Residential | | | Highways | Industrial | Shopping Center |
|---|---|---|---|---|---|---|---|---|
| | | | High | Med. | Low | | | |
| (lbs/acre/yr) | 1,000 | 400 | 420 | 250 | 10 | 880 | 500 | 440 |
| (kg/hectare/yr) | 1,124 | 450 | 472 | 281 | 11 | 989 | 562 | 494 |

**Source:** U.S. EPA Stormwater Best Management Practice Design Guide Volume 1, Appendix D, Table D-1, Burton and Pitt 2002

## 3.4 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in Table 2, Section 3.5, and based on third-party performance testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol *Procedure for Laboratory Testing of Oil-Grit Separators*, as follows:

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

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

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

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

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 3.3.

3.4.5 The Peclet Number is not an approved method or model for calculating TSS removal, sizing, or scaling OGS devices.

3.4.6 If an alternate OGS device is proposed, supporting documentation shall be submitted that demonstrates:

- Canadian ETV or ISO 14034 ETV Verification Statement which verifies third-party performance testing conducted in accordance with the **Procedure for Laboratory Testing of Oil-Grit Separators,** including the Light Liquid Re-entrainment Simulation Testing.
- Equal or better sediment (TSS) removal of the PSD specified in Table 2 at equivalent surface loading rates, as compared to the OGS device specified herein.
- Equal or better Light Liquid Re-entrainment Simulation Test results (using low-density polyethylene beads as a surrogate for light liquids such as oil and fuel) at equivalent surface loading rates, as compared to the OGS device specified herein. However, an alternative OGS device shall not be allowed as a substitute if the Light Liquid Re-entrainment Simulation Test was performed with screening components within the OGS device that are effective at retaining the low-density polyethylene beads, but would not be expected to retain light liquids such as oil and fuel.
- Equal or greater sediment storage capacity, as compared to the OGS device specified herein.
- Supporting documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.5 PARTICLE SIZE DISTRIBUTION (PSD) FOR SIZING

The OGS device shall be sized to achieve the Engineer-specified average annual percent sediment (TSS) removal based solely on the test sediment used in the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** This test sediment is comprised of inorganic ground silica with a specific gravity of 2.65, uniformly mixed, and containing a broad range of particle sizes as specified in Table 2. No alternative PSDs or deviations from Table 2 shall be accepted.

**Table 2**
**Canadian ETV Program Procedure for Laboratory Testing of Oil-Grit Separators**
**Particle Size Distribution (PSD) of Test Sediment**

| Particle Diameter (Microns) | % by Mass of All Particles | Specific Gravity |
|---|---|---|
| 1000 | 5% | 2.65 |
| 500 | 5% | 2.65 |
| 250 | 15% | 2.65 |
| 150 | 15% | 2.65 |
| 100 | 10% | 2.65 |
| 75 | 5% | 2.65 |
| 50 | 10% | 2.65 |
| 20 | 15% | 2.65 |
| 8 | 10% | 2.65 |
| 5 | 5% | 2.65 |
| 2 | 5% | 2.65 |

3.6 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party scour testing conducted and have in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. This scour testing is conducted with the device pre-loaded with test sediment comprised of the particle size distribution (PSD) illustrated in Table 2.

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

Data generated from laboratory scour testing performed with an OGS device pre-loaded with a coarser PSD than in Table 2 (i.e. the coarser PSD has no particles in the 1-micron to 50-micron size range, or the $D_{50}$ of the test sediment exceeds 75 microns) shall not be acceptable for the determination of the device's suitability for on-line installation.

3.7 DESIGN ACCOUNTING FOR BYPASS

3.7.1 The OGS device shall be specified to achieve the TSS removal performance and water quality objectives without washout of previously captured pollutants. The OGS device shall also have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record. To ensure this is achieved, there are two design options with associated requirements:

3.7.1.1 The OGS device shall be placed **off-line** with an upstream diversion structure (typically in an upstream manhole) that only allows the water quality volume to be diverted to the OGS device, and excessive flows diverted downstream around the OGS device to prevent high flow washout of pollutants previously captured. This design typically incorporates a triangular layout including an upstream bypass manhole with an appropriately engineered weir wall, the OGS device, and a downstream junction manhole, which is connected to both the OGS device and bypass structure. In this case with an external bypass required, the OGS device manufacturer must provide calculations and designs for all structures, piping and any other required material applicable to the proper functioning of the system, stamped by a Professional Engineer.

3.7.1.2 Alternatively, OGS devices in compliance with Section 3.6 shall be acceptable for an **on-line** design configuration, thereby eliminating the requirement for an upstream bypass manhole and downstream junction manhole.

3.7.2 The OGS device shall also have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record. If an alternate OGS device is proposed, supporting documentation shall be submitted that demonstrates equal or better hydraulic conveyance capacity as compared to the OGS device specified herein. This documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.8 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

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

3.9 PETROLEUM HYDROCARBONS AND FLOATABLES STORAGE CAPACITY

Petroleum hydrocarbons and floatables storage capacity in the OGS device shall be a minimum 50 gallons (189 Liters), or more as specified.

3.9.1 The OGS device shall have gasketed precast concrete joints that are watertight, and oil resistant and meet the design criteria according to ASTM C-443 to provide safe oil and other hydrocarbon materials storage and ground water protection. Mastic sealants or butyl tape/rope alone are not an acceptable alternative.

3.10 SURFACE LOADING RATE SCALING OF DIFFERENT MODEL SIZES

The reference device for scaling shall be an OGS device that has been third-party tested in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Other model sizes of the tested device shall only be scaled such that the claimed TSS removal efficiency of the scaled device shall be no greater than the TSS removal efficiency of the tested device at identical **surface loading rates** (flow rate divided by settling surface area). The depth of other model sizes of the tested device shall be scaled in accordance with the depth scaling provisions within Section 6.0 of the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.10.1 The Peclet Number and volumetric scaling are not approved methods for scaling OGS devices.

**PART 4 – INSPECTION & MAINTENANCE**

The OGS manufacturer shall provide an Owner's Manual upon request.
Maintenance shall be performed by a professional service provider who has experience in cleaning OGS devices and has been trained and certified in applicable health and safety practices, including confined space entry procedures.

4.1 A Quality Assurance Plan that provides inspection for a minimum of 5 years shall be included with the OGS stormwater quality device, and written into the Environmental Compliance Approval (ECA) or the appropriate State/Provincial or local approval document.

4.2 OGS device inspection shall include determination of sediment depth and presence of petroleum hydrocarbons below the insert. Inspection shall be easily conducted from finished grade through a frame and cover of at least 22 inch (560 mm) in diameter.

4.3 Inspection and pollutant removal shall be conducted periodically. For routine maintenance cleaning activities, pollutant removal shall typically utilize a truck equipped with vacuum apparatus, and shall be easily conducted from finished grade through a frame and cover of at least 22-inches (560 mm) in diameter.

4.4 Diameter of the maintenance access opening to the lower chamber and sump shall be scaled consistently across all model sizes, and shall be 1/3 the inside diameter of the OGS structure, or larger.

4.5 No confined space entry shall be required for routine inspection and maintenance cleaning activities.

4.6 For OGS model sizes of diameter 72 inches (1828 mm) and greater, the access opening to the OGS device's lower chamber and sump shall be large enough to allow a maintenance worker to enter the lower chamber to facilitate non-routine maintenance cleaning activities and repairs, as needed.

4.7 The orifice-containing component (i.e. drop pipe, duct, chute, etc.) of the OGS device used to control flow rate into the lower chamber shall be removable from the insert to facilitate cleaning, repair, or replacement of the orifice-containing component, as needed.

**PART 5 – EXECUTION**

5.1 PRECAST CONCRETE INSTALLATION

The installation of the precast concrete OGS stormwater quality treatment device shall conform to ASTM C 891, ASTM C 478, ASTM C 443, CAN/CSA-A257.4-14, CAN/CSA-A257.4-14, CAN/CSA-S6-00 and all highway, State/Provincial, or local specifications for the construction of manholes. Selected sections of a general specification that are applicable are summarized below. The Contractor shall furnish all labor, equipment and materials necessary to offload, assemble as needed the OGS internal components as specified in the Shop Drawings.

5.2 EXCAVATION

5.2.1 Excavation for the installation of the OGS stormwater quality treatment device shall conform to highway, State/Provincial or local specifications. Topsoil that is removed during the excavation for the OGS stormwater quality treatment device shall be stockpiled in designated areas and not be mixed with subsoil or other materials. Topsoil stockpiles and the general site preparation for the installation of the OGS stormwater quality device shall conform to highway, State/Provincial or local specifications.

5.2.2 The OGS device shall not be installed on frozen ground. Excavation shall extend a minimum of 12 inch (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

5.2.3 In areas with a high water table, continuous dewatering shall be provided to ensure that the excavation is stable and free of water.

5.3 BACKFILLING

Backfill material shall conform to highway, State/Provincial or local specifications. Backfill material shall be placed in uniform layers not exceeding 12 inches (300 mm) in depth and compacted to highway, State/Provincial or local specifications.

5.4 OGS WATER QUALITY DEVICE CONSTRUCTION SEQUENCE

5.4.1 The precast concrete OGS stormwater quality treatment device is installed and leveled in sections in the following sequence:

- aggregate base
- base slab, or base
- riser section(s) (if required)
- riser section w/ pre-installed fiberglass insert
- upper riser section(s)
- internal OGS device components
- connect inlet and outlet pipes
- riser section, top slab and/or transition (if required)
- frame and access cover

5.4.2 The precast concrete base shall be placed level at the specified grade. The entire base shall be in contact with the underlying compacted granular material. Subsequent sections, complete with oil resistant, watertight joint seals, shall be installed in accordance with the precast concrete manufacturer's recommendations.

5.4.3 Adjustment of the OGS stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets shall be repaired or replaced as necessary. Once the OGS stormwater quality treatment device has been constructed, any lift holes must be plugged with mortar.

5.5 DROP PIPE AND OIL INSPECTION PIPE

Once the upper precast concrete riser has been attached to the lower precast concrete riser section, the OGS device Drop Pipe and Oil Inspection Pipe must be attached, and watertight sealed to the fiberglass insert using Sikaflex 1a. Installation instructions and required materials shall be provided by the OGS manufacturer.

5.6 INLET AND OUTLET PIPES

Inlet and outlet pipes shall be securely set using grout or approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight. Non-secure inlets and outlets will result in improper performance.

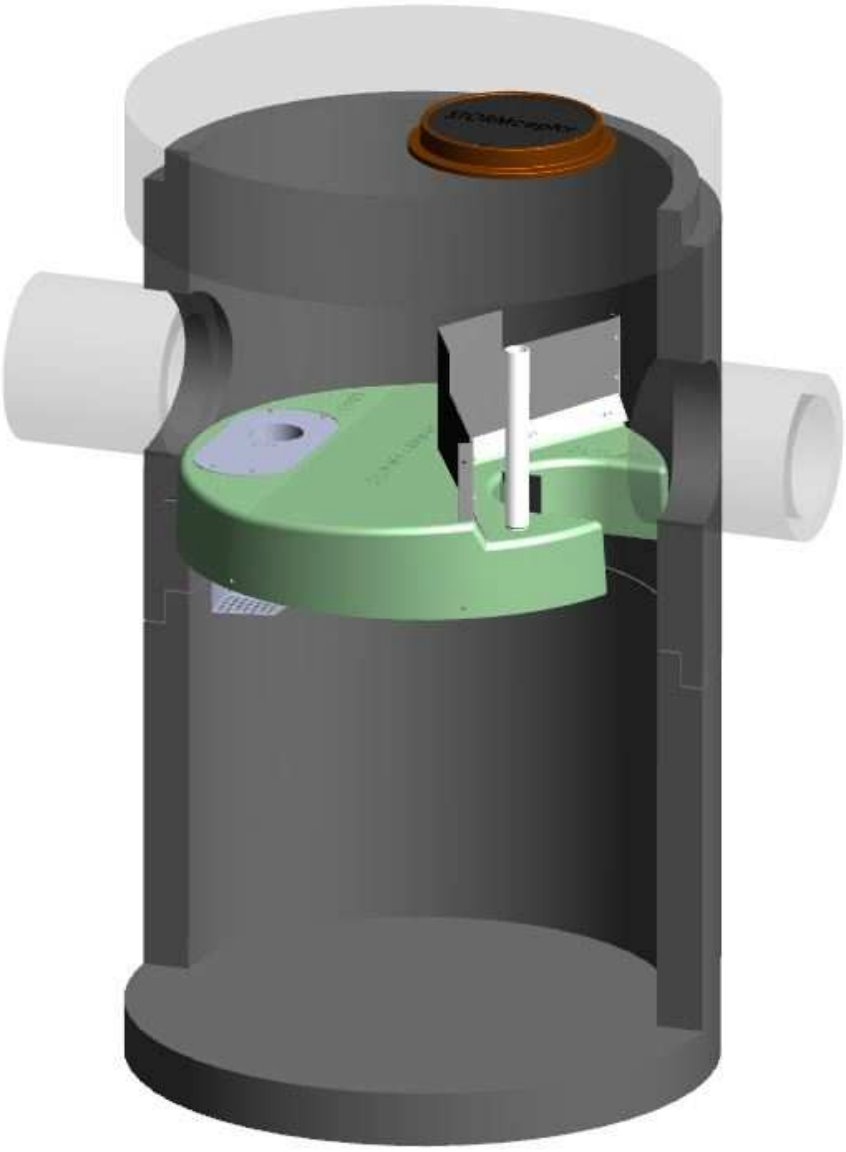
5.7 FRAME AND COVER OR FRAME AND GRATE INSTALLATION

Precast concrete adjustment units shall be installed to set the frame and cover/grate at the required elevation. The adjustment units shall be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover/grate should be set in a full bed of mortar at the elevation specified.

5.7.1 A minimum of one cover, at least 22-inch (560 mm) in diameter, shall be clearly embossed with the OGS device brand or product name to properly identify this asset's purpose is for stormwater quality treatment.

# Stormceptor® EF

# Owner's Manual



*Stormceptor is protected by one or more of the following patents:*

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

**Table of Contents:**

**1 - Stormceptor EF Overview**

**2 - Stormceptor EF Operation, Components**

**3 - Stormceptor EF Model Details**

**4 - Stormceptor EF Identification**

**5 - Stormceptor EF Inspection & Maintenance**

**6 – Stormceptor Contacts**

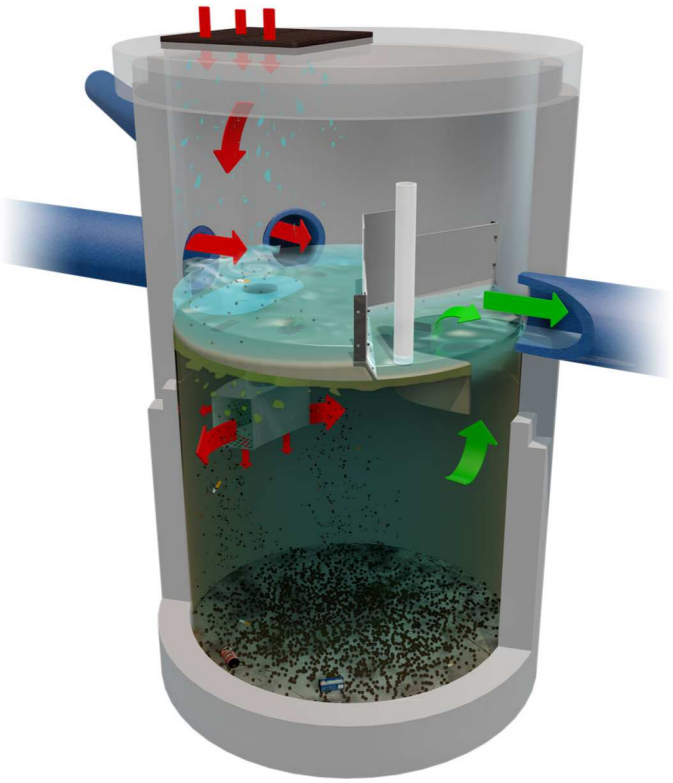
## OVERVIEW

**Stormceptor® EF** is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

## OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



## COMPONENTS

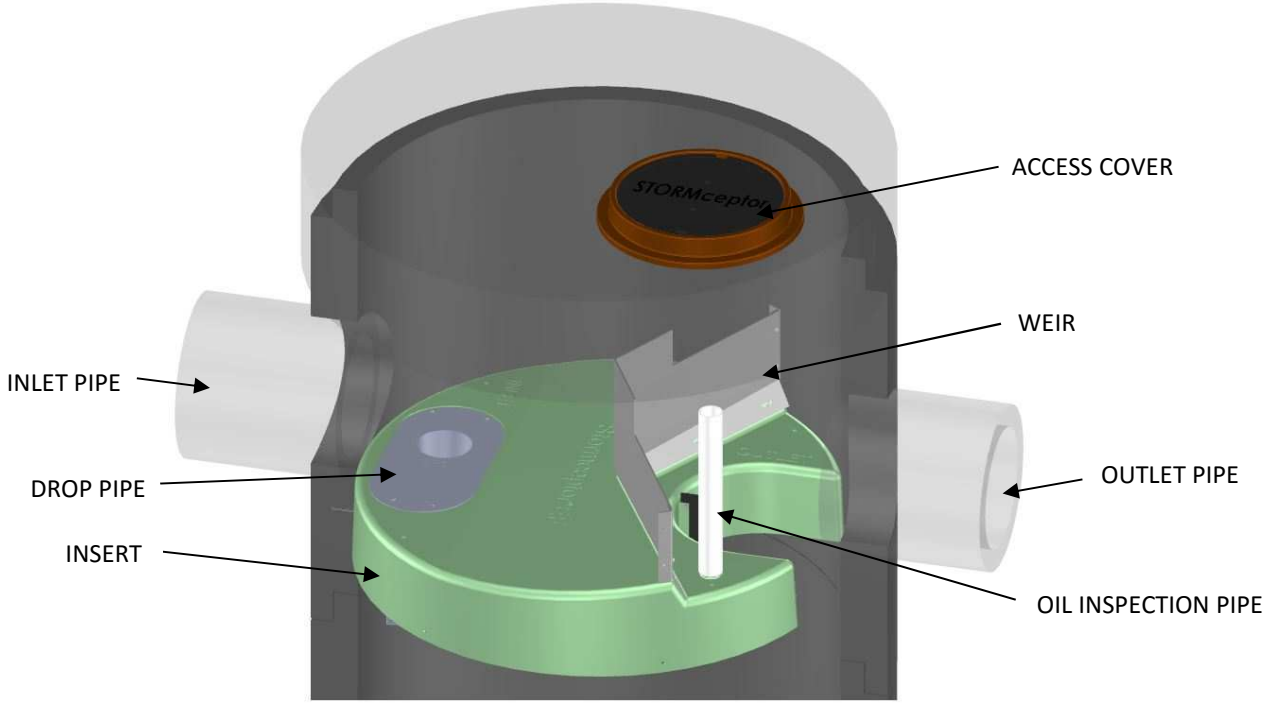



**Figure 1**

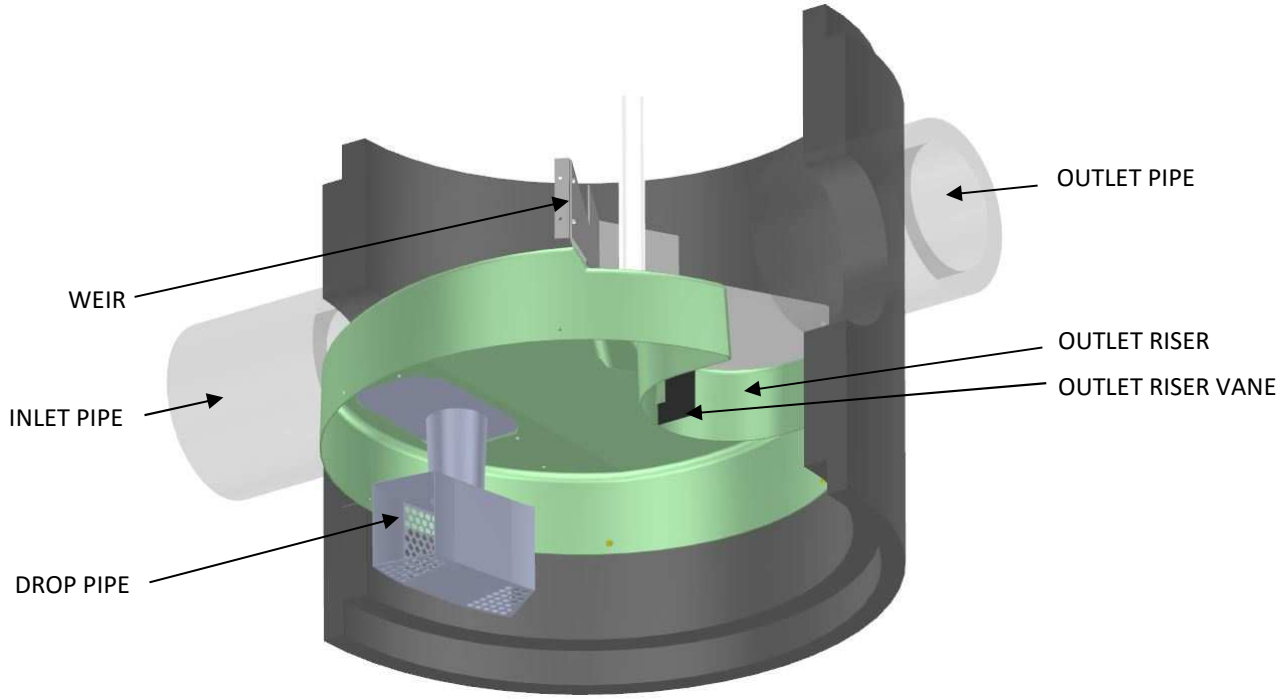



**Figure 2**

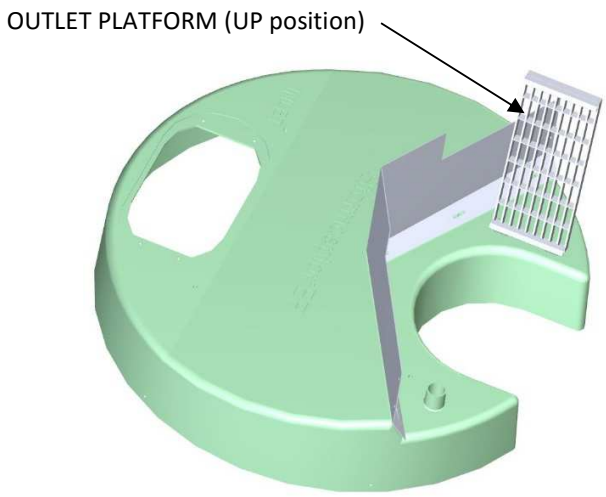



**Figure 3A**

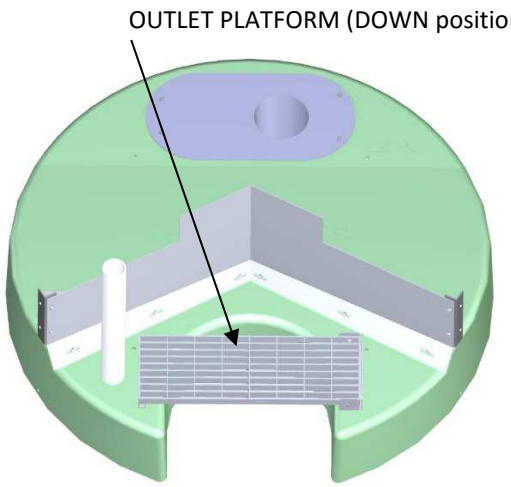



**Figure 3B**

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

# PRODUCT DETAILS

## METRIC DIMENSIONS AND CAPACITIES

### Table 1

| Stormceptor Model | Inside Diameter (m) | Minimum Surface to Outlet Invert Depth (mm) | Depth Below Outlet Pipe Invert (mm) | Wet Volume (L) | Sediment Capacity [1] ($m^3$) | Hydrocarbon Storage Capacity [2] (L) | Maximum Flow Rate into Lower Chamber [3] (L/s) | Peak Conveyance Flow Rate [4] (L/s) |
|---|---|---|---|---|---|---|---|---|
| EF4 / EFO4 | 1.22 | 915 | 1524 | 1780 | 1.19 | 265 | 22.1 / 10.4 | 425 |
| EF6 / EFO6 | 1.83 | 915 | 1930 | 5070 | 3.47 | 610 | 49.6 / 23.4 | 990 |
| EF8 / EFO8 | 2.44 | 1219 | 2591 | 12090 | 8.78 | 1070 | 88.3 / 41.6 | 1700 |
| EF10 / EFO10 | 3.05 | 1219 | 3251 | 23700 | 17.79 | 1670 | 138 / 65 | 2830 |
| EF12 / EFO12 | 3.66 | 1524 | 3886 | 40800 | 31.22 | 2475 | 198.7 / 93.7 | 2830 |

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/$m^2$.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/$m^2$.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

## U.S. DIMENSIONS AND CAPACITIES

### Table 2

| Stormceptor Model | Inside Diameter (ft) | Minimum Surface to Outlet Invert Depth (in) | Depth Below Outlet Pipe Invert (in) | Wet Volume (gal) | Sediment Capacity [1] ($ft^3$) | Hydrocarbon Storage Capacity [2] (gal) | Maximum Flow Rate into Lower Chamber [3] (cfs) | Peak Conveyance Flow Rate [4] (cfs) |
|---|---|---|---|---|---|---|---|---|
| EF4 / EFO4 | 4 | 36 | 60 | 471 | 42 | 70 | 0.78 / 0.37 | 15 |
| EF6 / EFO6 | 6 | 36 | 76 | 1339 | 123 | 160 | 1.75 / 0.83 | 35 |
| EF8 / EFO8 | 8 | 48 | 102 | 3194 | 310 | 280 | 3.12 / 1.47 | 60 |
| EF10 / EFO10 | 10 | 48 | 128 | 6261 | 628 | 440 | 4.87 / 2.30 | 100 |
| EF12 / EFO12 | 12 | 60 | 153 | 10779 | 1103 | 655 | 7.02 / 3.31 | 100 |

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe cone. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/$ft^2$.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/$ft^2$.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

## IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor***® embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor***® is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

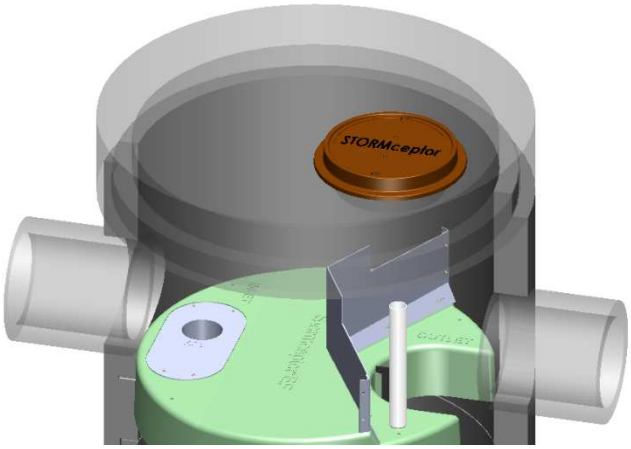



**Figure 4**

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

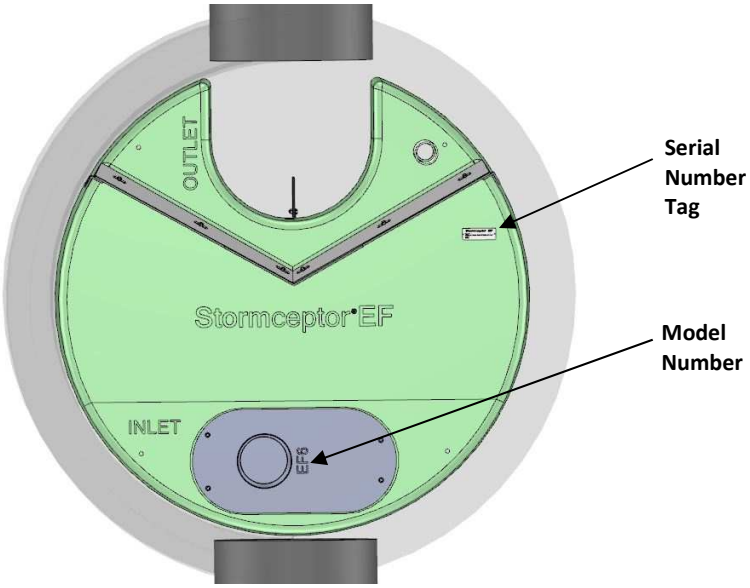



**Figure 5**

## INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

**Quick Reference**

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
  NOTE: EF4/EFO4 requires the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

***When is inspection needed?***

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

***What equipment is typically required for inspection?***

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

***When is maintenance cleaning needed?***

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

**Table 3**

| **Recommended Sediment Depths for Maintenance Service*** | |
|---|---|
| MODEL | Sediment Depth (in/mm) |
| EF4 / EFO4 | 8 / 203 |
| EF6 / EFO6 | 12 /305 |
| EF8 / EFO8 | 24 / 610 |
| EF10 / EFO10 | 24 / 610 |
| EF12 / EFO12 | 24 / 610 |

* Based on a minimum distance of 40 inches (1,016 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

***What equipment is typically required for maintenance?***

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

***What conditions can compromise Stormceptor performance?***

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

## Maintenance Procedures

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.

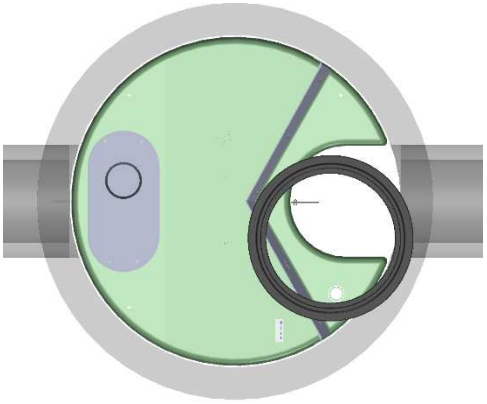


**Figure 6**

- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

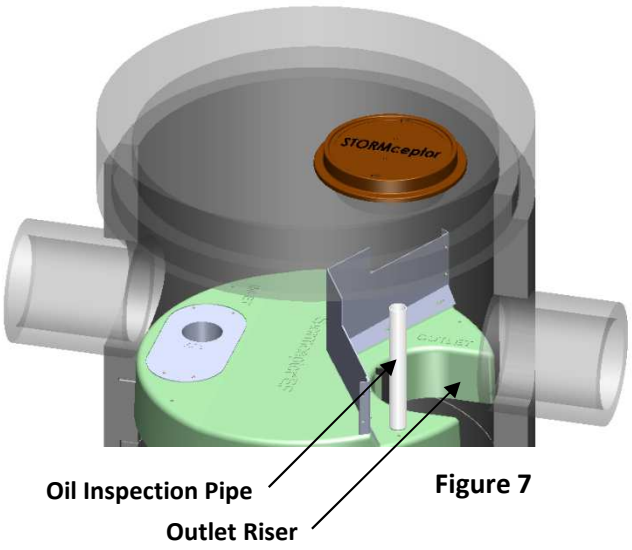



**Figure 7**




**Figure 8**

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.



**Figure 9**

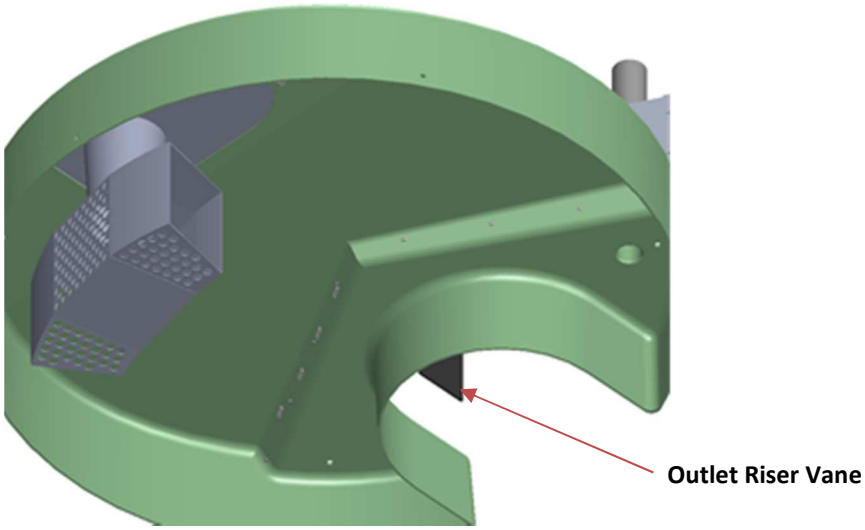
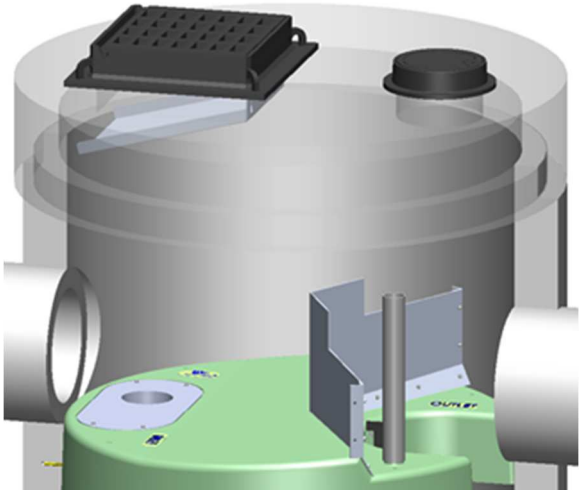



**Figure 10**

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

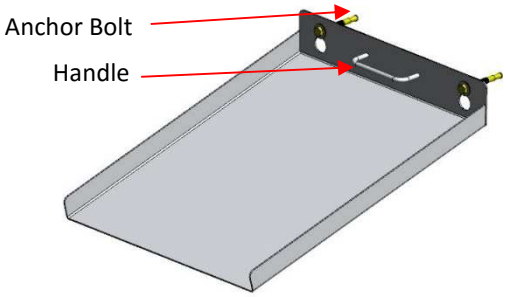
## Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 model requires a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.



**How to Remove:**

1. Loosen anchor bolts
2. Pull up and out using the handle




Removable Flow Deflector

**Figure 11**

## Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

### Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

### Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

### Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

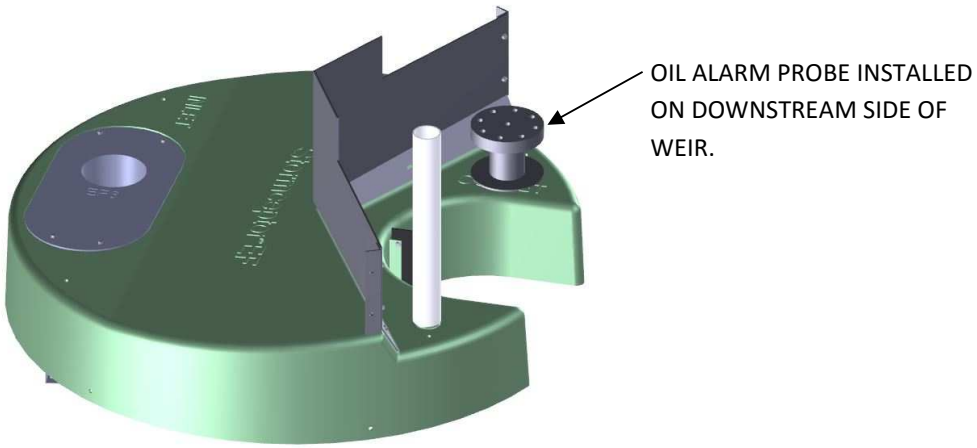



**Figure 12**

## Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

## Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Recommended Sediment Maintenance Depth: _____

| DATE | SEDIMENT DEPTH (inch or mm) | OIL DEPTH (inch or mm) | SERVICE REQUIRED (Yes / No) | MAINTENANCE PERFORMED | MAINTENANCE PROVIDER | COMMENTS |
|---|---|---|---|---|---|---|
| | | | | | | |
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Other Comments:

# Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Stormceptor representative or by visiting our website at **www.stormceptor.com.**

**Imbrium Systems Inc. & Imbrium Systems LLC**

| | |
|---|---|
| Canada | 1-416-960-9900 / 1-800-565-4801 |
| United States | 1-301-279-8827 / 1-888-279-8826 |
| International | +1-416-960-9900 / +1-301-279-8827 |

www.imbriumsystems.com
www.stormceptor.com
info@imbriumsystems.com

# Appendix B

## Fire Hydrant Flow Test
## Fire Water Demand Calculations

Budget Fire Safety

# WATER FLOW TEST REPORT

## General information

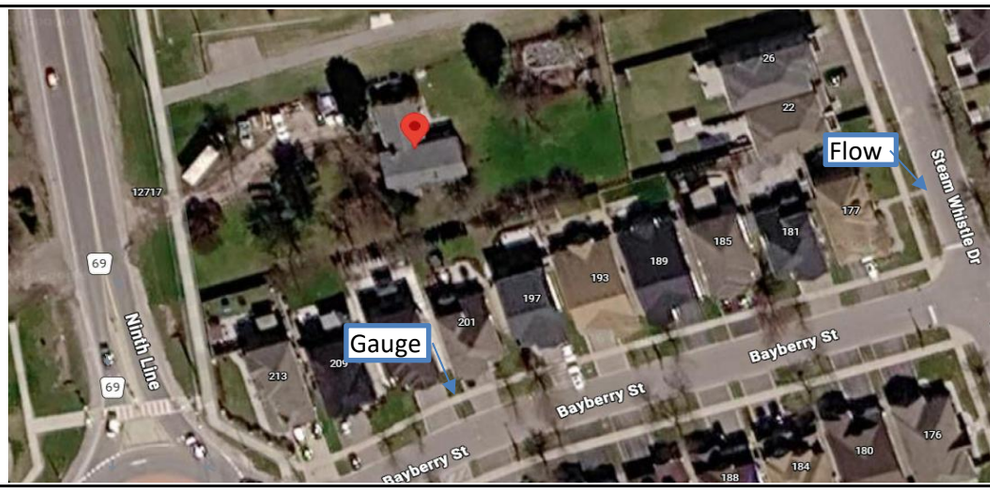
| | | | |
|---|---|---|---|
| TEST ADDRESS | **12717 Ninth Line** | DATE | **2026-08-25** |
| CITY | **Stouffville, ONTARIO** | TIME | **10:00 AM** |
| PERFORMED BY | **H.MARDIROZ / S.TAHERIAN** | | |

## System information

| | |
|---|---|
| MAIN SIZE / MATERIAL | **300 mm / PVC** |
| CONFIGURATION | **LOOPED** |

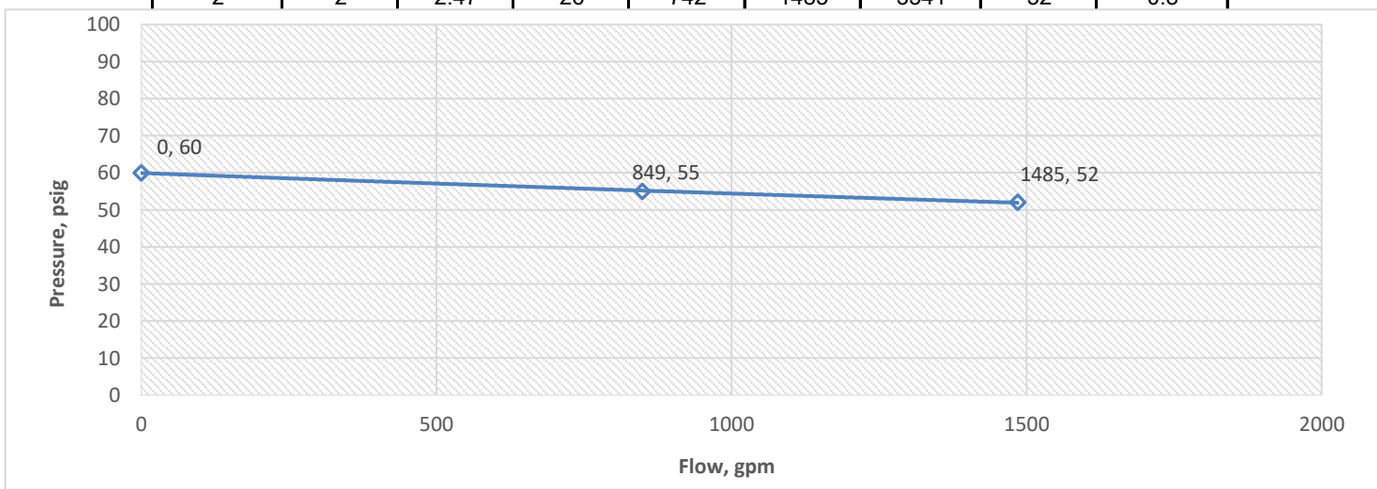
TEST CONDUCTED PER NFPA 291: RECOMMENDED PRACTICE FOR FIRE FLOW

## Test Location




## Results

| Test # | Number of Outlets | Orifice Size (in) | Pitot Reading (psig) | EquivInt Flow (usgpm) | Total Flow (usgpm) | Projected flow at 20psi | Gauge Pressure (psig) | Discharge Coef'nt |
|---|---|---|---|---|---|---|---|---|
| Static | N/A | N/A | N/A | N/A | 0 | N/A | 60 | N/A |
| 1 | 1 | 2.47 | 34 | 849 | 849 | 2609 | 55 | 0.8 |
| 2 | 2 | 2.47 | 26 | 742 | 1485 | 3541 | 52 | 0.8 |




## Disclaimer

BY ACCEPTING OR USING THIS DRAWING AND/OR THE INFORMATION CONTAINED HEREIN, THE USER AGREES TO THE FOLLOWING TERMS AND CONDITIONS: THE ELECTRONIC INFORMATION IN THE DRAWING MAY BE SUBJECT TO INTENTIONAL OR UNINTENTIONAL ALTERATION. ANY USE, REUSE, COPYING MODIFICATION OR ALTERATION OF THE INFORMATION CONTAINED HEREIN SHALL BE AT THE SOLE RISK OF THE USER. THIS INFORMATION MAY NOT BE SOLD OR TRANSFERRED TO ANY THIRD PARTY, USED ON OTHER PROJECTS OR ADDITIONS TO THE PROJECT FOR WHICH IT WAS PREPARED, OR USED FOR COMPLETION OF THIS PROJECT BY ANY THIRD PARTY. BUDGET FIRE SAFETY. DISCLAIMS ALL LIABILITY FOR THE USE OR REUSE OF ALTERED FILES BY THE USER OR ANY THIRD PARTY AND SUCH USE WILL BE AT USER'S SOLE RISK. USER SHALL, TO THE FULLEST EXTENT PERMITTED BY LAW, DEFEND, INDEMNIFY, AND HOLD FIRE CUBE INC. HARMLESS FROM ANY AND ALL CLAIMS FOR LOSS, DAMAGE OR INJURY ARISING DIRECTLY OR INDIRECTLY THEREFROM.

# APPENDIX B

## FIRE FLOW CALCULATIONS
## 12717 NINTH LINE, STOUFVILLE ON

**Client:**
**Building.:**

2026-09-01

**Fire Flow Calculation Procedure per Water Supply for Public Fire Protection, 1999 by Fire Underwriter Survey, p 20.**

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

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in the building being considered in square metres

**A. Determine Type of Construction**

=> Non Combustible

Therefore C = ( **0.80** **For Type II Noncombustible Construction**

**B. Determine Total Effective Area**

**As per the Site Statistic we have:**

| | | |
|---|---|---|
| **Third Floor Area=** | **1,519.2** | **$m^2$** |
| **Second Floor Area 1519.2 (25%)** | **380** | **$m^2$** |
| **Fourth Floor Area 1280.3 (25%)** | **320** | **$m^2$** |
| **Total** | **1,200** | **$m^2$** |
| | **2,219** | |

**C. Determined the Fire Flow**

F = $220x0.80x(2219)^{0.50}$

F = **8,291 Lpm**

**D. Determine Increase or Decrease for Occupancy**

As the Building is low Hazard, a factor 0f -25% may be applied but considering it to a limited combustible, thus we apply 15% reduction factor to the Fire Flow calculated in 'D'

Fire Flow = 8291x(1-0.15) Lpm

**= 7,047 Lpm**

**E. Determine Decrease for Automatic Sprinkler Protection**

Automatic Sprinkler Protection (Per NFPA 13 Standards)

Supervised **0% Reduction**

= - Lpm

= **-** Lpm

**F.** **Determine the Total Increase For Exposures**

| Face | Distance (m) | Charge | | |
|---|---|---|---|---|
| West Side | 71 | 0% | | |
| East Side | 21 | 10% | | |
| North Side | 46 | 0% | | |
| South Side | 17 | 15% | | |
| | Total | 25% | of | 7,047 |
| | | | = | **1761.75** Lpm |

**G.** **Req'd Fire Flow = E - F + G**

**=+7047-0+1762**

**8,809** Lpm

F = 8,809 Lpm (2,000 Lpm < F < 45,000 Lpm; OK)

Rounding to nearest 1,000L/s 9,000 Lpm

F = 2,375 US GPM

= 150.0 L/s

**'Fire Demand + Maximum dialy Demand**

**= 150 + 0.713** **(See FSR Section 2.3.1)**

**150.713L/Sec**

**Notes**

The watermain testing results completed by Budget Fire Safety, dated August 08,2019 , indicated a flow in excess of 6,297 US GPM(166.36 L/sec) at a pressure of 20 psi.



# Appendix C

# Sanitary System Design Sheet

# SANITARY SEWER DESIGN SHEET
# 12717 NINTH LINE
# STOUFFVILLE

**Project:** 12717 Ninth Line, Town of Stouffville

**Project Name** Apartment Building

**Persons/Unit** 2.2 (Conservative)

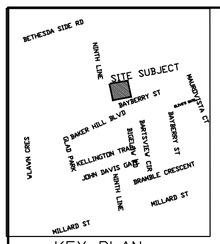
| LOCATION | RESIDENTIAL | | | COMMERCIAL | FLOW | | | | | | | | PIPE DIA | SLOPE | FULL FLOW CAPACITY (n=0.013) | % of Design Capacity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Area | Number of Units | Population | Commercial Floor Area (ha) | Total Cumulative Population | Residential @ 350L/day | Commercial 180,000L/ha/day | Harmon Peaking Factor Residential(Only)* Flow (L/s) | Residential Peak Flow (L/s) | Commercial Peak Flow (L/s) | Extraneous Flow L/sec | Total Design Flow (L/s) | (mm) | | L/s | (%) |
| **Proposed Condition** | | | | | | | | | | | | | | | | |
| Residential | 0.3 | 40 | 88 | | 88 | 30800 | 0 | 4.00 | 1.4326 | | 0.069 | 1.50 | 200 | 0.5% | 23.20 | 6.47 |
| Existing 300 Sanitray | | | | | | | | | | | | | 450 | 0.35% | 168.70 | 0.89 |

**Existing Residential Flow** 350 L/c/day
***Harmon Peaking Factor =** $1+[14/(4+P^{0.50})]$
**Maximum =** 4.0 Town Maximum
**I/I(Infiltration Inflow) =** 0.23 L/ha/sec

| | | | |
|---|---|---|---|
| Calc by | MFI | Project: | Sheet No. 1 of 1 |
| Checked | MFI | 12717 Ninth Line | |
| Date | 01-Sep-26 | Town of Stouffville | |

# Appendix D

## Site Servicing Plan
## Site Grading and Drainage Plan




KEY PLAN
N.T.S.

CONNECT TO Ex SAN.065C (3000ø)
TOP 278.84
Ex 450ø E INV 273.752
Ex 375ø S INV 273.610

Ex SAN.084C (1200ø)
TOP 280.83
450ø E INV 273.904
200ø S INV 274.123
450ø W INV 273.674

Ex 450ø PVC SAN @ 0.35%

Ex 375ø PVC SAN @ 0.35%
(IN 900ø CONCRETE CASING)

Ex 200ø PVC SAN @ 1.0%

PROP STM MH3
TOP 279.85±
E INV 278.51
S INV 278.48

PROP CB3
TOP 279.60
INV278.72

TW280.07
BO278.55

TW280.07

TW279.95
BO279.00±

TW280.26
BO279.98

279.92

LANDSCAPE

PROP RETAINING WALL

EXIST 25ø WATER TO BE ABANDONED AS PER THE MUNICIPAL ENG'S STD.

1.0%

PROP 200mm STORM 21m @ 1.0% PVC

PROP SWALE @ 1.0%
WITH SUB-DRAIN

PROP SWALE 30m @ 1.0%
WITH SUB-DRAIN

PROP SAN
INV 273.66ø±

280.20 280.15 280.00 280.11

280.00

280.10 280.10 280.10 280.10 280.20

TENTATIVE LOCATION OF TRANSFORMER
CONCRETE PAD(ELECT ENGR. TO CONFIRM)

18 RESIDENT PARKINGS

PROPOSED SIDE WALK

2.0%

PROP 200mm STORM
13m @ 1.0% PVC

LANDSCAPE

280.06 280.05

WALKWAY

VISITOR PARKING

279.95

280.10

279.91

280.10

GARAGE LOADING AREA

1.4%

PROP STM MH4
TOP 279.54
S INV 278.13
S INV 278.10

PROP CB2
TOP 279.71
INV 278.80

PROP CB1
TOP 279.71
INV 278.80

278.53±

279.43 279.54

8.0% 4.0% 8.0%

DRIVEWAY

279.91±

1.33%

PROP 250mm STORM
10m @ 0.90% PVC

PROP STM MH2
TOP 278.84±
E INV 278.28
W INV 278.35
S INV 278.22

PROP 250mm STORM 63m @ 0.70% PVC

279.91

2.3%

TEMP. SNOW STORAGE AREA

PROP STM MH1
WITH CONTROL
ORIFICE PLATE
TOP 279.71
INVERT 278.72

TW280.16
BO279.85±

TC279.95

279.79

OPEN PARKING SPACE

LANDSCAPE

PROP STM MH5
TOP 279.45±
N INV 278.30
E INV 278.30
S INV 278.25

6 BIKE PARKINGS

RD

2 RESIDENT PARKINGS

WALKWAY

DROP OFF/
LOADING

10 RESIDENT PARKINGS

280.10 280.10 280.10 280.10 280.10 280.10

PROP 300mm STORM
13m @ 0.50%

PROP WATER
CHAMBER 3600mmx12400mm
2400mm±(DEPTH)

PROP
FIRE
HYD

3.5%

PROPOSED SIDE WALK

LANDSCAPE

(19 BIKE PARKINGS)

EXIST WATER 400mm CPP

W/V
200ø

PROP FIRE WATER 200mm

W/V
100ø

PROP FIRE WATER 200mm PVC DR18

PROP DOMESTIC WATER 100mm PVC DR18

PROP RIPRAP

PROP STM MH6
INV 277.80

PROP300mm STORM
9m @ 0.70%

278.80

279.05

PROP 250mm STORM
10mm @ 0.90% PVC

OUTDOOR AMENITY
(128 SQM)

279.35

279.61

TW279.66
BO279.19

PROP SWALE 59m @ 2.0%

PROP RETAINING WALL

280.10
TW280.00
BO279.60±

TEMP. SNOW STORAGE AREA

280.24 280.29
TW280.35
BO279.60±

280.09
TW280.24

280.09 280.29
TW280.34
BO279.60±

STORMCEPTER
MODEL EF06
TOP 279.29
N INV 277.92
S INV 277.89

PROP CB4
TOP 278.73
INV 278.10

PROP 200mm STORM
4m @ 1.0%

EXISTING SIDE WALK

LEGENDS

| | |
|---|---|
| EXISTING GRADE | |
| PROPOSED GRADE | x 90.38 |
| PROPOSED WALL TOP | xTW90.96 |
| BACK OF WALL | x BW90.96 |
| EXIST. OVERLAND FLOW DIRECTION | |
| PROP. MINOR OVERLAND FLOW DIRECTION | |
| INTERPOLATED EXIST GRADE | [344.45] |
| PROPOSED STORM | |
| PROPOSED WATER | |
| PROPOSED SANITARY | |

## BENCHMARK NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO THE TOWN OF STOUFFVILLE BENCHMARK No.13020070004, HAVING AN ELEVATION OF 264.933M. IN EAST FACE OF CONCRETE HEADWALL, 0.50 Km WEST OF WEST LAWN COURT AND 46.5 m NORTH OF MALLARD STREET. TABLET SET FLUSH IS EAST FACE OF CONCRETE HEADWALL, 0.07 m BELOW TOP OF WALL AND 0.09 m NORTH OF THE SOUTHEAST CORNER.

| NO: | REVISION | DATE | INIT. |
|---|---|---|---|
| 1 | 1SSUED FOR ZONING APPROVAL | SEP 01, 2026 | MFI |

BENCHMARK NOTE

REGISTERED PROFESSIONAL ENGINEER
M F ISMAIL
SEP 01, 2026
PROVINCE OF ONTARIO


**TOWN OF WHITCHURCH–STOUFFVILLE**
PREMIER ENGINEERING SOLUTIONS
CIVIL ENGINEERS
3294 ALPACA AVENUE, MISSISSAUGA ONTARIO L5M 7V3
PHONE: (905) 817–1294 FAX: (905) 817–1299


# PROPOSED RESIDENTIAL DEVELOPMENT

12717 NINTH LINE
TOWN OF WHITCHURCH–STOUFFVILLE, ONTARIO
SITE SERVICING PLAN

| | |
|---|---|
| FIELD NOTES | |
| DATE | |
| SCALE | 1:200 |
| DWG No. | SS1 |
| MUN. REF. No. | REV. 1 |

CAT:VTY/MM/DD

KEY PLAN
N.T.S.

SITE SUBJECT

PIN 03708 – 0595

PART 1, 65R-1346

CONCESSION 9

SUBJECT TO AN EASEMENT AS SET OUT IN INST. No.R581297

PART 2, 65R-3119

PIN 03708 – 0644

(YORK REGIONAL HWY No. 69) NINTH LINE

CENTRELINE OF ROAD

EDGE OF PAVEMENT

OF LOT 4, CONCESSION 9

(REFERENCE BEARING) N85°51'10"W

SOUTHWESTERLY CORNER

PROP RETAINING WALL

PROP SWALE @ 1.0% WITH SUB-DRAIN

PROP SWALE 30m @ 1.0% WITH SUB-DRAIN

PROP SWALE 59m @ 2.0%

TENTATIVE LOCATION OF TRANSFORMER CONCRETE PAD(ELECT ENGR. TO CONFIRM)

18 RESIDENT PARKINGS

2 RESIDENT PARKINGS

10 RESIDENT PARKINGS

6 BIKE PARKINGS

(19 BIKE PARKINGS)

DROP OFF/ LOADING

VISITOR PARKING

GARAGE LOADING AREA

OPEN PARKING SPACE

SWIMMING POOL

WOOD DECK

WALKWAY

LANDSCAPE

OUTDOOR AMENITY (128 SQM)

PROPOSED SIDE WALK

EXISTING SIDE WALK

CHAIN LINK FENCE

ASPHALT DRIVEWAY

PROP SIM MH1 WITH CONTROL ORIFICE PLATE TOP 279.71

PROP SIM MH2 TOP 279.85±

PROP SIM MH3 TOP 279.85±

PROP SIM MH4 TOP 279.54

PROP CB1 TOP 279.71

PROP CB2 TOP 279.71

PROP CB3 TOP 279.60

PROP CB4 TOP 278.73

STORMCEPTER MODEL EF06 TOP 279.28

TEMP. SNOW STORAGE AREA

100 YEAR HW 279.91

100 YEAR PONDING AREA = 530m²
PONDING STORAGE = 35.3m³
MAX PONDING DEPTH = 0.20m
MAX PONDING ELEV. = 279.91m

No.12717 1 STOREY ALUM. DWELLING D.S.=279.67

No.209 2 STOREY BRICK DWELLING

No.205 2 STOREY BRICK DWELLING

No.201 2 STOREY BRICK DWELLING

No.197 2 STOREY BRICK DWELLING

No.193 2 STOREY BRICK DWELLING

No.189 2 STOREY BRICK DWELLING

LOT 1 — PIN 03708–0855

LOT 4

LOT 5

LOT 6

LOT 7

PIN 03708–0859

PIN 03708–0860

PIN 03708–0861

LEGENDS

EXISTING GRADE

PROPOSED GRADE

PROPOSED WALL TOP

BACK OF WALL

EXIST. OVERLAND FLOW DIRECTION

PROP MINOR OVERLAND FLOW DIRECTION

INTERPOLATED EXIST GRADE

BENCHMARK NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO THE TOWN OF STOUFFVILLE BENCHMARK No.13020070004, HAVING AN ELEVATION OF 264.933M. IN EAST FACE OF CONCRETE HEADWALL, 0.50 Km WEST OF WEST LAWN COURT AND 46.5 m NORTH OF MALLARD STREET. TABLET SET FLUSH IS EAST FACE OF CONCRETE HEADWALL, 0.07 m BELOW TOP OF WALL AND 0.09 m NORTH OF THE SOUTHEAST CORNER.

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# PROPOSED RESIDENTIAL DEVELOPMENT

12717 NINTH LINE

TOWN OF WHITCHURCH–STOUFFVILLE, ONTARIO

## GRADING AND DRAINAGE PLAN

FIELD NOTES

DATE

SCALE 1:200

DWG No. SG1

MUN. REF. No.

REV. 1

CAT:YYY/MM/DD