# PROPOSED MIXED-USE DEVELOPMENT COMMERCIAL & RESIDENTIAL

## SITE SERVICING AND STORMWATER MANAGEMENT for 3996 INNES ROAD, OTTAWA, ONTARIO

**NOVEMBER 23, 2021**

Advanced Design, Assessment & Development Inc
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# SITE SERVICING AND STORMWATER MANAGEMENT

# for

# 3996 INNES ROAD,

# OTTAWA, ONTARIO

**Prepared BY**

**Advanced Design, Assessment & Development Inc.**

**SUBMITTED TO:**

Mr. Lou Frangian
2809354 Ontario Inc**,**

**Report No.: 215-03-PR1**
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# 1. INTRODUCTION

## 1.1 General:

The following report demonstrates, in brief, the preliminary assessment/ design of site plan servicing and the stormwater management in support of a Site Plan Application for 3996 Innes Road, City of Ottawa, Ontario. The total area of the land is 1516.74 $m^2$, with 520.76 $m^2$ building roof, asphalt/pavers area of 739.54 $m^2$, and 257.25 $m^2$ of sidewalk being proposed will potentially be the new location for Mixed-Use Development commercial & Residential. Figure 1 shows close and far views of the property.

The report covers a brief explanation of each service, preliminary calculations in compliance with the City of Ottawa and provincial requirements and by-laws for submission with the engineering drawings to the City of Ottawa site plan approval.

## 1.3 References:

Various documents were referred to in preparing the current report, including:

- Ottawa Water Distribution Design Guidelines, City of Ottawa, WDG001, July 2010.
- Ottawa Sewer Design Guidelines, City of Ottawa, SDG002, October 2012.
- Tech Bulletin ISTB-2018-02, Revision to Ottawa Design Guidelines – Water Distribution.
- Fire Underwriters Survey, Water Supply for Public Fire Protection, CGI Group Inc., 2007.
- Ontario Building Code, Ontario, https://www.ontario.ca/laws/regulation/120332
- Stormwater Management Planning and Design Manual, Ontario Ministry of the Environment (MOE), 2003.



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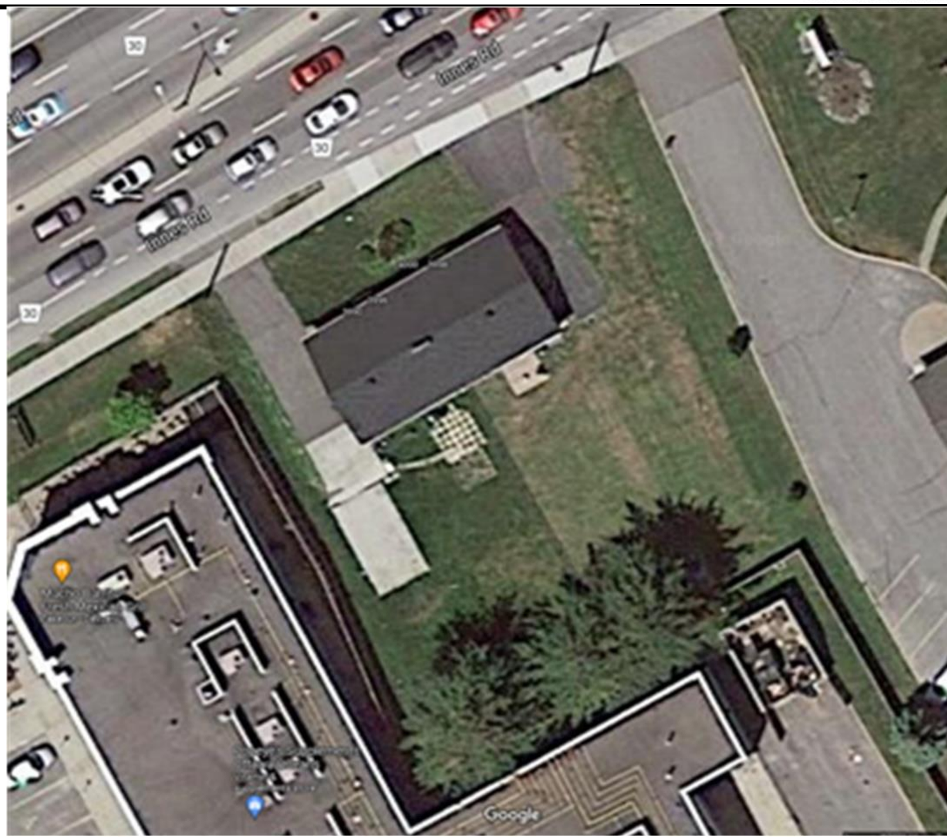
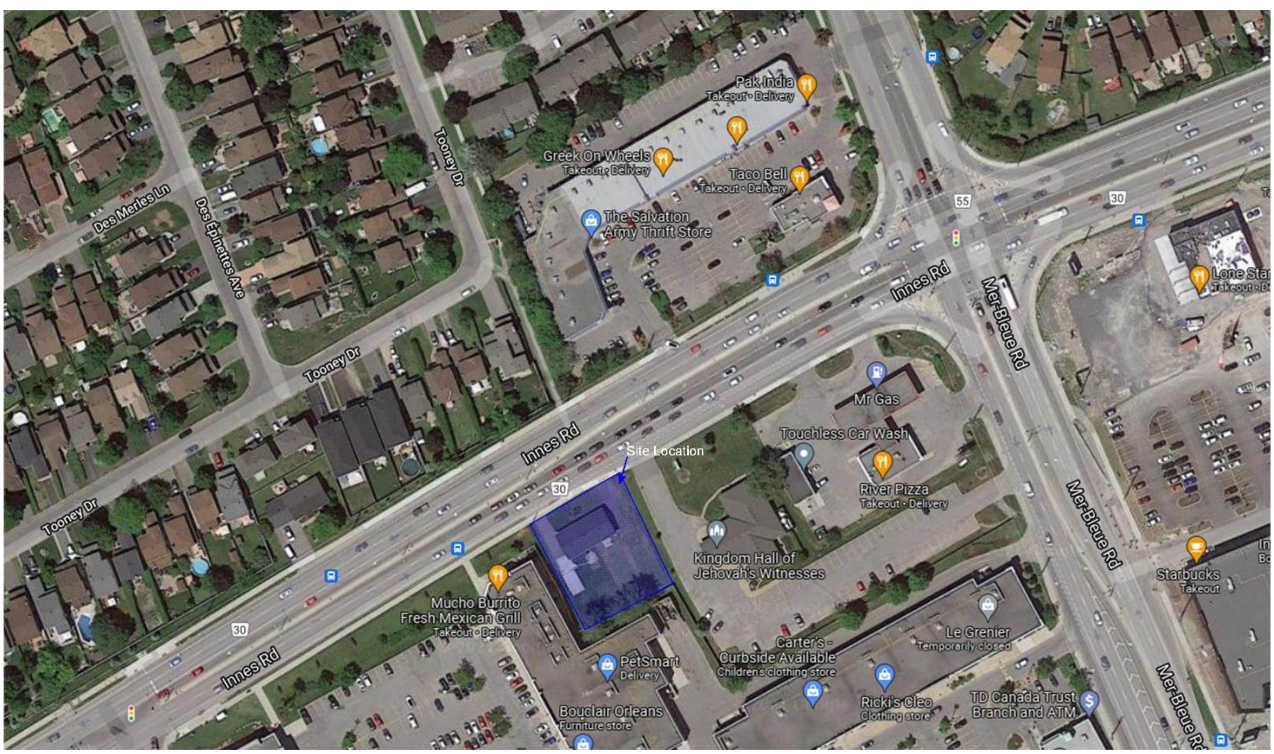



Close view




General view

**Figure 1-1 – Site Location**

# 2. SITE SERVICES

## 2.1 General

### 2.1.1 Current Site Condition

The property has an approximate surface area of 1516.74 $m^2$ located at 3996 Innes Road, City of Ottawa, Ontario. The site is currently has a building and sheds with a total of 181.45 $m^2$, an asphalt/pavers area of 249.0 $m^2$, and the rest of the area of 1086.29 $m^2$ is a green area with grass and three trees at the far back of the land. The site is mostly flat. The overall site drainage goes to the east towards the existing wetlands, with some low-lying areas lacking surficial drainage due to the topography of the site. The average site elevation is +90.5 ± 0.45 meters above sea level (masl).

### 2.1.2 Proposed Site

It is proposed to construct a mixed-use development of a commercial and residential building. Besides the building, there will be external parking, sidewalks. The total area of the land is 1516.74 $m^2$, with 520.76 $m^2$ building roof, asphalt/pavers area of 739.54 $m^2$, and 257.25 $m^2$ of sidewalk are proposed. The footprint of the building will be 450 $m^2$ with a basement, first-floor commercial and second to the fifth floor of residential apartments. There will be one entrance to access the site from Innes road. The site will be serviced by the city water, wastewater, and stormwater systems on Innes Road.

## 2.2 Water Supply Quantity

The domestic water demands are estimated below, utilizing the City of Ottawa Water Distribution Guidelines parameters. The following summarizes the parameters used

The average daily water consumption is as follows:

**First Floor (Commercial):** The maximum number of employees and patients is eighteen (18), including three (3) practitioners.

i. As per OBC, Table 8.2.1.3.B, Item 25, the maximum daily water demand is:

$Q_{dailyC}$ = 3 X 275 + (18-3) X 75 = 1,950 liter/ day

ii. As per ODGS, Figure 4.3, the maximum daily water demand is:

$Q_{dailyC}$ = 50000 * (450/10000) = 2,250 liter/ day

**Second to Fifth Floors (Residential):** The maximum number of residents is:

i. As per Ottawa Water Distribution Design Guidelines, Table 4.1, the total number of residents is:

$N_{Res}$ = 3 X 6 X 1.4 + 2 X 2.1 = 29.4 C



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ii. As per Ottawa Water Distribution Design Guidelines, Table 4.2, the total water demand for the residents is:

$Q_{dailyR}$ = 29.4 X 350 = 10,290 liter/ day

**Total average daily demand:**

$Q_{daily-Avg}$ = 2,250 + 10,290 = 12,540 L/ day

= 0.14514 L/ Sec

**Maximum daily demand = P.F. X $Q_{daily-Avg}$**

$$P.F. = 1 + \left( \frac{14}{4 + \left(\frac{P}{1000}\right)^{1/2}} \right) * K$$

Where P is the Publiation and K is a Correction Factor = 1

$$P.F. = 1 + \left( \frac{14}{4 + \left(\frac{29.4}{1000}\right)^{1/2}} \right) * 1$$

P.F. = 4.356

$Q_{dailyMax}$ = 4.356 X 0.14514 = 0.6323 L/ Sec

Maximum hourly demand = $Q_{daily-Avg}$ /24

$Q_{hourlyMax}$ = 0.6323 / 24 = 0.0026344 L/ Sec

## 2.3 Fire Protection

The required flow for the fire protection of the proposed site was estimated based on the Technical Bulletin ISTB-2018-02, Revision to Ottawa Design Guidelines – Water Distribution. The following equation from Appendix H, Protocol to Clarify the Application of the Fire Flow Calculation Method Published by Fire Underwriters Survey (FUS), was used for calculation of the supply rates required to be supplied by the hydrant.

$F = 220 * C * \sqrt{A}$ (PP G92-G93)

Where:

F = the required fire flow in liters per minute (L/min)

C = coefficient related to the type of construction

A = the total floor area in square meters ($m^2$)

**Table 2-1 – Summary of Required Fire Protection Flow**

| Item | Design Value |
|---|---|
| Floors Above Grade | 5 Floor |
| Construction Coefficient (C) | 0.8 |
| Fire Protection Type | automatic sprinkler system |
| Building Height (m) | 21 m |
| Building Area ($m^2$) | 5 X 450 $m^2$ |
| Required fire flow F (L/min) | 9000 |
| Reduction due to low Occupancy | - 25% |
| Reduction due to use of automatic sprinkler system | - 50% |
| Increase due to Separation | 15% |
| Fire Flow Requirement | 4000 (L/min) or 66.7 (L/sec) |

Table A.1 of Appendix A shows the detailed calculation of the fire protection flow.

### 2.4 Sanitary Servicing

Based on the water supply calculations in Section 2.2, the daily maximum sanitary demand is 0.6323 L/ Sec. The proposed sanitary system includes a four-inch diameter sewer connecting the Northwest building end to a sanitary manhole; then, a four-inch diameter sewer links the onsite sanitary manhole to the City of Ottawa Sewer as shown in the Services Plan (Drawing S-01). The details of the sanitary sewers design sheet is shown in Appindex D, Table D-1.

## 3. STORMWATER MANAGEMENT

### 3.1 Design Criterion

The storm flow is calculated in conformance with the latest version of the City of Ottawa Design Guidelines (October 2012 and updates). The allowable release rate for the site is limited to a 5-year storm event, and a runoff coefficient as calculated in Table B-3 of Appendix B. Flows in excess of the 5- year and up to the 100-year rate are detained onsite using an underground detention tank of volume equal to 30 $m^3$, or 30,000 Liter.

**Method of Analysis:** The Modified Rational Method has been used to calculate the runoff rate from the drainage catchment to quantify the detention storage for the controlled measures. Refer to Appendix B for all stormwater calculations.

The stormwater management criteria for this development are based on the City of Ottawa Sewer Design Guidelines (2012) and later updates, the Ministry of the Environment (MOE)

Stormwater Management Planning and Design Manual (2003). The design is guided by the City of Ottawa engineers' instructions throughout the preliminary design stage.

### 3.2 Pre-Development Release Rate

Although there is no requirement to control runoff to pre-development conditions, calculations of pre-development peak flows were estimated to clarify the pre-development conditions. The pre-development runoff coefficient for the site was determined to be 0.36, with calculations shown below.

Using time of concentration ($T_C$) of 20 minutes and an average pre-development runoff coefficient of 0.50 (as advised by the City of Ottawa Senior Engineer, Ms. Natasha Baird), the pre-development release rates from the site is determined for the 5-year and 100-year storms using the Rational Method as follows:

$$Q_{PRE} = 2.78\ C\ I\ A$$

Where:

| | | | | |
|---|---|---|---|---|
| | $Q_{PRE}$ | = | Pre-development Peak Discharge (L/sec) | |
| | $C_{AVG}$ | = | Average Runoff Coefficient | |
| | I | = | Average Rainfall Intensity for a return period | (mm/hr) |
| | | = | $998.071/ (T_C+6.053)^{0.814}$ (5-year) | |
| | | = | $1735.688/ (T_C+6.014)^{0.820}$ (100-year) | |
| | $T_c$ | = | Time of concentration (mins) | |
| | A | = | Drainage Area (hectares) | |
| Therefore: | $I_{5PRE}$ | = | $998.071/ (20 + 6.053)^{0.814}$ | = 70.291 mm/hr |
| | $Q_{5PRE}$ | = | 2.78 (0.50) (70.291 mm/hr) (0.151674 ha) | = 14.82 L/sec |
| | $I_{100PRE}$ | = | $1735.688/ (20 + 6.014)^{0.820}$ | = 119.95 mm/hr |
| | $Q_{100PRE}$ | = | 2.78 (0.625) (119.95 mm/hr) (0.151674 ha) | = 31.611 L/sec |

The 5-year and 100-year pre-development flows were estimated at 14.82 L/sec and 31.611 L/sec, respectively.

### 3.3 Calculation of Allowable Release Rate

The total site area is about 0.151674 ha. The site is divided into three watersheds, WS-01, WS-02, and WS-03. WS-01 has a total area of 0.073954 ha, and it drains towards the catchbasins. WS-02 accounts for the building roof, with an area of 0.052076 ha drains into the two catchbasins by four pipes. WS-03 accounts for the grass/trees, with an area of 0.025644 ha. This last watershed drains towards the parking garage, then to the two catchbasins.

The allowable release rate from the site is based on the 5-year storm event with a post-development runoff coefficient of 0.799. The City of Ottawa Sewer Design Guidelines (2012) specifies a time of concentration of 10 mins for the proposed type of development.

$Q_{\#\#\#ALLOW} = 2.78\ C\ I\ A$

Where:

| | | | | |
|---|---|---|---|---|
| | $Q_{\#\#\#ALLOW}$ | = | Peak Discharge (L/sec) Runoff | |
| | $C_{AVG}$ | = | Average Runoff Coefficient | |
| | $I_{\#\#\#ALLOW}$ | = | Average Rainfall Intensity for a return period | (mm/hr) |
| | | = | $998.071/\ (T_C+6.053)^{0.814}$ (5-year) | |
| | $T_c$ | = | Time of concentration (mins) | |
| | A | = | Drainage Area (hectares) | |
| Therefore: | $I_{5ALLOW}$ | = | $998.071/\ (10 + 6.053)^{0.814}$ | = 104.29 mm/hr |
| | $Q_{5ALLOW}$ | = | 2.78 (0.799) (104.29 mm/hr) (0.151674 ha ha) | = 35.12 L/sec |

Hence, the allowable release rate from the site is 35.12 L/s for the 5-year storm event.

### 3.4 Calculation of Post-Development Release Rate

The total site area is about 0.151674 ha. The site is divided into three watersheds, WS-01, WS-02, and WS-03. WS-01 has a total area of 0.073954 ha, and it drains towards the catchbasins. WS-02 accounts for the building roof, with an area of 0.052076 ha drains into the two catchbasins by four pipes. WS-03 accounts for the grass/trees, with an area of 0.025644 ha. This last watershed drains towards the parking garage, then to the two catchbasins. The allowable release rate from the site is based on the 5-year storm event with a post-development runoff coefficient of 0.799. The two proposed catch basins collect and convey the drainage towards a stormwater manhole then into an oil-grit separator (STC 750). The controlled flow will outlet to the STC then to an underground detention tank (see Drawing S-01) then to the existing City of Ottawa Stormwater Manhole on Innes Road. Refer to the Site Servicing Plan in Drawing S-01 for the proposed stormwater management layout.

Using time of concentration ($T_C$) of 10 minutes and average runoff coefficients, the post-development release rates from the site are determined for the three watersheds for the 5-year and 100-year storms using the Rational Method as follows:



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$Q_{PRE}$ = 2.78 C I A

Where:

| | | | | |
|---|---|---|---|---|
| | $Q_{POST}$ | = | Post-development Peak Discharge (L/sec) | |
| | $C_{AVG}$ | = | Average Runoff Coefficient | |
| | I | = | Average Rainfall Intensity for a return period (mm/hr) | |
| | | = | $998.071/ (T_C+6.053)^{0.814}$ (5-year) | |
| | | = | $1735.688/ (T_C+6.014)^{0.820}$ (100-year) | |
| | $T_c$ | = | Time of concentration (mins) | |
| | A | = | Drainage Area (hectares) | |
| Therefore: | $I_{5POST}$ | = | $998.071/ (10 + 6.053)^{0.814}$ | = 104.29 mm/hr |
| | $I_{100PRE}$ | = | $1735.688/ (10+6.014)^{0.820}$ | = 178.56 mm/hr |

Table 3.1 summarize the calculations for the estimations of the 5-year and the 100-year post-development flows of the three watershed areas. A total relase to the city stormwater system is 55.439 L/Sec.

**Table 3-1 – Summary of Post-Development Flows**

| | | | **Storm: 5 Y** | **Storm: 100 Y** |
|---|---|---|---|---|
| **No.** | **Area Name** | **Area (ha)** | **$Q_{5POST}$ (L/Sec)** | **$Q_{100POST}$ (L/Sec)** |
| **1** | **WS-01** | 0.07395 | 19.297 | 36.71 |
| **2** | **WS-02** | 0.05208 | 13.588 | 25.85 |
| **3** | **WS-03** | 0.02564 | 2.230 | 4.774 |
| | **Overall Site** | **0.15167** | **35.12** | **75.154** |

## 3.5 Storage Requirements

Comparing the 100 Year design storm post-development with the allowable release rates for the site with the Allowable Runoff, for a time concentration of 10 mins, the increase in the release rate due to the development is quantified. Table 3.2 shows a summary of this comparison between the post-development and the allowable release rates. The runoff increase is 32.22 L/Sec for 100 years design storm in excess of the 5Y minor stormwater system. Table B-6 of Appendix B shows the detailed calculations of the excess runoff.

**Table 3-2 – Summary of Flows Runoff increase due to Post-Development**



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| No. | Area Name | Area (ha) | Allowable Runoff $Q_{ALLOW}$ (L/Sec) | P-D Increase of Runoff $Q_{INC100}$ (L/Sec) |
|---|---|---|---|---|
| 1 | WS-01 | 0.07395 | 19.297 | 17.414 |
| 2 | WS-02 | 0.05208 | 13.588 | 12.262 |
| 3 | WS-03 | 0.02564 | 2.230 | 2.543 |
| | Overall Site | 0.15167 | 35.12 | 32.22 |

The required underground storage is calculated based on maintaining the same allowable release rate of the site for the five-year design storm. Table B-7 shows the detailed calculations for the required surface storage volume using the Modified Rational Method. The table shows that 24.02 $m^3$ storage volume is required for the 100-year design storm. A precast reinforced concrete detention tank of volume equal to 30 $m^3$ is proposed.

## 3.6 Proposed Stormwater Management Plan

### 3.6.1 Proposed Runoff Flow Quantity Controls

The runoff flow of the proposed development site will be managed by grading toward two catchbasins that convey the stormwater to a stormwater manhole and then to STC that move the water to a detention tank then into the City of Ottawa stormwater system as shown in drawing GR-1.

The 5-year and 100-year storm events have been analyzed. It was found that the 100-year storm governs the detention tank design.

An ICD is to be installed and centred in the outlet leading to the City Storm Manhole. With the use of this ICD, and the 35.12 L/Sec release rate, 24.02 $m^3$ of storage volume needs to be provided onsite. The required storage will be provided as an underground precast concrete tank. The total storage volume provided is 30 $m^3$.

### 3.6.2 Proposed Quality Controls

Enhanced quality control providing 80% TSS removal will be accomplished with the use of a stormceptor (STC-750). The STC-750 will be located east of the development area, which will then discharge to the existing roadside ditch. Rip-rap will be used to prevent erosion at the stormceptor outlet. The STC750 will provide 84% TSS removal based on the anticipated flow rates. Therefore, onsite quality control is achievable and has been designed accordingly. Refer to Site Servicing Plan drawing SS-1 for the stormceptor location and Appendix C for the stormceptor sizing, maintenance, and technical manual-Canada.

It is noted that it will be the owner's responsibility to ensure the adequate operation & maintenance of the stormceptor. If inspection indicates the potential need for maintenance, access is provided via the manhole lid of the Stormceptor. Maintenance is accomplished with the use of a sump-vac. Refer to Appendix C for manufacturer maintenance schedule recommendations.

# 4. ERROSION AND SEDIMENT CONTROL

During all construction activities, erosion and sedimentation shall be controlled by the following techniques:

- Install a light-duty silt fence barrier along the perimeter of the property to capture any sediments from leading into the ditch.
- Strawbales are to be placed at the downstream end of any existing swales to act as a filtering agent.
- A visual inspection shall be completed daily on sediment control barriers, and any damage will be repaired immediately. Care is to be taken to prevent damage during construction operations.
- In some cases, barriers may be removed temporarily to accommodate the construction operations. The affected barriers are to be reinstated at night when construction is completed.
- The sediment control devices are to be cleaned of accumulated silt as required. The deposits will be disposed of as per the requirements of the contract,
- During the course of construction, if ADAD Inc. performs an inspection and believes that additional prevention methods are required to control erosion and sedimentation, the contractor shall install additional silt fences or other methods as required to the satisfaction of ADAD Inc. civil team.
- Sediment control measures are to remain in place throughout the entire construction phase and monitored/maintained on a regular basis until all disturbed areas have been fully restored or vegetated.

Refer to the erosion and sediment control plan (ES-1) for more details.

# 5. SUMMARY & CONCLUSIONS

Based on the information presented in this report, the proposed civil engineering design ensures that stormwater management requirements for this site are achievable. The following is a summary of the stormwater management plan for this site:

- The project consists of constructing a 520.76 $m^2$ building along with a parking zone.
- The building will be serviced with a sanitary sewer connected to an onsite sanitary manhole connected to the city sanitary system on Innes Rd.
- The property will have water service connected to the City Water Network.

- The allowable release rate for the site development area is 35.12 L/Sec.
- Using the Modified Rational Method, an ICD will organize the flow to a peak rate of 35.12 L/Sec, thereby meeting the allowable release rate.
- The ICD will be located at the outlet of the detention tank.
- With a controlled release rate of 35.12 L/Sec, the required storage volume capacity is 24.02 $m^3$. Accordingly, a total storage volume of 30 $m^3$ will be stored underground using a proposed concrete tank.
- Enhanced quality control of 80% TSS removal is required for this site. A stormceptor model STC-750, has been sized to provide 84% TSS removal, thereby meeting quality control requirements.


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# APPENDIX A: CALCULATION OF FIRE FLOW REQUIREMENTS

## Table A-1 – Calculation of Fire Flow Requirements

The Calculations are Based on Tech Bulletin ISTB-2018-02 (based on FUS, 1999).

1) An estimate of the Fire Flow required for a given fire area may be estimated by:

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

Where:

F = the required fire flow in litres per minute (L/min)

A = the total floor area in square metres ($m^2$)

C = coefficient related to the type of construction (page G86, of Appendix H)

| | |
|---|---|
| 1.5 | for wood construction (structure essentially combustible) |
| 1.0 | for ordinary construction (brick or other masonry walls, combustible floor and interior) |
| 0.8 | for noncombustible construction (unprotected metal structural components, masonary or metal walls) |
| 0.6 | for fire-resistive construction (fully protected frame, floors, roof) |

| | | | |
|---|---|---|---|
| No. of Floors = | 1 | | |
| Area / Floor = | 450 | $m^2$ | |
| A = | 5 X 450= 2250 | $m^2$ | |
| C = | 0.8 | | |
| F = | 8,349 | L/min | Rounded to the nearest 1000 = 9,000 L/min |

2) The value obtained in (1) may be reduced by as much as 25% for occupancies having a low contents fire hazard.

| | |
|---|---|
| Non-combustible = | -25% |
| Limited Combustible = | -15% |
| Combustible = | 0% |
| Free Burning = | 15% |
| Rapid Burning = | 25% |

Reduction due to low occupancy hazard = -25% X 9,000 = 6,750 L/min



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3) The value above may be reduced by up to 50% for an automatic sprinkler system.
Reduction due to automatic sprinker system = 50% X 6,750 = 3,375 L/min

4) The value obtained in (2) may be increased for structures exposed within 45 metres by the fire area under consideration.

| Separation (metres) | Condtion | Charge |
|---|---|---|
| 0m to 3.0m | 1 | 25% |
| 3.1m to 10.0m | 2 | 20% |
| 10.1m to 20.0m | 3 | 15% |
| 20.1m to 30.0m | 4 | 10% |
| 30.1m to 45.0m | 5 | 5% |
| 45.1m and more | 6 | 0% |

| Exposure | Distance (m) | Condition | Charge |
|---|---|---|---|
| Front | 6 | 0% | |
| Back | 6 | 0% | |
| Side 1 | 6 | 0% | |
| Side 2 | 6 | 0% | |

Increase due to separation = 15% X 3,375 = 510 L/min
Fire Flow Requierment is = 3,885 L/min
rounded to the nearest 1000 = 4,000 L/min Or 66.7 L/Sec

# APPENDIX B: STORMWATER MANAGEMENT DESIGN SHEETS/ TABLES

### Table B-1 – Calculations of Average Runoff Coefficients (Pre-Development)

| No. | Area Name | Area Type | Areas ($m^2$) | $C_x$ | $C_x$ Value | Sum of (A x Cx) |
|---|---|---|---|---|---|---|
| 1 | **EWS-01** | Asphalt/ Pavers | 249 | $C_{ASPH}$ | 0.9 | 224.1 |
| 2 | **EWS-02** | Building | 181.45 | $C_{BUL}$ | 0.9 | 163.305 |
| 2 | **EWS-03** | Grassed | 1086.29 | $C_{GRASS}$ | 0.3 | 325.887 |
| | | | | | **Oveall Area** | **1516.74** |
| | | | | | **Average Runoff Coefficients (Pre-Development) $C_{AVGPRE}$** | **0.36** |

### Table B-2 – Calculations of Peak Runoff (Pre-Development)

| Area Discribtion | Area (ha) | Time of Concentration, Tc (min) | Storm: 5 Y | | | Storm: 100 Y | | |
|---|---|---|---|---|---|---|---|---|
| | | | $I_5$ (mm/hr) | $C_{AVG5}$ | $Q_{5PRE}$ (L/Sec) | $I_{100}$ (mm/hr) | $C_{AVG100}$ | $Q_{100PRE}$ (L/Sec) |
| **Overall Site** | 0.151674 | 20 | 70.2906509 | 0.50 | 14.8192 | 119.95 | 0.625 | 31.61096566 |

**Notes:**

1) Intensity, $I = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of Ottawa)

2) Intensity, $I = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)

3) Cavg for 100-year is increased by 25%

### Table B-3 – Calculations of Average Runoff Coefficients (Post-Development)

| No. | Area Name | Area Type | Areas ($m^2$) | $C_x$ | $C_x$ Value | Sum of (A x Cx) |
|---|---|---|---|---|---|---|
| 1 | **WS-01** | Asphalt/ Pavers | **739.54** | $C_{ASPH}$ | **0.900** | **665.586** |
| 2 | **WS-02** | Building | 520.76 | $C_{ASPH}$ | 0.900 | 468.684 |
| 3 | **WS-03** | Grassed | 256.44 | $C_{GRASS}$ | 0.300 | 76.932 |
| 4 | **Overall Site** | **Total WS** | **1516.74** | $C_{AVGWPost}$ | **0.799** | **1211.2** |
| | | | | | **Oveall Area** | **1516.74** |
| | | | | | **Average Runoff Coefficients (Post-Development) $C_{AVGPost}$** | **0.799** |

## Table B-4 – Calculations of Allowable Runoff (Five-Year Storm)

| Area Discribtion | Area (ha) | Time of Concentration, Tc (min) | Storm: 5 Y | | |
|---|---|---|---|---|---|
| | | | $I_5$ (mm/hr) | $C_{AVG}$ | $Q_{ALLOW}$ (L/Sec) |
| **WS-01** | **0.073954** | 10 | 104.288231 | 0.900 | **19.2968** |
| **WS-02** | **0.052076** | 10 | 104.288231 | 0.900 | **13.5881** |
| **WS-03** | **0.025644** | 10 | 104.288231 | 0.300 | **2.23042** |
| **Overall Site** | 0.151674 | 10 | 104.288231 | 0.799 | **35.1153** |

**Notes:**

1) Allowable Capture Rate is based on 5-year storm with $T_{CONC}$ = 10 mins

2) Intensity, I = 998.071/(Tc+6.035)0.814 (5-year, City of Ottawa)

3) Intensity, I = 1735.688/(Tc+6.014)$^{0.820}$ (100-year, City of Ottawa)

4) Cavg for 100-year is increased by 25%



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## Table B-5 – Calculations of Peak Runoff (Post-Development)

| No. | Area Name | Area (ha) | Time of Concentration, Tc (min) | Storm: 5 Y $I_5$ (mm/hr) | $C_{AVG5POS}$ | $Q_{5POST}$ (L/Sec) | Storm: 100 Y $I_{100}$ (mm/hr) | $C_{AVG100POS}$ | $Q_{100POST}$ (L/Sec) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **WS-01** | 0.073954 | 10 | 104.288 | 0.900 | 19.297 | 178.559 | 1.000 | 36.710 |
| **2** | **WS-02** | **0.052076** | **10** | **104.288** | **0.900** | **13.588** | **178.559** | **1.000** | **25.850** |
| 3 | **WS-03** | 0.025644 | 10 | 104.288 | 0.300 | 2.230 | 178.559 | 0.375 | 4.774 |
| | **Overall Site** | 0.151674 | 10 | 104.288 | 0.799 | **35.115** | 178.559 | 0.998 | **75.154** |

**Notes:**

1) Intensity, $I = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of Ottawa)

2) Intensity, $I = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)

3) $C_{avg}$ for 100-year is increased by 25% (Maximum of 1.0)

## Table B-6 – Calculations of Post-Development increase in Runoff Rate Based on Allowable Runoff

| No. | Area Name | Area (ha) | Time of Concentration, Tc (min) | Storm: 5 Y $I_5$ (mm/hr) | $C_{AVG5Post}$ | $Q_{5Post}$ (L/Sec) | Storm: 100 Y $I_{100}$ (mm/hr) | $C_{AVG100Post}$ | $Q_{100PRE}$ (L/Sec) | Flow Release $Q_{ALLOW}$ (L/Sec) | $Q_{INC100}$ (L/Sec) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **WS-01** | 0.073954 | 10 | 104.288 | 0.900 | 19.297 | 178.559 | 1.000 | 36.710 | 19.297 | 17.414 |
| **2** | **WS-02** | **0.052076** | **10** | **104.288** | **0.900** | **13.588** | **178.559** | **1.000** | **25.850** | **13.588** | 12.262 |
| 3 | **WS-03** | 0.025644 | 10 | 104.288 | 0.300 | 2.230 | 178.559 | 0.375 | 4.774 | 2.230 | 2.543 |
| | **Overall Site** | 0.151674 | 10 | 104.288 | 0.799 | 35.115 | 178.559 | 0.998 | 75.154 | 35.115 | 32.219 |

**Notes:**

1) Intensity, $I = 998.071/(Tc+6.035)^{0.814}$ (5-year, City of Ottawa)

2) Intensity, $I = 1735.688/(Tc+6.014)^{0.820}$ (100-year, City of Ottawa)

3) $C_{avgPost}$ for 100-year is increased by 25% (Maximum of 1.0)

## Table B-7 – Storage Volumes for 5-year and 100-year Return Period Storms (Modified Rational Method)

| Duration, $T_D$ (min) | Release Rate = 35.12 L/Sec<br>Return Period = 5 Years<br>Intensity, $I = 998.071/(T_D+6.035)^{0.814}$ (5-year, City of Ottawa) | | | | | Release Rate = 35.12 L/Sec<br>Return Period = 100 Years<br>Intensity: $I = 1735.688/(T_D+6.014)^{0.820}$ (100-year, City of Ottawa) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Rainfall Intensity, I (mm/hr) | Peak Flow (L/sec) | Release Rate (L/sec) | Storage Rate (L/sec) | Storage ($m^3$) | Rainfall Intensity, I (mm/hr) | Peak Flow (L/sec) | Release Rate (100Y) (L/sec) | Storage Rate (L/sec) | Storage ($m^3$) |
| 0 | 231.04 | 77.79 | 35.12 | 42.68 | 0.00 | 398.62 | 167.78 | 35.12 | 132.66 | 0.00 |
| **10** | **104.29** | **35.12** | **35.12** | **0.00** | **0.00** | **178.56** | **75.15** | **35.12** | **40.04** | **24.02** |
| 20 | 70.29 | 23.67 | 35.12 | -11.45 | -13.74 | 119.95 | 50.49 | 35.12 | 15.37 | 307.42 |
| 30 | 53.95 | 18.17 | 35.12 | -16.95 | -30.51 | 91.87 | 38.67 | 35.12 | 3.55 | 106.54 |
| 40 | 44.20 | 14.88 | 35.12 | -20.23 | -48.56 | 75.15 | 31.63 | 35.12 | -3.49 | -139.49 |
| 50 | 37.66 | 12.68 | 35.12 | -22.43 | -67.30 | 63.95 | 26.92 | 35.12 | -8.20 | -409.88 |
| 60 | 32.95 | 11.09 | 35.12 | -24.02 | -86.47 | 55.89 | 23.53 | 35.12 | -11.59 | -695.38 |
| 70 | 29.38 | 9.89 | 35.12 | -25.22 | -105.94 | 49.79 | 20.96 | 35.12 | -14.16 | -991.15 |
| 80 | 26.57 | 0.00 | 35.12 | -35.12 | -168.55 | 44.99 | 18.94 | 35.12 | -16.18 | -1294.32 |
| 90 | 24.29 | 8.18 | 35.12 | -26.94 | -145.45 | 41.11 | 17.30 | 35.12 | -17.81 | -1603.08 |
| 100 | 22.41 | 7.55 | 35.12 | -27.57 | -165.42 | 37.90 | 15.95 | 35.12 | -19.16 | -1916.22 |

**Notes:**
1 ) Peak flow is equal to the product of 2.78 x C x I x A
2) $I = 998.071/(T_D+6.035)^{0.814}$ [5-year] $I = 1735.688/(T_D+6.014)^{0.820}$ [100-year] City of Ottawa. From Ottawa Sewer Design Guidelines, Section 5.4.2, where TD = storm duration (mins)
3) Release Rate = Desired Capture (Release) Rate
4 ) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximium Storage = Max Storage Over Duration

## Figure B-1 Underground Storm Water Detention Tank, Size 30,000 Liter

**30,000 LITRE CONCRETE WATER HOLDING TANK MODEL H30L**

WILKINSON HEAVY PRECAST
WWW.WILKINSONHEAVYPRECAST.COM
DUNDAS, ONTARIO 1-800-263-8503

**CONSTRUCTION DETAILS: LOW PROFILE**

**Concrete:** 35 MPa at 28 Days, 5 to 8% Air Entrainment.

**Reinforcing:** Designed for a maximum 1.2 metre burial over the top slab in firm soil. Optional reinforcing for CHBDC vehicular loading available upon request.

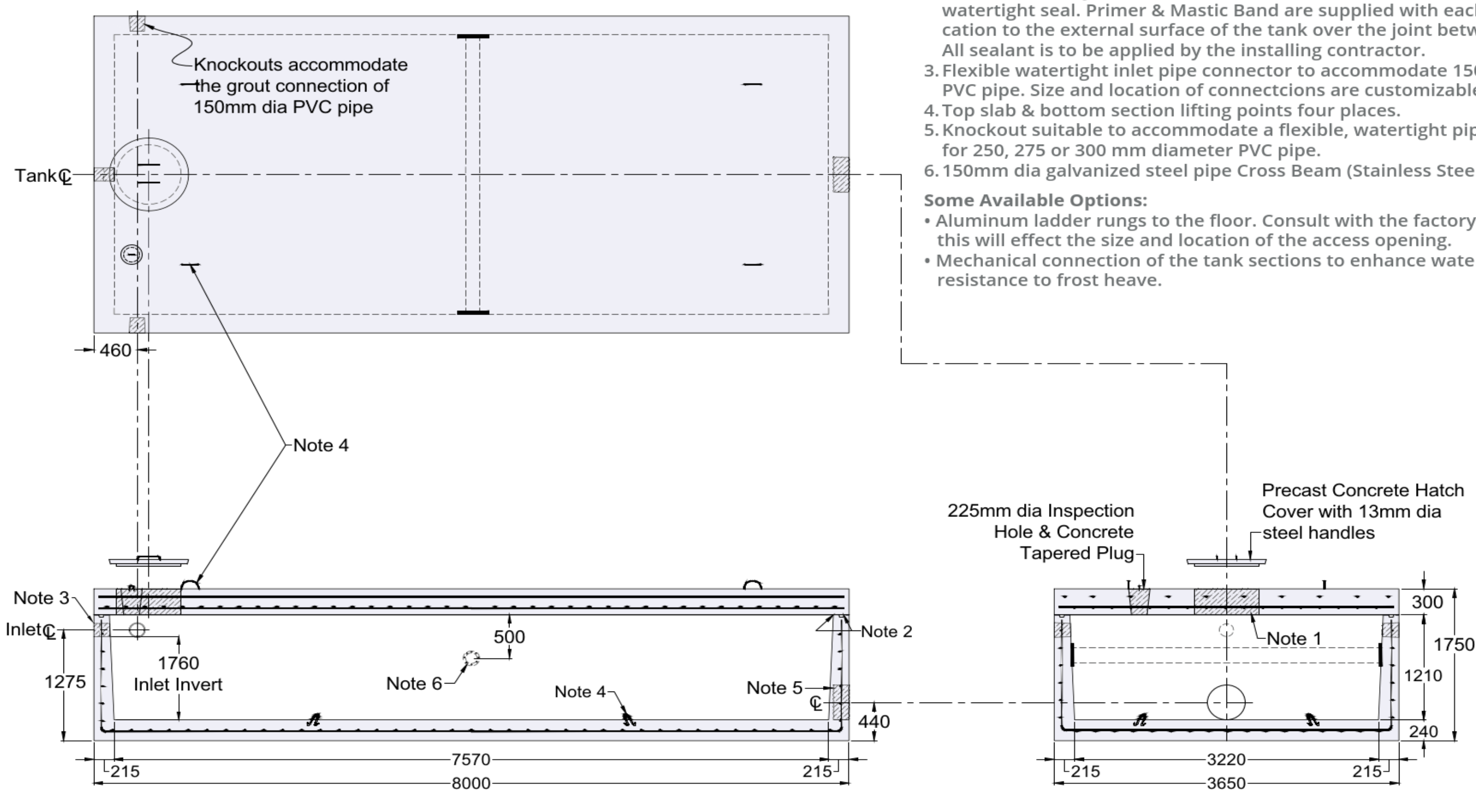
| WEIGHT: | CAPACITY: |
|---|---|
| Top Slab - 21,100 kg | Per Vertical Metre - 24,917 Ltires |
| Bottom Section - 31,500 kg | To Underside of Roof Slab - 30,150 Litres |

**NOTES:**

1. Large 685 mm diameter roof access openings facilitate tank maintenance. Unless otherwise specified when ordered this tank will be shipped with 840 mm diameter concrete roof access cover only. Please see Access Riser section for available riser & hatch options.
2. Close tolerance joint and fibrous mastic sealant ensures a solid structural & watertight seal. Primer & Mastic Band are supplied with each tank for application to the external surface of the tank over the joint between sections. All sealant is to be applied by the installing contractor.
3. Flexible watertight inlet pipe connector to accommodate 150 mm diameter PVC pipe. Size and location of connectcions are customizable.
4. Top slab & bottom section lifting points four places.
5. Knockout suitable to accommodate a flexible, watertight pipe connectoin for 250, 275 or 300 mm diameter PVC pipe.
6. 150mm dia galvanized steel pipe Cross Beam (Stainless Steel Optional).

**Some Available Options:**

- Aluminum ladder rungs to the floor. Consult with the factory as to how this will effect the size and location of the access opening.
- Mechanical connection of the tank sections to enhance water tightness and resistance to frost heave.




Dimensions in mm
N.T.S.

*Product designed for a **Maximum 1.2 Metre** burial over the top slab in firm soil away from any area of vehicular traffic.

For recommended installation proceedures refer to Wilkinson Installation Guidelines.

WARNING! IMPROPER INSTALLATION ESPECIALLY IN UNSTABLE SOIL CAN RESULT IN THE STRUCTURAL FAILURE OF THIS PRODUCT

November 15, 2021

# APPENDIX C: STORMWATER SEWAR DESIGN SHEET

## Table C-1 – Storm Sewers Design Sheet

# Storm sewer design sheet

Q= 2.78 CIA
Where:
Q= Peak flow rate (L/s)
C = runoff coefficient
I = rainfull intensity (mm/hr)
A = area (ha)

$$Q = \left(\frac{1}{n}\right) * A * R^{\frac{2}{3}} * S^{1/2}$$

Q= Flow Capacity of Sewer ($m^3$/s)
A = Area ($m^2$)
R = Hydraulic radius of pipe (m)
S: Sewer slope (m/m)
n: Manning roughness coefficient (unitless)

| # | LOCATION | | | (hectares) | Flow (L/s) | | | Sewer Design Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Location Street | Location From | Location To | AREAS (ha) R = | Time of Conc. (min) | Rainfall Intensity I | Peak Flow (L/s) | Sewer Diameter (mm) | Sewer Slope (%) | Sewer Length (m) | Sewer Capacity (L/s) n = 0.013 | Sewer Flow Vecocity (m/s) | Sewer Flow Time (min) |
| 1 | 3996 Innes Rd. | ST-Storage | MH-ST (City) | 0.1517 | 10 | 104.288231 | 35.121 | 254.0 | 1.00% | 27.1 | 112.0 | 0.762 | 0.592 |
| 2 | 3996 Innes Rd. | STC | ST-Storage | 0.1517 | 10 | 104.288231 | 35.009 | 254.0 | 1.00% | 1.5 | 112.0 | 0.760 | 0.033 |
| 3 | 3996 Innes Rd. | MH-ST#1 | STC | 0.1517 | 10 | 104.288231 | 35.009 | 254.0 | 1.00% | 2.0 | 112.0 | 0.760 | 0.044 |
| 4 | 3996 Innes Rd. | CB-1 | MH-ST#1 | 0.07585 | 10 | 104.288231 | 17.561 | 152.4 | 1.50% | 7.7 | 35.1 | 1.059 | 0.121 |
| 5 | 3996 Innes Rd. | CB-2 | MH-ST#1 | 0.07585 | 10 | 104.288231 | 17.561 | 152.4 | 1.50% | 10.9 | 35.1 | 1.059 | 0.172 |
| 6 | 3996 Innes Rd. | RD1 | CB-1 | 0.013019 | 10 | 104.288231 | 3.397 | 101.6 | 1.50% | 9.4 | 11.9 | 0.461 | 0.340 |
| 7 | 3996 Innes Rd. | RD2 | CB-1 | 0.013019 | 10 | 104.288231 | 3.397 | 101.6 | 1.50% | 8.4 | 11.9 | 0.461 | 0.304 |
| 8 | 3996 Innes Rd. | RD3 | CB-2 | 0.013019 | 10 | 104.288231 | 3.397 | 101.6 | 1.50% | 11.9 | 11.9 | 0.461 | 0.430 |
| 9 | 3996 Innes Rd. | RD4 | CB-2 | 0.013019 | 10 | 104.288231 | 3.397 | 101.6 | 1.50% | 10.4 | 11.9 | 0.461 | 0.376 |

# APPENDIX D: SANITARY SEWER DESIGN SHEET

# Table C-1 – Sanitary Sewers Design Sheet

**Sanitary sewer design sheet**

$$Q = \left(\frac{1}{n}\right) * A * R^{\frac{2}{3}} * S^{1/2}$$

Q= Flow Capacity of Sewer ($m^3$/s)

A = Area ($m^2$)

R = Hydraulic radius of pipe (m)

S: Sewer slope (m/m)

n: Manning roughness coefficient (unitless)

| LOCATION | | | AREA (hectares) | | Flow (L/s) | | | Sewer Design | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Location Street | Location From | Location To | Individual Area A (ha) | Cumulative Area (ha) | Com. Flow Q(c) L/s | Peack extraneous flow Q(i) L/s | Peak Design Flow Q(d) (L/s)* | Proposed Sewer Length (m) | Proposed Sewer Size (mm) | Proposed Sewer Type of Pipe | Proposed Sewer Grade % | Proposed Sewer Capacity (L/s) n= 0.013 | Proposed Sewer Full Flow Velocity (m/s) | Proposed SewerActual Flow Velocity at Q(d) (m/s) |
| 3996 Innes Rd | New SAN. MH. | S-MH (City) | NA | NA | NA | NA | 0.6322495 | 26.4 | 100 | PVC SDR 35 SAN. PIPE | 1.50% | 7.04 | 4.58 | 0.41 |
| 3996 Innes Rd | Building Basement | New SAN. MH. | NA | NA | NA | NA | 0.6322495 | 7 | 100 | PVC SDR 35 SAN. PIPE | 1.50% | 7.04 | 4.58 | 0.41 |

# APPENDIX E: STORMCEPTOR SIZING, MAINTENANCE, AND TECHNICAL MANUAL- CANADA



ADAD Inc.135 Mngrove Cres., Ottawa, ON. K1T 0E4.Tel:+1 613-526-1111
http://**www.adadengineering.ca**

# Stormceptor® STC

## Technical Manual

imbrium™

## Stormceptor Design Notes

- Only the STC 300i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 300i to STC 6000 may accommodate multiple inlet pipes.

**Inlet and outlet invert elevation differences are as follows:**

| Inlet and Outlet Pipe Invert Elevations Differences | | | |
|---|---|---|---|
| **Inlet Pipe Configuration** | STC 300 | STC 750 to STC 6000 | STC 9000 to STC 14000 |
| **Single inlet pipe** | 75 mm | 25 mm | 75 mm |
| **Multiple inlet pipes** | 75 mm | 75 mm | Only one inlet pipe. |

**Maximum inlet and outlet pipe diameters:**

| **Inlet/Outlet Configuration** | **Inlet Unit** STC 300i | **In-Line Unit** STC 750 to 6000 | **Series*** STC 9000 to 14000 |
|---|---|---|---|
| **Straight Through** | 24 inch (600 mm) | 42 inch (1050 mm) | 60 inch (1500 mm) |
| **Bend (90 degrees)** | 18 inch (375 mm) | 33 inch (825 mm) | 42 inch (1050 mm) |

- The inlet an din-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to invert is 1.2 m
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
  - Top of grade elevation
  - Stormceptor inlet and outlet pipe diameters and invert elevations
  - Standing water elevation
- Stormceptor head loss, K = 1.3

**For technical assistance and pricing, please contact:**


**Imbrium Systems Inc.**

Tel: 800-565-4801
www.imbriumsystems.com`

Stormceptor® STC

# Design Worksheet

## PROJECT INFORMATION

| | | | | |
|---|---|---|---|---|
| Date: | | Total Drainage Area: | | hectares |
| Project Number: | | Impervious | | % |
| Project Name: | | Upstream Quantity Control (A2): | YES | NO |
| City/Town: | | Is the unit submerged (C4): | YES | NO |
| Development Type: | | Describe Land Cover: | | |
| Province: | | Describe Land Use: | | |

## A. DESIGN FOR TOTAL SUSPENDED SOLIDS REMOVAL

Units are sized for TSS removal. All units are designed for spills capture for hydrocarbon with a specific gravity of 0.86.

**A1**. Identify Water Quality Objective:

| | | |
|---|---|---|
| Desired Water Quality Objective: | | % Annual TSS Removal |

**A2**. If upstream quantity control exists, identify stage storage and discharge information:

| | Elevation (m) | Storage (ha-m) | Discharge ($m^3/s$) |
|---|---|---|---|
| Permanent Water Level | | | |
| 5 year | | | |
| 10 year | | | |
| 25 year | | | |
| 100 year | | | |

**A3**. Select Particle Size Distribution:

☐ Fine Distribution

| Particle Size um | Distribution % |
|---|---|
| 20 | 20 |
| 60 | 20 |
| 150 | 20 |
| 400 | 20 |
| 2000 | 20 |

☐ Coarse Distribution

| Particle Size um | Distribution % |
|---|---|
| 150 | 60 |
| 400 | 20 |
| 2000 | 20 |

☐ User Defined Particle Size Distribution
Identify particle size distribution
(please contact your local Stormceptor representative)

| Particle Size um | Distribution % | Specific Gravity |
|---|---|---|
| | | |

**A4**. Enter all parameters from items A1 to A3 into PCSWMM for Stormceptor to select the model that meets the water quality objective.

### SUMMARY OF STORMCEPTOR REQUIREMENTS FOR TSS REMOVAL

| | | |
|---|---|---|
| Stormceptor Model: | | |
| Annual TSS Removed: | | % |
| Annual Runoff Captured: | | % |

## B. STORMCEPTOR SITING CONSIDERATIONS

**B1**. Difference Between Inlet and Outlet Invert Elevations:

| Number of Inlet Pipes | Inlet Unit STC 300 | In-line STC 750 to STC 6000 | Series STC 10000 to STC 14000 |
|---|---|---|---|
| One | 75 mm | 25 mm | 75 mm |
| >1 | 75 mm | 75 mm | N/A |

**B2**. Other considerations:

| | |
|---|---|
| Minimum Distance From Top of Grade to Invert Elevation | 1.2 m |
| Bends: | The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees |
| Multiple Inlet Pipe: | Yes for Inlet and In-Line Stormceptor Units. Please contact your local affiliate for more details |
| Inlet Covers | Only the STC 300 can accommodate a catch basin frame and cover. |

**B3**. Standard maximum inlet and outlet pipe diameters:

| Inlet/Outlet Configuration | Inlet Unit STC 300 | In-line STC 750 to STC 6000 | Series STC 10000 to STC 14000 |
|---|---|---|---|
| Straight Through | 600 mm | 1050 mm | 2400 mm |
| Bend | 450 mm | 825 mm | 1050 mm |

Please contact your local Stormceptor representative for larger pipe diameters.

**B4**. Submerged conditions:
A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative for further assistance.

Stormceptor® STC

# STORMCEPTOR® QUOTATION AND ORDER FORM

Quotation No: ______________________

Date: ______________________

## Project Information:

Project Number: ______________________

Project Name: ______________________

Closing Date: ______________________

Jobsite Address: ______________________

Municipality: ______________________

## Contractor Information

Contact Name: ______________________

Company: ______________________

Phone No: ______________________

Fax No: ______________________

E-mail: ______________________

## Consultant Information:

Contact Name: ______________________

Company: ______________________

Phone No: ______________________

Fax No: ______________________

E-mail:

## Owner Information (Required for Maintenance):

Contact Name: ______________________

Company: ______________________

Phone No: ______________________

Fax No: ______________________

E-mail:

## Land Use (Check one):

| | | | | |
|---|---|---|---|---|
| ☐ Commercial | ☐ Gas Station | ☐ Government | ☐ Industrial | ☐ Military |
| ☐ Street | ☐ Residential | ☐ Transportation | ☐ Other ______ | |

## STORMCEPTOR INFORMATION

Structure No.: ______________________

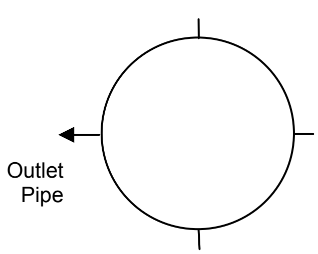
Top of Grate Elev.: ______________________

Outlet Invert Elev.: ______________________ Outlet Pipe Material: ______________________

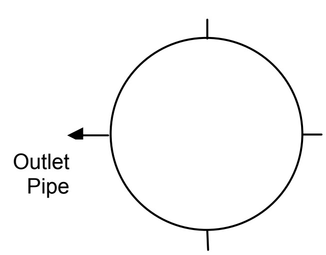
Inlet invert Elev.: ______________________ Inlet Pipe Material: ______________________

## STORMCEPTOR MODEL REQUIRED (circle model number)

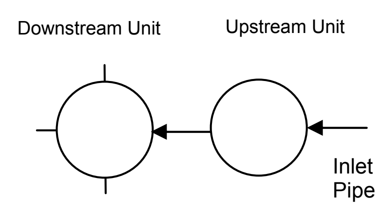
| INLET SYSTEM | IN-LINE SYSTEM | SERIES SYSTEM |
|---|---|---|
| STC 300 | STC 750, STC 1000, STC 1500<br>STC 2000, STC 3000, STC 4000<br>STC 5000, STC 6000 | STC 9000, STC 11000<br>STC 14000 |




Show Orientation of Inlet Pipe




Show Orientation of Inlet Pipe




Show Orientation of Outlet Pipe on Downstream Unit

Please complete the attached form and fax to (416) 960-5637 or your local manufacturer

www.imbriumsystems.com

# Table of Content

# 1. About Stormceptor

The Stormceptor® (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

## 1.1. Distribution Network

Imbrium Systems has partnered with a global network of affiliates who manufacture and distribute the Stormceptor System.

| Canada | | |
|---|---|---|
| Ontario | Hanson Pipe & Precast Ltd | 888-888-3222<br>www.hansonpipeandprecast.com |
| Québec | Lécuyer et Fils Ltée | (800) 561-0970<br>www.lecuyerbeton.com |
| New Brunswick / Prince Edward Island | Strescon Limited | (506) 633-8877<br>www.strescon.com |
| Newfoundland / Nova Scotia | Strescon Limited | (902) 494-7400<br>www.strescon.com |
| Western Canada | Lafarge Canada Inc. | (888) 422-4022<br>www.lafargepipe.com |
| British Columbia | Langley Concrete Group | (604) 533-1656<br>www.langleyconcretegroup.com |

### 1.2. Patent Information

The Stormceptor technology is protected by the following patents:

- **Australia Patent No**. 693,164 • 707,133 • 729,096 • 779401
- **Austrian Patent No**. 289647
- **Canadian Patent No** 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- **China Patent No** 1168439
- **Denmark** DK 711879
- **German** DE 69534021
- **Indonesian Patent No** 16688
- **Japan Patent No** 9-11476 (Pending)
- **Korea** 10-2000-0026101 (Pending)
- **Malaysia Patent No** PI9701737 (Pending)
- **New Zealand Patent No** 314646
- **United States Patent No** 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- **Stormceptor OSR** Patent Pending • **Stormceptor LCS** Patent Pending

### 1.3. Contact Imbrium Systems

Contact us today if you require more information on other products:

**Imbrium Systems Inc.**
2 St. Clair Ave. West
Suite 2100
Toronto, On M4V 1L5

T 800 565 4801
info@imbriumsystems.com
www.imbriumsystems.com

## 2. Stormceptor Design Overview

### 2.1. Design Philosophy

The patented Stormceptor System has been designed focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

### 2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum CHBDC)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18” (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

### 2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

# 3. Key Operation Features

## 3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

## 3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{\theta_H} = \frac{Q}{A_S}$$

Where:
$v_{SC}$ = critical settling velocity, ft/s (m/s)
$H$ = tank depth, ft (m)
$\theta_H$ = hydraulic detention time, ft/s (m/s)
$Q$ = volumetric flow rate, ft$^3$/s (m$^3$/s)
$A_S$ = surface area, ft$^2$ (m$^2$)
(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

### 3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (406 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall and the surrounding soils.

## 4. Stormceptor Product Line

### 4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

**Table 1. Canadian Stormceptor Models**

| Stormceptor Model | Total Storage Volume Imp. Gal (L) | Hydrocarbon Storage Capacity Imp. Gal (L) | Maximum Sediment Capacity Imp. Gal (L) |
|---|---|---|---|
| STC 300i | 470 (1 775) | 66 (300) | 319 (1 450) |
| STC 750 | 895 (4 070) | 46 (915) | 660 (3 000) |
| STC 1000 | 1,070 (4 871) | 46 (915) | 836 (3 800) |
| STC 1500 | 1,600 (7 270) | 46 (915) | 1,365 (6 205) |
| STC 2000 | 2,420 (6 205) | 636 (2 890) | 1,300 (7 700) |
| STC 3000 | 3,355 (15 270) | 636 (2 890) | 1,694 (11 965) |
| STC 4000 | 4,450 (20 255) | 739 (3 360) | 3,627 (16 490) |
| STC 5000 | 5,435 (24 710) | 739 (3 360) | 4,606 (20 940) |
| STC 6000 | 6,883 (31 285) | 864 (3 930) | 5,927 (26 945) |
| STC 9000 | 9,758 (44 355) | 2,322 (10 555) | 7,255 (32 980) |
| STC 10000 | 10,734 (48 791) | 2,322 (10 555) | 8,230 (37 415) |
| STC 14000 | 14,610 (66 410) | 2,574 (11 700) | 11,854 (53 890) |

**NOTE:** Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

### 4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

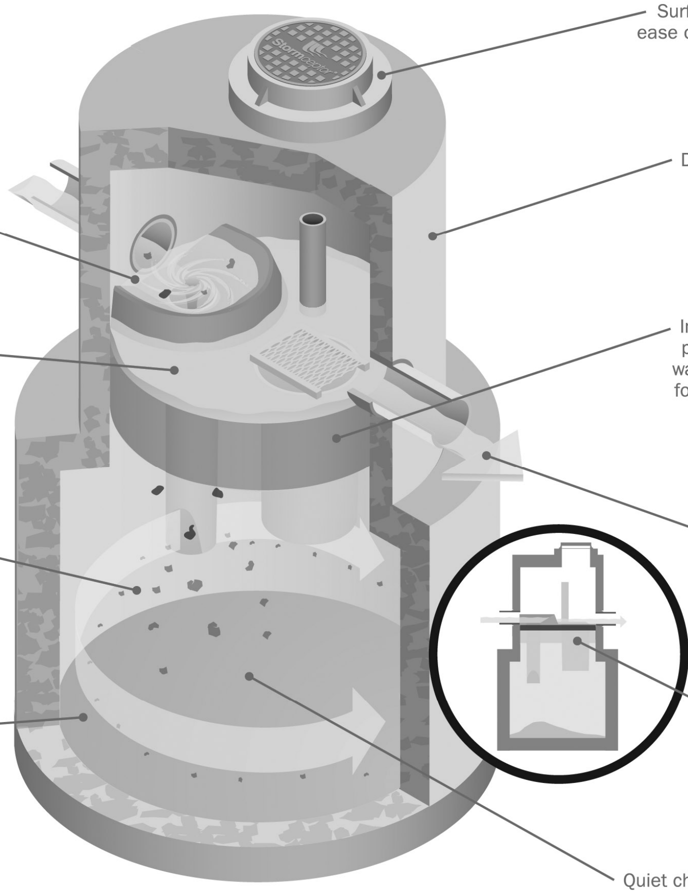



**Figure 1. Inline Stormceptor**

## Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

## 4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

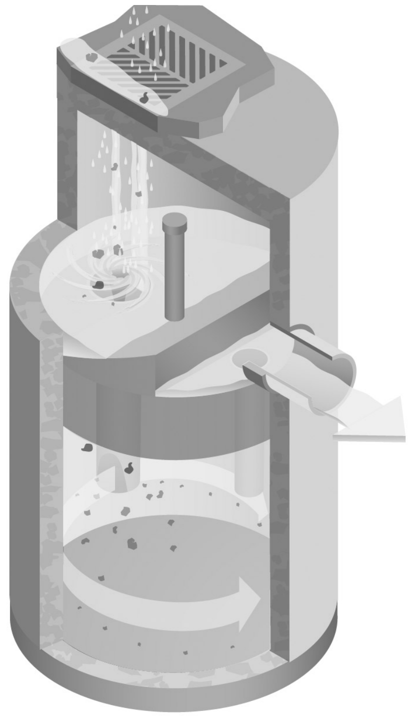


**Figure 2. Inlet Stormceptor**

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

### 4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

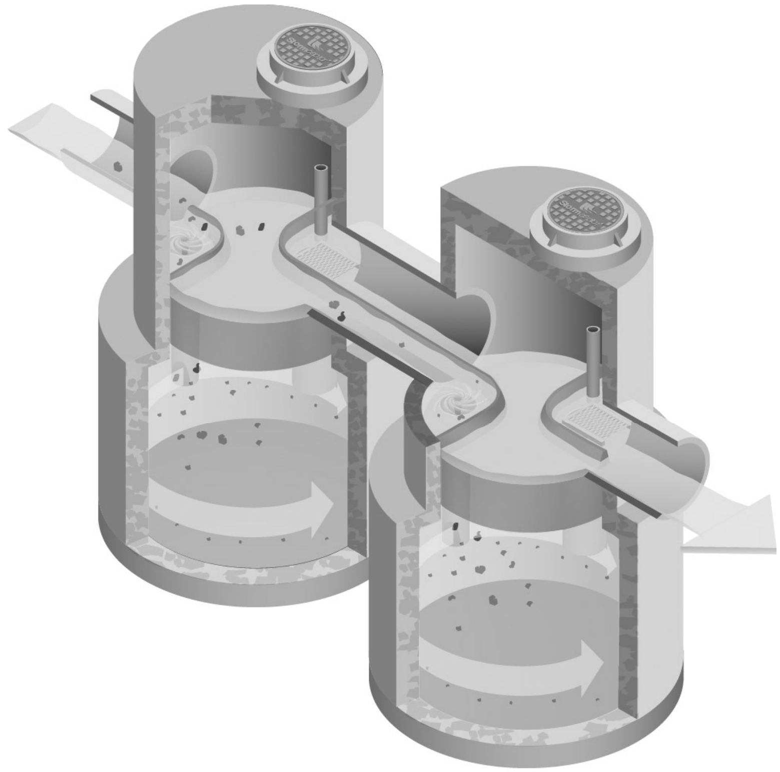


**Figure 3. Series System**

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

## 5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

**STEP 1 – Project Details**

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

**STEP 2 – Site Details**

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

**STEP 3 – Upstream Attenuation**

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

**STEP 4 – Particle Size Distribution**

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

**Table 2. Fine Distribution**

| Particle Size | Distribution | Specific Gravity |
|---|---|---|
| 20 | 20% | 1.3 |
| 60 | 20% | 1.8 |
| 150 | 20% | 2.2 |
| 400 | 20% | 2.65 |
| 2000 | 20% | 2.65 |

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

**STEP 5 – Rainfall Records**

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

**STEP 6 – Summary**

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

**STEP 7 – Sizing Summary**

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

## 5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge) The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
   a. The hydrology of the local area is properly and **accurately** incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
   b. The distribution of TSS with the hydrology is properly and **accurately** considered in the sizing
   c. Particle size distribution is properly considered in the sizing
   d. The sizing can be optimized for TSS removal
   e. The cost benefit of alternate TSS removal criteria can be easily assessed
   f. The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit **www.imbriumsystems.com** to download a free copy of the program.

## 5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

**Typical Sites**

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

**Unstable Sites**

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting proper unit size for such unstable sites.

## 6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

'Spill Capture' describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

### 6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil level alarm is designed to trigger at approximately 85% of the unit's available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection. The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

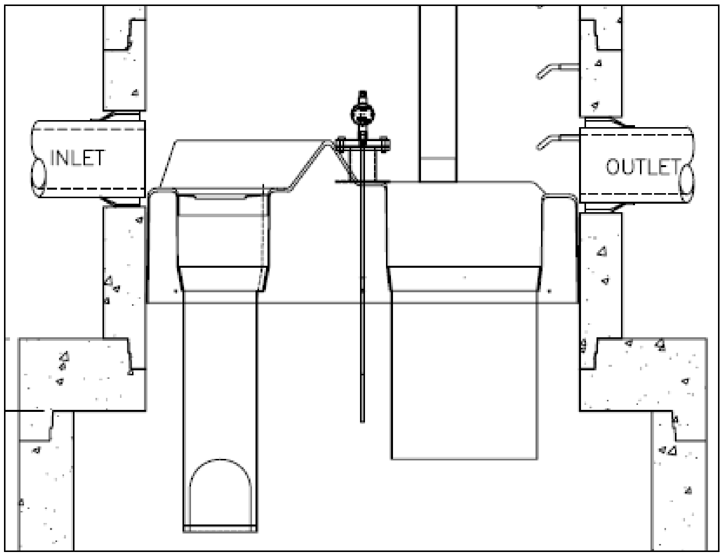



**Figure 4. Oil level alarm**

### 6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

## 7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

### 7.1. Installation Depth / Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

### 7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters.

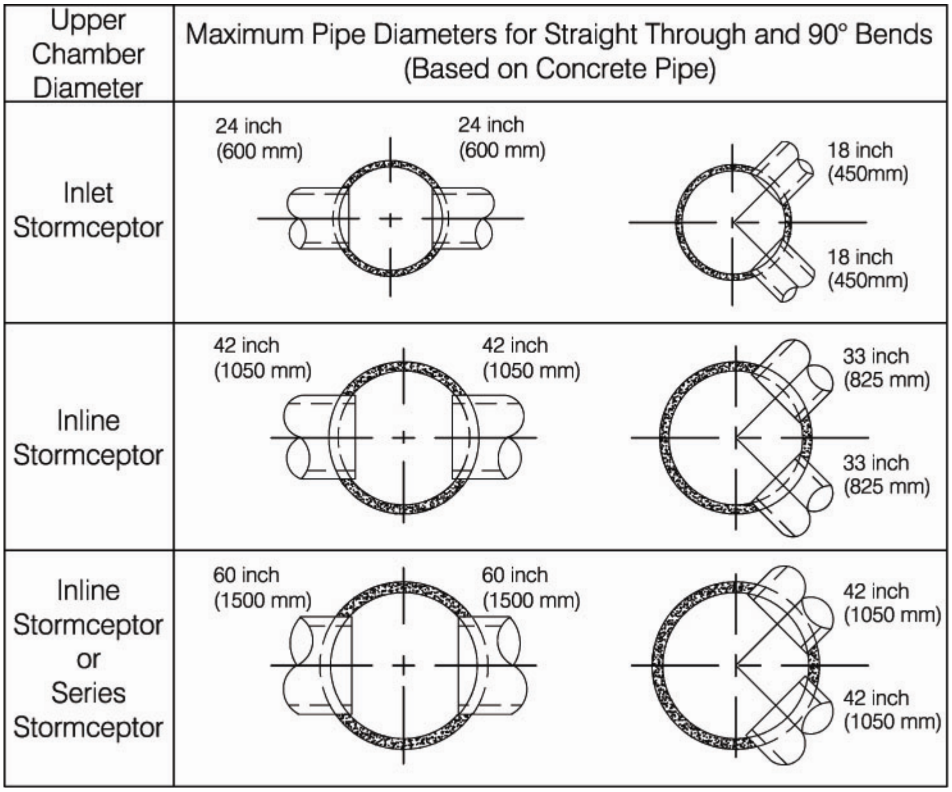



**Figure 5. Maximum pipe diameters for straight through and bend applications.**

*****The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

## 7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations for the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

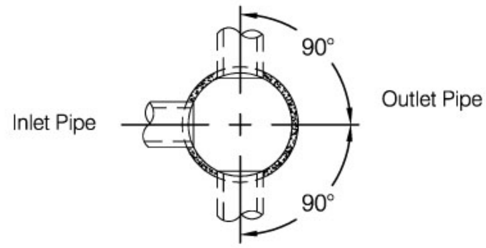
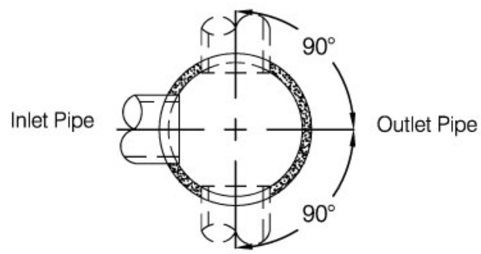
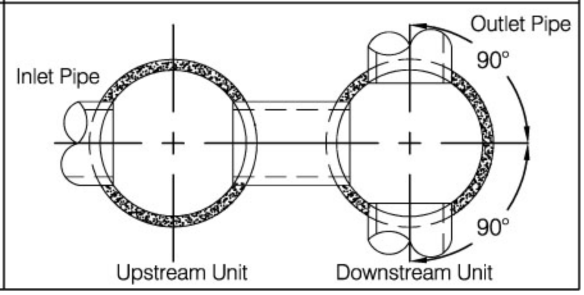
| Stormceptor System | Maximum Bend Configurations |
|---|---|
| Inlet Stormceptor |  |
| Inline Stormceptor |  |
| Series Stormceptor |  |

**Figure 6. Maximum bend angles.**

## 7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

## 7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

**Table 3. Recommended drops between inlet and outlet pipe inverts.**

| Number of Inlet Pipes | Inlet System | Inline System | Series System |
|---|---|---|---|
| 1 | 3 inches (75 mm) | 1 inch (25 mm) | 3 inches (75 mm) |
| >1 | 3 inches (75 mm) | 3 inches (75 mm) | Not Applicable |

### 7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

### 7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (HS-20 in the US and CHBDC in Canada). In instances of other loads, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

### 7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life-cycle maintenance cost.

### 7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a maintenance hole. The K value for calculating minor losses is approximately 1.3 (minor loss $= k*1.3v^2/2g$). However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

### 7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

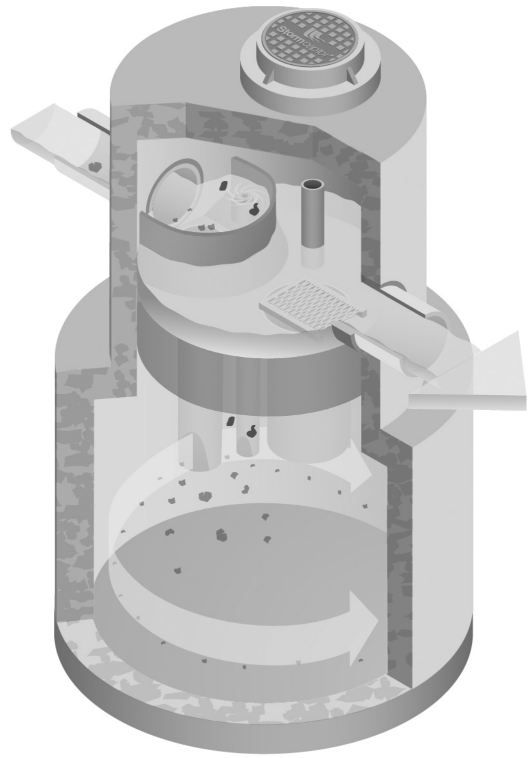


**Figure 7. Submerged Stormceptor**

## 8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between “approved alternatives”. The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

### 8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (*Ontario MOE, 1994*).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

### 8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

### 8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

### 8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

## 9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 750/900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection laboratory testing protocol was followed.
- City of Indianapolis – full scale testing of an STC 750/900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

## 10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, provincial or local specifications for the installation of maintenance holes. Selected sections of a general specification that are applicable are summarized in the following sections.

### 10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, provincial or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials. Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway, provincial or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300mm) 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.

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

### 10.2. Backfilling

Backfill material should conform to state highway, provincial or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway, provincial or local specifications.

## 11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

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

Adjustment of the Stormceptor 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 should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

## 12. Maintenance

### 12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs are provided for entry into the unit, if required

### 12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the table 4.

**Table 4. Sediment Depths indicating required servicing.**

| Sediment Depths Indicating Required Servicing * | |
|---|---|
| Model (CAN) | Sediment Depth inches (mm) |
| 300i | 9 (225) |
| 750 | 9 (230) |
| 1000 | 11 (275) |
| 1500 | 16 (400) |
| 2000 | 14 (350) |
| 3000 | 19 (475) |
| 4000 | 16 (400) |
| 5000 | 20 (500) |
| 6000 | 17 (425) |
| 9000 | 16 (400) |
| 10000 | 20 (500) |
| 14000 | 17 (425) |
| * based on 15% of the Stormceptor unit's total storage | |

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

**The following procedures should be taken when cleaning out Stormceptor:**

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

### 12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

### 12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

### 12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

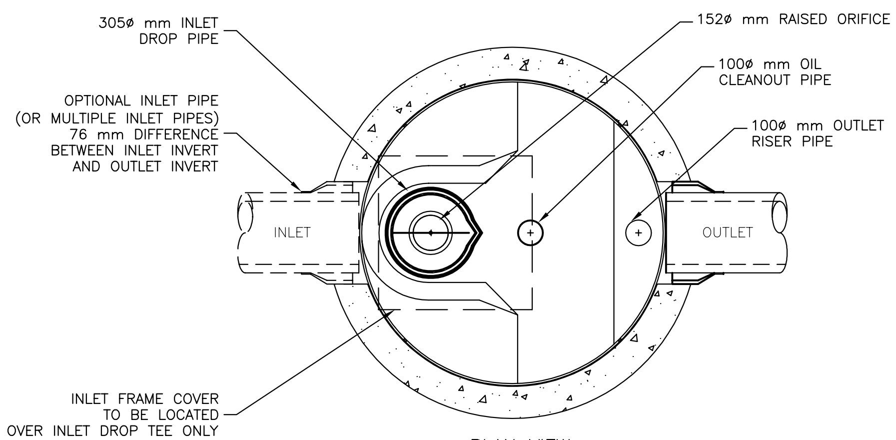
### 12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 ppm). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

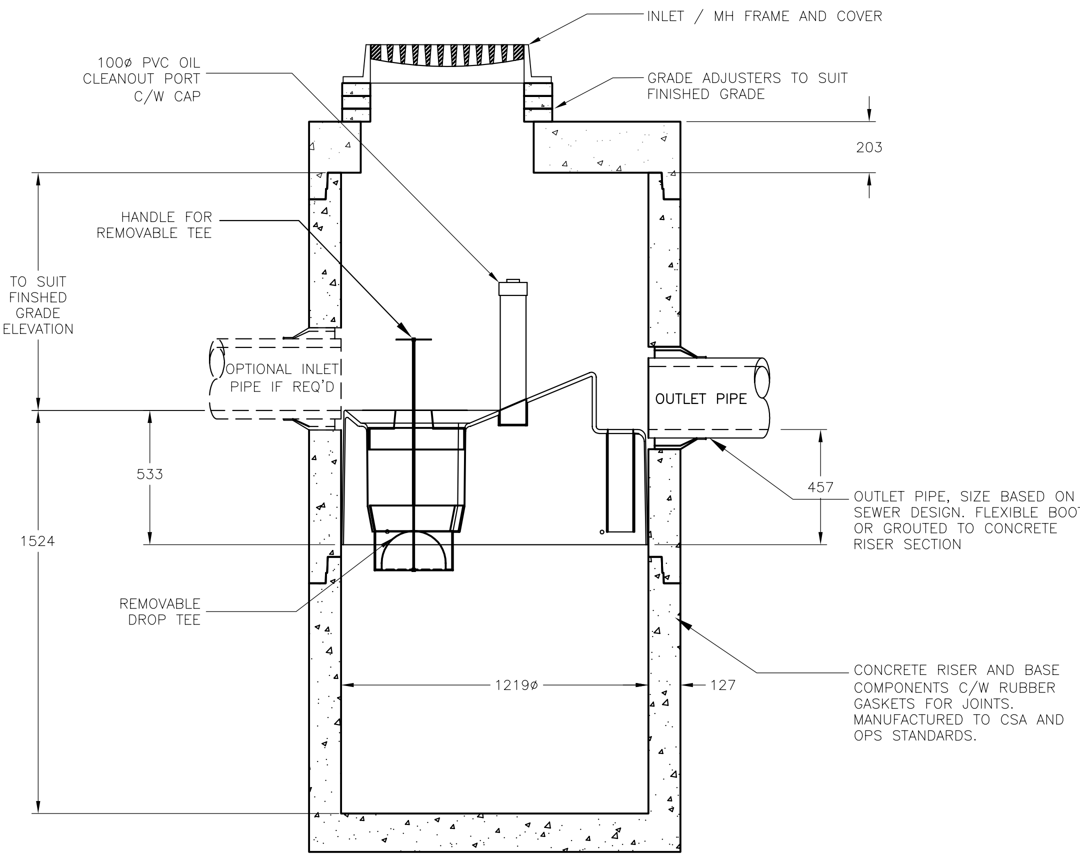
The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

# Appendix 1 Stormceptor Drawings

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW

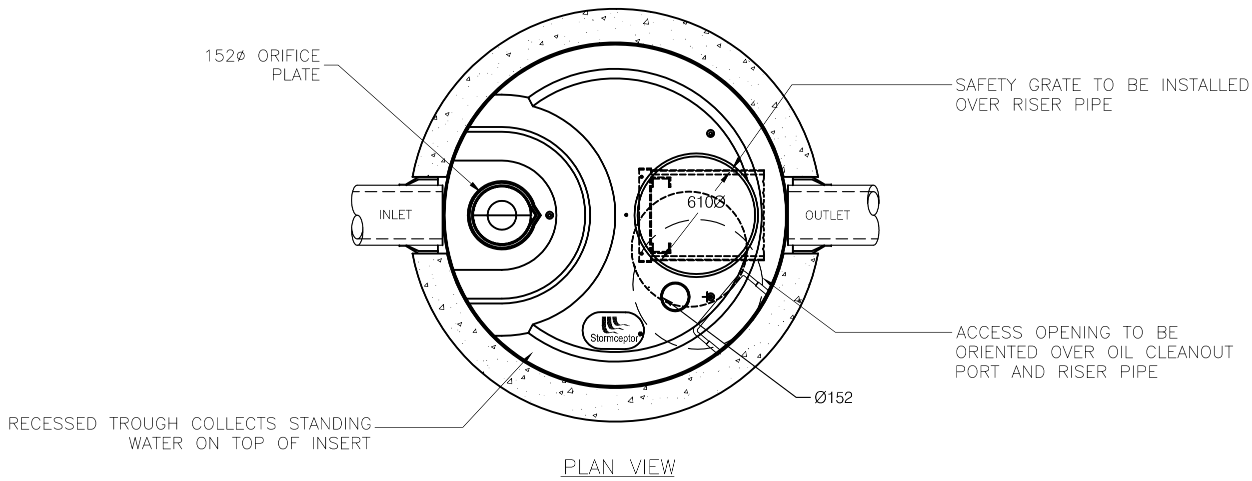



SECTION VIEW

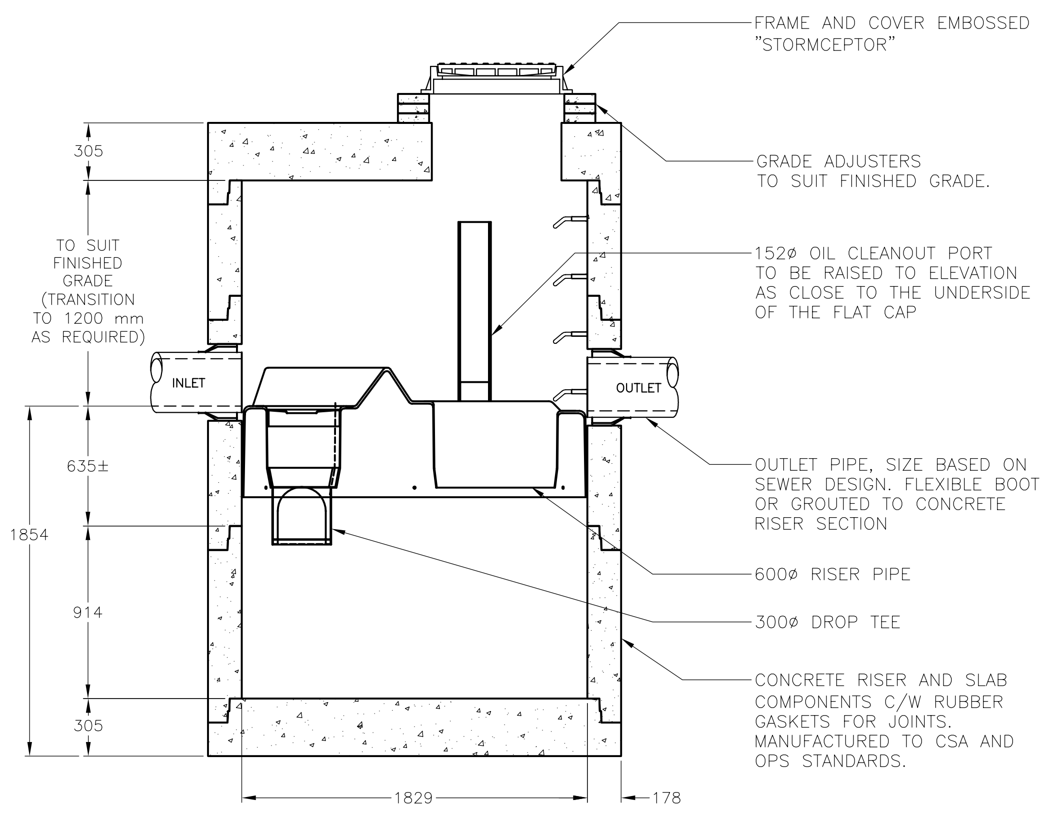
THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS
Australia Patent No. 693,164 • 707,133 • 729,096 • 779401 | Austrian Patent No. 289,647 |
Canadian Patent No. 2,009,280 • 2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending) |
China Patent No. 1,168,439 | Denmark DK 711,879 | German DE 69,534,021 | Indonesian Patent No 16,688 | Japan Patent No. 9-11476 (Pending) |
Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **STORMCEPTOR STC INLET MODEL** STC 300i | SCALE 1:30 | | | | | | Stormceptor STC |
| | | | | | | | FILE: **stc300.dwg** |
| | | | | | | | DRAWN BY: **B.L.** |
| | | | | | | | DATE: **15 Aug 07** |
| | REV | Y | M | D | DRN | CHK | DESCRIPTION |
| | | | | | | | REV.: 1 OF 1 |

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW

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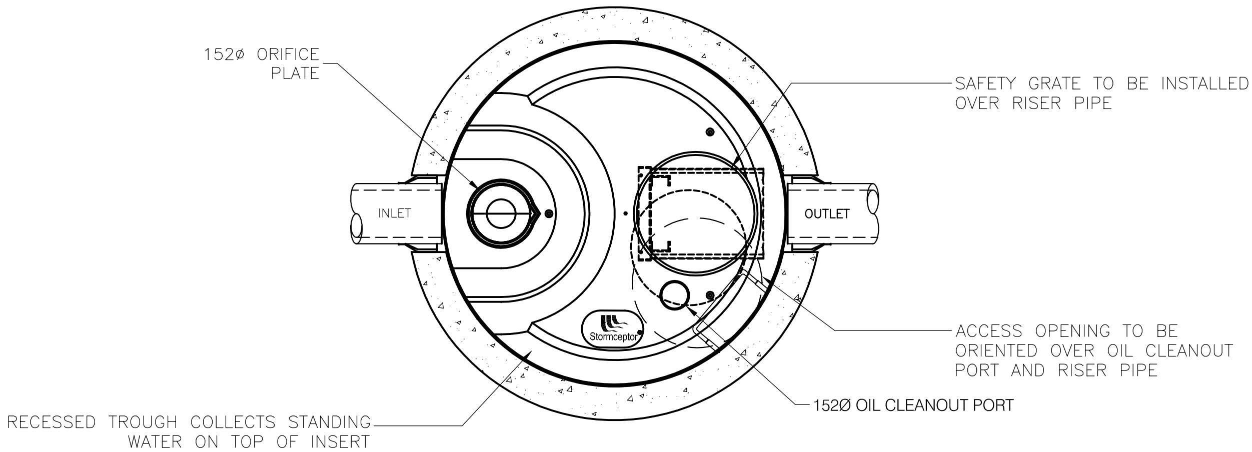
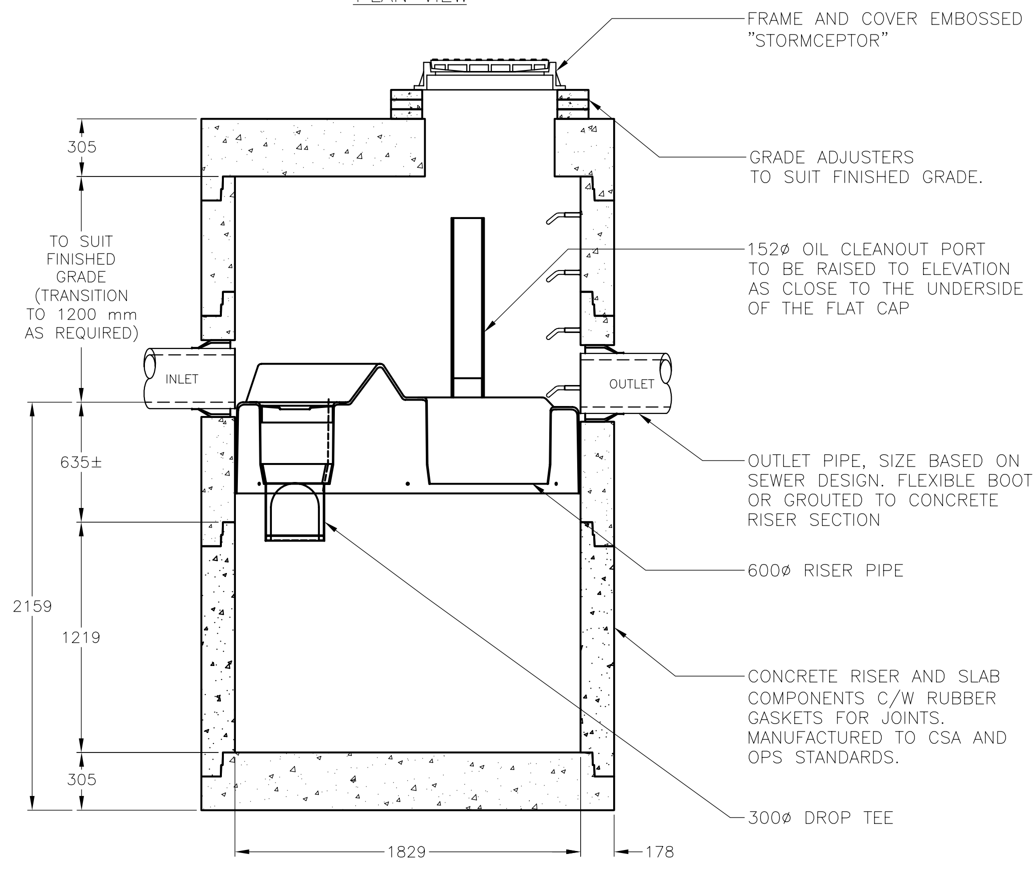
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **STORMCEPTOR STC INLINE MODEL** STC 750 | SCALE 1:40 | | | | | | Stormceptor STC |
| | | | | | | | FILE: **stc750.dwg** |
| | | | | | | | DRAWN BY: **B.L.** |
| | | | | | | | DATE: **8 Aug 07** |
| | REV | Y | M | D | DRN | CHK | DESCRIPTION | REV.: 1 OF 1 |

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW

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Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

**STORMCEPTOR STC**
**INLINE MODEL**
STC 1000

SCALE 1:40

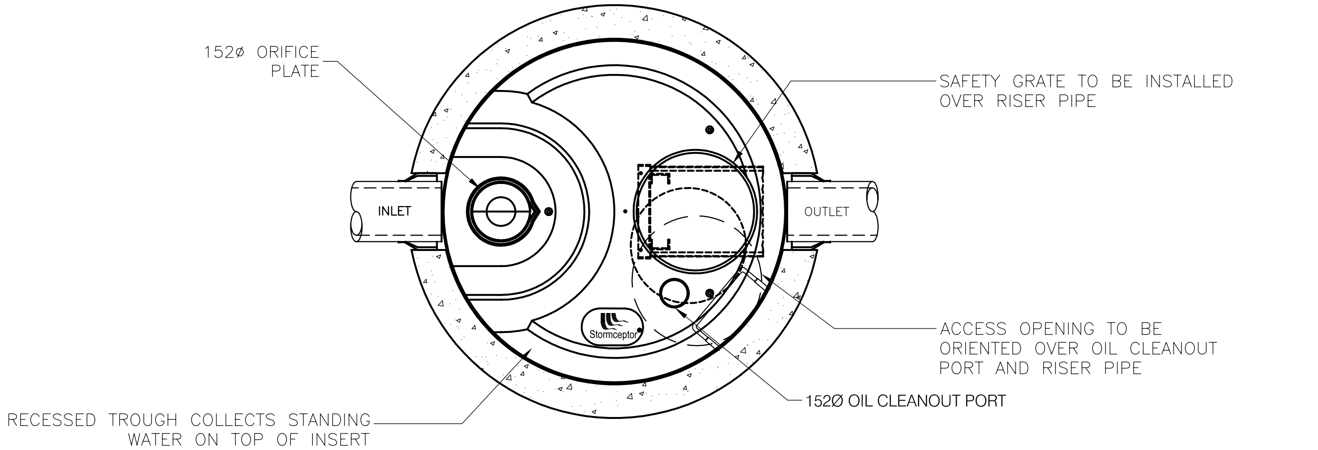
| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

Stormceptor STC

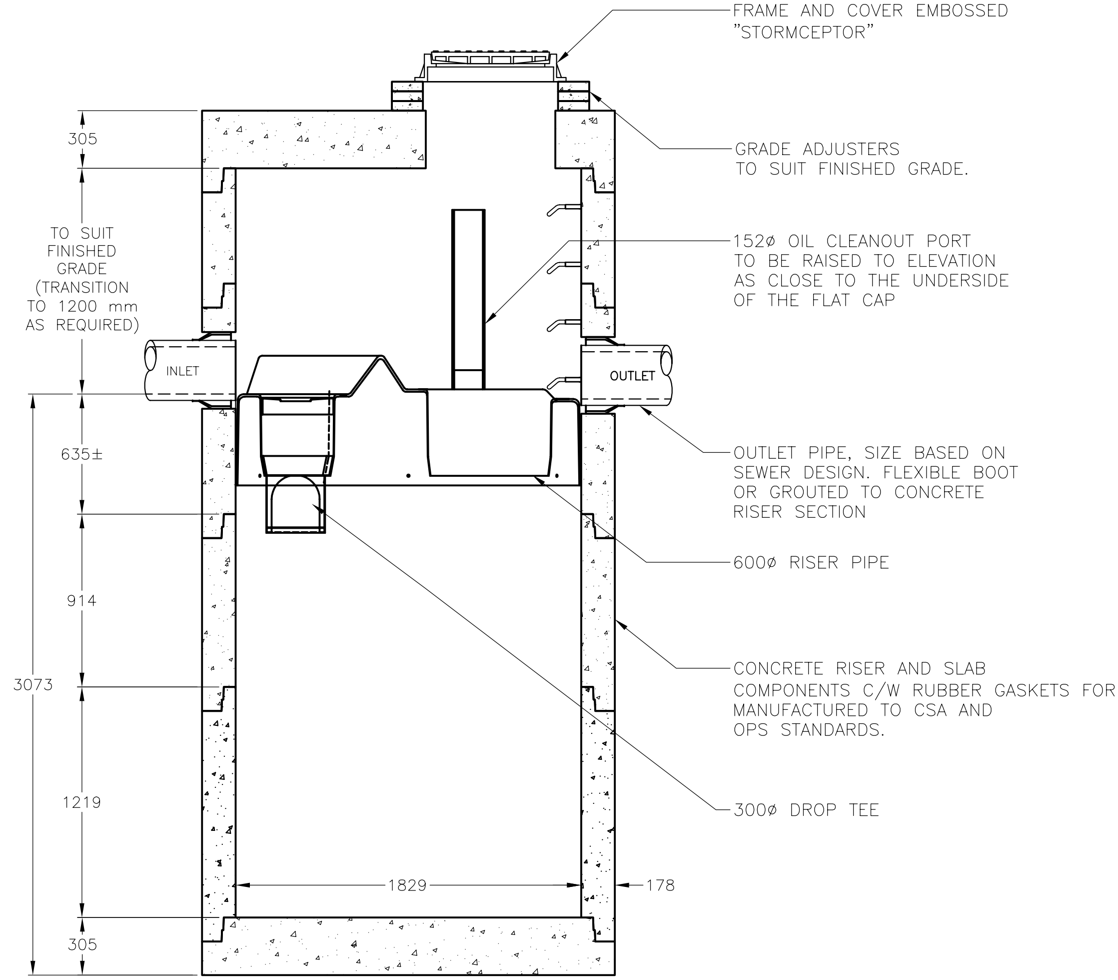
FILE: **stc1000.dwg**
DRAWN BY: **B.L.**
DATE: **8 Aug 07**
REV.:

1 OF 1

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW




SECTION VIEW

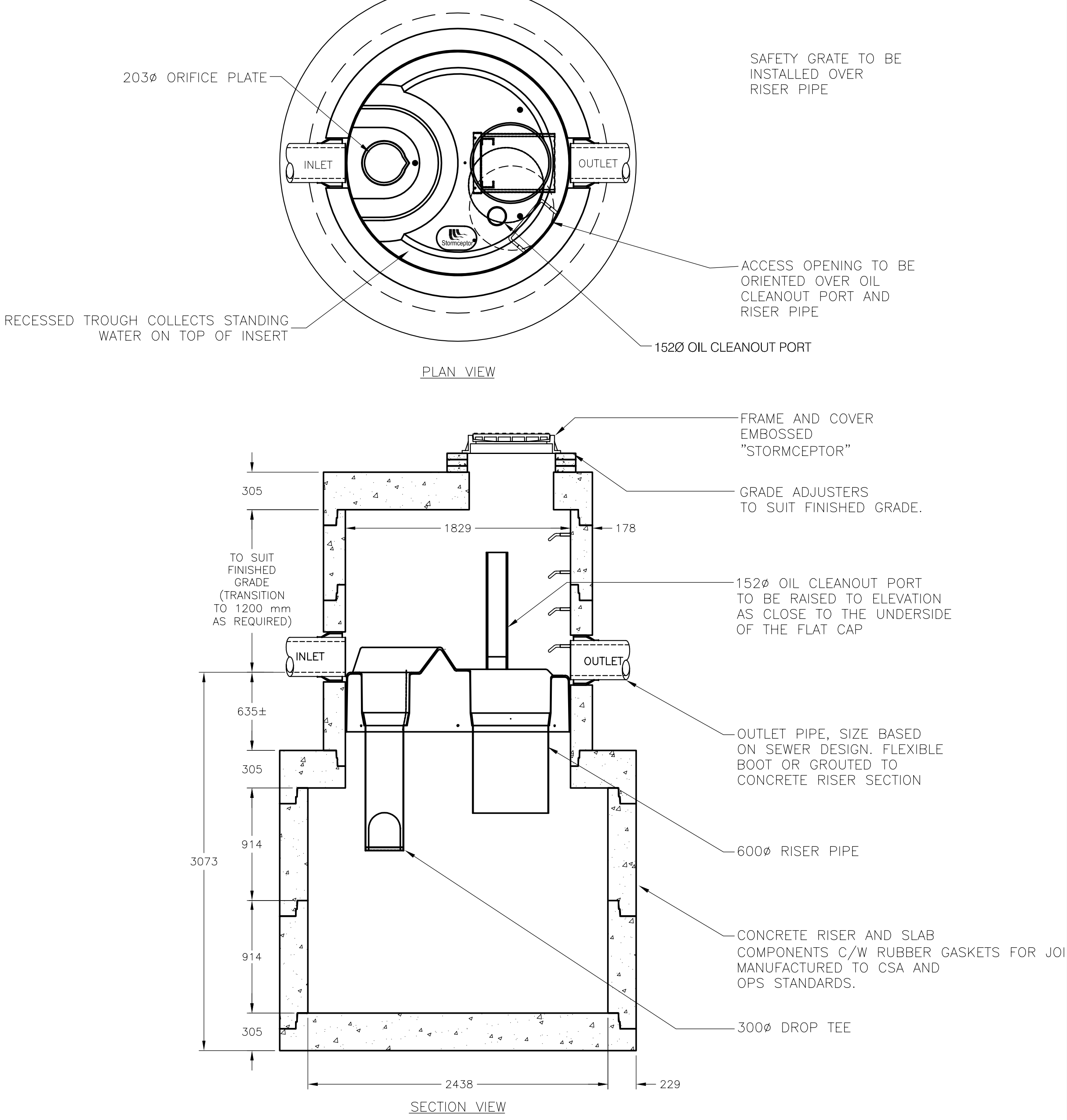
**STORMCEPTOR STC**
**INLINE MODEL**
STC 1500

SCALE 1:40

| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

FILE: **stc1500.dwg**
DRAWN BY: **J.W.**
DATE: **17 Aug 07**
REV.:

# DRAWING NOT TO BE USED FOR CONSTRUCTION




THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS
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Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

**STORMCEPTOR SYSTEM**
**INLINE MODEL**
STC 2000

SCALE 1:50

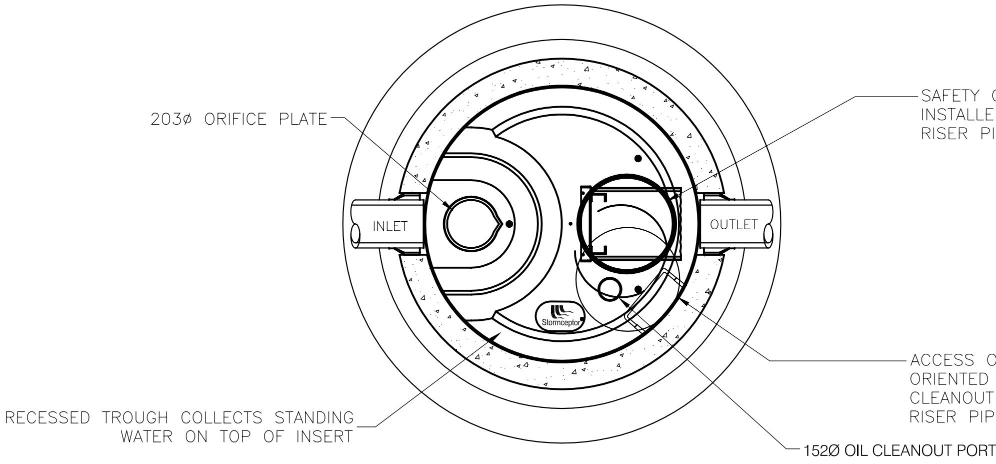
| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

Stormceptor STC

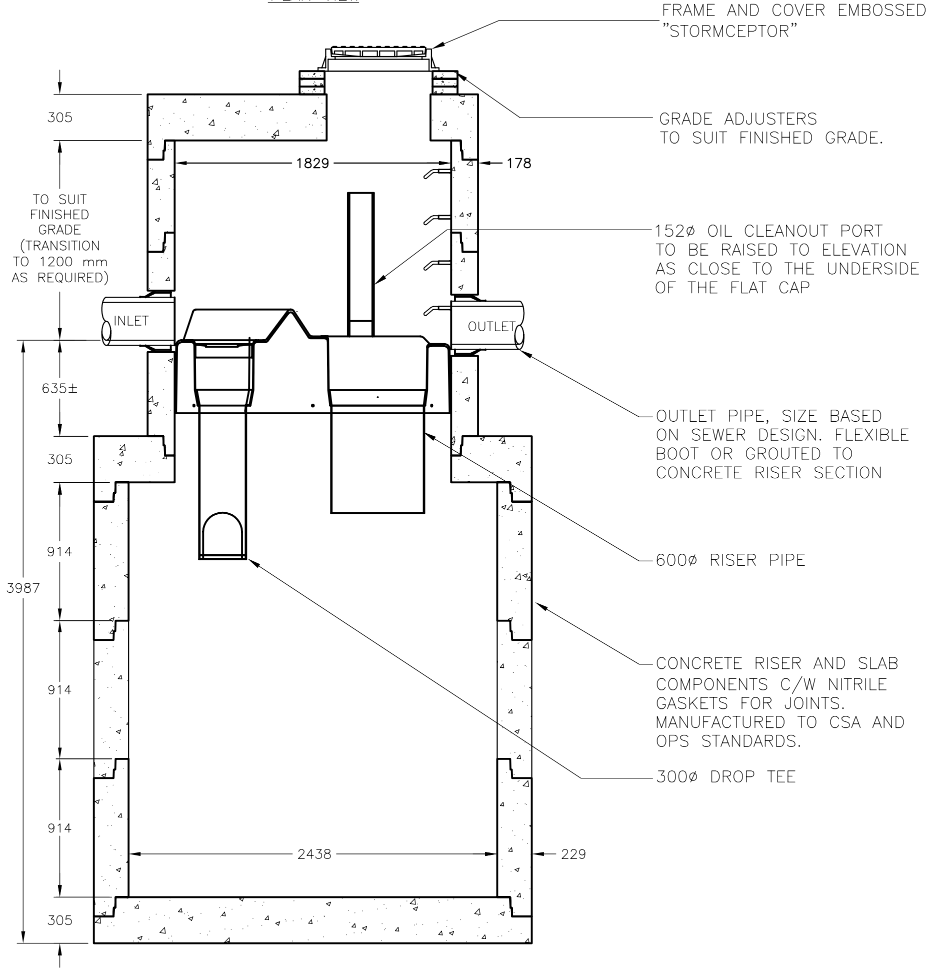
FILE: **stc2000.dwg**
DRAWN BY: **B.L.**
DATE: **8 Aug 07**
REV.:

1 OF 1

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW




SECTION VIEW

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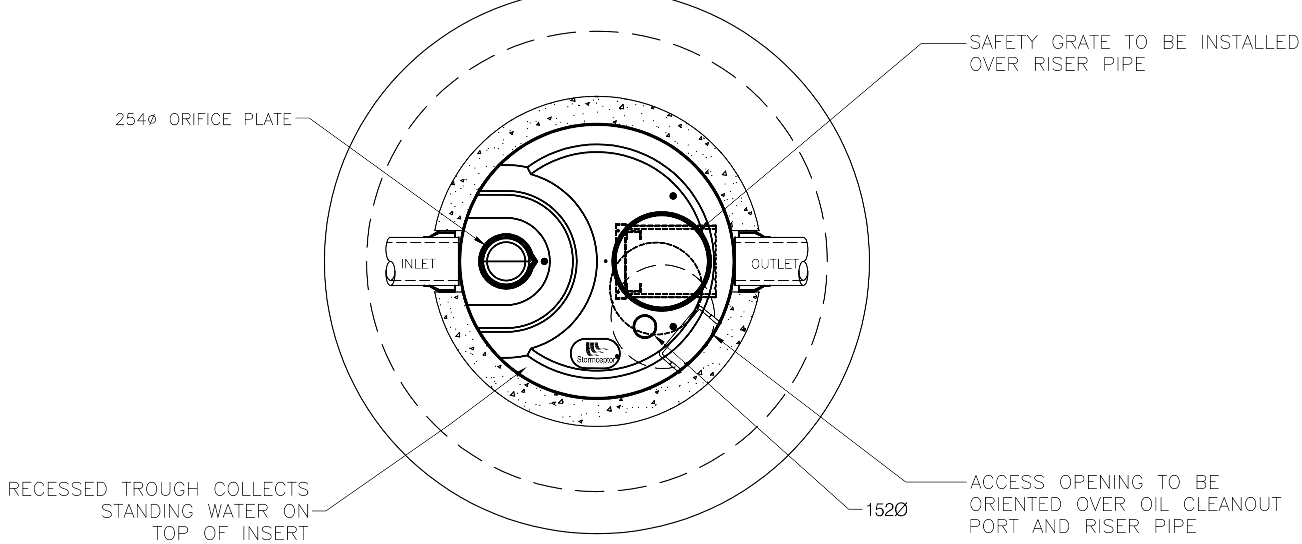
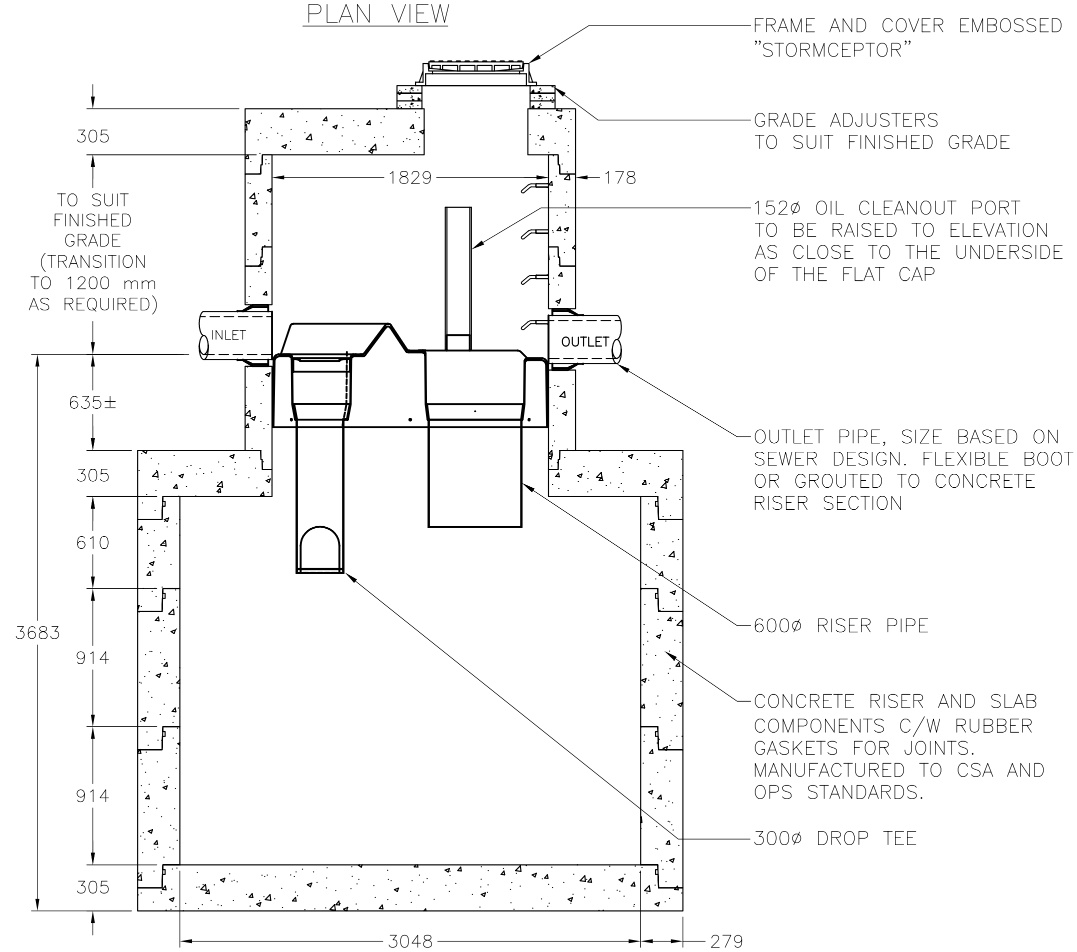
Canadian Patent No. 2,009,280 • 2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending) |
China Patent No. 1,168,439 | Denmark DK 711,879 | German DE 69,534,021 | Indonesian Patent No 16,688 | Japan Patent No. 9-11476 (Pending) |
Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

| **STORMCEPTOR SYSTEM INLINE MODEL** STC 3000 | SCALE 1:50 | Stormceptor STC |
|---|---|---|
| | | FILE: **stc3000.dwg** |
| | | DRAWN BY: **B.L.** |
| | | DATE: **29 AUG 07** |
| | REV \| Y \| M \| D \| DRN \| CHK \| DESCRIPTION | REV.: |
| | | 1 OF 1 |

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW




SECTION VIEW

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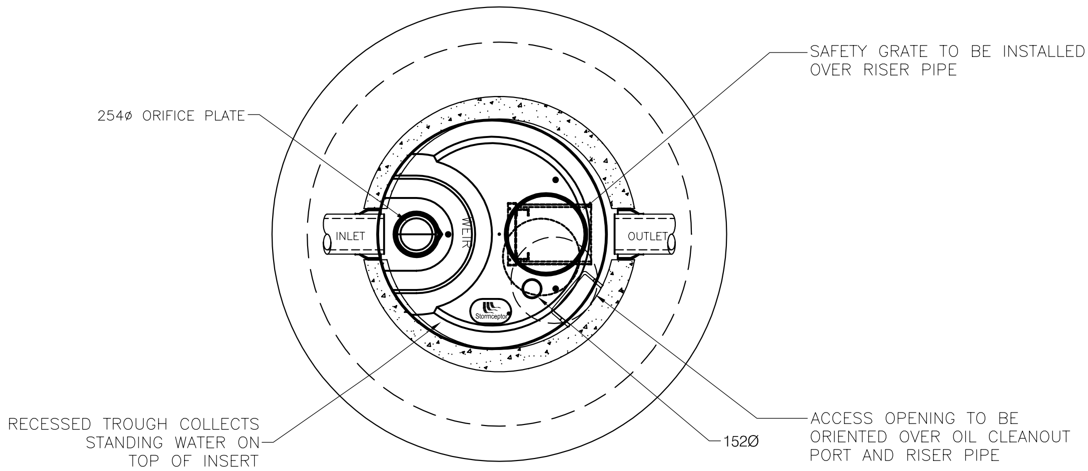
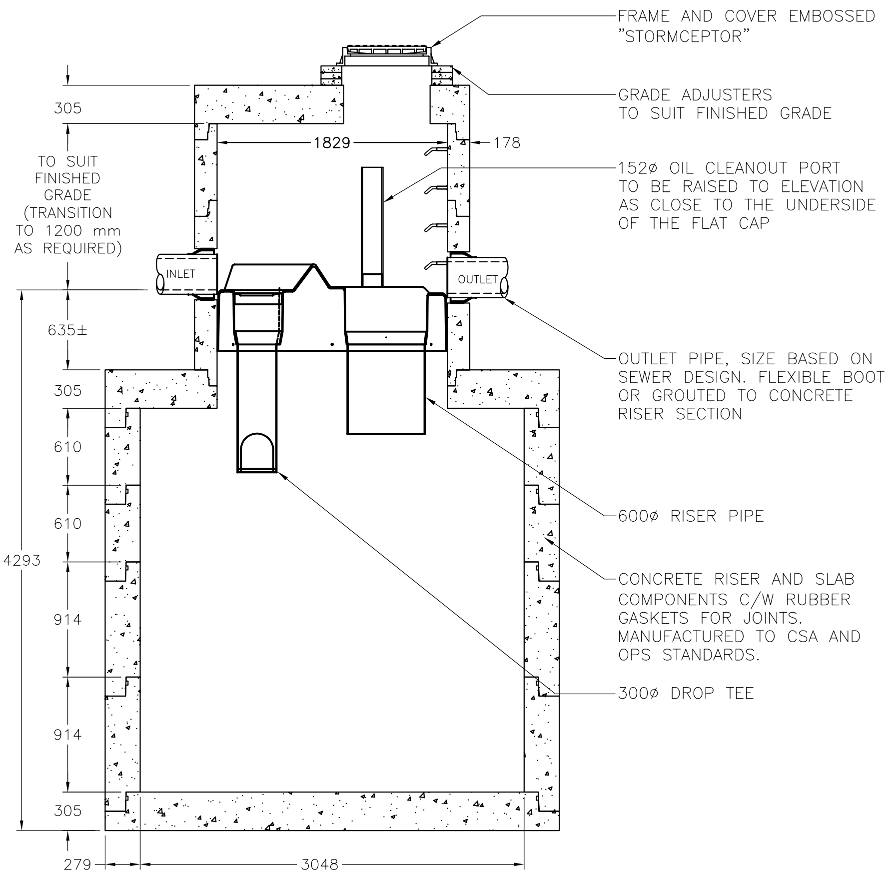
Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **STORMCEPTOR STC INLINE MODEL** STC 4000 | SCALE 1:50 | | | | | | | Stormceptor STC |
| | | | | | | | | FILE: **STC4000.DWG** |
| | | | | | | | | DRAWN BY: **B.L.** |
| | | | | | | | | DATE: **8 Aug 07** |
| | REV | Y | M | D | DRN | CHK | DESCRIPTION | REV.: |
| | | | | | | | | 1 OF 1 |

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW




SECTION VIEW

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Canadian Patent No. 2,009,280 • 2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending) |
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United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

**STORMCEPTOR STC**
**INLINE MODEL**
STC 5000

SCALE 1:60

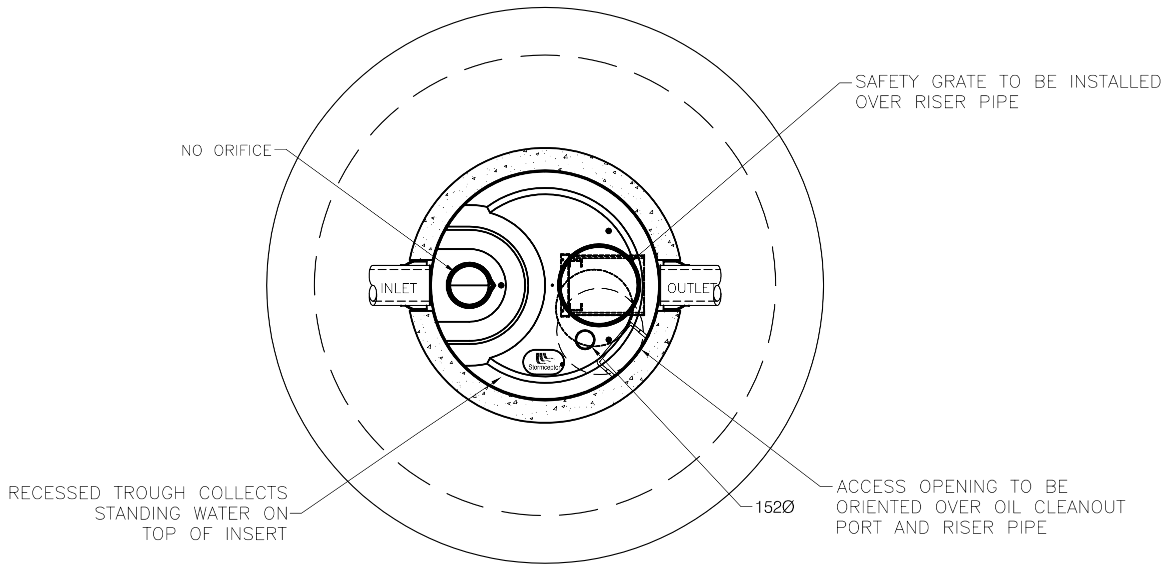
| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

Stormceptor STC

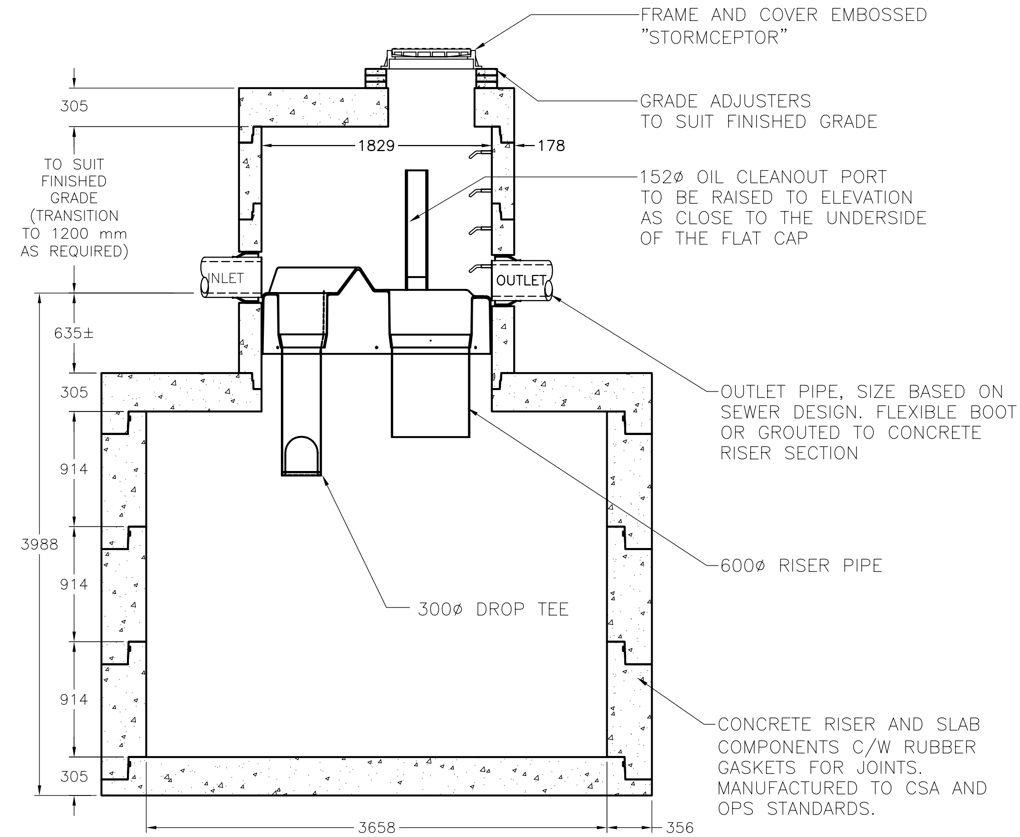
FILE: **stc5000.dwg**
DRAWN BY: **B.L.**
DATE: **8 Aug 07**
REV.:

1 OF 1

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW




SECTION VIEW

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Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

<table>
<tr><td rowspan="6">STORMCEPTOR STC<br>INLINE MODEL<br>STC 6000</td><td colspan="6">SCALE 1:60</td><td></td><td colspan="2">Stormceptor STC</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2"></td></tr>
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<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>DATE: 8 Aug 07</td><td rowspan="2">1 OF 1</td></tr>
<tr><td>REV</td><td>Y</td><td>M</td><td>D</td><td>DRN</td><td>CHK</td><td>DESCRIPTION</td><td>REV.:</td></tr>
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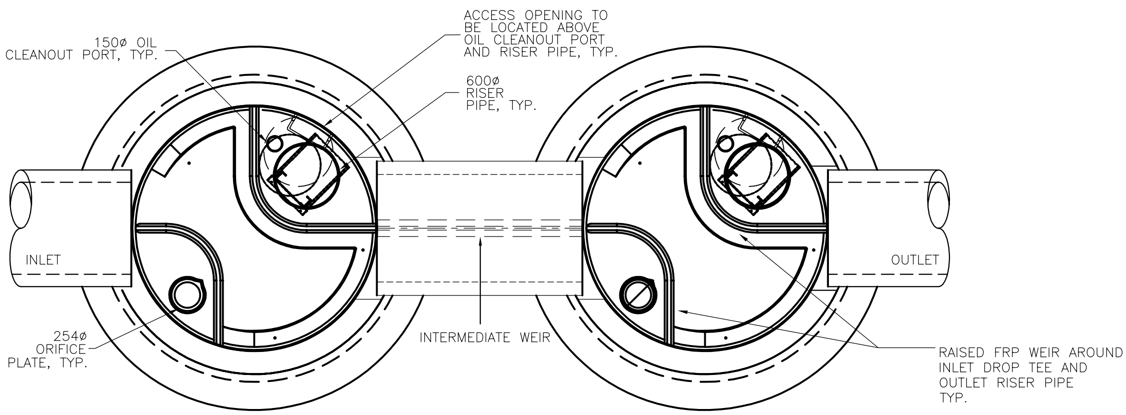
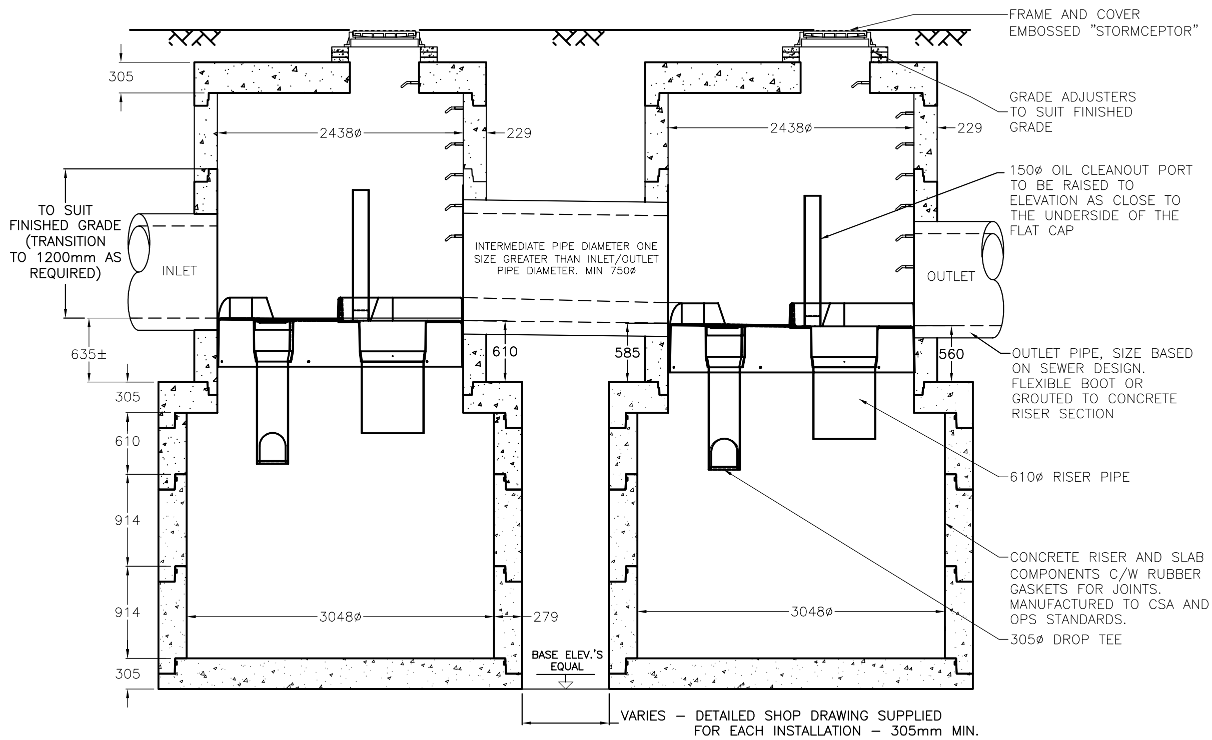



PLAN VIEW




SECTION VIEW

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China Patent No. ZL 97 1 13074.4 | European Patent Treaty No. 95 307 996.9 | Japan Patent No. 9-11476 (Pending) |
Korea Patent No. 10-2000-002601 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148; 5,498,331; 5,725,760; 5,753,115; 5,849,181; 6,068,765

**STORMCEPTOR STC SERIES MODEL**

STC 9000

SCALE 1:75

| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

Stormceptor® STC

FILE: **stc9000.dwg**

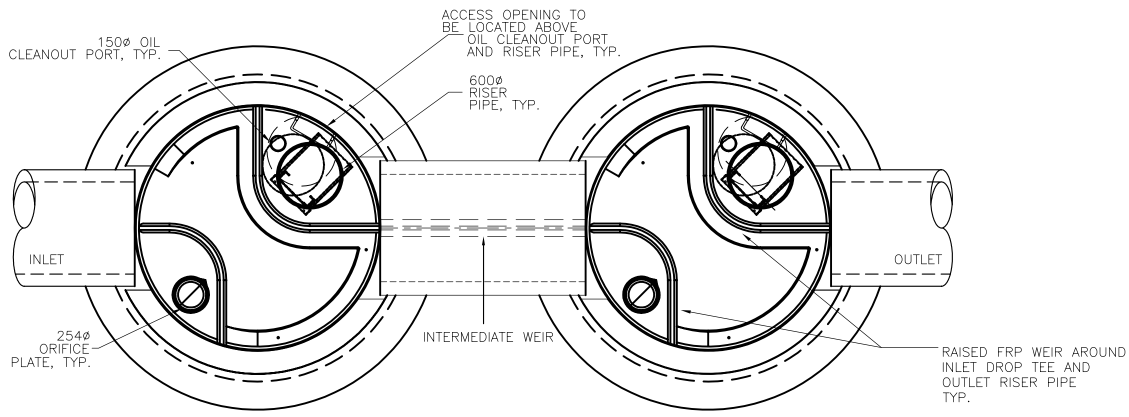
DRAWN BY: **B.L.**

DATE: **8 Aug 07**

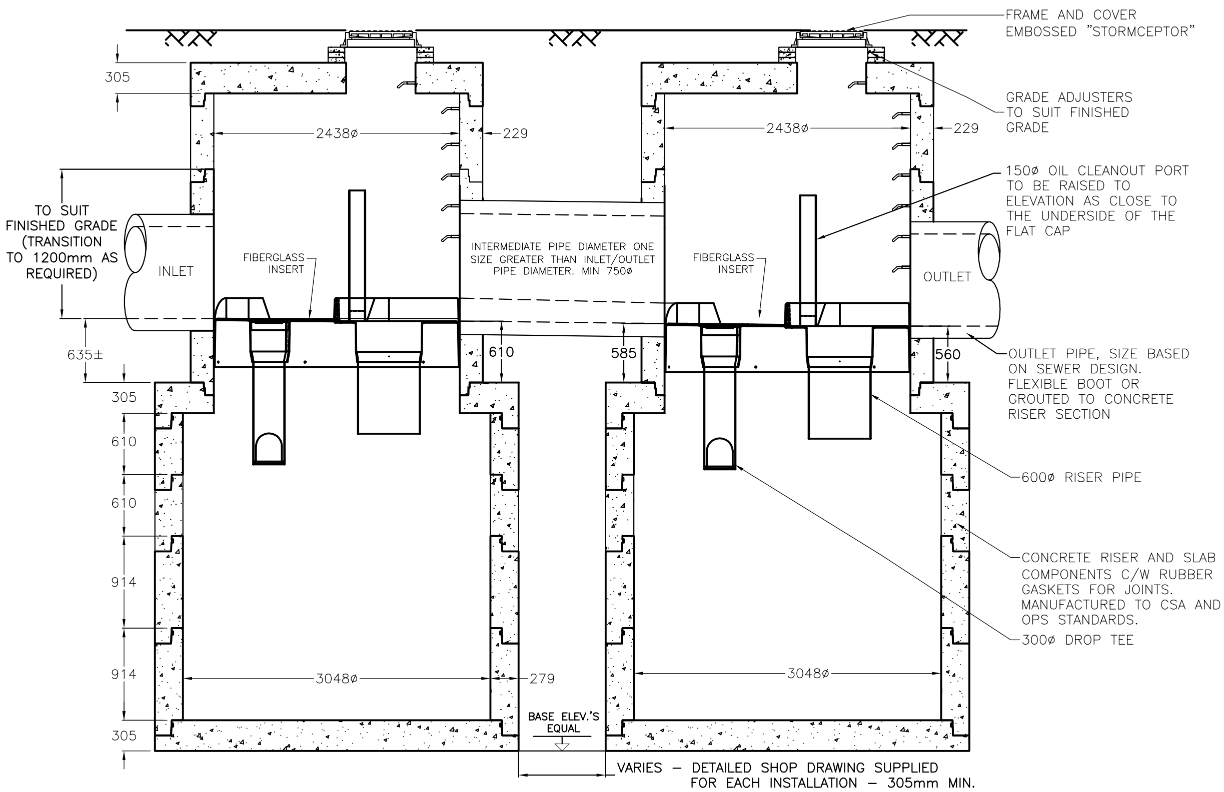
REV.:

1 OF 1

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW

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Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

**STORMCEPTOR SYSTEM SERIES MODEL**
STC 10000

SCALE 1:75

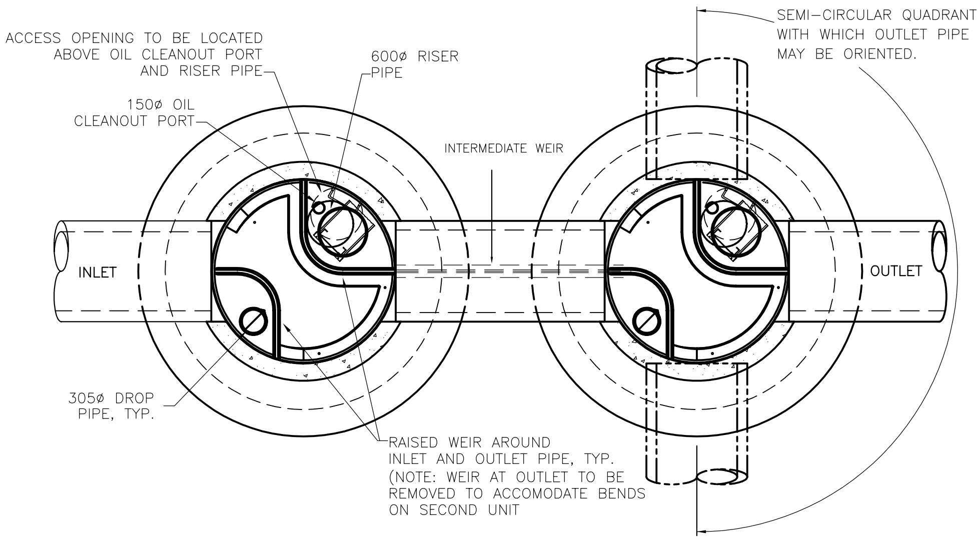
| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

Stormceptor STC

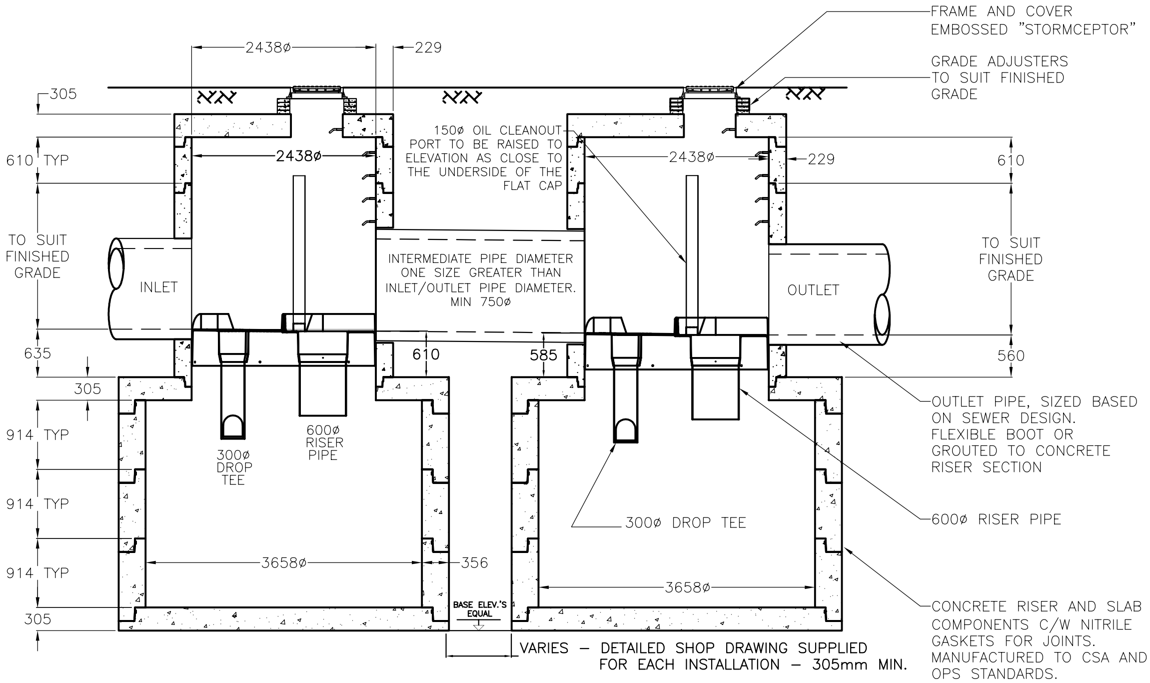
FILE: **stc10000.dwg**
DRAWN BY: **B.L.**
DATE: **8 Aug 07**
REV.:

1 OF 1

# DRAWING NOT TO BE USED FOR CONSTRUCTION




PLAN VIEW

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Korea Patent No. 10-2000-0026101 (Pending) | Malaysia Patent No. P19701737 (Pending) | New Zealand Patent No. 314646 |
United States Patent No. 4,985,148 • 5,498,331 • 5,725,760; 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690

**STORMCEPTOR STC SERIES MODEL**
STC 14000

SCALE 1:100

Stormceptor STC

FILE: **stc14000.dwg**
DRAWN BY: **B.L.**
DATE: **8 Aug 07**
REV.:

1 OF 1

| REV | Y | M | D | DRN | CHK | DESCRIPTION |
|---|---|---|---|---|---|---|

**Contact**
**800 565 4801**
**www.imbriumsystems.com**

imbrium™

Gmail

**Husham Almansour <hkhha.adad@gmail.com>**

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## Preliminary Assessment of Site Services for the new development on 3996 Innes Rd

**Baird, Natasha** <Natasha.Baird@ottawa.ca> Tue, Nov 16, 2021 at 1:07 PM
To: Husham Almansour <hkhha.adad@gmail.com>
Cc: AMMAR ALDU <ammar.aldu@gmail.com>, "Boughton, Michael" <Michael.Boughton@ottawa.ca>, "Curry, William" <William.Curry@ottawa.ca>, Pierre Tabet <ptabetarchitecte@outlook.com>, lou frangian <loufrangian@hotmail.com>

Good Afternoon Husham,

The post C value will be determined by the design.

The OSDG state that the tc should be 20 minutes.

The OSDG states that the minor system could 5 year (it depends on the type of street – please refer to the OSDG). The major overland is 100 year.

Thanks,

**I will be away November 19, 2021, and from December 25, 2021 to January 9, 2022.**

**I will be working remotely until further notice. Given technical constraints, my phone might not be reliable at this time. The best way to correspond will be via email. Please feel free to leave me a phone number if it is urgent.**

**Natasha Baird**, P.Eng. ing., LEED Green Associate

Senior Engineer | Ingénieure principale

Development Review, East Group | Examen des projets d'aménagement, groupe est

*Please consider your environmental responsibility before printing this e-mail

---

**From:** Husham Almansour <hkhha.adad@gmail.com>
**Sent:** November 16, 2021 7:46 PM
**To:** Baird, Natasha <Natasha.Baird@ottawa.ca>
**Cc:** AMMAR ALDU <ammar.aldu@gmail.com>; Boughton, Michael <Michael.Boughton@ottawa.ca>; Curry, William <William.Curry@ottawa.ca>; Pierre Tabet <ptabetarchitecte@outlook.com>; lou frangian <loufrangian@hotmail.com>
**Subject:** Re: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd

**CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.**

**ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.**

Hi Natasha,

Thank you for setting the design boundaries for the site on 3996 Innes Rd. However, the following two lines are not clear:

Storm Pre to post, C of .5, Pre tc 20; post tc 10

Onsite, 5-year pipe minimum and store up to 100-year on site. No 2-year ponding on site.

The questions we have are:

- Is "C =0.5" for both, Pre and Post, or "C" for post is calculated according to the City of Ottawa Guidelines
- tc for Pre is usually 15 mins, why it has to be 20 mins
- Is the release rate to the City of Ottawa stormwater system is 5-year or 100-year Predevelopment

Please advise.

Best Regards,

Husham

Husham Almansour, P.Eng, Ph.D.

On Tue, Nov 9, 2021 at 12:04 PM Baird, Natasha <Natasha.Baird@ottawa.ca> wrote:

> Good Morning Husham,
>
> This information was provided earlier. For existing infrastructure information, please send a request to the informationcentre@ottawa.ca. The sanitary design should be done as per the Sewer Design Guidelines and associated technical bulletins.
>
> Please let me know if you have any questions.

**Site Plan Requirements**

**Submission Requirements**

Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

Location of service connections (MAP)

Type of development and the amount of fire flow required (as per FUS).

Average daily demand: ___ l/s.

Maximum daily demand: ___l/s.

Maximum hourly daily demand: ___ l/s.

**Submission Documents:**

Site Plan

Topographical Plan of Survey Plan with a published Bench Mark

Removals Plan

Grading & Drainage Plan

General Plan of Services

Erosion & Sediment Control Plan

Design Brief and Stormwater Management Report

Geotechnical Report

Lighting Plan and or and Memo

Stationary Noise Study

TIA

Design Criteria - Civil Engineer to contact me directly

From the center of road (18.75m) provide a **new Property Line location**

Storm Pre to post, C of .5, Pre tc 20; post tc 10

Onsite, 5-year pipe minimum and store up to 100-year on site. No 2-year ponding on site.

Permissible ponding of 350mm for 100-year. No spilling to adjacent sites.

At 100-year ponding elevation you must spill to City ROW

100-year Spill elevation must be 300mm lower than any building opening

**Minimum Drawing and File Requirements- All Plans**

Plans are to be submitted on standard **A1 size** (594mm x 841mm) sheets, utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400, or 1:500).

With all submitted hard copies provide individual PDF of the DWGs and for reports please provide one PDF file of the reports. **All PDF documents are to be unlocked and flattened.**

**I will be away November 11, 12 and 19, 2021, and from December 25, 2021 to January 9, 2022.**

**I will be working remotely until further notice. Given technical constraints, my phone might not be reliable at this time. The best way to correspond will be via email. Please feel free to leave me a phone number if it is urgent.**

**Natasha Baird**, P.Eng. ing., LEED Green Associate

Senior Engineer | Ingénieure principale

Development Review, East Group | Examen des projets d'aménagement, groupe est

*Please consider your environmental responsibility before printing this e-mail

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**From:** Husham Almansour <hkhha.adad@gmail.com>
**Sent:** November 09, 2021 8:32 AM
**To:** Baird, Natasha <Natasha.Baird@ottawa.ca>
**Cc:** AMMAR ALDU <ammar.aldu@gmail.com>; Boughton, Michael <Michael.Boughton@ottawa.ca>; Curry, William <William.Curry@ottawa.ca>; Pierre Tabet <ptabetarchitecte@outlook.com>; lou frangian <loufrangian@hotmail.com>
**Subject:** Re: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd

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**ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.**

Good meeting morning, Natasha,

I hope you are doing well.

I wonder if you have any updates about the stormwater and the wastewater front m your team? We are preparing the submission for site plane control within two weeks and your input is highly appreciated.

Best regards

Husham

On Wed, Nov 3, 2021 at 2:43 PM Baird, Natasha <Natasha.Baird@ottawa.ca> wrote:

I will have to follow up with my team and inform you.

**I will be away November 11, 12 and 19, 2021, and from December 25, 2021 to January 9, 2022.**

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Senior Engineer | Ingénieure principale

Development Review, East Group | Examen des projets d'aménagement, groupe est

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**From:** Husham Almansour <hkhha.adad@gmail.com>
**Sent:** November 03, 2021 2:42 PM
**To:** Baird, Natasha <Natasha.Baird@ottawa.ca>
**Cc:** AMMAR ALDU <ammar.aldu@gmail.com>; Boughton, Michael <Michael.Boughton@ottawa.ca>; Curry, William <William.Curry@ottawa.ca>; Pierre Tabet <ptabetarchitecte@outlook.com>; lou frangian <loufrangian@hotmail.com>
**Subject:** Re: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd



Hi Natasha,

Thank you very much for the update.

I wonder if you have any updates about the stormwater and the wastewater? We are preparing the submission for site plane control and your input is highly appreciated.

Best Regards,

Husham

On Wed, Nov 3, 2021 at 1:55 PM Baird, Natasha <Natasha.Baird@ottawa.ca> wrote:

Good Afternoon Husham,

Please find boundary conditions attached.

Please take note of the City's expectation from the owner/builder, as per City's internal discussion:

Assuming there are 2 small services now....and assuming a need for a larger service.....

1. Blank both services at the main.
2. Tap a completely new service.
3. Additional fees will be required in the Water Permit for Inspections of all works related to the 610 mm Ø Watermain.
4. Add adequate notes to the Plans to support #3 above.

Thank you,

**I will be away November 11, 12 and 19, 2021, and from December 25, 2021 to January 9, 2022.**

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**Natasha Baird**, P.Eng. ing., LEED Green Associate

Senior Engineer | Ingénieure principale

Development Review, East Group | Examen des projets d'aménagement, groupe est



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**From:** Husham Almansour <hkhha.adad@gmail.com>
**Sent:** November 03, 2021 12:32 PM
**To:** Baird, Natasha <Natasha.Baird@ottawa.ca>
**Cc:** AMMAR ALDU <ammar.aldu@gmail.com>; Boughton, Michael <Michael.Boughton@ottawa.ca>; Curry, William <William.Curry@ottawa.ca>; Pierre Tabet <ptabetarchitecte@outlook.com>; lou frangian <loufrangian@hotmail.com>
**Subject:** Re: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd

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Hi Natasha,

Thank you for the update.

Have a nice day.

Husham

On Wed, Nov 3, 2021 at 10:03 AM Baird, Natasha <Natasha.Baird@ottawa.ca> wrote:

> Good Morning Husham,
>
> I am waiting for the boundary conditions. There has been an internal discussion about the connection.
>
> Thanks,
>
> **I will be away November 11, 12 and 19, 2021, and from December 25, 2021 to January 9, 2022.**
>
> **I will be working remotely until further notice. Given technical constraints, my phone might not be reliable at this time. The best way to correspond will be via email. Please feel free to leave me a phone number if it is urgent.**
>
> **Natasha Baird**, P.Eng. ing., LEED Green Associate
>
> Senior Engineer | Ingénieure principale
>
> Development Review, East Group | Examen des projets d'aménagement, groupe est
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> 
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>
> **From:** Husham Almansour <hkhha.adad@gmail.com>
> **Sent:** November 03, 2021 8:16 AM

**To:** Baird, Natasha <Natasha.Baird@ottawa.ca>
**Cc:** AMMAR ALDU <ammar.aldu@gmail.com>; Boughton, Michael <Michael.Boughton@ottawa.ca>; lou frangian <loufrangian@hotmail.com>; Pierre Tabet <ptabetarchitecte@outlook.com>; Curry, William <William.Curry@ottawa.ca>
**Subject:** Re: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd

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Good morning Natasha,

I hope you are doing well.

I wonder if you have any updates as we need to proceed with the site plan control application and we need your approval for the level of services (water, wastewater, and stormwater) that the new development requires.

Best Regards,

Husham

Husham Almansour, P.Eng., Ph.D.,

6136012139

On Wed, Oct 20, 2021 at 1:29 PM Husham Almansour <hkhha.adad@gmail.com> wrote:

> Hi Natasha,
>
> Thank you for the follow-up. The current building is a house consist of two separate dwelling units side a side with a standard service where it needs to be upsized to the proposed levels.
>
> Please let me know if you need more information.
>
> Husham Almansour, P.Eng., Ph.D.
>
> 613 601 2139
>
> On Tue, Oct 19, 2021 at 8:07 PM Baird, Natasha <Natasha.Baird@ottawa.ca> wrote:
>
>> Hello Ammar,
>>
>> Could you please confirm with your engineer if there is already a service on the site and you don't need to upsize? We are still in discussion about the connection to the City's infrastructure since the only watermain on Innes is a 610mm diameter pipe.

Thank you,

**I will be away November 11, 12 and 19, 2021.**

**I will be working remotely until further notice. Given technical constraints, my phone might not be reliable at this time. The best way to correspond will be via email. Please feel free to leave me a phone number if it is urgent.**

**Natasha Baird**, P.Eng. ing., LEED Green Associate

Senior Engineer | Ingénieure principale

Development Review, East Group | Examen des projets d'aménagement, groupe est



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**From:** AMMAR ALDU <ammar.aldu@gmail.com>
**Sent:** October 15, 2021 3:57 PM
**To:** Boughton, Michael <Michael.Boughton@ottawa.ca>
**Cc:** Husham Almansour <hkhha.adad@gmail.com>; lou frangian <loufrangian@hotmail.com>; Baird, Natasha <Natasha.Baird@ottawa.ca>; Pierre Tabet <ptabetarchitecte@outlook.com>
**Subject:** Re: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd



Good afternoon Michael,

The following is the response I received from our civil engineer for your information and action.

Following please find the answers to the City of Ottawa request:

1. Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:
    a. Location of service(s):

>> Please refer to Appendix B of the attached version (F2) of the Preliminary Assessment report: the location of the following services are highlighted by coloured ellipses:

— water line and the proposed connection (please see the blue ellipse);

— Wastewater (sewage) line and manhole (MH-S), (please see the red ellipse);

— Stormwater line and manhole (MH-ST), (please see the brown ellipse).

b. Type of development and the amount of fire flow required (as per FUS, 1999).

c. Average daily demand: 0.1417 l/s.

d. Maximum daily demand: 0.3543 l/s.

e. Maximum hourly daily demand: 0.01476 l/s.

2. Fire protection (Fire demand, Hydrant Locations)

The fire demand is based on the City of Ottawa Tech Bulletin ISTB-2018-02 (which is based on FUS, 1999) = 4000 l/min or 66.7 l/Sec

The Hydrant locations are shown in the attached drawing.

Please attach the new version of the report (where the locations of the services are highlighted).

Best Regards,

Husham

Mes salutations distinguées,
Best Regards,

*Ammar A. Aldu. Architect, OAA*

*PhD. Architecture/Urban*

For / Pour:
PIERRE TABET ARCHITECTE
2232 Saint-Louis, Gatineau, QC J8T 5L6
Tel. : 819.568.3994
Fax.: 819.246.4312

On Thu, Oct 14, 2021 at 4:41 PM Boughton, Michael <Michael.Boughton@ottawa.ca> wrote:

Good afternoon Ammar,

I requested my engineering colleague to provide feedback on the preliminary servicing report (attached). The following is the response I received for your information and action.

Please provide the following information listed below for your request for boundary conditions:

1. Water boundary condition requests must include the location of the service(s) and the expected loads required by the proposed developments. Please provide all the following information:
   a. Location of service(s)
   b. Type of development and the amount of fire flow required (as per FUS, 1999).
   c. Average daily demand: ___ l/s.
   d. Maximum daily demand: ___l/s.
   e. Maximum hourly daily demand: ___ l/s.
2. Fire protection (Fire demand, Hydrant Locations)

I hope this is helpful.

Sincerely,

*Michael J. Boughton, MCIP, RPP*

Senior Planner | *Urbaniste principal*

Development Review | *Examen des projects d'aménagement*

Planning, Infrastructure and Economic Development | *Service de la planification, de l'infrastructure et du développement économique*

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West, Ottawa, ON | 110, avenue Laurier Ouest (Ontario) K1P 1J1

613-580-2424, ext/poste 27588; Fax/téléc: 613-560-6006

Michael.Boughton@ottawa.ca

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**From:** AMMAR ALDU <ammar.aldu@gmail.com>
**Sent:** October 05, 2021 11:33 AM
**To:** Boughton, Michael <Michael.Boughton@ottawa.ca>
**Cc:** Husham Almansour <hkhha.adad@gmail.com>; lou frangian <loufrangian@hotmail.com>
**Subject:** Fwd: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd

Good morning Michael,

Could we please have engineering staff feedback in regard to the preliminary servicing report and plan?

Please note that we will meet the Submission deadline for the UDRP meeting on Friday, November 5, 2021. When we receive their comment, we will start coordinating for the site plan control.

Owner and P.Eng. Husham are cc'd in this email.

Mes salutations distinguées,

Best Regards,

*Ammar A. Aldu. Architect, OAA*

*PhD. Architecture/Urban*

For / Pour:
PIERRE TABET ARCHITECTE
2232 Saint-Louis, Gatineau, QC J8T 5L6
Tel. : 819.568.3994
Fax.: 819.246.4312

---------- Forwarded message ---------
From: **Husham Almansour** <hkhha.adad@gmail.com>
Date: Tue, Oct 5, 2021 at 10:29 AM
Subject: Preliminary Assessment of Site Services for the new development on 3996 Innes Rd
To: AMMAR ALDUJAILI <ammar.aldu@gmail.com>

Hi Ammar,

Attached please find the preliminary assessment for the site services proposed mixed-use development commercial & residential on 3996 Innes Road. The assessment indicated that the approximately required services are as follows:

1. Water Supply Quantity: 12,240 L/ day
2. Fire Flow Requirement: 4000 L/min
3. Sewer Output: 12,240 L/ day
4. Stormwater output: 55.439 L/Sec

If the City of Ottawa agrees with the above number, we will finalize the site plan control plan and report for the first submission.

Best Regards,

Husham

Husham Almansour, P.Eng. Ph.D.

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