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SITE SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

RIOCAN HOLDINGS INC.
2525 CARLING AVENUE – PHASE 1

CITY OF OTTAWA

PROJECT NO.: 17-997
CITY APPLICATION NO.: D07-12-18-0195

NOVEMBER 2019 – REV. 5

SITE SERVICING AND STORMWATER MANAGEMENT REPORT FOR 2525 CARLING AVENUE – PHASE 1

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by RioCan Holdings Inc. to prepare a Site Servicing and Stormwater Management report in support of the application for Site Plan Control (SPC) for the redevelopment of the Lincoln Fields Shopping Centre, located at 2525 Carling Avenue.

The subject property is located within the City of Ottawa urban boundary, in the Bay Ward. As illustrated in ***Figure 1,*** below, the subject property is bounded by Carling Avenue to the south; Richmond Road to the north; Croydon Avenue to the west and the Sir John A. Macdonald Parkway to the west. The subject property measures approximately ***6.55 ha***. The proposed SPC application is for Phase 1 of the development which encompasses ***4.69 Ha*** of the south portion of the property.

Figure 1: Site Location

The proposed SPC application is for relocation of existing tenants only as future plans for the remaining lands have not been finalized at this time. The first phase of the proposed development would allow for the construction of a new 1-storey retail store central to the site and a new 2-storey retail building fronting Carling Avenue.

It is proposed to remove and/or abandon existing watermains on site as shown on drawing ***EX-1*** accompanying this report. The existing water services for Wendy's and Pizza Pizza are currently connected to watermains that are proposed to be removed, therefore, relocation of existing water services is proposed as a part of this application.

Stormwater management quantity control requirements for the proposed development are extracted from section 3.3.6 of the *May 2019 Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area Final Report,* prepared by JFSA, referred to in this report as ***Pinecrest Creek SWM***. For future development of the site, the SWM design shall evaluate the entirety of the Lincoln Fields site (6.55 ha) to demonstrate compliance with the appropriate SWM design criteria.

The objective of this report is to provide sufficient detail to demonstrate that Phase 1 of the proposed development, consisting of the two proposed retail buildings, is supported by existing services.

1.1 Existing Conditions

The existing site includes a commercial mall, external restaurant buildings and associated surface parking. The elevations range between 75.25 m at the south-west corner of the site to 71.00 m internal to the site.

Sewer and watermain mapping, along with as-built information collected from the City of Ottawa indicate the following existing infrastructure is located within the adjacent right-of-ways:

Carling Avenue:

- 1067 mm diameter concrete water pressure pipe CL C301;
- 152 mm diameter watermain;
- 600 mm diameter watermain;
- 900 mm storm sewer; and
- 300 mm sanitary sewer.

Croydon Avenue:

- 150 mm diameter watermain;
- 225 mm diameter sanitary sewer; and

- 300 mm diameter storm sewer.

Richmond Road:

- 300 mm diameter watermain;
- 300 mm diameter sanitary sewer; and
- 600 mm diameter storm sewer.

Sir John A Macdonald Parkway:

- 450 mm diameter sanitary sewer, within an easement of 1330 Richmond Road;
- 600 mm diameter storm sewer, within an easement of 1330 Richmond Road; and
- 1524 mm diameter concrete pressure pipe.

1.2 Required Permits / Approvals

The proposed development is subject to the site plan control approval process. The City of Ottawa must approve the engineering design drawings and reports prior to the issuance of site plan control.

Section 53 of the Ontario Water Resources Act Ontario Regulation 525/98, 3. (a) Subsection 53 (1) and (3) indicate that an Environmental Compliance Approval (ECA) is not required for a property which meets the following requirements:

a) Is designed to service one lot or parcel of land;

The subject property meets the above stated preapproval requirements; therefore, it is anticipated the an ECA through the Ministry of Environment, Conservation and Parks (MECP) will not be required. Consultation between the City of Ottawa and the local MECP representative may be required to confirm this assumption.

1.3 Pre-consultation

Pre-consultation correspondence, along with the servicing guidelines checklist, is located in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012.
  (City Standards)

  - **Technical Bulletin ISDTB-2014-01**
    City of Ottawa, February 5, 2014.
    (ITSB-2014-01)

  - **Technical Bulletin PIEDTB-2016-01**
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)

  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    (ISTB-2018-01)

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (ISDTB-2014-02)

  - **Technical Bulletin ISDTB-2018-02**
    City of Ottawa, March 21, 2018.
    (ISDTB-2018-02)

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MOE* Design Guidelines*)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch,
  January 1, 2010 Update.
  (OBC)

- **City of Ottawa Infrastructure Master Plan**
  City of Ottawa
  November 2013
  (City of Ottawa IMP)

- **Stormwater Management Guidelines for the Pinecrest Creek/Westboro Area Final Report**
  JF Sabourin & Associates Inc.
  May 2019
  (Pinecrest Creek SWM)

- **Geotechnical Investigation Report**
  Golder Assocuates Ltd.& Associates Inc.
  November 2018
  (Geotech Reports)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 1W pressure zone, as shown by the Pressure Zone map, located in ***Appendix B***. The site is currently serviced by the existing 152 mm diameter watermain within the Carling Avenue right-of-way, as well as, the 305 mm diameter watermain within the Richmond Road right-of-way.

The existing development is currently serviced by a looped 254 mm diameter watermain, with one connection to the 305 mm diameter watermain within the Richmond Road right-of-way and one connection to the 152 mm diameter watermain within the Carling Avenue right-of-way. The existing shopping complex on site is serviced through a 102 mm diameter connection to the 152 mm diameter watermain within the Carling Avenue right-of-way. Refer to ***Table 1,*** below, for estimated existing water demand.

Table 1
Summary of Existing Water Demand

Design Parameter	Existing Demand[1] (L/min)
Average Daily Demand	44.8
Max Day	67.1
Peak Hour	120.8

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.

Refer to drawing ***EX-1,*** accompanying this report, for the existing site servicing layout.

3.2 Water Supply Servicing Design

It is proposed that Buildings A & B will be serviced by a proposed 200 mm diameter looped internal watermain network with connections to the existing 150 mm diameter watermain within Carling Avenue. The existing water service for Pizza Pizza located at the north corner of the site is proposed to connect to the proposed internal watermain network. Refer to drawing ***SSP-1***, accompanying this report, for the proposed watermain layout.

The existing Wendy's located south-west of the site will be serviced by a connection to the existing water service currently servicing the existing shopping mall. Refer to drawing ***SSP-1***, accompanying this report, for the proposed watermain layout.

Table 2, below, summarizes the ***Water Supply Guidelines*** employed in the preparation of the preliminary water demand estimate.

Table 2
Water Supply Design Criteria

Design Parameter	Value
Restaurant	125 L/seat/d
Commercial Retail	2.5 $L/m^2/d$
Commercial Maximum Daily Demand	1.5 x avg. day
Commercial Maximum Hour Demand	1.8 x max. day
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure must not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa
Daily Average based on Appendix 4-A from **Water Supply Guidelines* *** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.* *-Table updated to reflect ISD-2010-2 and ISTB-2018-02.*	

Table 3, below, summarizes the anticipated water demand for the proposed development and existing Pizza Pizza, which was calculated using the ***Water Supply Guidelines.*** Refer to ***Appendix B*** for associated calculations.

Table 3
Summary of Estimated Water Demand for
Bldg A, Bldg B and Existing Pizza Pizza

Design Parameter	Proposed Demand[1] (L/min)	Boundary Conditions			
		Connection 1 – Carling Avenue ($m\ H_2O$ / kPa)		Connection 2 – Carling Avenue ($m\ H_2O$ / kPa)	
Average Daily Demand	11.2	42.1	412.9	40.9	401.6
Max Day + Fire Flow (100 L/s)	16.9 + 6,000	17.5	171.6	28.8	282.9
Max Day + Fire Flow (83 L/s)	16.9 + 5,000	22.5	220.6	29.8	292.7
Peak Hour	30.4	35.0	343.3	33.8	332.0

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
Boundary conditions supplied by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 73.51m for Connection 1, and 74.66m for Connection 2. See ***Appendix B.***

Table 4, below, summarizes the anticipated water demand for the existing Wendy's, which was calculated using the ***Water Supply Guidelines.*** Refer to ***Appendix B*** for associated calculations.

Table 4
Summary of Estimated Water Demand for Existing Wendy's

Design Parameter	Proposed Demand[1] (L/min)	Boundary Conditions	
		Connection 3 – Carling Avenue ($m\ H_2O$ / kPa)	
Average Daily Demand	3.2	40.7	398.9
Max Day	4.8	-	-
Peak Hour	8.6	33.6	329.2

1) Water demand calculation per ***Water Supply Guidelines***. Boundary conditions supplied by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 74.94m for Connection 3. See ***Appendix B.*** See ***Appendix B*** for detailed calculations.

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand as shown in ***Table 3*** and ***Table 4***. Correspondence with the City has been included in ***Appendix B***.

The estimated fire flow for the proposed buildings was calculated in accordance with **ISTB-2018-02**; the resulting flows for each building were sent to the City of Ottawa for boundary conditions. The following parameters, below, were provided by the Architect, see ***Appendix A*** for collaborating correspondence:

- Type of construction – Non-Combustible Construction;
- Occupancy type – Limited Combustibility; and
- Sprinkler Protection – Supervised Sprinkler System.

The estimated fire flow for the existing Wendy's was also calculated in accordance with **ISTB-2018-02**; and was sent to the City of Ottawa for boundary conditions. Assuming the most conservative parameters, the fire flow demand was estimated to be ***5,000 L/min***, see ***Appendix B*** for details***.***

It is proposed that the development will be serviced by two proposed hydrants. The first hydrant is located west of building B and the second is located southwest of building A. Refer to drawing ***SSP-1***, accompanying this report, for the location of proposed hydrants.

Table 5, below, summarizes the fire flow for each building, per the above assumptions and the available fire flow based on hydrants within 150 m per ***Table 18.5.4.3*** of the ***ISTB-2018-02***.

Table 5
Anticipated Fire Flow Demand

Building Type	Anticipated Fire Demand (L/min)	Available Fire Flow per Table 18.5.4.3 of ISTB-2018-02 (L/min)
Building A	6,000	11,356
Building B	3,000	17,034
Existing Wendy's	5,000	30,282

3.3 Watermain Modelling

EPANet was utilized to determine the availability of pressures throughout the system during average day, max day plus fire flow, and peak hour demands. This static model determines pressures based on the available head obtained from the boundary conditions provided by the City of Ottawa.

The model utilizes the Hazen-Williams equation to determine pressure drop, while the pipe properties have been selected in accordance with ***Water Supply Guidelines***. The model was prepared to assess the available pressure at each building, as well as, the pressures the watermain provides to fire hydrants during fire flow conditions.

The maximum fire flow indicated in ***Table 3*** was used to model fire demand at each of the hydrants servicing the site. Please refer to ***Appendix B*** for a model sketch showing the node locations, fire demands assigned to each hydrant and the resulting pressures. ***Table 6*** indicates the hydrant resulting in the lowest pressure in the fire flow scenario.

Table 6
Fire Demand and Minimum Pressure at Hydrants

Node ID[1]	Fire Demand at Each Node (L/min)	Total Fire Demand (L/min)	Minimum Pressure at Node (kPa)
5 (HYD-2)	6,000	6,000	188.84
1) See EPANET model in ***Appendix B*** for Node ID			

As shown above, all hydrants on-site can provide the required fire flow while maintaining minimum pressures described in ***Table 2***.

The fire flow yielding the lowest pressure, which occurred with ***6,000 L/min*** applied to Hydrant 2, was utilized in the analysis below. ***Appendix B*** contains output reports and model schematics for each scenario.

Table 7
Model Simulation Output Summary

Location	Average Day (kPa)	Max Day + Fire Flow (100 L/s) (kPa)	Max Day + Fire Flow (83 L/s) (kPa)	Peak Hour (kPa)
3	425.75	251.23	253.20	356.10
4	426.74	237.99	253.49	357.08
5	430.66	188.84	254.47	361.01
6	450.28	208.66	268.11	380.63
HYD-1	425.26	250.74	252.71	355.61
BLDG-B	425.26	236.52	252.02	355.61
HYD-2	430.17	188.35	253.98	360.52
BLDG-A	447.83	206.21	265.65	378.18
10	424.77	266.15	270.36	355.12
11	429.68	188.25	240.05	360.03
12	423.79	354.14	354.14	354.14
13	417.91	348.16	348.16	348.06
14	448.22	206.50	265.95	378.27

As demonstrated in ***Table 7***, the anticipated pressures during the average day, peak hour and max day + fire flow scenarios simulations are within the allowable pressure range described in ***Table 2*** from the ***Water Supply Guidelines***.

3.4 Water Supply Conclusion

It is proposed to service the development through a looped internal watermain network with two connections to the existing 150 mm diameter watermain within Carling Avenue.

Estimated water demand under proposed conditions was submitted to the City of Ottawa for establishing boundary conditions. As demonstrated by ***Tables 3 & 4***, which is based on the City's model, the minimum and maximum pressures fall within the required range identified in ***Table 2***.

It is proposed that the development will be serviced by two proposed hydrants. The EPANET water distribution model confirmed adequate pressure exists within fire hydrants during fire flow, and within the system for the Average Day, Max Day + Fire Flow and Peak Hour scenarios. The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject site lies within the Pinecrest Collector Sewer catchment area, as shown by the City sewer mapping included in ***Appendix C***. The existing site consists of a commercial mall, currently contributing wastewater to the existing 450 mm diameter sanitary sewer crossing the Sir John A. Macdonald Parkway.

Table 8, below, summarizes the existing wastewater flow being discharged from the site.

Table 8
Summary of Existing Wastewater Flows

Design Parameter	Existing Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	3.00
Peak Dry Weather Flow Rate	4.34
Peak Wet Weather Flow Rate	6.17
*1) Based on criteria shown in **Table 9***	

4.2 Wastewater Design

The proposed development will be serviced through a single sanitary connection directed to the existing sanitary service conveying flow to the 450 mm diameter sanitary sewer within the Sir John A. Macdonald Parkway right-of-way. Refer to drawing ***SSP-1***, accompanying this report, for the proposed sanitary sewer layout.

Table 9, below***,*** summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 9
Wastewater Design Criteria

Design Parameter	Value
Office Floor Space	75 L/9.3m^2/d
Restaurant Space	125 L/seat/d
Commercial Floor Space	5 L/m^2/d
Commercial Peaking Factor	1.5 x Average ICI Flow
Residential Daily Demand	280 L/person/day
Peaking Factor	Harmon's Peaking Factor. Max 3.8
Infiltration and Inflow Allowance	0.33 L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sanitary Sewer Lateral	135 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012 and City of Ottawa ISTB-2018-01.	

Table 10, below, demonstrates the estimated peak flow discharging to the existing 450 mm diameter sanitary sewer within the Sir John A. Macdonald Parkway right-of-way. See ***Appendix C*** for associated calculations.

Table 10
Summary of Estimated Peak Wastewater Flow – Proposed Conditions

Design Parameter	Anticipated Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	0.60
Peak Dry Weather Flow Rate	0.60
Peak Wet Weather Flow Rate	2.44
1) *Based on criteria shown in* ***Table 9*** and technical bulletin *2018-01*	

The peak wastewater flow was calculated to be ***2.44 L/s***. Since hours of commercial operation for buildings A and B are unknown, the more conservative approach is to select the shortest hours of operation as that results in the highest wastewater flow. Therefore, 12 hours of commercial operation was assumed for buildings A and B.

The peak flow from the proposed development to the existing sanitary sewer within Sir John A. Macdonald Parkway is results in a ***3.73 L/s*** decrease from the existing conditions. Due to the decrease to the existing sanitary flow, it is anticipated that the sanitary sewer within Sir John A. Macdonald Parkway has sufficient capacity to convey peak flows from the proposed development.

As per section 4.4.4.4 of the ***City Standards,*** a minimum cover of 2.0 m from the finished grade is required for all proposed sanitary sewers. Proposed sanitary sewers with a cover less than 2.0 m shall be protected against frost as per geotechnical recommendations.

4.3 Wastewater Servicing Conclusions

The site is tributary to the Pinecrest Collector sewer. It is proposed to discharge wastewater from the site through a single connection to the existing 450 mm diameter sanitary sewer within the Sir John A. Macdonald Parkway right-of-way.

A sanitary analysis was completed for the Carling Avenue sanitary sewer to ensure adequate capacity in both outlets exists to service the subject property. The proposed development results in a decrease in sanitary flow from current conditions to the Sir John A. Macdonald Parkway sanitary sewer. As a result, it is anticipated that this sewer has adequate capacity to service the proposed development.

The proposed wastewater design conforms to all relevant ***City Standards***.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system and is located within the Ottawa River West sub-watershed. As such, approvals for proposed development within this area are under the approval authority of the City of Ottawa.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Pinecrest Creek watershed and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA).

The existing shopping complex is serviced through a network on internal sewers with the majority of flow discharging to the existing 600 mm diameter sewer crossing the Sir John A. Macdonald Parkway. The storm sewer crosses the Parkway and is tributary to a 2400mm storm sewer and the Ottawa River Parkway Pipe (ORP) described in the ***Pinecrest Creek SWM.***

A portion of the subject property discharges to storm sewers within Richmond Road and Croydon Avenue and are proposed to be retained in the proposed condition. Refer to ***EX-1*** for existing internal sewer layout.

5.2 Post-development Stormwater Management Target – Phase I

Stormwater management quantity and quality control requirements for the proposed development are extracted from section 3.3.6 of the ***Pinecrest Creek SWM***. Future development of the site would also need to ensure that the SWM design compiles with the ***Pinecrest Creek SWM*** design criteria.

- The more stringent of the following criteria will govern:

  i) 100-year storm event discharge is not to exceed ***33.5 L/s/ha***; based on a controlled site area of ***4.965 Ha***, allowable release rate is equal to ***166.3 L/s***

  ii) requirements of City's Sewer Design Guideline. Based on a 2-year storm event, 0.5 run-off coefficient and 19.5 minute time of concentration, a 2-year flow rate of ***364.4 L/s*** was calculated.

  - Total suspended solids (TSS) removal of 80%.

Based on the above criteria, the allowable release rate for the site must be attenuated to ***166.3 L/s***.

5.3 Proposed Stormwater Management System

To meet the stormwater objectives the proposed development will utilize a combination of rooftop, surface and subsurface storage.

The private stormwater sewer system has been sized to convey an uncontrolled 5-year storm runoff rate. Detailed layout and sizing are illustrated by ***SSP-1*** and the storm sewer calculation sheet included in ***Appendix D***.

It is proposed that existing drainage areas that will not be modified by the proposed Phase 1 works will be accommodated in the storm sewer design, however, will not require flow attenuation in accordance with ***Section 5.2***. This includes existing drainage to Richmond Road Storm Sewer (***EX-2*** on ***SWM-1****)*; existing drainage from the north-west corner of the site to directed to the proposed storm sewer (***EX-3*** on ***SWM-1***) and existing drainage to Croydon Avenue storm sewer (***EX-1*** on ***SWM-1***).

The remaining ***4.965 Ha*** of drainage area is proposed to be controlled to the allowable release rate by inlet control devices (ICD) located at various catch basins and manholes. ***Table 11*** below summarizes inlet control details, flow rates and storages for each control area.

Table 11
Stormwater Flow Rate Summary

Control Area	Drainage Area (Ha)	Inlet Control Device	5-Year Release Rate (L/s)	5-Year Required Storage (m^3)	100-Year Release Rate (L/s)	100-Year Required Storage (m^3)	100-Year Available Storage (m^3)
Unattenuated Areas (U1)	0.039		4.2	0.0	8.9	0.0	0.0
Roof Controls (BLDG-A)	0.444		22.4	67.8	29.6	151.6	351.5
Roof Controls (BLDG B)	0.092		4.7	14.0	6.2	31.3	73.0
Attenutated Areas (A118+A119)	0.693	TEMPEST LMF 105	14.5	152.7	15.8	359.4	483.5
Attenutated Areas (A120)	0.212	TEMPEST LMF 45	2.6	56.8	2.8	140.0	145.8
Attenutated Areas (A100)	0.321	TEMPEST LMF 45	2.1	18.8	2.2	50.2	96.1
Attenutated Areas (A109+A110)	0.849	75mm dia	9.5	126.1	19.1	311.9	316.1
Attenutated Areas (A122)	1.072	82mm dia	19.6	254.9	20.6	598.9	621.8
Attenutated Areas (A123)	0.093	TEMPEST LMF 60	2.8	1.6	2.9	5.9	6.6
Attenutated Areas (A103-A)	0.025	75mm dia	5.9	0.1	12.1	0.2	0.5
Attenutated Areas (A103-B)	0.039	TEMPEST LMF 100	7.6	0.1	11.9	2.9	3.2
Attenutated Areas (A103-C)	0.083	TEMPEST LMF 65	4.8	7.5	5.0	23.5	27.1
Attenutated Areas (A103-D)	0.067	TEMPEST LMF 90	9.3	4.2	9.6	16.7	17.7
Attenutated Areas (A106)	0.229	TEMPEST LMF 75	6.3	4.2	6.5	15.1	15.8
Attenutated Areas (A125)	0.706	TEMPEST LMF 100	8.6	180.4	13.0	398.3	402.3
Total	**4.964**		**124.9**	**889.0**	**166.3**	**2106.0**	**2561.1**

It is calculated that ***2106.0 m³*** of storage will be required on site to attenuate flow to a release rate of ***166.3 L/s***; Detailed storage calculations are included in ***Appendix D***.

To meet the storage requirements outlined in ***Table 11*** above, a combination of rooftop, surface and sub-surface storage chambers are proposed to be utilized. Refer to drawing ***SSP-1*** for storage chamber locations.

Per the manufacturer and pavement design recommendations, the minimum required cover for the sub-surface storage chambers were calculated as follows:

- 0.50 m of cover for *Stormtech SC-310 & SC-740* tanks in light duty areas;
- 0.79 m of cover for *Stormtech SC-310* & *SC-740* tanks in heavy duty areas;
- 0.65 m of cover for *Stormtech MC-3500* tanks in light duty areas.

Based on borehole info provided in the ***Geotech Report,*** storage chambers were kept 1-m higher than the recorded groundwater level in the nearest borehole. However, in areas where groundwater level records were not available, chambers with minimum heights were utilized and conservatively placed at a minimum cover of 0.79 m below the proposed grade, to achieve the highest separation from groundwater level. It is DSEL's engineering judgement that the proposed design of underground storage chambers is an appropriate measure to ensure groundwater does not infiltrate the chambers.

The Credit Valley Conservation (CVC) provides guidance with regards to infiltration trenches and recommends 1-meter separation from the bottom of infiltration trenches to the seasonally high-water table or top of bedrock elevation. It is proposed to provide infiltration in the granular bedding below the proposed underground storage chambers.

Rooftop scuppers, in buildings A and B, are to be located above the 100-year rooftop storage elevation. Refer to the architectural drawing set, prepared by RLA, for scupper elevations.

The receiving 600 mm diameter storm sewer, located within parts 23 and 24, has a maximum capacity of approximately ***223.1 L/s*** based on field observations and minimum slope. The 100-year controlled flow from the site is ***166.3 L/s,*** which represents approximately a ***94%*** reduction from existing conditions, therefore the storm sewers downstream of the site storm outlet have sufficient capacity to accommodate flows from the proposed development. Refer to ***Appendix D*** for calculations.

The required storage in the 2-year storm for all private parking lots was calculated, see ***Appendix D*** for calculations. Available subsurface storage exceeded the calculated required storage; therefore, no surface ponding in parking lots will occur in the 2-year storm.

Quality control to achieve an 80% TSS removal is proposed to be provided by two Oil-Grit Separators (OGS) located at the outlet to the existing storm sewer on Sir John A. Macdonald, refer to ***Appendix D*** for a copy of the OGS sizing reports.

As per section 5.7.1 of the ***City Standards,*** a minimum cover of 2.0 m from the finished grade is required for all storm sewers. Proposed storm sewers with a cover less than 2.0 m shall be protected against frost as per geotechnical recommendations.

5.4 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the target release rate for storm events up to and including the 100-year storm in accordance with the ***Pinecrest Creek SWM***. It is calculated that ***2106.0 m³*** of storage will be required on site to attenuate flow to the established release rate of ***166.3 L/s.***

Two Oil-Grit Separator units are proposed to achieve a quality control target of 80% TSS removal.

The receiving storm sewer downstream of the subject site storm outlet that crosses Sir John A. Macdonald Parkway has sufficient capacity to accommodate flows from the proposed development.

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies for approval.

6.0 UTILITIES

Gas and Hydro services currently exist within the Caring Avenue and Merivale Road right-of-ways. Utility servicing will be coordinated with the individual utility companies prior to site development.

Special considerations will need to be taken with development within the Hydro corridor. The proposed development will be coordinated and approved by the utility company having jurisdiction.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. During construction the extent of erosion losses is exaggerated due to the removal of vegetation and the top layer of soil becoming agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have SILTSACKs or an approved equivalent installed under the grate during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents:

- Limit extent of exposed soils at any given time;
- Re-vegetate exposed areas as soon as possible;
- Minimize the area to be cleared and grubbed;
- Protect exposed slopes with plastic or synthetic mulches;
- Install silt fence to prevent sediment from entering existing ditches;
- No refueling or cleaning of equipment near existing watercourses;
- Provide sediment traps and basins during dewatering;
- Install filter cloth between catch basins and frames;
- Plan construction at proper time to avoid flooding; and
- Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers; and
- Clean and change filter cloth at catch basins.

8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by RioCan Holdings Inc. to prepare a Site Servicing and Stormwater Management Report in support of the Site Plan Control (SPC) application for the Phase I development at 2525 Carling Avenue. The preceding report outlines the following:

- Based on boundary conditions provided by the City the existing municipal water infrastructure is capable of providing the contemplated development with water within the City's required pressure range;

- It is proposed that the development will be serviced by two proposed hydrants. The EPANET water distribution model confirmed adequate pressure exists within fire hydrants during fire flow, and within the system for the Average Day, Max Day + Fire Flow and Peak Hour scenarios;

- Existing sanitary sewers within Sir John A. Macdonald Parkway has sufficient capacity to convey peak wastewater flow of ***3.73 L/s*** from the proposed development;

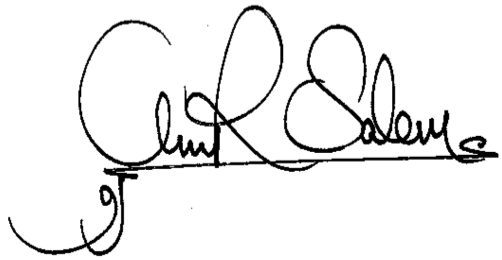
- Stormwater objectives will be met through retention via rooftop, surface and subsurface storage. It is calculated that ***2106.0 m^3*** of storage will be required on site to attenuate flow to the established release rate of ***166.3 L/s***.

- Two Oil-Grit Separator units are proposed to achieve a quality control target of 80% TSS removal per the ***Pinecrest Creek SWM***.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Brandon Chow

Prepared by,
David Schaeffer Engineering Ltd.



Per: Amr Salem

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Robert D. Freel, P. Eng.

z:\projects\17-997_riocan_lincoln-fields\b_design\b3_reports\b3-2_servicing (dsel)\2019-11_fsr_sub5\ssr-2019-11-28_997_aas.docx

APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-997 05/11/2019

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures, EX-1
☒	Plan showing the site and location of all existing services.	Figure 1, EX-1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0, Section 5.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3, Appendix A
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1, EX-1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	GP-1
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 2.1
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	Drawings/Figures

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 3.1
☒	Identification of system constraints	Section 3.1
☐	Identify boundary conditions	Not available at time of report
☒	Confirmation of adequate domestic supply and pressure	Section 3.2, 3.2.1, 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2, Appendix B
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.2.1, 3.3
☒	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 3.2, SSP-1
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2, Appendix B
☒	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Section 3.2.1, Appendix B

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1, EX-1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2, Appendix C
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2, SSP-1
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3, Appendix D
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 5.3
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Section 5.4
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☐	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

Genavieve Melatti

From: Robert Verch <rverch@rlaarchitecture.ca>
Sent: Friday, December 14, 2018 2:48 PM
To: Genavieve Melatti
Cc: Steve Merrick; Brandon Chow
Subject: 1803 RioCan Lincoln Fields - FUS Calculations

See below.

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: December-14-18 1:24 PM
To: Robert Verch <rverch@rlaarchitecture.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>; Brandon Chow <BChow@dsel.ca>
Subject: RioCAN Lincoln Fields - FUS Calculations

Good afternoon Rob,

I was wondering if you would be able to provide some information for us today that is required in order to complete the FUS calculations for this project.

- Would you be able to please confirm the sprinkler systems for the buildings? **Yes**
- We are assuming that both storeys of the metro will be retail space (2620m^2 total) and that "Building 2" will be 746.6 m^2 of commercial space and 771.0 m^2 of office space. Would you be able to confirm this? **Second floor of the Metro is a mezzanine, it is there offices. Yes to the areas and use of the Rexall / Office building.**
- I have included the ISO Guide in which sections 1, 2 and 3 on pages 3 to 10 provides definitions to clarify as well as the section from the City's technical bulletin. Note that ISO refers only to fire-resistive for fire ratings not less than 1-hour. Would you be able to provide the ISO class for each building. **Class 3 (non-combustible)**

A. *Determine the type of construction.*

- Coefficient *C* in the FUS method is equivalent to coefficient *F* in the ISO method:

Correspondence between FUS and ISO construction coefficients

FUS type of construction	ISO class of construction	Coefficient *C*
Fire-resistive construction	Class 6 (fire resistive)	0.6
	Class 5 (modified fire resistive)	0.6
Non-combustible construction	Class 4 (masonry non-combustible)	0.8
	Class 3 (non-combustible)	0.8
Ordinary construction	Class 2 (joisted masonry)	1.0
Wood frame construction	Class 1 (frame)	1.5

However, the FUS definition of fire-resistive construction is more restrictive than those of ISO construction classes 5 and 6 (modified fire resistive and fire resistive). FUS requires structural members and floors in buildings of fire-resistive construction to have a fire-resistance rating of 3 hours or longer.

- With the exception of fire-resistive construction that is defined differently by FUS and ISO, practitioners can refer to the definitions of the ISO construction classes (and the supporting definitions of the types of materials and assemblies that make up the ISO construction classes) found in the current ISO guide [4] (see Annex i) to help select coefficient *C*.
- To identify the most appropriate type of construction for buildings of mixed construction, the rules included in the current ISO guide [4] can be followed (see Annex i). For a building to be assigned a given classification, the rules require ⅔ (67%) or more of the total wall area and ⅔ (67%) or more of the total floor and roof area of the building to be constructed according to the given construction class or a higher class.
- New residential developments (less than 4 storeys) are predominantly of wood frame construction ($C = 1.5$) or ordinary construction ($C = 1.0$) if exterior walls are of brick or masonry. Residential buildings with exterior walls of brick or masonry veneer and those with less than ⅔ (67%) of their exterior walls made of brick or masonry are considered wood frame construction ($C = 1.5$).

If you have any questions at all please feel free to contact me.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

Amr Salem

From: Robert Freel
Sent: October 3, 2019 4:15 PM
To: Brandon Chow; Amr Salem
Subject: Fw: 2525 Carling Lincoln Fields - easements
Attachments: 4R-489.PDF

Follow Up Flag: Follow up
Flag Status: Flagged

Sent via BlackBerry Hub+ Inbox for Android

From: brian.webster@stantec.com
Sent: October 3, 2019 1:06 p.m.
To: aird@fotenn.com
Cc: RFreel@dsel.ca
Subject: RE: 2525 Carling Lincoln Fields - easements

Hi Bria
The easement at the SE corner (Easement agreement LT100989) is to Hydro Ottawa over parts 11, 12, 13, 15, 24 & 25 on plan 4R-489 (attached). Only Part 11 is in on RioCan lands.
The easement further north on the ease side of the property (Easement agreement LT109017) gives RioCan an access easement over parts 13 and 14 on plan 4R-489 (part 14 is now part 5, 4R-3056 as shown on our plan). It also gives Riocan an easement over Parts 23 and 24 for services.
Hope this helps.

Brian Webster BSc, OLS, CLS
Principal, Survey/Geomatics
Direct: 613 724-3132
Mobile: 613 229-7644
Fax: 613 722-0769
brian.webster@stantec.com
Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

Stantec

From: Bria Aird <aird@fotenn.com>
Sent: Wednesday, October 2, 2019 11:23 AM
To: Webster, Brian <brian.webster@stantec.com>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: RE: 2525 Carling Lincoln Fields - easements

Excellent, thank you Brian!

Bria Aird, M.Pl.

Planner
T 613.730.5709 ext. 224

Please note that I will be working from Fotenn's Toronto Office from October 1-3, and can be contacted at 613-447-6565 during that time.

From: Webster, Brian <brian.webster@stantec.com>
Sent: October 2, 2019 11:20 AM
To: Bria Aird <aird@fotenn.com>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: Re: 2525 Carling Lincoln Fields - easements

I'll get this to you tomorrow. We have the documents.

Get Outlook for iOS

From: Bria Aird <aird@fotenn.com>
Sent: Wednesday, October 2, 2019 10:52:54 AM
To: Webster, Brian <brian.webster@stantec.com>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: 2525 Carling Lincoln Fields - easements

Hi Brian,

The City has asked us for some additional information related to the easements east of the RioCan property at Lincoln Fields (see attached). In particular, they want to know who the southerly easement is in favour of.

Do you have this information to hand from your work on the property? I've cc'd Bobby Freel, as he has been in direct contact with the City on this and can provide further information if needed.

Many thanks,

Bria Aird, M.Pl.
Planner
T 613.730.5709 ext. 224

Please note that I will be working from Fotenn's Toronto Office from October 1-3, and can be contacted at 613-447-6565 during that time.

PLAN 4R-489

APPROVED 9 Jan. 1973
James N. Dardine
ASS'T. EXAMINER OF SURVEYS

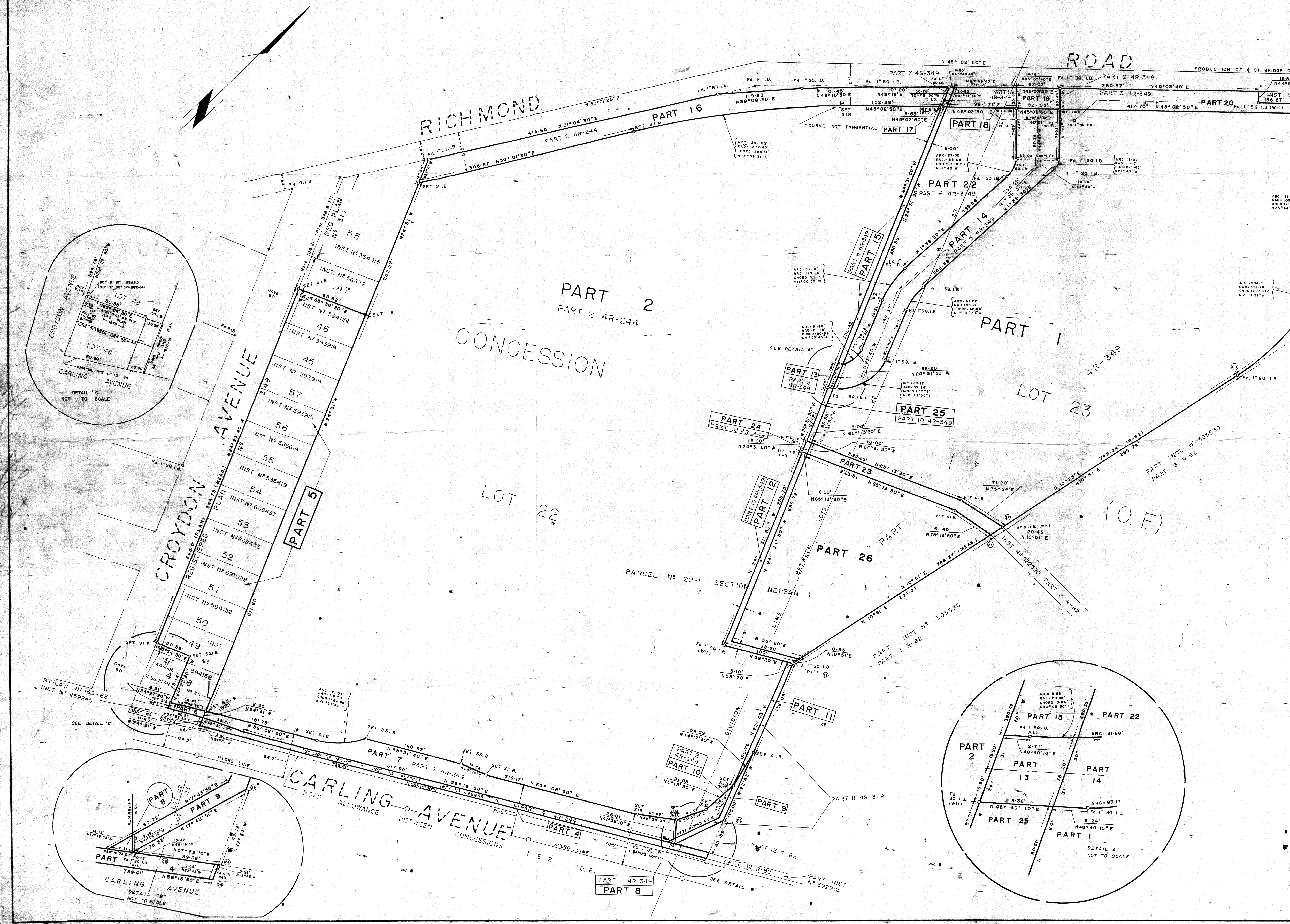
RECORDED UNDER Nº 4 R-489
REGISTERED 18th May 1973
J.M. Fatica
DEPUTY MASTER OF TITLES

c-7189

RECEIVED AND DEPOSITED AS 4R-489
DATE 18th May 1973
SIGNATURE
REGISTRAR FOR THE REGISTRY DIVISION OF THE CITY OF OTTAWA

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER PART II OF THE REGISTRY ACT
DATE Feb. 15th 1973
Thomas Wilson
SIGNATURE
THOMAS WILSON
NAME IN PRINT

LAND REGISTRATION SYSTEM UNDER WHICH PARTS ARE REGISTERED	
Office	Part Number
REGISTRY OFFICE	4, 5, 6
LAND TITLES OFFICE	1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, & 26



PLAN

OF

LOTS 50, 51, 52, 53, 54, 55, 56, 57, 45, & 46
REGISTERED PLAN 348

PART OF LOT 49
REGISTERED PLAN 348

PARTS OF LOT 48
REGISTERED PLAN 311

AND

PARTS OF LOTS 22 & 23, CONCESSION I, OTTAWA FRONT

TOWNSHIP OF NEPEAN
NOW IN THE
CITY OF OTTAWA
REGIONAL MUNICIPALITY OF OTTAWA — CARLETON
SCALE 1" = 50'
W.H. MOFFATT O.L.S.
1972

SCHEDULE

PART	LOT	CON. OR REG. PLAN	INST. Nº/PARCEL Nº	OWNER	AREA	REMARKS
1	22 & 23	CON. I (O.F.)	PARCEL Nº 22-1 SEC. NEPEAN I	LINCOLN FIELDS OF OTTAWA LIMITED	264,090 SQ.FT.	6·062 ACRES
2	22 & 23	" " "	" "	" " " " "	647,270 SQ.FT.	14·859 ACRES
3	23	" " "	PARCEL Nº 22-2 SEC. NEPEAN I	REMUS INVESTMENTS LIMITED	3,360 SQ.FT.	
4	22 & 23	" " "	INST. Nº 496483	THE CORPORATION OF THE CITY OF OTTAWA	5,238 SQ.FT.	SEE NOTE "C"
5	48 45, 46, 49 TO 57 INCL.	REG. PLAN Nº 311 REG. PLAN Nº 348	594158, 594152 593928, 608433 585619, 593915 593919, 594154	LINCOLN FIELDS OF OTTAWA LIMITED	58131 SQ.FT.	1·33 ACRES
6	48	REG. PLAN Nº 311	594158	" " " " "	425 SQ.FT.	
7	22	CON. I (O.F.)	PARCEL Nº 22-1 SEC. NEPEAN I	" " " " "	16,364 SQ.FT.	
8	22	" " "	" "	" " " " "	56 SQ.FT.	
9	22 & 23	" " "	" "	" " " " "	1,184 SQ.FT.	
10	22 & 23	" " "	" "	" " " " "	1,530 SQ.FT.	
11	23	" " "	" "	" " " " "	1,316 SQ.FT.	
12	22 & 23	" " "	" "	" " " " "	3,124 SQ.FT.	
13	22	" " "	" "	" " " " "	302 SQ.FT.	
14	22 & 23	" " "	" "	" " " " "	20,171 SQ.FT.	0·463 ACRES
15	22	" " "	" "	" " " " "	3,123 SQ.FT.	
16	22	" " "	" "	" " " " "	19,700 SQ.FT.	0·452 ACRES
17	22	" " "	" "	" " " " "	246 SQ.FT.	
18	22 & 23	" " "	" "	" " " " "	2720 SQ.FT.	
19	23	" " "	" "	" " " " "	1887 SQ.FT.	
20	23	" " "	" "	" " " " "	10,462 SQ.FT.	0·240 ACRES
21	23	" " "	PARCEL Nº 22-2 SEC. NEPEAN I	REMUS INVESTMENTS LIMITED	654 SQ.FT.	
22	22 & 23	" " "	PARCEL Nº 22-1 SEC. NEPEAN I	LINCOLN FIELDS OF OTTAWA LIMITED	23,688 SQ.FT.	0·521 ACRES
23	22 & 23	" " "	" "	" " " " "	4,742 SQ.FT.	
24	22	" " "	" "	" " " " "	129 SQ.FT.	
25	22	" " "	" "	" " " " "	708 SQ.FT.	
26	22 & 23	" " "	" "	" " " " "	53,808 SQ.FT.	1·235 ACRES

STA	GRID CO-ORDINATES IN FEET		GRID CO-ORDINATES IN METRES	
	NORTH	EAST	NORTH	EAST
14	16,487,543·695	1,183,800·720	5,025,403·32	360,822·46
15	507·867	765·204	392·40	811·63
16	441·798	832·173	372·10	831·89
17	349·310	899·883	344·07	852·68
18	308·279	967·429	331·56	873·27
19	121·317	933·177	274·58	862·83
20	486,732·066	861·863	155·93	841·10
21	711·947	858·179	149·80	839·97
22	385·322	798·338	050·25	821·73
23	161·851	894·032	5,024,982·13	850·90
24	116·455	913·473	968·30	856·83
56	109·937	916·264	966·31	857·68
58	095·479	880·519	961·90	846·78

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY

1. THAT THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE LAND TITLES ACT, THE REGISTRY ACT AND THE REGULATIONS MADE THEREUNDER.
2. THAT I WAS PRESENT AT AND DID PERSONALLY SUPERVISE THE SURVEY REPRESENTED BY THIS PLAN.
3. THAT THE SURVEY WAS COMPLETED ON THE 3rd. DAY OF AUGUST, 1972.
4. THAT THIS PLAN CONTAINS A TRUE COPY OF THE FIELD NOTES OF SURVEY.

AUGUST 3/1972 — W.H. Moffatt
DATE — W.H. MOFFATT O.L.S.

BEARING NOTE

BEARINGS HEREON ARE ASSUMED TO BE ASTRONOMIC AND ARE DERIVED FROM THE SOUTH EASTERLY LIMIT OF OF RICHMOND ROAD, SHOWN TO BE N 45°03'40"E ON PLAN 4R-244.

LEGEND

- I.B. DENOTES IRON BAR 5/8" x 5/8" x 2' LONG
- S.I.B. " STANDARD IRON BAR 1" x 1" x 4' LONG
- S.S.I.B. " SHORT STANDARD IRON BAR 1" x 1" x 2' LONG
- R.I.B " ROUND IRON BAR
- Fd. " FOUND MONUMENT

NOTES

A. (R-82) DENOTES GRID MEASUREMENTS AS PER INTEGRATED SURVEY OF THE NATIONAL CAPITOL COMMISSION.

B. CO-ORDINATES SHOWN WERE DERIVED FROM PLAN R-82 BEING AN INTEGRATED SURVEY BY THE NATIONAL CAPITOL COMMISSION

C. RIGHT-OF-WAY APPENDANT TO PARCEL 22-1 SEC. NEPEAN I UNTIL SUCH TIME AS THE LANDS ARE DEDICATED AS A PUBLIC HIGHWAY.

FAIRHALL & MOFFATT LIMITED
ONTARIO LAND SURVEYORS
OTTAWA ONTARIO

109017

THE COMMITTEE OF ADJUSTMENT

FOR THE CORPORATION OF THE

CITY OF OTTAWA

IN THE MATTER OF an application to the Committee of Adjustment for the Corporation of the City of Ottawa for consent in respect of a by-law passed under Section 29 of The Planning Act.

I, EILEEN EVANS, Secretary, of the Committee of Adjustment of the City of Ottawa, make oath and say:

1. The said Committee is composed of 5 members.
2. On the 16th day of May 19 74, 4 members, constituting a quorum, heard the said application.
3. A majority of the members who heard the application concurred in and signed the decision to grant the consent.

SWORN before me at the City of Ottawa in the Regional Municipality of Ottawa-Carleton this 20th day of September 19 74

[signature]

A Commissioner, Etc.

109017

The Planning Act

CERTIFICATE OF SECRETARY-TREASURER

Pursuant to subsection 20 of section 42 of The Planning Act I certify that the consent of the Committee of Adjustment of the City of Ottawa was given on the 16th day of May, 1974 to the transaction to which the within instrument relates, as shown on the schedule attached.

F. H. Lee per
Secretary-Treasurer

DATED this 20th day
of September 1974.

109017

B-1146

REMUS INVESTMENTS LIMITED grant of easement to
LINCOLN FIELDS OF OTTAWA LIMITED

BEING Parts 13, 14, 23 and 24 on Plan 4R-489

Ministry of Revenue

Land Speculation Tax Section

Queen's Park
Toronto, Ontario
M7A 1Y2

109017

Easement Roadway

③

FILE NUMBER 45365

LIEN CLEARANCE CERTIFICATE

Pursuant to subsection 2 of Section 5 of The Land Speculation Tax Act, 1974:

This is to certify that no lien is claimed up to and including the date as of which this certificate is given with respect to the designated land described below resulting from its disposition.

Name of Transferor: Ramus Investment Limited

Address:

DESCRIPTION OF DESIGNATED LAND

Easement

All of Parcel 22-2 in the Register for Section Nepean-1 Ottawa

Proceeds of disposition $ 10.00

Given as of the 30th day of September 1974

[signature]
For Minister of Revenue

08/74-17001A

R.C.

109017

(Easement Agreement)

THE LAND TITLES ACT

APPLICATION TO REGISTER NOTICE OF AN EASEMENT UNDER Section 43, R.S.O. 1970 CHAPTER 234

TO THE LAND REGISTRAR AT OTTAWA:

REMUS INVESTMENTS LIMITED, Trustee, the registered owner of the land registered in the Office of Land Titles at Ottawa as Parcel 22-2 in the Register for Section Nepean-1 hereby applies under the provisions of Section 43 of The Land Titles Act for an entry to be placed upon the register for the said parcel of the burden of certain rights of easement hereinafter set out which easements are for the benefit and enjoyment of the owners from time to time of lands and those entitled thereunder registered in the Office of Land Titles at Ottawa as Parcel 22-1 in the Register for Section Nepean-1.

The particulars of the said easements are as follows:

1. (a) The lands burdened by the easement rights are owned by Remus Investments Limited and all of Parcel 22-2 in the Register for Section Nepean-1;

(b) The lands benefiting from the easement (the "Lincoln Fields Lands") are owned by Lincoln Fields of Ottawa Limited and are all of Parcel 22-1 in the Register for Section Nepean-1, together with all of Part 5 on a plan deposited in the Registry Office for the Registry Division of Ottawa as Number 4R-489.

2. Lincoln Fields of Ottawa Limited, its successors and assigns, are the owners of a free and uninterrupted right of way by way of easement for persons, animals and vehicles in common with such others to whom the grant of rights by Remus Investments Limited has been consented to by Lincoln Fields of Ottawa Limited, for the use of the owner or owners from time to time of the whole or any part of the said Lincoln Fields Lands, its and their successors and

assigns and its and their servants, agents, workmen, invitees, customers and such other persons, who from time to time may lawfully be entitled to go upon or use all or any part of the Lincoln Fields Lands, over, along, under and upon the lands and premises registered in the Office of Land Titles at Ottawa as Part of said Parcel 22-2 in the Register for Section Nepean-1, being shown as Parts 13 and 14 on a Plan filed in the Office of Land Titles at Ottawa as Number 4R-489 together with the right of the said owner and owners and any of its and their successors and assigns to enter upon the said Parts 13 and 14 at any and all times to construct, install, repair, maintain and replace a roadway and sidewalks thereon, pavement markings, traffic control signs and lights, traffic control personnel and equipment, shopping centre identification signs, to remove snow, ice and debris, and generally to do all acts which it deems useful or necessary for the maintenance and up-keep of the said right of way and improvements thereon;

3. Lincoln Fields of Ottawa Limited, its successors and assigns, and the owner or owners from time to time of the whole or any part of the Lincoln Fields Lands are the owners of a free and uninterrupted exclusive right of way by way of sub-surface easement to use, install, maintain, operate, repair and replace sewer, water, gas and other transmission pipes or conduits of any and all sort on, over or under the lands registered in the Office of Land Titles at Ottawa as part of Parcel 22-2 in the Register for Section Nepean-1 and being shown as Parts 23 and 24 as shown on a Plan filed in the Office of Land Titles at Ottawa as Number 4R-489 together with the right to excavate and do all other acts necessary for the full enjoyment of the said right of easement, and to enter upon and traverse such portions of the said Parcel 22-2 as may be reasonably necessary to gain access to Parts 23 and 24 on said Plan 4R-489 in order to maintain, repair or replace any such installations, together with the right to enjoy along with others entitled thereto the easement rights affecting Part 2 on Reference Plan R-82 filed in the Registry Office for the

Registry Division of Ottawa and shown in part in broken outline on said Plan 4R-489, as more particularly set out in an indenture dated August 21, 1967 registered in the said Office of Land Titles as Instrument No. 532599 , Ottawa, as shown on the Register for Parcel 22-1, Section Nepean-1.

The evidence in support of this Application consists of:

The executed copy of the Easement Agreement dated the 11th day of July , 1974 between Lincoln Fields of Ottawa Limited and Remus Investments Limited, Trustee, hereto annexed.

DATED at Toronto this 25th day of July , 1974.

REMUS INVESTMENTS LIMITED

Per: ______________________
PRESIDENT

Per: ______________________
SECRETARY-TREASURER

LINCOLN FIELDS OF OTTAWA LIMITED, the registered owner of lands registered in the Office of Land Titles at Ottawa as the whole of Parcel 22-1, in the Register for Section Nepean-1, hereby applies under the provisions of Section 43 of The Land Titles Act for an entry to be placed upon the register for the said Parcel of the benefit of certain rights of easement more particularly set out in the application of Remus Investments Limited, Trustee, above.

The evidence in support of this application consists of:

The executed copy of the Easement Agreement dated the

109017

11th day of July , 1974 between Lincoln Fields of Ottawa Limited and Remus Investments Limited, Trustee, hereto annexed.

DATED at Toronto this 25th day of July , 1974.

LINCOLN FIELDS OF OTTAWA LIMITED

Per: ____________________
PRESIDENT

Per: ____________________
VICE-PRESIDENT

EASEMENT AGREEMENT

109017

THIS AGREEMENT made in triplicate the 11th day of July, One Thousand Nind Hundred and Seventy-four.

BETWEEN:

LINCOLN FIELDS OF OTTAWA LIMITED
a corporation incorporated under the laws of the Province of Ontario

hereinafter called "Lincoln Fields"

OF THE FIRST PART;

- and -

REMUS INVESTMENTS LIMITED, Trustee,
a corporation incorporated under the laws of the Province of Ontario

hereinafter called "Remus"

OF THE SECOND PART.

CONSENT
Consent to Register under the Planning Act
Granted this ____ Day of ____ 1974
Committee of Adjustment - City of Ottawa
E. H. Lee
Secretary-Treasurer

WHEREAS Lincoln Fields is the registered owner of lands registered in the Office of Land Titles at Ottawa as part of Parcel 22-1 in the Register for Section Nepean-1, and of Part 5 on a Plan deposited in the Registry Office for the Registry Division of Ottawa as Number 4R-489 (herein sometimes called the "Lincoln Fields Lands");

AND WHEREAS Remus is the registered owner of land registered in the Office of Land Titles at Ottawa as the whole of Parcel 22-2 in the Register for Section Nepean-1 (herein sometimes called the "Remus Lands");

AND WHEREAS as part of the consideration for the conveyance by Lincoln Fields to Remus of the Remus Lands, it was agreed that Lincoln Fields would reserve and retain unto itself certain rights of easement hereinafter set out.

AND THEREFORE IN CONSIDERATION of the premises and of the sum of TEN DOLLARS ($10.00) each to the other paid, the receipt whereof is hereby acknowledged, the parties agree as follows:

Remus hereby grants and conveys to Lincoln Fields, and its successors and assigns forever:

(1) a free and uninterrupted right of way by way of easement for persons, animals and vehicles in common with such others to whom the grant of rights by Remus has been consented to by Lincoln Fields, for the use of the owner or owners from time to time of the whole or any part of the said Lincoln Fields Lands, its and their successors and assigns and its and their servants, agents, workmen, invitees, customers and such other persons, who from time to time may lawfully be entitled to go upon or use all or any part of the Lincoln Fields Lands, over, along, under and upon the lands and premises registered in the Office of Land Titles at Ottawa as Part of said Parcel 22-2 in the Register for Section Nepean-1 being shown as Parts 13 and 14 on a Plan filed in the Office of Land Titles at Ottawa as Number 4R-489 together with the right of the said owner and owners and any of its and their successors and assigns to enter upon the said Parts 13 and 14 at any and all times to construct, install, repair, maintain and replace a roadway and sidewalks thereon, pavement markings, traffic control signs and lights, traffic control personnel and equipment, shopping centre identification signs, to remove snow, ice and debris and generally to do all acts which it deems useful or necessary for the maintenance and up-keep of the said right of way and improvements thereon;

(2) a free and uninterrupted exclusive right of way by way of sub-surface easement to use, install, maintain, operate, repair and replace sewer, water, gas and other transmission pipes or conduits of any and all sort on, over or under the lands registered in the Office of Land Titles at Ottawa, Part of Parcel 22-2, Section Nepean-1, and being shown as Parts 23 and 24 on a Plan filed in

the Office of Land Titles at Ottawa as Number 4R-489 together with the right to excavate and do all other acts necessary for the full enjoyment of the said right of easement, and to enter upon and traverse such portions of said Parcel 22-2, Section Nepean-1 as may be reasonably necessary to gain access to the said Parts 23 and 24 on said Plan 4R-489 in order to maintain, repair or replace any such installations, together with the right to enjoy along with others entitled thereto the easement rights affecting Part 2 on Reference Plan R-82 filed in the Registry Office for the Registry Division of Ottawa and shown in part in broken outline on said Plan 4R-489, as more particularly set out in an indenture dated August 21st, 1967, registered in the said Office of Land Titles as Instrument No. 532599, Ottawa, as shown on the Register for Parcel 22-1, Section Nepean-1.

Provided that Lincoln Fields shall make good any damage to the lands and any improvements, buildings and structures thereon occasioned by any construction, repair, replacement, removal, operation and maintenance by it, but Lincoln Fields shall have the right to take up any sod, turf or paving or temporarily remove any fencing or other light structures for the purposes aforesaid, provided that it shall replace the same, as soon as possible.

Provided further that Lincoln Fields shall indemnify Remus and save it harmless from any damages or claim for damages howsoever caused to any person or thing by reason of the easements herein set out on the Remus Lands, save and except for any negligence caused by Remus or any party for whom in law, Remus is responsible.

109017

This agreement shall enure to the benefit of the Lincoln Fields Lands and the owner or owners, mortgagee or mortgagees thereof from time to time and shall be a burden upon the Remus Lands and the owner or owners, mortgagee or mortgagees thereof from time to time.

Witness the corporation seals of the parties hereto duly attested to by their proper officers duly authorized in that behalf.

LINCOLN FIELDS OF OTTAWA LIMITED

Per: ______________________
PRESIDENT

Per: ______________________
VICE-PRESIDENT

REMUS INVESTMENTS LIMITED

Per: ______________________
PRESIDENT

Per: ______________________
SECRETARY-TREASURER

109017

Dye & Durham Co. Limited, 180 Bartley Drive, Toronto
Form No. 442

Affidavit

In The Matter of The Land Transfer Tax Act

PROVINCE OF ONTARIO

JUDICIAL DISTRICT OF YORK

To Wit:

I, RICHARD WAYNE ROSENMAN

of the City of Toronto

in the* Municipality of Metropolitan Toronto

named in the within (or annexed) transfer

*For place of residence insert appropriate County, District, Regional Municipality, etc.

make oath and say:

This affidavit may be made by the purchaser or vendor or by any one acting for them under power of attorney or by an agent accredited in writing by the purchaser, or vendor or by the solicitor of either of them or by some other person approved by the Minister of Revenue.

1. I am the solicitor for the Grantor named in the within ~~(or annexed) transfer~~ grant of easement.
2. I have a personal knowledge of the facts stated in this affidavit.
3. (1) The total consideration for this transaction has been allocated as follows:

(a) Land, building, fixtures and goodwill	$ NIL
(b) Chattels — items of tangible personal property (see note)	$ NIL
TOTAL CONSIDERATION	$ NIL

(2) The true consideration for the transfer or conveyance for Land Transfer Tax purposes is as follows:

(a) Monies paid in cash	$ NIL
(b) Property transferred in exchange (Detail Below)	$ NIL
(c) Securities transferred to the value of (Detail Below)	$ NIL
(d) Balances of existing encumbrances with interest owing at date of transfer	$ NIL
(e) Monies secured by mortgage under this transaction	$ NIL
(f) Liens, legacies, annuities and maintenance charges to which transfer is subject	$ NIL
(g) Other (Detail Below)	$ NIL
TOTAL CONSIDERATION (should agree with 3(1)(a) above)	$ NIL

All blanks must be filled in.

4. If consideration is nominal, is the transfer for natural love and affection? n/a
5. If so, what is the relationship between Grantor and Grantee? n/a
6. Other remarks and explanations, if necessary The grant of easement rights were contemplated at the time the Grantor received the lands from the Grantee by an instrument dated June 1, 1970 and registered June 2, 1970 as Instrument No. 575863 registered in the Registry Office for the Registry Division of Ottawa. The grant of easement was delayed until a precise location of the easement was determined, consent from the Committee of Adjustment was obtained and all conditions attached by the Committee were satisfied.

SWORN before me at the City of Toronto, in the Municipality of Metropolitan Toronto

this 30 day of August 1974

[signature]
(signature)

[signature]
A Commissioner, etc.

Chattels: Retail sales tax is payable on the valuation of items shown in 3(1)(b) unless otherwise exempted under the provisions of The Retail Sales Tax Act.

For the purpose of this affidavit insert above only the value of chattels, the total value of which in the opinion of the deponent exceeds $100.00. This does not exonerate a purchaser from the payment of Retail Sales Tax on any tangible personal property as part of this transaction. When chattels are purchased as part of this transaction with a value of less than $100.00, the applicable tax should be paid by the purchaser to the Treasurer of Ontario and remitted to the Minister of Revenue.

109017

Dye & Durham Co. Limited, 180 Bartley Drive, Toronto
NO. 614

THE LAND TRANSFER TAX ACT, 1974

Affidavit of Residence

IN THE MATTER OF THE CONVEYANCE OF a grant of easement over Parts 13, 14
23 and 24, Plan No. 4R-489
(insert brief description of land)

TO Lincoln Fields of Ottawa Limited
(insert names of all transferees)

I, RICHARD WAYNE ROSENMAN of the City of Toronto, in the
(print name and address)
Municipality of Metropolitan Toronto

MAKE OATH AND SAY THAT:

1. I am (place a clear mark within the square opposite that one of the following paragraphs that describes the capacity of the deponent):
   (a) A person to whom or in trust for whom the land conveyed in the above-described conveyance is being conveyed; ☐
   (b) One of the trustees named in the above-described conveyance to whom the land is being conveyed; ☐
   (c) A transferee named in the above-described conveyance; ☐
   (d) An agent authorized in writing to act for ________ *(insert name of principal)* who is a person described in paragraph ____ above *(insert only one of paragraph (a), (b), or (c) above)*; ☐
   (e) The solicitor acting in this matter for Lincoln Fields of Ottawa Limited *(insert name of client)* who is a ~~person~~ corporation described in paragraph (a) above *(insert only one of paragraph (a), (b) or (c) above)*; ☒
   and as such, I have personal knowledge of the facts herein deposed to.

2. None of the transferees to whom or in trust for whom the land conveyed in the above-described conveyance is being conveyed is, within the meaning of the Act, a non-resident person (strike out this paragraph if inapplicable).

3. ~~The following persons to whom or in trust for whom the land conveyed in the above-described conveyance is being conveyed are non-resident persons within the meaning of the Act.~~

(insert the name and place of residence — or in the case of a corporation, the place of incorporation — of any transferee who is a non-resident person. If space is insufficient, attach a list of those transferees who are non-resident persons.)

4. I have read over and considered the definitions of "non-resident corporation" and "non-resident person" set out respectively in clause f and g of subsection 1 of section 1 of the Act.

Sworn before me at the City of Toronto
in the Municipality
of Metropolitan Toronto
this 30
day of August 19 74

A Commissioner, etc.

109017

Form No. 446

The Land Titles Act

IN THE MATTER of the PLANNING ACT (as amended)

AND IN THE MATTER of a ~~(Transfer) (Charge) (Caution) (Lease)~~ Grant of Easement of (Part of) Parcel 22-2 in the Register for Section Nepean-1 dated July 11, 1974.

I, RICHARD WAYNE ROSENMAN,

of the City of Toronto,

in the Municipality of Metropolitan Toronto

make oath and say as follows:

1. That I am (the solicitor for) the ~~(Transferor) (Chargor) (Cautioner) (Lessor)~~ Parties named in the above mentioned ~~(Transfer) (Charge) (Caution) (Lease)~~ Grant of Easement which is attached hereto.

2. That the said ~~(Transfer) (Charge) (Caution) (Lease)~~ Grant of Easement *does not contravene* the provisions of *The Planning Act*, as amended, because:

(State Exception) Consent to the said grant has been given by the Committee of Adjustment for the City of Ottawa as evidenced by the endorsement of the Secretary of the said Committee marked thereon.

SWORN before me at the City of Toronto, in the Municipality of Metropolitan Toronto, this 30 day of August 1974.

A Commissioner, etc.

(16) 109017

DATED: July 11, 1974

109017

No.
Received at 3:54 o'clock P. M. on
day of

SEP 20 1974

Land Registry Office
at Ottawa
No. 4

LAND REGISTRAR

LINCOLN FIELDS OF OTTAWA
LIMITED

- and -

REMUS INVESTMENTS LIMITED

EASEMENT AGREEMENT

LAND REGISTRY #4

EXECUT.	
MEMO.	
CHECK.	
ASSES.	
1600	

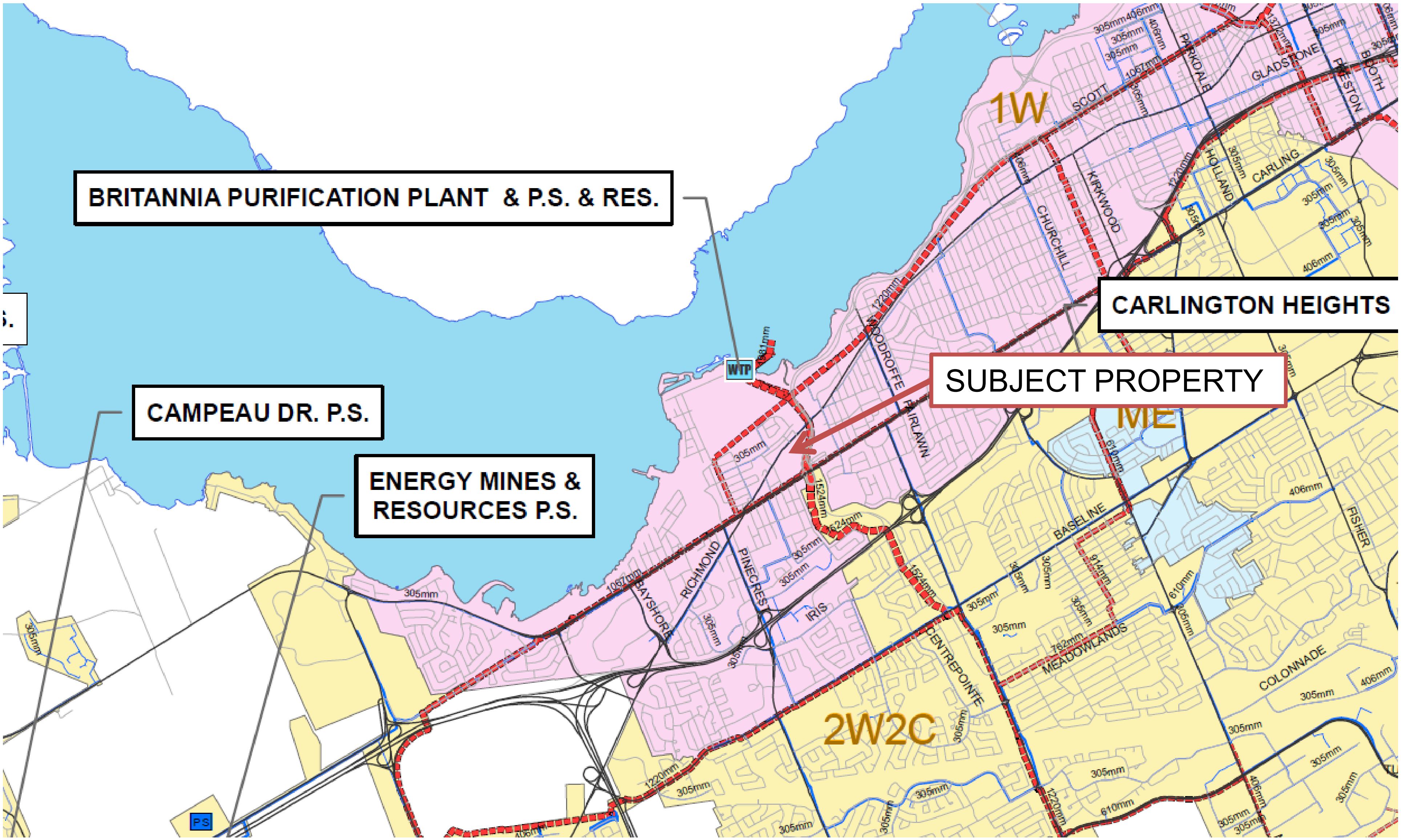
PROPERTY OF
THE LAND REGISTRY OFFICE (No. 4)

Messrs. Weir and Foulds
Barristers and Solicitors
330 University Avenue
Toronto, Ontario, M5G 1S2

APPENDIX B

Water Supply

Pressure Zone Map



Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

DSEL

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	-	0
Semi-detached	2.7	-	0
Townhouse	2.7	-	0
Apartment			0
Bachelor	1.4	-	0
1 Bedroom	1.4	-	0
2 Bedroom	2.1	-	0
3 Bedroom	3.1	-	0
Average	1.8	-	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	0	0.0	0.0	0.0	0.0	0.0	0.0

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Office	75	$L/9.3m^2/d$	-	0.00	0.0	0.0	0.0	0.0	0.0
Restaurant*	125	L/seat/d	71	8.94	6.2	13.4	9.3	24.1	16.8
Shopping Centres	2.5	$L/m^2/d$	22,204	55.51	38.5	83.3	57.8	149.9	104.1
Industrial - Heavy	55,000	L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	64.4	44.8	96.7	67.1	174.0	120.8
			Total Demand	**64.4**	**44.8**	**96.7**	**67.1**	**174.0**	**120.8**

* Estimated number of seats at 1seat per $9.3m^2$

RIOCAN HOLDINGS INC.
2525 CARLING AVENUE - PHASE 1
Proposed Site Conditions
(Bldg A + Bldg B + Ex. Pizza Pizza)

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	-	0
Semi-detached	2.7	-	0
Townhouse	2.7	-	0
Apartment			0
Bachelor	1.4	-	0
1 Bedroom	1.4	-	0
2 Bedroom	2.1	-	0
3 Bedroom	3.1	-	0
Average	1.8	-	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	0	0.0	0.0	0.0	0.0	0.0	0.0

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
a) Bldg A- Metro	2.5	$L/m^2/d$	3,137	7.84	5.4	11.8	8.2	21.2	14.7
b) Bldg B - Rexall	2.5	$L/m^2/d$	1,590	3.98	2.8	6.0	4.1	10.7	7.5
Office	75	$L/9.3m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Restaurant - *(Ex. Pizza Pizza)**	125	L/seat/d	35	4.37	3.0	6.6	4.6	11.8	8.2
Shopping Centres	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000	L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	16.2	11.2	24.3	16.9	43.7	30.4
			Total Demand	**16.2**	**11.2**	**24.3**	**16.9**	**43.7**	**30.4**

* Estimated number of seats at 1 seat per $9.3m^2$

2525 CARLING AVENUE - PHASE 1

Existing Wendy's Demand

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	-	0
Semi-detached	2.7	-	0
Townhouse	2.7	-	0
Apartment			0
Bachelor	1.4	-	0
1 Bedroom	1.4	-	0
2 Bedroom	2.1	-	0
3 Bedroom	3.1	-	0
Average	1.8	-	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	0	0.0	0.0	0.0	0.0	0.0	0.0

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate		Units	Avg. Daily m^3/d	Avg. Daily L/min	Max Day m^3/d	Max Day L/min	Peak Hour m^3/d	Peak Hour L/min
Commercial floor space	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Office	75	$L/9.3m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Restaurant*	125	L/seat/d	37	4.57	3.2	6.8	4.8	12.3	8.6
Shopping Centres	2.5	$L/m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000	L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	4.6	3.2	6.8	4.8	12.3	8.6
			Total Demand	**4.6**	**3.2**	**6.8**	**4.8**	**12.3**	**8.6**

* Estimated number of seats at 1 seat per $9.3m^2$

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	4278.9	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	11512.7	L/min	
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%
Fire Flow	**10200.0 L/min**

3. Reduction for Sprinkler Protection

Sprinklered - Supervised	-50%
Reduction	**-5100 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	>45m	97	1	97	0%
S	Non-Combustible	>45m	72	2	144	0%
E	Non-Combustible	20.1m-30m	56	2	112	10%
W	Non-Combustible	>45m	56	1	56	0%
		% Increase				**10%** *value not to exceed 75%*

Increase	**1020.0 L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure. Max 5 stories
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	6120.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	6000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Roderick Lahey Architect Inc.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey
Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1517.6	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	6856.3 L/min	
	7000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**5950.0 L/min**

3. Reduction for Sprinkler Protection

Sprinklered - Supervised -50%

Reduction	**-2975 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Non-Combustible	>45m	31	1	31	0%
S	Non-Combustible	>45m	31	2	62	0%
E	Non-Combustible	>45m	31	1	31	0%
W	Non-Combustible	>45m	31	2	62	0%
		% Increase				**0%** *value not to exceed 75%*

Increase	**0.0 L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure. Max 5 stories
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	2975.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	3000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Roderick Lahey Architect Inc.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	339.7	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	4054.8 L/min	
	4000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Rapid Burning 25%

Fire Flow	**5000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered 0%

Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Ordinary - Unprotected Openings	>45m	14	1	14	0%
S	Ordinary - Unprotected Openings	20.1m-30m	14	1	14	6%
E	Ordinary - Unprotected Openings	>45m	36	1	36	0%
W	Ordinary - Unprotected Openings	>45m	36	1	36	0%
		% Increase				**6%** *value not to exceed 75%*

Increase	**300.0 L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure. Max 5 stories
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	5300.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	5000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Roderick Lahey Architect Inc.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey
Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	325.2	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	3967.3 L/min	
	4000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Rapid Burning	25%
Fire Flow	**5000.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Ordinary - Unprotected Openings	>45m	21	1	21	0%
S	Ordinary - Unprotected Openings	>45m	21	1	21	0%
E	Ordinary - Unprotected Openings	>45m	12	5	60	0%
W	Ordinary - Unprotected Openings	>45m	12	1	12	0%
		% Increase				**0%** *value not to exceed 75%*

Increase	**0.0 L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure. Max 5 stories
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	5000.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	5000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Roderick Lahey Architect Inc.
-Calculations based on Fire Underwriters Survey - Part II

Boundary Conditions Unit Conversion

Connection 1 - Carling Avenue

	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	115.6	73.51	42.1	59.9	412.9
Fire Flow (6000 L/min)	91.0	73.51	17.5	24.9	171.6
Fire Flow (5000 L/min)	96.0	73.51	22.5	32.0	220.6
Peak Hour	108.5	73.51	35.0	49.8	343.3

Connection 2 - Carling Avenue

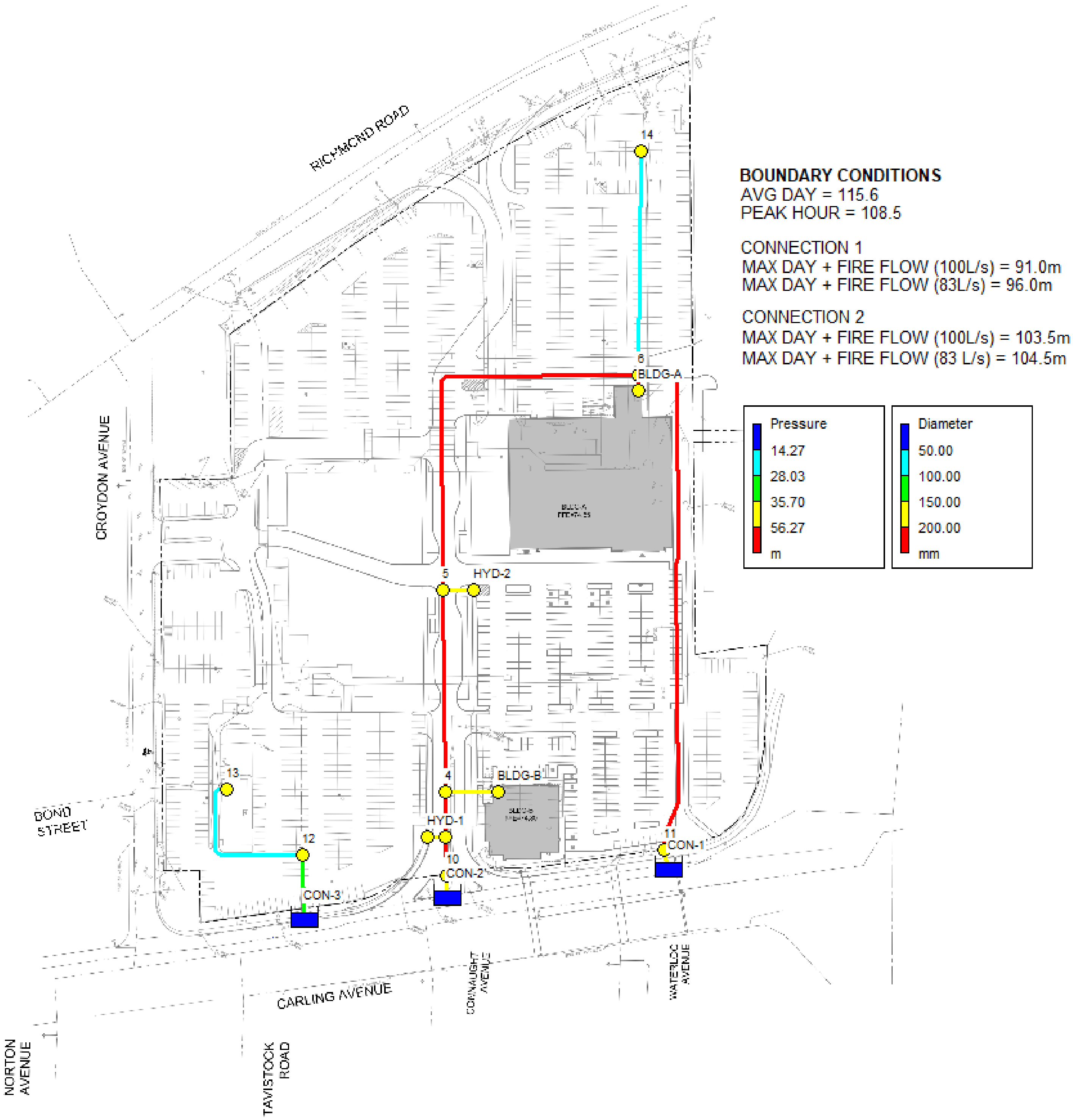
	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	115.6	74.66	40.9	58.2	401.6
Fire Flow (6000 L/min)	103.5	74.66	28.8	41.0	282.9
Fire Flow (5000 L/min)	104.5	74.66	29.8	42.5	292.7
Peak Hour	108.5	74.66	33.8	48.1	332.0

Connection 3 - Carling Avenue

	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	115.6	74.94	40.7	57.9	398.9
Peak Hour	108.5	74.94	33.6	47.7	329.2

Watermain Modelling

AVERAGE DAY (PHASE 1)



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*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.0                                *
**********************************************************************
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Input File: 2019-10-30_997_AVG-DAY.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	3	4	19.4	200
3	4	5	85.9	200
4	5	6	173.1	200
6	3	HYD-1	7.5	150
7	4	BLDG-B	18.7	150
8	5	HYD-2	13.1	150
9	6	BLDG-A	3.7	200
10	CON-2	10	4.5	150
11	10	3	20.7	200
12	6	11	217.4	200
13	11	CON-1	8.7	150
14	CON-3	12	28.2	100
15	12	13	65	50
1	14	6	118	50

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
3	0.00	115.60	43.40	0.00	
4	0.00	115.60	43.50	0.00	
5	0.00	115.60	43.90	0.00	
6	0.00	115.60	45.90	0.00	
HYD-1	0.00	115.60	43.35	0.00	
BLDG-B	2.80	115.60	43.35	0.00	
HYD-2	0.00	115.60	43.85	0.00	
BLDG-A	5.40	115.60	45.65	0.00	
10	0.00	115.60	43.30	0.00	
11	0.00	115.60	43.80	0.00	
12	0.00	115.60	43.20	0.00	
13	3.20	115.60	42.60	0.00	
14	3.00	115.59	45.69	0.00	
CON-2	-6.35	115.60	0.00	0.00	Reservoir
CON-1	-4.85	115.60	0.00	0.00	Reservoir
CON-3	-3.20	115.60	0.00	0.00	Reservoir

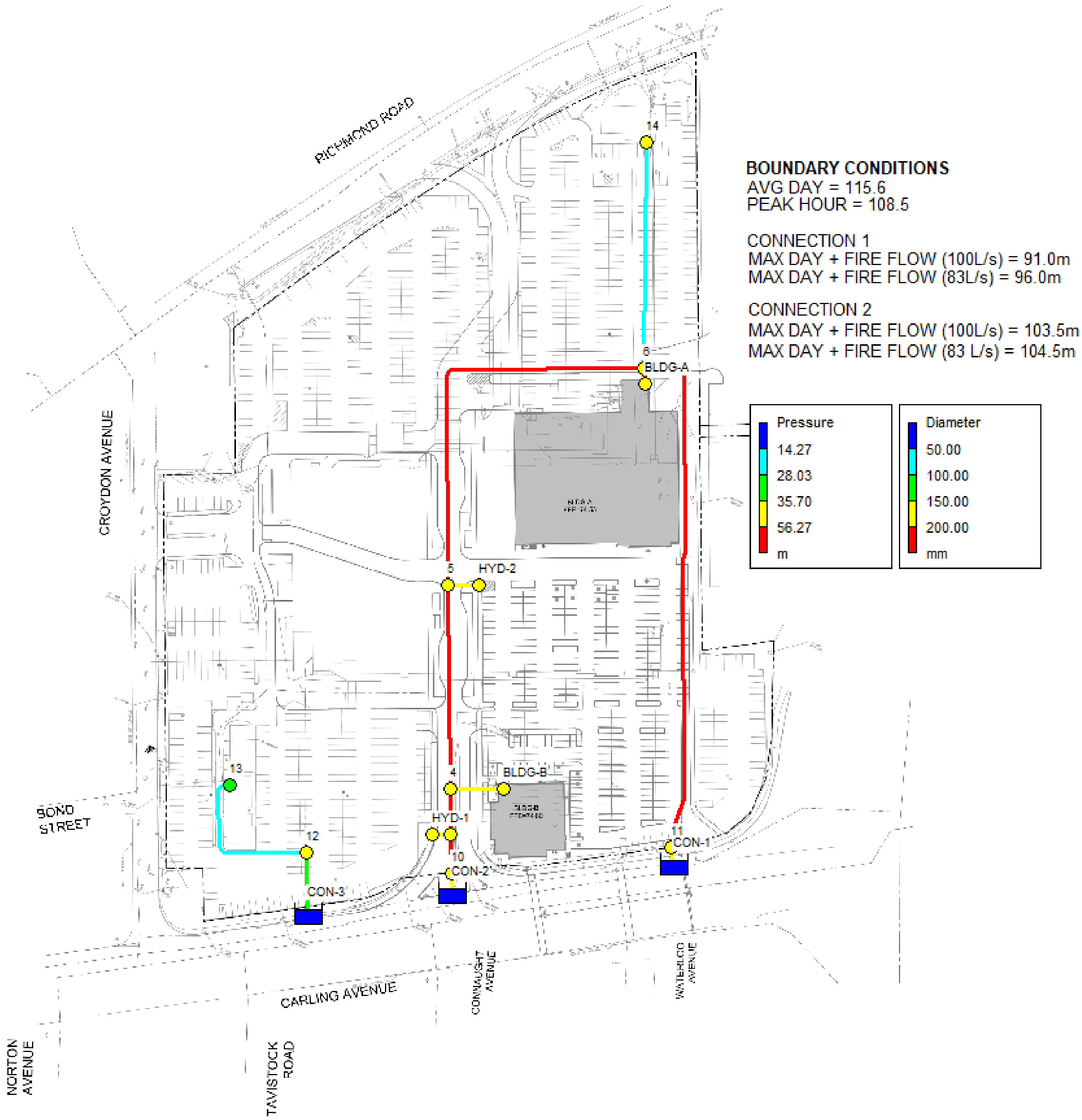
Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
2	6.35	0.00	0.00	Open
3	3.55	0.00	0.00	Open
4	3.55	0.00	0.00	Open
6	0.00	0.00	0.00	Open
7	2.80	0.00	0.00	Open
8	0.00	0.00	0.00	Open

AVERAGE DAY (PHASE 1)

9	5.40	0.00	0.00	Open
10	6.35	0.01	0.00	Open
11	6.35	0.00	0.00	Open
12	-4.85	0.00	0.00	Open
13	-4.85	0.00	0.00	Open
14	3.20	0.01	0.00	Open
15	3.20	0.03	0.06	Open
1	-3.00	0.03	0.05	Open

PEAK HOUR (PHASE 1)



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*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.0                                *
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Input File: 2019-11-21_997_PEAK HOUR.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	3	4	19.4	200
3	4	5	85.9	200
4	5	6	173.1	200
6	3	HYD-1	7.5	150
7	4	BLDG-B	18.7	150
8	5	HYD-2	13.1	150
9	6	BLDG-A	3.7	200
10	CON-2	10	4.5	150
11	10	3	20.7	200
12	6	11	217.4	200
13	11	CON-1	8.7	150
14	CON-3	12	28.2	100
15	12	13	65	50
1	14	6	118	50

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
3	0.00	108.50	36.30	0.00	
4	0.00	108.50	36.40	0.00	
5	0.00	108.50	36.80	0.00	
6	0.00	108.50	38.80	0.00	
HYD-1	0.00	108.50	36.25	0.00	
BLDG-B	7.50	108.50	36.25	0.00	
HYD-2	0.00	108.50	36.75	0.00	
BLDG-A	14.70	108.50	38.55	0.00	
10	0.00	108.50	36.20	0.00	
11	0.00	108.50	36.70	0.00	
12	0.00	108.50	36.10	0.00	
13	8.60	108.48	35.48	0.00	
14	8.20	108.46	38.56	0.00	
CON-2	-17.17	108.50	0.00	0.00	Reservoir
CON-1	-13.23	108.50	0.00	0.00	Reservoir
CON-3	-8.60	108.50	0.00	0.00	Reservoir

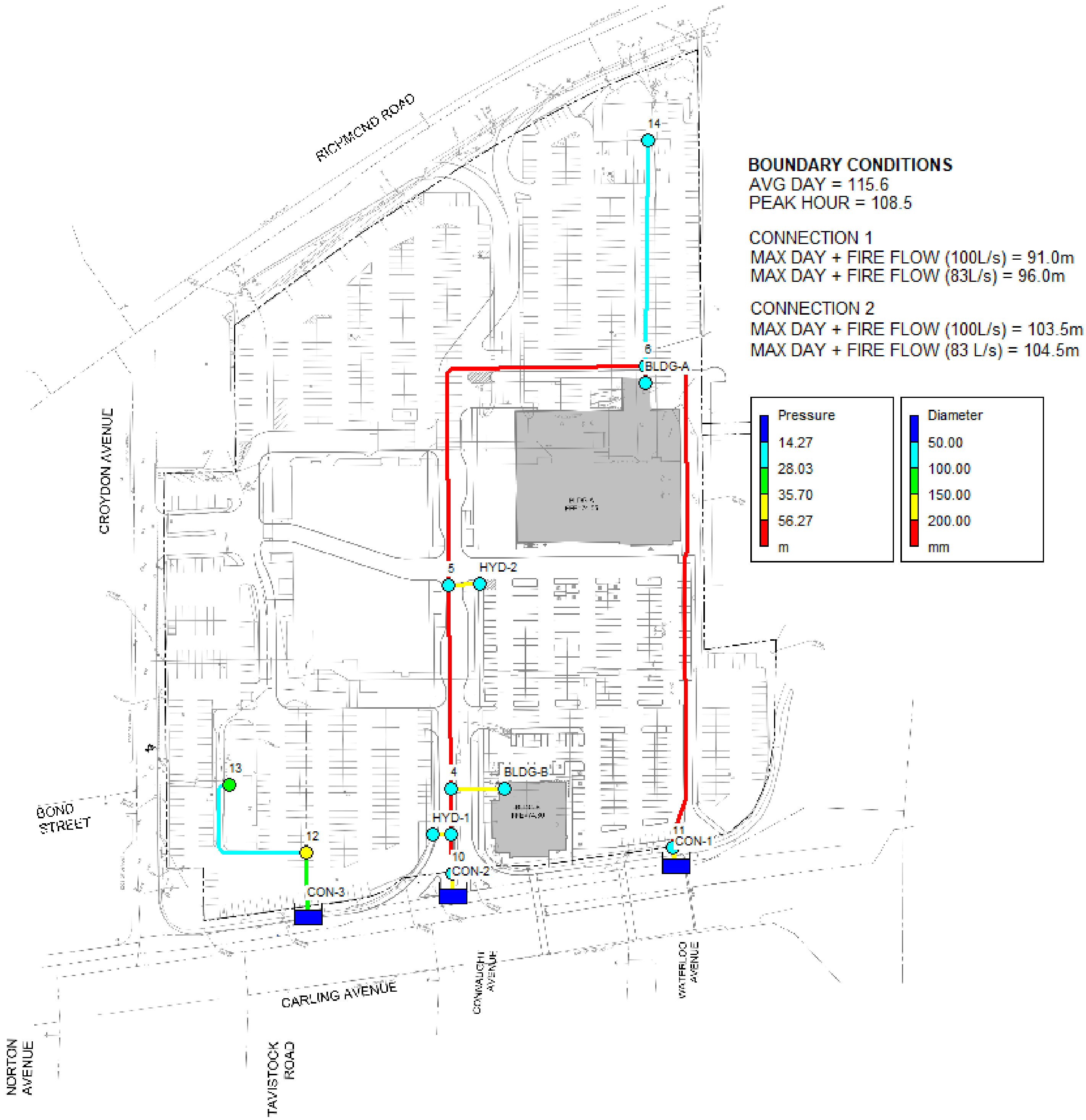
Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
2	17.17	0.01	0.00	Open
3	9.67	0.01	0.00	Open
4	9.67	0.01	0.00	Open
6	0.00	0.00	0.00	Open
7	7.50	0.01	0.00	Open
8	0.00	0.00	0.00	Open

PEAK HOUR (PHASE 1)

9	14.70	0.01	0.00	Open
10	17.17	0.02	0.01	Open
11	17.17	0.01	0.00	Open
12	-13.23	0.01	0.00	Open
13	-13.23	0.01	0.01	Open
14	8.60	0.02	0.01	Open
15	8.60	0.07	0.36	Open
1	-8.20	0.07	0.32	Open

MAX DAY + FIRE FLOW (100L/s) (PHASE 1)



MAX DAY + FIRE FLOW (100L/s) (PHASE 1)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*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.0                                *
**********************************************************************
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Input File: 2019-11-21_997_MAX-DAY(100-Ls).net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	3	4	19.4	200
3	4	5	85.9	200
4	5	6	173.1	200
6	3	HYD-1	7.5	150
7	4	BLDG-B	18.7	150
8	5	HYD-2	13.1	150
9	6	BLDG-A	3.7	200
10	CON-2	10	4.5	150
11	10	3	20.7	200
12	6	11	217.4	200
13	11	CON-1	8.7	150
14	CON-3	12	28.2	100
15	12	13	65	50
1	14	6	118	50

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
3	0.00	97.81	25.61	0.00	
4	0.00	96.36	24.26	0.00	
5	6000.00	90.95	19.25	0.00	
6	0.00	90.97	21.27	0.00	
HYD-1	0.00	97.81	25.56	0.00	
BLDG-B	4.10	96.36	24.11	0.00	
HYD-2	0.00	90.95	19.20	0.00	
BLDG-A	8.20	90.97	21.02	0.00	
10	0.00	99.43	27.13	0.00	
11	0.00	90.99	19.19	0.00	
12	0.00	108.50	36.10	0.00	
13	4.80	108.49	35.49	0.00	
14	4.60	90.95	21.05	0.00	
CON-2	-5822.17	103.50	0.00	0.00	Reservoir
CON-1	-194.73	91.00	0.00	0.00	Reservoir
CON-3	-4.80	108.50	0.00	0.00	Reservoir

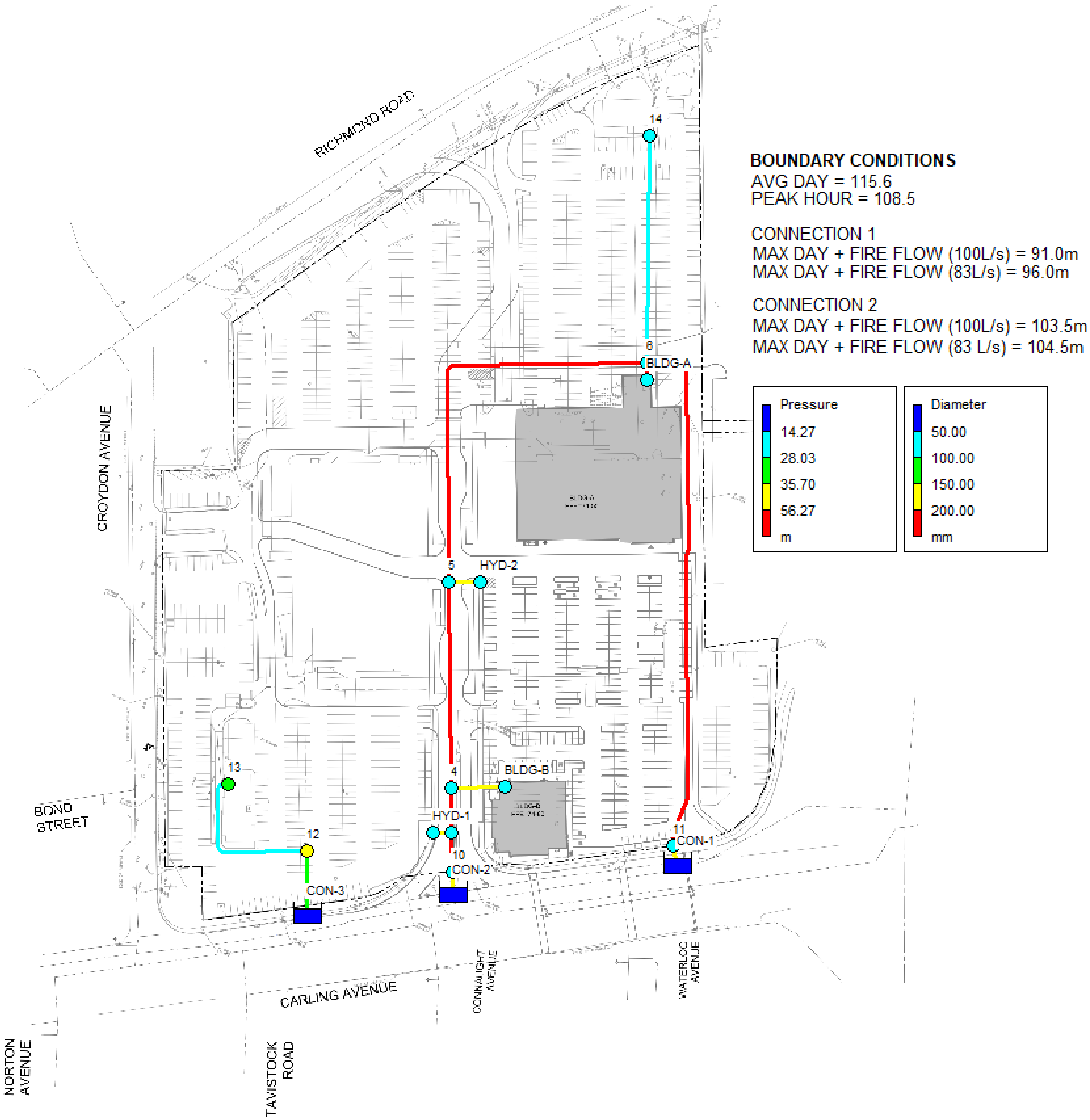
Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
2	5822.17	3.09	74.72	Open
3	5818.07	3.09	63.00	Open
4	-181.93	0.10	0.10	Open
6	0.00	0.00	0.00	Open
7	4.10	0.00	0.00	Open
8	0.00	0.00	0.00	Open

MAX DAY + FIRE FLOW (100L/s) (PHASE 1)

9	8.20	0.00	0.00	Open
10	5822.17	5.49	903.51	Open
11	5822.17	3.09	78.47	Open
12	-194.73	0.10	0.12	Open
13	-194.73	0.18	0.93	Open
14	4.80	0.01	0.00	Open
15	4.80	0.04	0.12	Open
1	-4.60	0.04	0.11	Open

MAX DAY + FIRE FLOW (83L/s) (PHASE 1)



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*                           E P A N E T                              *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.0                                *
**********************************************************************
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Input File: 2019-11-21_997_MAX-DAY(83-Ls).net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
2	3	4	19.4	200
3	4	5	85.9	200
4	5	6	173.1	200
6	3	HYD-1	7.5	150
7	4	BLDG-B	18.7	150
8	5	HYD-2	13.1	150
9	6	BLDG-A	3.7	200
10	CON-2	10	4.5	150
11	10	3	20.7	200
12	6	11	217.4	200
13	11	CON-1	8.7	150
14	CON-3	12	28.2	100
15	12	13	65	50
1	14	6	118	50

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality	
3	5000.00	98.02	25.82	0.00	
4	0.00	97.94	25.84	0.00	
5	0.00	97.64	25.94	0.00	
6	0.00	97.03	27.33	0.00	
HYD-1	0.00	98.02	25.77	0.00	
BLDG-B	4.10	97.94	25.69	0.00	
HYD-2	0.00	97.64	25.89	0.00	
BLDG-A	8.20	97.03	27.08	0.00	
10	0.00	99.86	27.56	0.00	
11	0.00	96.27	24.47	0.00	
12	0.00	108.50	36.10	0.00	
13	4.80	108.49	35.49	0.00	
14	4.60	97.02	27.12	0.00	
CON-2	-6228.64	104.50	0.00	0.00	Reservoir
CON-1	1211.74	96.00	0.00	0.00	Reservoir
CON-3	-4.80	108.50	0.00	0.00	Reservoir

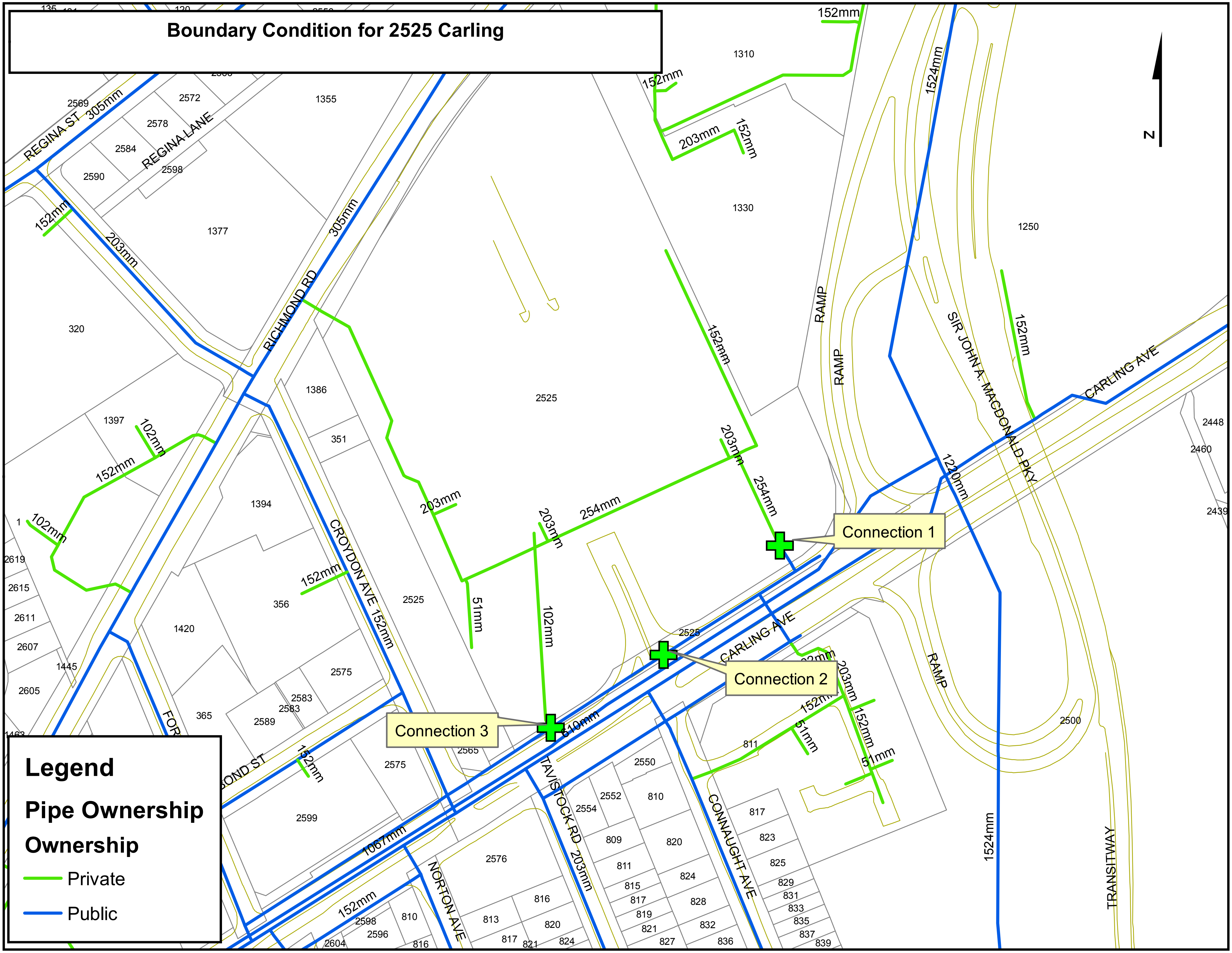
Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
2	1228.64	0.65	4.02	Open
3	1224.54	0.65	3.48	Open
4	1224.54	0.65	3.52	Open
6	0.00	0.00	0.00	Open
7	4.10	0.00	0.00	Open
8	0.00	0.00	0.00	Open

MAX DAY + FIRE FLOW (83L/s) (PHASE 1)

9	8.20	0.00	0.00	Open
10	6228.64	5.87	1030.79	Open
11	6228.64	3.30	89.13	Open
12	1211.74	0.64	3.49	Open
13	1211.74	1.14	31.09	Open
14	4.80	0.01	0.00	Open
15	4.80	0.04	0.12	Open
1	-4.60	0.04	0.11	Open

Boundary Condition for 2525 Carling



Amr Salem

From: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Sent: October 3, 2019 11:37 AM
To: Amr Salem
Cc: Robert Freel; Brandon Chow; Kuruvilla, Santhosh; Dickinson, Mary
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request
Attachments: 2525 Carling Oct 2019.pdf

Hi Amr,

Based on your request in the email below, the following are boundary conditions, HGL, for hydraulic analysis at 2525 Carling (zone 1W) assumed to be connected to (see attached PDF for locations):

- 152mm stub off the 152mm watermain on Carling (connection 1)
- 152mm on Carling (connection 2)
- 152mm on Carling (connection 3, Wendy's)

	Connection 1	Connection 2	Connection 3
Minimum HGL	108.5m	108.5m	108.5m
Maximum HGL	115.6m	115.6m	115.6m
MaxDay + FireFlow (100L/s)	91.0m	109.5m	-----------
MaxDay + FireFlow (83 L/s)	96.0m	104.5m	-----------
MaxDay + FireFlow (50L/s)	104.0m	110.5m	---------

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

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

Ghislaine Miliu, P.Eng, LEED AP BD+C
Project Manager – Infrastructure Approvals
Development Review | Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa

From: Amr Salem <ASalem@dsel.ca>
Sent: October 01, 2019 10:33 AM
To: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Brandon Chow <BChow@dsel.ca>; Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>; Dickinson, Mary <mary.dickinson@ottawa.ca>
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request

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.

Hey Ghislaine,

I updated the calculations to reflect your comments; ordinary construction class was assumed instead of non-combustible to be more conservative. Based on our experience with similar projects, the buildings would not be made of combustible or wooden structures. New estimated fire flow demand is 5,000 L/min which can still be accommodated via the previously specified hydrants.

Since Wendy's may be potentially serviced via our proposed hydrant, I've revised the boundary conditions request to include its Fire Flow demand of 5000 L/min for Connection points 1+2. Please note that Pizza Pizza will be serviced via existing hydrants independent of our proposed network.

Please find revised demands for Connection Points 1+2 below and revised calculations attached.

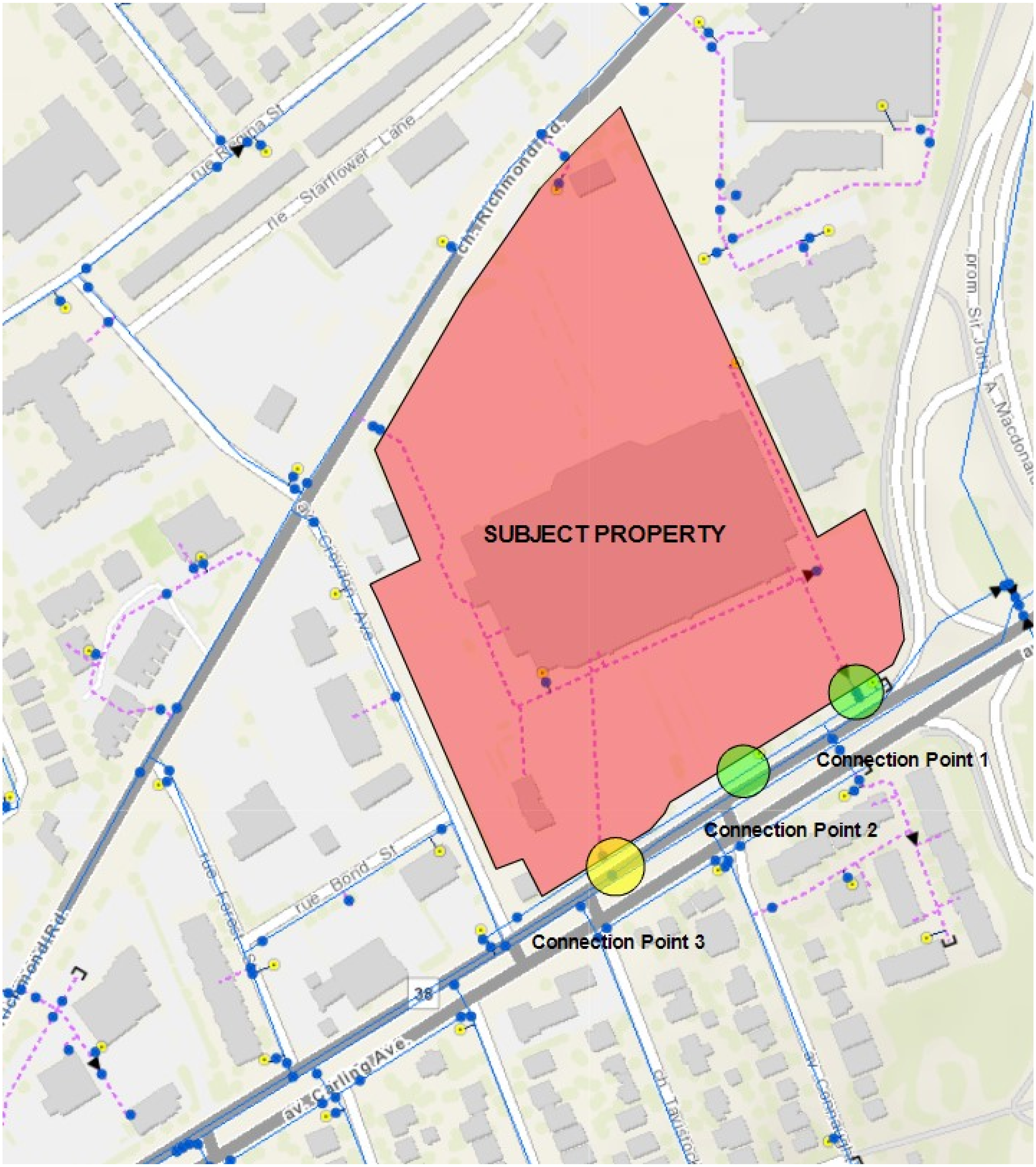
- Kindly provide boundary conditions at the proposed **Connection Points 1 and 2** shown in **green** below at the following demands;

	L/min	L/s
Avg. Daily	13.2	0.22
Max Day + Fire flow 1	19.8 + 6000	0.33 + 100
Max Day + Fire flow 2	19.8 + 3000	0.33 + 50
Max Day + Fire flow 3 (Wendy's)	19.8 + 5000	0.33 + 83.3
Peak Hour	35.6	0.59

- Kindly provide boundary conditions at the proposed C**onnection Point 3** shown in **yellow** below at the following demands;

	L/min	L/s
Avg. Daily	3.2	0.05
Max Day	4.8	0.08
Peak Hour	8.6	0.14

-



Thank you,

Amr Salem
Project Coordinator

Amr Salem

From: Brandon Chow
Sent: October 30, 2019 10:08 AM
To: Amr Salem
Subject: FW: D07-12-18-0195 - 2525 Carling (2nd Submission) - Request for your Modified Rational Method / Detailed Storage Calculations

Follow Up Flag: Follow up
Flag Status: Flagged

From: Robert Freel <RFreel@dsel.ca>
Sent: October 29, 2019 4:22 PM
To: Brandon Chow <BChow@dsel.ca>
Subject: FW: D07-12-18-0195 - 2525 Carling (2nd Submission) - Request for your Modified Rational Method / Detailed Storage Calculations

FYI

Thank you,

Bobby Freel, P.Eng.
Project Manager

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.558
cell: (613) 314-7675
email: rfreel@DSEL.ca

From: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Sent: October 29, 2019 4:00 PM
To: Robert Freel <RFreel@dsel.ca>
Cc: Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>; Dickinson, Mary <mary.dickinson@ottawa.ca>
Subject: RE: D07-12-18-0195 - 2525 Carling (2nd Submission) - Request for your Modified Rational Method / Detailed Storage Calculations

Hi Bobby,

Please note the following comments regarding water servicing. I apologize in advance that these were not incorporated into the 2nd set of review comments provided last week. I anticipate that these can easily be addressed.

1. With respect to the Model Results table in Appendix B: why is link 9 (from node 6 to Bldg A) 1000m? Please revise.

2. There is an error in the boundary conditions provided from the City of Ottawa: the HGL at connection 2 during a fire flow of 100 L/s is 103.5m, **not 109.5m**. We apologize for this however given that the 100 L/s fire flow model results were not provided in Appendix B, we expect that this won't be an issue.

Please disregard the comment made regarding the min pressure of 18.14 m. Please note this is greater than 20psi.

Lastly, note that model results will be conservative where a smaller pipe diameter is modelled vs a larger pipe diameter proposed in the Site Servicing Plan: there will be no need to remodel if the pipe size modelled is smaller than that proposed in the drawings.

Please confirm receipt of this email and let Brandon know he can call me if he has any questions.

Thanks.

Ghislaine Miliu, P.Eng, LEED AP BD+C
Project Manager – Infrastructure Approvals
Development Review | Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa

From: Robert Freel <RFreel@dsel.ca>
Sent: October 25, 2019 3:44 PM
To: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Subject: RE: D07-12-18-0195 - 2525 Carling (2nd Submission) - Request for your Modified Rational Method / Detailed Storage Calculations

Good afternoon Ghislaine,

I believe we should meet to discuss the comments provided on the most recent submission. There are quite a few that we did not previously discuss over the phone.

Can we meet early next week?

Thank you,

Bobby Freel, P.Eng.
Project Manager

DSEL
david schaeffer engineering ltd.

Amr Salem

From: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Sent: November 19, 2019 11:36 AM
To: Amr Salem
Cc: Robert Freel; Kuruvilla, Santhosh
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request

Hi Amr,

I received confirmation that there is no change in boundary conditions. Please continue to ensure that the HGL at connection 2 during a fire flow of 100 L/s is at 103.5m, not 109.5m.

Please let me know if you have any other questions.

Ghislaine Miliu, P.Eng, LEED AP BD+C
Project Manager – Infrastructure Approvals
Development Review | Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa

From: Amr Salem <ASalem@dsel.ca>
Sent: November 18, 2019 2:29 PM
To: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request

Thank you Ghislaine!

Amr Salem
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 512
email: asalem@DSEL.ca

From: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Sent: November 18, 2019 1:35 PM
To: Amr Salem <ASalem@dsel.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Brandon Chow <BChow@dsel.ca>
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request

Hi Amr,

Your request for updated boundary conditions was sent off this morning. I will let you know as soon as a I receive a response to your request.

Thanks.

Ghislaine Miliu, P.Eng, LEED AP BD+C
Project Manager – Infrastructure Approvals
Development Review | Examen des projets d'aménagement
City of Ottawa | Ville d'Ottawa

From: Amr Salem <ASalem@dsel.ca>
Sent: November 15, 2019 5:22 PM
To: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Brandon Chow <BChow@dsel.ca>
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request

Hey Ghislaine,

I wanted to confirm with you if updated boundary conditions will be required for Lincoln Fields.

As per your discussion with Bobby, we updated the water demands to reflect the gross leasable floor area as opposed to gross floor area. This results in a ***15% decrease*** in average demand for connection points 1 and 2.

Please note that the area of building footprint is used in fire flow demand calculations to be conservative, hence the fire flow demand will not change. Please also note demands for connection 3 will remain unchanged.

Please see summary of updated demands below for connection point 1 and 2 for your reference ;

	L/min	L/s
Avg. Daily	11.2	0.19
Max Day + Fire flow 1	16.9 + 6000	0.28 + 100
Max Day + Fire flow 2	16.9 + 3000	0.28 + 50
Max Day + Fire flow 3 (Wendy's)	16.9 + 5000	0.28 + 83.3
Peak Hour	30.4	0.51

Please advise on whether updated boundary conditions are required.

Thank you in advance,

Amr Salem
Project Coordinator

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 512
email: asalem@DSEL.ca

From: Miliu, Ghislaine <ghislaine.miliu@ottawa.ca>
Sent: October 3, 2019 11:37 AM
To: Amr Salem <ASalem@dsel.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Brandon Chow <BChow@dsel.ca>; Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>; Dickinson, Mary <mary.dickinson@ottawa.ca>
Subject: RE: Lincol;n Fields - Updated Boundary Condition Request

Hi Amr,

Based on your request in the email below, the following are boundary conditions, HGL, for hydraulic analysis at 2525 Carling (zone 1W) assumed to be connected to (see attached PDF for locations):

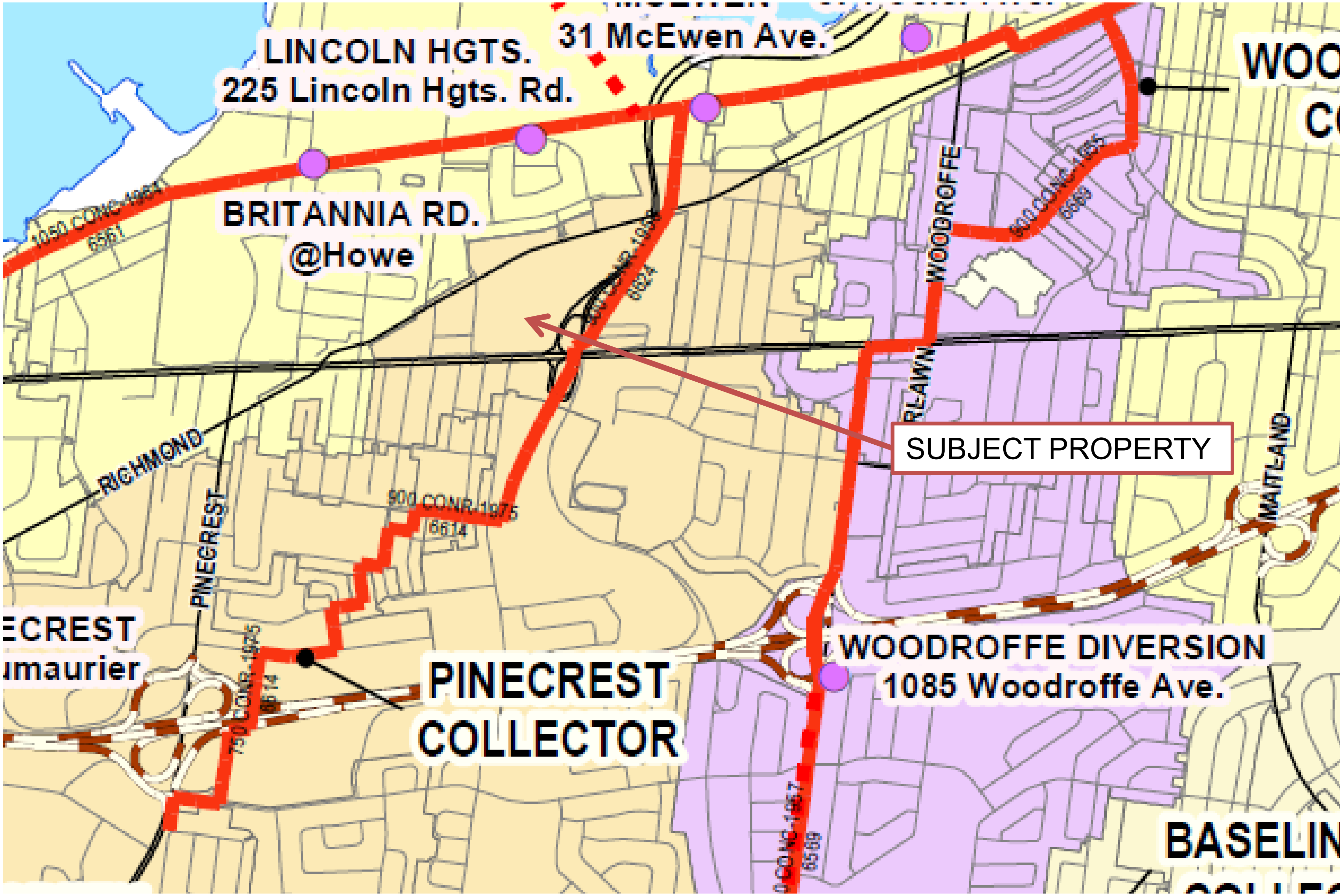
- 152mm stub off the 152mm watermain on Carling (connection 1)
- 152mm on Carling (connection 2)
- 152mm on Carling (connection 3, Wendy's)

	Connection 1	Connection 2	Connection 3
Minimum HGL	108.5m	108.5m	108.5m
Maximum HGL	115.6m	115.6m	115.6m
MaxDay + FireFlow (100L/s)	91.0m	109.5m	-----------
MaxDay + FireFlow (83 L/s)	96.0m	104.5m	-----------

APPENDIX C

Wastewater Collection

Sanitary Trunk Sewer and Collection Area Map



Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 6.550 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.33**	**L/s**
Infiltration / Inflow (Wet)	**1.83**	**L/s**
Infiltration / Inflow (Total)	**2.16**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duple	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**0**	
Average Domestic Flow	**0.00**	**L/s**
Peaking Factor	**3.80**	
Peak Domestic Flow	**0.00**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Commercial floor space*	5	$L/m^2/d$	22,204	2.57
Hospitals	900	L/bed/d		0.00
Restaurant *** *(Existing Wendy's + Pizza Pizza)*	125	L/seat/d	71	0.10
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**2.67**
Peak Institutional / Commercial Flow	4.01
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**4.01**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*
*** Estimated number of seats at 1seat per $9.3m^2$

Total Estimated Average Dry Weather Flow Rate	**3.00**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**4.34**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.17**	**L/s**

2525 CARLING AVENUE - PHASE 1
Proposed Site Conditions
Buildings A and B

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 6.550 **ha**

Extraneous Flow Allowances

Infiltration / Inflow (Dry)	**0.33**	**L/s**
Infiltration / Inflow (Wet)	**1.83**	**L/s**
Infiltration / Inflow (Total)	**2.16**	**L/s**

Domestic Contributions

Unit Type	**Unit Rate**	**Units**	**Pop**
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**0**	
Average Domestic Flow	**0.00**	**L/s**
Peaking Factor	**3.80**	
Peak Domestic Flow	**0.00**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Commercial floor space*	5	$L/m^2/d$		0.00
Bldg A	5	$L/m^2/d$	3,137	0.18
Bldg B	5	$L/m^2/d$	1,590	0.09
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.27**
Peak Institutional / Commercial Flow	0.27
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.27**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**0.60**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.60**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**2.44**	**L/s**

SANITARY SEWER CALCULATION SHEET

CLIENT: **RIOCAN HOLDINGS INC.**
LOCATION: **2525 Carling Avenue**
FILE REF: **18-997**
DATE: **18-Nov-19**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280 L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8				Infiltration / Inflow	0.33 L/s/ha
Avg. Daily Flow Comm	50,000 L/ha/d	Peak Fact. Comm. If (Q_c/Q_{TOTAL}>20%)	1	Peak Fact. Comm.	1	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	28,000 L/ha/d	Peak Fact. Instit. If (Q_i/Q_{TOTAL}>20%)	1.5	Peak Fact. Instit.	1	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust	35,000 L/ha/d	Peak Fact. Indust. per MOE graph				Mannings N	0.013
		Correction Factor K	0.8				

Location			Residential Area and Population										Commercial		Institutional		Industrial		Infiltration				Pipe Data								
Area ID	Up	Down	Area (ha)	Number of Units by type: Singles	Semi's	Town's	Apt's**	Pop.	Cumulative Area (ha)	Cumulative Pop.	Peak. Fact. (-)	Q_{res} (L/s)	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Q_{C+I+I^*} (L/s)	Total Area (ha)	Accu. Area (ha)	Infiltration Flow (L/s)	Total Flow (L/s)	DIA (mm)	Slope (%)	Length (m)	$A_{hydraulic}$ (m^2)	R (m)	Velocity (m/s)	Q_{cap} (L/s)	Q / Q full (-)
BLDG A	MH100A	MH101A	0.000					0.0	0.0	0.0	3.80	0.00	0.31	0.31		0.00		0.00	0.18	6.550	6.550	2.162	2.34	250	0.75	44.4	0.049	0.063	1.05	51.5	0.05
BLDG B	MH101A	MH102A	0.000					0.0	0.000	0.0	3.80	0.00	0.16	0.47		0.00		0.00	0.27	0.000	6.550	2.162	2.44	250	0.75	79.8	0.049	0.063	1.05	51.5	0.05
	MH102A	MH103A	0.000					0.0	0.000	0.0	3.80	0.00		0.47		0.00		0.00	0.27	0.000	6.550	2.162	2.44	250	0.25	76.9	0.049	0.063	0.61	29.7	0.08
	MH103A	MH104A	0.000					0.0	0.000	0.0	3.80	0.00		0.47		0.00		0.00	0.27	0.000	6.550	2.162	2.44	250	0.25	26.3	0.049	0.063	0.61	29.7	0.08
	MH104A	MH105A	0.000					0.0	0.000	0.0	3.80	0.00		0.47		0.00		0.00	0.27	0.000	6.550	2.162	2.44	250	0.85	10.5	0.049	0.063	1.12	54.8	0.04

**Commercial peaking factor not applied since total commercial area is less than 20% of total contributing area per City of Ottawa Technical Memo ISTB-2018-01.*

APPENDIX D

Stormwater Management

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Existing Drainage Charateristics From EX-1

Area	0.4994	ha
C	0.20	Rational Method runoff coefficient
L	300	m
Up Elev	77.7	m
Dn Elev	71.99	m
Slope	1.9	%
Tc	10.0	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	21.3	28.9	61.9	L/s

Existing Drainage Charateristics From EX-2

Area	0.3840	ha
C	0.85	Rational Method runoff coefficient
L	300	m
Up Elev	77.7	m
Dn Elev	71.99	m
Slope	1.9	%
Tc	10.0	min

1) Time of Concentration per Federal Aviation Administrat

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	69.6	94.5	190.5	L/s

Existing Drainage Charateristics From EX-3

Area	5.6990	ha
C	0.85	Rational Method runoff coefficient
L	300	m
Up Elev	77.7	m
Dn Elev	71.99	m
Slope	1.9	%
Tc	10.0	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	1033.5	1402.0	2826.7	L/s

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

DSEL

Target Flow Rate

Area 4.965 ha
Q* 166.3 L/s
*Allowable release rate calculated at 33.5 L/s/ha per SWM Guidelines for Pinecrest Creek / Westboro Study Area

Note:
10mm of rainwater volume to be detained on-site as per Pinecrest Creek SWM Criteria.
Req. Vol. 496.5 m³

Estimated Post Development Peak Flow from Unattenuated Areas

Area ID U1
Total Area 0.039 ha
C 0.37 Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	4.2	4.2	0.0	0.0	178.6	8.9	8.9	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Building ID BLDG-A
Roof Area 0.444 ha
Avail Storage Area 0.422
C 0.90 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*
t_c 10 min, tc at outlet without restriction

Estimated Number of Roof Drains
Building Length
Building Width
Number of Drains 19
m^2 / Drain 222.0 max 232.25m^2/notch as recommended by Zurn for Ottawa

Roof Top Rating Curve per Zurn Model Z-105-5						
d (m)	A (m^2)	V_{acc} (m^3)	V_{avail} (m^3)	Q_{notch} (L/s)	Q_{roof} (L/s)	$V_{drawdown}$ (hr)
0.000	0	0.0	0.0	0.00	0.00	0.00
0.025	263.6	2.2	2.2	0.38	7.22	0.08
0.050	1054.5	15.4	17.6	0.77	14.63	0.38
0.075	2372.6	41.7	59.3	1.14	21.66	0.91
0.100	4218.0	81.3	140.6	1.52	28.88	1.69
0.125	4218.0	105.5	246.1	1.90	36.10	2.51
0.150	4218.0	105.5	351.5	2.28	43.32	3.18

* Assumes one notch opening per drain, assumes maximum slope of 10cm

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	115.7	22.4	93.2	55.9	178.6	220.2	29.6	190.6	114.4
15	83.6	92.7	22.4	70.3	63.3	142.9	176.2	29.6	146.6	131.9
20	70.3	78.0	22.4	55.6	66.7	120.0	147.9	29.6	118.3	142.0
25	60.9	67.6	22.4	45.2	67.8	103.8	128.1	29.6	98.4	147.7
30	53.9	59.9	22.4	37.4	67.4	91.9	113.3	29.6	83.7	150.6
35	48.5	53.9	22.4	31.4	66.0	82.6	101.8	29.6	72.2	151.6
40	44.2	49.0	22.4	26.6	63.9	75.1	92.7	29.6	63.0	151.3
45	40.6	45.1	22.4	22.7	61.3	69.1	85.2	29.6	55.5	149.9
50	37.7	41.8	22.4	19.4	58.2	64.0	78.9	29.6	49.2	147.7
55	35.1	39.0	22.4	16.6	54.7	59.6	73.5	29.6	43.9	144.9
60	32.9	36.6	22.4	14.2	51.0	55.9	68.9	29.6	39.3	141.5
65	31.0	34.5	22.4	12.0	47.0	52.6	64.9	29.6	35.3	137.6
70	29.4	32.6	22.4	10.2	42.8	49.8	61.4	29.6	31.8	133.4
75	27.9	31.0	22.4	8.5	38.5	47.3	58.3	29.6	28.6	128.9
80	26.6	29.5	22.4	7.1	33.9	45.0	55.5	29.6	25.9	124.1
85	25.4	28.2	22.4	5.7	29.3	43.0	53.0	29.6	23.3	119.0
90	24.3	27.0	22.4	4.5	24.6	41.1	50.7	29.6	21.1	113.8
95	23.3	25.9	22.4	3.5	19.7	39.4	48.6	29.6	19.0	108.3
100	22.4	24.9	22.4	2.5	14.8	37.9	46.7	29.6	17.1	102.7
105	21.6	24.0	22.4	1.5	9.7	36.5	45.0	29.6	15.4	96.9
110	20.8	23.1	22.4	0.7	4.6	35.2	43.4	29.6	13.8	90.9

5-year Q_{roof} **22.41 L/s** **100-year Q_{roof}** **29.64 L/s**
5-year Max. Storage Required **67.8 m^3** **100-year Max. Storage Required** **151.6 m^3**
5-year Storage Depth **0.078 m** **100-year Storage Depth** **0.103 m**
5-year Estimated Drawdown Time **0.99 hr** **00-year Estimated Drawdown Time** **1.78 hr**

Building ID BLDG-B
Roof Area 0.092 ha
Avail Storage Area 0.088
C 0.90 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*
t_c 10 min, tc at outlet without restriction

Estimated Number of Roof Drains
Building Length 31
Building Width 31
Number of Drains 4
m^2 / Drain 219.0 max 232.25m^2/notch as recommended by Zurn for Ottawa

Roof Top Rating Curve per Zurn Model Z-105-5						
d (m)	A (m^2)	V_{acc} (m^3)	V_{avail} (m^3)	Q_{notch} (L/s)	Q_{roof} (L/s)	$V_{drawdown}$ (hr)
0.000	0	0.0	0.0	0.00	0.00	0.00
0.025	54.7	0.5	0.5	0.38	1.52	0.08
0.050	219.0	3.2	3.6	0.77	3.08	0.37
0.075	492.7	8.7	12.3	1.14	4.56	0.90
0.100	875.9	16.9	29.2	1.52	6.08	1.67
0.125	875.9	21.9	51.1	1.90	7.60	2.47
0.150	875.9	21.9	73.0	2.28	9.12	3.14

* Assumes one notch opening per drain, assumes maximum slope of 10cm

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	24.0	4.7	19.3	11.6	178.6	45.7	6.2	39.5	23.7
15	83.6	19.3	4.7	14.5	13.1	142.9	36.6	6.2	30.4	27.3
20	70.3	16.2	4.7	11.5	13.8	120.0	30.7	6.2	24.5	29.4
25	60.9	14.0	4.7	9.3	14.0	103.8	26.6	6.2	20.4	30.6
30	53.9	12.4	4.7	7.7	13.9	91.9	23.5	6.2	17.3	31.1
35	48.5	11.2	4.7	6.5	13.6	82.6	21.1	6.2	14.9	31.3
40	44.2	10.2	4.7	5.5	13.1	75.1	19.2	6.2	13.0	31.2
45	40.6	9.4	4.7	4.7	12.6	69.1	17.7	6.2	11.5	30.9
50	37.7	8.7	4.7	4.0	11.9	64.0	16.4	6.2	10.2	30.5
55	35.1	8.1	4.7	3.4	11.2	59.6	15.3	6.2	9.0	29.8
60	32.9	7.6	4.7	2.9	10.4	55.9	14.3	6.2	8.1	29.1
65	31.0	7.2	4.7	2.4	9.5	52.6	13.5	6.2	7.3	28.3
70	29.4	6.8	4.7	2.1	8.7	49.8	12.8	6.2	6.5	27.4
75	27.9	6.4	4.7	1.7	7.7	47.3	12.1	6.2	5.9	26.4
80	26.6	6.1	4.7	1.4	6.8	45.0	11.5	6.2	5.3	25.4
85	25.4	5.8	4.7	1.1	5.8	43.0	11.0	6.2	4.8	24.3
90	24.3	5.6	4.7	0.9	4.8	41.1	10.5	6.2	4.3	23.2
95	23.3	5.4	4.7	0.7	3.8	39.4	10.1	6.2	3.9	22.1
100	22.4	5.2	4.7	0.5	2.7	37.9	9.7	6.2	3.5	20.9
105	21.6	5.0	4.7	0.3	1.7	36.5	9.3	6.2	3.1	19.6
110	20.8	4.8	4.7	0.1	0.6	35.2	9.0	6.2	2.8	18.4

5-year Q_{roof}	**4.71 L/s**	**100-year Q_{roof}**	**6.23 L/s**
5-year Max. Storage Required	**14.0 m^3**	**100-year Max. Storage Required**	**31.3 m^3**
5-year Storage Depth	**0.077 m**	**100-year Storage Depth**	**0.102 m**
5-year Estimated Drawdown Time	**0.98 hr**	**00-year Estimated Drawdown Time**	**1.75 hr**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A118, A119
Available Sub-surface Storage
Maintenance Structures

ID	CBMH 118	CBMH 119	CB 118A	CB 119A
Structure Dia./Area (mm/mm^2)	1200	1200	360	360
T/L*	73.85	73.85	73.85	73.85
INV	71.82	71.48	72.35	72.35
Depth	2.03	2.37	1.50	1.50
$V_{structure}$ (m^3)	2.3	2.7	0.2	0.2

Sewers

ID	250mm	375mm		U/G STORG.
Storage Pipe Dia (mm)	250	375		
L (m)	39.5	38		
V_{sewer} (m^3)	1.9	4.2		143.0

*Top of lid or max ponding elevation = 74.15

Total Subsurface Storage (m^3) 154.5

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	71.48		0.00			0.0	0.0	0.00
Storage Pipe INV	72.64		1.16	1.16	1.3	1.3	10.8	0.03
Storage Pipe SL	72.85		1.37	0.21	71.7	73.0	11.6	1.75
Storage Pipe OBV	73.05		1.57	0.20	71.7	144.8	12.2	3.30
T/L	73.85	1	2.37	0.80	9.7	154.5	15.0	2.86
0.15m Ponding	74.00	880	2.52	0.15	45.9	200.4	15.6	3.57
0.30m Ponding	74.15	3124	2.67	0.15	283.1	483.5	16.0	8.39

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **CBMH 119 TEMPEST LMF 105**
Total Area 0.693 ha
C 0.88 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	176.5	13.4	163.1	97.9	178.6	343.7	13.4	330.3	198.2
20	70.3	119.0	13.4	105.6	126.7	120.0	230.9	13.4	217.5	261.0
30	53.9	91.4	13.4	78.0	140.3	91.9	176.8	13.4	163.4	294.2
40	44.2	74.8	13.4	61.4	147.5	75.1	144.7	13.4	131.3	315.0
50	37.7	63.8	13.4	50.4	151.2	64.0	123.1	13.4	109.7	329.1
60	32.9	55.8	13.4	42.4	152.7	55.9	107.6	13.4	94.2	339.1
70	29.4	49.8	13.4	36.4	152.7	49.8	95.8	13.4	82.4	346.3
80	26.6	45.0	13.4	31.6	151.7	45.0	86.6	13.4	73.2	351.4
90	24.3	41.1	13.4	27.7	149.8	41.1	79.1	13.4	65.7	355.0
100	22.4	38.0	13.4	24.6	147.3	37.9	73.0	13.4	59.6	357.4
110	20.8	35.3	13.4	21.9	144.4	35.2	67.8	13.4	54.4	358.8
120	19.5	33.0	13.4	19.6	141.0	32.9	63.3	13.4	49.9	359.4
130	18.3	31.0	13.4	17.6	137.2	30.9	59.5	13.4	46.1	359.4
140	17.3	29.3	13.4	15.9	133.2	29.2	56.1	13.4	42.7	358.8
150	16.4	27.7	13.4	14.3	128.9	27.6	53.2	13.4	39.8	357.8
160	15.6	26.4	13.4	13.0	124.3	26.2	50.5	13.4	37.1	356.3
170	14.8	25.1	13.4	11.7	119.6	25.0	48.1	13.4	34.7	354.4
180	14.2	24.0	13.4	10.6	114.7	23.9	46.0	13.4	32.6	352.2
190	13.6	23.0	13.4	9.6	109.7	22.9	44.1	13.4	30.7	349.7
200	13.0	22.1	13.4	8.7	104.5	22.0	42.3	13.4	28.9	347.0
210	12.6	21.3	13.4	7.9	99.1	21.1	40.7	13.4	27.3	344.0
220	12.1	20.5	13.4	7.1	93.7	20.4	39.2	13.4	25.8	340.8
230	11.7	19.8	13.4	6.4	88.2	19.7	37.9	13.4	24.5	337.4
240	11.3	19.1	13.4	5.7	82.6	19.0	36.6	13.4	23.2	333.9

5-year $Q_{attenuated}$	**14.48 L/s**	**100-year $Q_{attenuated}$**	**15.82 L/s**
5-year Max. Storage Required	**152.7 m^3**	**100-year Max. Storage Required**	**359.4 m^3**
Est. 5-year Storage Elevation	**73.70 m**	**Est. 100-year Storage Elevation**	**74.08 m**

Area ID A120
Available Sub-surface Storage
Maintenance Structures

ID		MH 120	CB 120A		
Structure Dia./Area (mm/mm^2)		1200	360		
T/L*		74.29	73.95		
INV		71.97	72.45		
Depth		2.32	1.50		
$V_{structure}$ (m^3)		2.6	0.2		

Sewers

ID	250mm			U/G STORG.*
Storage Pipe Dia (mm)	250			
L (m)	17.7			
V_{sewer} (m^3)	0.9			49.0
	*Top of lid or max ponding elevation =			74.25

Total Subsurface Storage (m^3) 52.7

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	71.97		0.00			0.0	0.0	0.00
Storage Pipe INV	72.09		0.12	0.12	0.1	0.1	0.4	1.00
Storage Pipe SL	72.66		0.69	0.57	25.1	25.3	1.0	7.02
Storage Pipe OBV	73.23		1.26	0.57	25.1	50.4	1.2	11.67
T/L	73.95	1	1.98	0.72	2.3	52.7	2.6	5.63
0.15m Ponding	74.10	228	2.13	0.15	12.2	64.9	2.7	6.68
0.30m Ponding	74.25	930.0	2.28	0.15	80.9	145.8	2.8	14.47

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **MH 120 TEMPEST LMF 45**
Total Area 0.212 ha
C 0.82 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	50.3	1.6	48.7	29.2	178.6	105.2	1.6	103.6	62.1
35	48.5	23.4	1.6	21.8	45.8	82.6	48.6	1.6	47.0	98.8
60	32.9	15.9	1.6	14.3	51.5	55.9	32.9	1.6	31.3	112.7
85	25.4	12.3	1.6	10.7	54.3	43.0	25.3	1.6	23.7	120.8
110	20.8	10.1	1.6	8.5	55.8	35.2	20.7	1.6	19.1	126.3
135	17.8	8.6	1.6	7.0	56.5	30.0	17.7	1.6	16.1	130.1
160	15.6	7.5	1.6	5.9	56.8	26.2	15.5	1.6	13.9	133.0
185	13.9	6.7	1.6	5.1	56.6	23.4	13.8	1.6	12.2	135.1
210	12.6	6.1	1.6	4.5	56.2	21.1	12.5	1.6	10.9	136.7
235	11.5	5.5	1.6	3.9	55.6	19.3	11.4	1.6	9.8	137.9
260	10.6	5.1	1.6	3.5	54.9	17.8	10.5	1.6	8.9	138.8
285	9.9	4.8	1.6	3.2	54.0	16.6	9.8	1.6	8.2	139.4
310	9.2	4.4	1.6	2.8	53.0	15.5	9.1	1.6	7.5	139.8
335	8.7	4.2	1.6	2.6	51.9	14.5	8.6	1.6	7.0	140.0
360	8.2	3.9	1.6	2.3	50.7	13.7	8.1	1.6	6.5	140.0
385	7.7	3.7	1.6	2.1	49.4	13.0	7.7	1.6	6.1	139.9
410	7.4	3.6	1.6	2.0	48.1	12.4	7.3	1.6	5.7	139.6
435	7.0	3.4	1.6	1.8	46.8	11.8	6.9	1.6	5.3	139.2
460	6.7	3.2	1.6	1.6	45.3	11.3	6.6	1.6	5.0	138.8
485	6.4	3.1	1.6	1.5	43.9	10.8	6.4	1.6	4.8	138.2
510	6.2	3.0	1.6	1.4	42.4	10.4	6.1	1.6	4.5	137.6
535	5.9	2.9	1.6	1.3	40.8	10.0	5.9	1.6	4.3	136.9
560	5.7	2.8	1.6	1.2	39.2	9.6	5.7	1.6	4.1	136.1
585	5.5	2.7	1.6	1.1	37.6	9.3	5.5	1.6	3.9	135.3
610	5.4	2.6	1.6	1.0	36.0	9.0	5.3	1.6	3.7	134.4

5-year $Q_{attenuated}$	**2.63 L/s**	**100-year $Q_{attenuated}$**	**2.79 L/s**
5-year Max. Storage Required	**56.8 m^3**	**100-year Max. Storage Required**	**140.0 m^3**
Est. 5-year Storage Elevation	**74.00 m**	**Est. 100-year Storage Elevation**	**74.24 m**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A100
Available Sub-surface Storage
Maintenance Structures

ID	MH 100	MH 101	CB 100A	CB 100B	
Structure Dia./Area (mm/mm^2)	1200	1200	720	720	
T/L*	74.13	74.05	74.00	74.00	
INV	71.95	71.50	72.50	72.50	
Depth	2.18	2.55	1.50	1.50	
$V_{structure}$ (m^3)	2.5	2.9	0.8	0.8	

Sewers

ID	250mm	375mm		U/G STORG.*
Storage Pipe Dia (mm)	250	375		
L (m)	50	44		
V_{sewer} (m^3)	2.5	4.9		0.0

*Top of lid or max ponding elevation = 74.35

Total Subsurface Storage (m^3) 14.2

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	71.50		0.00			0.0	0.0	0.00
Storage Pipe SL	71.61		0.11	0.11	0.1	0.1	0.5	0.07
Storage Pipe OBV	71.73		0.23	0.12	0.1	0.3	0.8	0.09
T/L	74.00	2	2.50	2.27	14.0	14.2	2.1	1.88
0.15m Ponding	74.15	206	2.65	0.15	11.4	25.6	2.2	3.23
0.30m Ponding	74.30	799.0	2.80	0.15	70.5	96.1	2.2	12.13
0.35m Ponding	74.35	1057.0	2.85	0.05	46.2	142.4	2.2	17.97

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **MH 101 TEMPEST LMF 45**
Total Area 0.321 ha
C 0.25 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	23.2	2.1	21.1	12.7	178.6	49.8	2.2	47.6	28.5
25	60.9	13.6	2.1	11.4	17.2	103.8	28.9	2.2	26.7	40.1
40	44.2	9.8	2.1	7.7	18.5	75.1	20.9	2.2	18.7	45.0
55	35.1	7.8	2.1	5.7	18.8	59.6	16.6	2.2	14.4	47.6
70	29.4	6.5	2.1	4.4	18.5	49.8	13.9	2.2	11.7	49.0
85	25.4	5.7	2.1	3.5	17.9	43.0	12.0	2.2	9.8	49.8
100	22.4	5.0	2.1	2.9	17.1	37.9	10.6	2.2	8.4	50.2
115	20.1	4.5	2.1	2.3	16.2	34.0	9.5	2.2	7.3	50.2
130	18.3	4.1	2.1	1.9	15.1	30.9	8.6	2.2	6.4	50.0
145	16.8	3.7	2.1	1.6	14.0	28.4	7.9	2.2	5.7	49.6
160	15.6	3.5	2.1	1.3	12.7	26.2	7.3	2.2	5.1	49.1
175	14.5	3.2	2.1	1.1	11.5	24.4	6.8	2.2	4.6	48.4
190	13.6	3.0	2.1	0.9	10.1	22.9	6.4	2.2	4.2	47.7
205	12.8	2.9	2.1	0.7	8.8	21.6	6.0	2.2	3.8	46.8
220	12.1	2.7	2.1	0.6	7.4	20.4	5.7	2.2	3.5	45.9
235	11.5	2.6	2.1	0.4	5.9	19.3	5.4	2.2	3.2	44.9
250	10.9	2.4	2.1	0.3	4.5	18.4	5.1	2.2	2.9	43.9
265	10.4	2.3	2.1	0.2	3.0	17.6	4.9	2.2	2.7	42.8
280	10.0	2.2	2.1	0.1	1.5	16.8	4.7	2.2	2.5	41.7
295	9.6	2.1	2.1	0.0	0.0	16.1	4.5	2.2	2.3	40.5
310	9.2	2.1	2.1	0.0	0.0	15.5	4.3	2.2	2.1	39.3

5-year $Q_{attenuated}$	**2.14 L/s**	**100-year $Q_{attenuated}$**	**2.20 L/s**
5-year Max. Storage Required	**18.8 m^3**	**100-year Max. Storage Required**	**50.2 m^3**
Est. 5-year Storage Elevation	**74.06 m**	**Est. 100-year Storage Elevation**	**74.20 m**

Area ID A109+A110
Available Sub-surface Storage
Maintenance Structures

ID	MH 109	MH 110	CB 109A	CB 109B	CB 109C	CB 110A	CB 110B
Structure Dia./Area (mm/mm^2)	1200	1200	360	360	360	360	360
T/L*	73.25	73.21	73.05	73.05	73.05	73.20	73.20
INV	71.26	70.78	71.55	71.55	71.55	71.70	71.70
Depth	1.99	2.43	1.50	1.50	1.50	1.50	1.50
$V_{structure}$ (m^3)	2.3	2.7	0.2	0.2	0.2	0.2	0.2

Sewers

ID	250mm	375mm		U/G STORAGE*
Storage Pipe Dia (mm)	250	375		
L (m)	28.5	47.15		
V_{sewer} (m^3)	1.4	5.2		200.0

*Top of lid or max ponding elevation = 73.35

Total Subsurface Storage (m^3) 212.6

Stage Attenuated Areas Storage Summary

	Stage	Surface Storage			Surface and Subsurface Storage			
	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	70.78		0.00			0.0	0.0	0.00
Storage Pipe INV	70.94		0.16	0.16	0.2	0.2	4.8	0.01
Storage Pipe SL	71.32		0.54	0.38	100.4	100.6	8.8	3.19
Storage Pipe OBV	71.70		0.92	0.38	100.4	201.0	11.4	4.88
T/L	73.05	0	2.27	1.35	11.5	212.6	18.0	3.28
0.15m Ponding	73.20	192	2.42	0.15	10.0	222.6	18.6	3.33
0.18m Ponding	73.23	269	2.45	0.03	6.9	229.5	18.7	3.41
0.30m Ponding	73.35	956.0	2.57	0.15	86.6	316.1	19.1	4.59

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **MH 110** **Dia.** 75
Total Area 0.849 ha
C 0.57 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	140.1	9.5	130.6	78.4	178.6	300.0	12.0	288.1	172.8
20	70.3	94.4	9.5	85.0	102.0	120.0	201.6	12.0	189.6	227.5
30	53.9	72.5	9.5	63.0	113.5	91.9	154.4	12.0	142.4	256.3
40	44.2	59.4	9.5	49.9	119.9	75.1	126.3	12.0	114.3	274.3
50	37.7	50.6	9.5	41.2	123.5	64.0	107.5	12.0	95.5	286.5
60	32.9	44.3	9.5	34.8	125.4	55.9	93.9	12.0	82.0	295.1
70	29.4	39.5	9.5	30.0	126.1	49.8	83.7	12.0	71.7	301.2
80	26.6	35.7	9.5	26.3	126.0	45.0	75.6	12.0	63.6	305.5
90	24.3	32.6	9.5	23.2	125.3	41.1	69.1	12.0	57.1	308.5
100	22.4	30.1	9.5	20.7	124.0	37.9	63.7	12.0	51.7	310.4
110	20.8	28.0	9.5	18.5	122.4	35.2	59.2	12.0	47.2	311.5
120	19.5	26.2	9.5	16.7	120.4	32.9	55.3	12.0	43.3	311.9
130	18.3	24.6	9.5	15.1	118.1	30.9	51.9	12.0	40.0	311.7
140	17.3	23.2	9.5	13.8	115.6	29.2	49.0	12.0	37.0	311.0
150	16.4	22.0	9.5	12.5	112.9	27.6	46.4	12.0	34.4	310.0
160	15.6	20.9	9.5	11.5	110.0	26.2	44.1	12.0	32.1	308.5
170	14.8	19.9	9.5	10.5	107.0	25.0	42.0	12.0	30.1	306.7
180	14.2	19.1	9.5	9.6	103.8	23.9	40.2	12.0	28.2	304.6
190	13.6	18.3	9.5	8.8	100.5	22.9	38.5	12.0	26.5	302.3
200	13.0	17.5	9.5	8.1	97.1	22.0	36.9	12.0	25.0	299.8
210	12.6	16.9	9.5	7.4	93.6	21.1	35.5	12.0	23.6	297.0

5-year $Q_{attenuated}$ **9.45 L/s**
5-year Max. Storage Required **126.1 m^3**
Est. 5-year Storage Elevation **71.42 m**

100-year $Q_{attenuated}$ **19.11 L/s**
100-year Max. Storage Required **311.9 m^3**
Est. 100-year Storage Elevation **73.34 m**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A122
Available Sub-surface Storage
Maintenance Structures

ID	CBMH 122	DCB 122A	DCB 122B
Structure Dia./Area (mm/mm^2)	1200	720	720
T/L*	71.70	71.70	71.70
INV	69.77	70.20	70.20
Depth	1.93	1.50	1.50
$V_{structure}$ (m^3)	2.2	0.8	0.8

Sewers

ID	250mm			U/G STORG.*
Storage Pipe Dia (mm)	250			
L (m)	69.6			
V_{sewer} (m^3)	3.4			202.0

*Top of lid or max ponding elevation = 72.00

Total Subsurface Storage (m^3) 209.2

Stage Attenuated Areas Storage Summary

	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
		Surface Storage			Surface and Subsurface Storage			
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	69.91		0.00		0.0	0.0	0.0	0.00
Storage Pipe INV	70.49		0.58	0.58	0.7	0.7	10.9	0.02
Storage Pipe SL	70.70		0.78	0.20	101.2	101.9	12.6	2.24
Storage Pipe OBV	70.90		0.99	0.21	101.2	203.2	14.2	3.97
T/L	71.70	2	1.79	0.80	6.0	209.2	19.1	3.04
0.15m Ponding	71.85	1,367	1.94	0.15	70.9	280.1	19.9	3.91
0.30m Ponding	72.00	3333	2.09	0.15	341.8	621.8	20.6	8.37

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **CBMH 122** **DIA** 82
Total Area 1.072 ha
C 0.87 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

t_c	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}
	5-year					100-year				
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	269.9	15.7	254.2	152.5	178.6	531.7	15.7	516.0	309.6
25	60.9	157.8	15.7	142.0	213.0	103.8	309.2	15.7	293.5	440.2
40	44.2	114.5	15.7	98.7	236.9	75.1	223.8	15.7	208.0	499.2
55	35.1	91.0	15.7	75.2	248.3	59.6	177.5	15.7	161.8	533.9
70	29.4	76.1	15.7	60.3	253.4	49.8	148.3	15.7	132.5	556.6
85	25.4	65.7	15.7	50.0	254.9	43.0	127.9	15.7	112.2	572.0
100	22.4	58.0	15.7	42.3	253.8	37.9	112.9	15.7	97.1	582.7
115	20.1	52.1	15.7	36.4	251.0	34.0	101.3	15.7	85.5	590.0
130	18.3	47.4	15.7	31.6	246.8	30.9	92.0	15.7	76.3	594.8
145	16.8	43.5	15.7	27.8	241.7	28.4	84.4	15.7	68.7	597.7
160	15.6	40.3	15.7	24.6	235.7	26.2	78.1	15.7	62.4	598.9
175	14.5	37.6	15.7	21.8	229.0	24.4	72.8	15.7	57.0	598.9
190	13.6	35.2	15.7	19.5	221.8	22.9	68.2	15.7	52.4	597.8
205	12.8	33.2	15.7	17.4	214.1	21.6	64.2	15.7	48.4	595.8
220	12.1	31.4	15.7	15.6	206.0	20.4	60.7	15.7	44.9	593.0
235	11.5	29.8	15.7	14.0	197.5	19.3	57.6	15.7	41.8	589.5
250	10.9	28.3	15.7	12.6	188.7	18.4	54.8	15.7	39.0	585.4
265	10.4	27.0	15.7	11.3	179.6	17.6	52.3	15.7	36.5	580.8
280	10.0	25.9	15.7	10.1	170.3	16.8	50.0	15.7	34.3	575.7
295	9.6	24.8	15.7	9.1	160.7	16.1	48.0	15.7	32.2	570.2
310	9.2	23.9	15.7	8.1	151.0	15.5	46.1	15.7	30.3	564.4

5-year $Q_{attenuated}$ **19.60 L/s** **100-year $Q_{attenuated}$** **20.58 L/s**
5-year Max. Storage Required **254.9 m^3** **100-year Max. Storage Required** **598.9 m^3**
Est. 5-year Storage Elevation **71.80 m** **Est. 100-year Storage Elevation** **71.99 m**

Area ID A123
Available Sub-surface Storage
Maintenance Structures

ID	CB 123A				
Structure Dia./Area (mm/mm^2)	360				
T/L*	71.95				
INV	70.45				
Depth	1.50				
$V_{structure}$ (m^3)	0.2				

Sewers

ID	250mm			
Storage Pipe Dia (mm)	250			
L (m)	2			
V_{sewer} (m^3)	0.1			

*Top of lid or max ponding elevation = 72.20

Total Subsurface Storage (m^3) 0.3

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	70.64		0.00	7		0.0	0.0	0.00
T/L	72.05	0	1.41	1.41	0.3	0.3	2.8	0.03
0.20m Ponding	72.25	89.0	1.61	0.20	6.3	6.6	2.9	0.63

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CB123A TEMPEST LMF 60**
Total Area 0.094 ha
C 0.20 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	5.4	2.8	2.6	1.6	178.6	11.7	2.9	8.8	5.3
15	83.6	4.4	2.8	1.5	1.4	142.9	9.3	2.9	6.4	5.8
20	70.3	3.7	2.8	0.8	1.0	120.0	7.8	2.9	4.9	5.9
25	60.9	3.2	2.8	0.4	0.5	103.8	6.8	2.9	3.9	5.8
30	53.9	2.8	2.8	0.0	0.0	91.9	6.0	2.9	3.1	5.6
35	48.5	2.5	2.5	0.0	0.0	82.6	5.4	2.9	2.5	5.3
40	44.2	2.3	2.3	0.0	0.0	75.1	4.9	2.9	2.0	4.8
45	40.6	2.1	2.1	0.0	0.0	69.1	4.5	2.9	1.6	4.4
50	37.7	2.0	2.0	0.0	0.0	64.0	4.2	2.9	1.3	3.9
55	35.1	1.8	1.8	0.0	0.0	59.6	3.9	2.9	1.0	3.3
60	32.9	1.7	1.7	0.0	0.0	55.9	3.6	2.9	0.8	2.7
65	31.0	1.6	1.6	0.0	0.0	52.6	3.4	2.9	0.5	2.1
70	29.4	1.5	1.5	0.0	0.0	49.8	3.3	2.9	0.4	1.5
75	27.9	1.5	1.5	0.0	0.0	47.3	3.1	2.9	0.2	0.9
80	26.6	1.4	1.4	0.0	0.0	45.0	2.9	2.9	0.0	0.2
85	25.4	1.3	1.3	0.0	0.0	43.0	2.8	2.9	0.0	0.0
90	24.3	1.3	1.3	0.0	0.0	41.1	2.7	2.9	0.0	0.0
95	23.3	1.2	1.2	0.0	0.0	39.4	2.6	2.9	0.0	0.0
100	22.4	1.2	1.2	0.0	0.0	37.9	2.5	2.9	0.0	0.0
105	21.6	1.1	1.1	0.0	0.0	36.5	2.4	2.9	0.0	0.0
110	20.8	1.1	1.1	0.0	0.0	35.2	2.3	2.9	0.0	0.0

5-year $Q_{attenuated}$	**2.82 L/s**	**100-year $Q_{attenuated}$**	**2.89 L/s**
5-year Max. Storage Required	**1.6 m^3**	**100-year Max. Storage Required**	**5.9 m^3**
Est. 5-year Storage Elevation	**72.09 m**	**Est. 100-year Storage Elevation**	**72.23 m**

Area ID A103-A
Available Sub-surface Storage
Maintenance Structures

ID	**CB 103A**				
Structure Dia./Area (mm/mm^2)	360				
T/L*	74.50				
INV	73.00				
Depth	1.50				
$V_{structure}$ (m^3)	0.2				

Sewers

ID				
Storage Pipe Dia (mm)				
L (m)				
V_{sewer} (m^3)				0.0

*Top of lid or max ponding elevation = 74.55

Total Subsurface Storage (m^3) 0.2

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m^2)**	**(m)**	**(m)**	**(m^3)**	**(m^3)**	**(L/s)**	**(hr)**
Orifice INV	73.00		0.00			0.0	0.0	0.00
T/L	74.50	0	1.50	1.50	0.2	0.2	14.6	0.00
0.05m Ponding	74.55	17.6	1.55	0.05	0.3	0.5	14.9	0.01

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per Orifice Equation

Orifice Location **CB 103A** **Dia** 75
Total Area 0.025 ha
C 0.83 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	**i (mm/hr)**	**Q_{actual}‡ (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**	**i (mm/hr)**	**Q_{actual}‡ (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**
10	104.2	6.0	5.9	0.1	0.1	178.6	12.4	12.1	0.3	0.2
15	83.6	4.8	4.8	0.0	0.0	142.9	9.9	9.9	0.0	0.0
20	70.3	4.0	4.0	0.0	0.0	120.0	8.3	9.9	0.0	0.0
25	60.9	3.5	3.5	0.0	0.0	103.8	7.2	9.9	0.0	0.0
30	53.9	3.1	3.1	0.0	0.0	91.9	6.4	9.9	0.0	0.0
35	48.5	2.8	2.8	0.0	0.0	82.6	5.7	9.9	0.0	0.0
40	44.2	2.5	2.5	0.0	0.0	75.1	5.2	9.9	0.0	0.0
45	40.6	2.3	2.3	0.0	0.0	69.1	4.8	9.9	0.0	0.0
50	37.7	2.2	2.2	0.0	0.0	64.0	4.4	9.9	0.0	0.0
55	35.1	2.0	2.0	0.0	0.0	59.6	4.1	9.9	0.0	0.0
60	32.9	1.9	1.9	0.0	0.0	55.9	3.9	9.9	0.0	0.0
65	31.0	1.8	1.8	0.0	0.0	52.6	3.7	9.9	0.0	0.0
70	29.4	1.7	1.7	0.0	0.0	49.8	3.5	9.9	0.0	0.0
75	27.9	1.6	1.6	0.0	0.0	47.3	3.3	9.9	0.0	0.0
80	26.6	1.5	1.5	0.0	0.0	45.0	3.1	9.9	0.0	0.0
85	25.4	1.5	1.5	0.0	0.0	43.0	3.0	9.9	0.0	0.0
90	24.3	1.4	1.4	0.0	0.0	41.1	2.9	9.9	0.0	0.0
95	23.3	1.3	1.3	0.0	0.0	39.4	2.7	9.9	0.0	0.0
100	22.4	1.3	1.3	0.0	0.0	37.9	2.6	9.9	0.0	0.0
105	21.6	1.2	1.2	0.0	0.0	36.5	2.5	9.9	0.0	0.0
110	20.8	1.2	1.2	0.0	0.0	35.2	2.4	9.9	0.0	0.0

5-year $Q_{attenuated}$	**5.88 L/s**	**100-year $Q_{attenuated}$**	**12.13 L/s**
5-year Max. Storage Required	**0.1 m^3**	**100-year Max. Storage Required**	**0.2 m^3**
Est. 5-year Storage Elevation	**73.60 m**	**Est. 100-year Storage Elevation**	**74.24 m**

Area ID A103-B
Available Sub-surface Storage
Maintenance Structures

ID	CB 103B				
Structure Dia./Area (mm/mm^2)	360				
T/L*	74.40				
INV	72.90				
Depth	1.50				
$V_{structure}$ (m^3)	0.2				

Sewers

ID				
Storage Pipe Dia (mm)				
L (m)				
V_{sewer} (m^3)				

*Top of lid or max ponding elevation = 74.55

Total Subsurface Storage (m^3) 0.2

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	72.85		0.00			0.0	0.0	0.00
T/L	74.40	0	1.55	1.55	0.2	0.2	11.1	0.00
0.15m Ponding	74.55	55.5	1.70	0.15	3.0	3.2	12.0	0.07

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CB 103B TEMPEST LMF 100**
Total Area 0.039 ha
C 0.69 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	7.8	7.6	0.2	0.1	178.6	16.7	11.9	4.8	2.9
15	83.6	6.2	6.2	0.0	0.0	142.9	13.4	11.9	1.5	1.3
20	70.3	5.3	5.3	0.0	0.0	120.0	11.2	11.9	0.0	0.0
25	60.9	4.6	4.6	0.0	0.0	103.8	9.7	11.9	0.0	0.0
30	53.9	4.0	4.0	0.0	0.0	91.9	8.6	11.9	0.0	0.0
35	48.5	3.6	3.6	0.0	0.0	82.6	7.7	11.9	0.0	0.0
40	44.2	3.3	3.3	0.0	0.0	75.1	7.0	11.9	0.0	0.0
45	40.6	3.0	3.0	0.0	0.0	69.1	6.5	11.9	0.0	0.0
50	37.7	2.8	2.8	0.0	0.0	64.0	6.0	11.9	0.0	0.0
55	35.1	2.6	2.6	0.0	0.0	59.6	5.6	11.9	0.0	0.0
60	32.9	2.5	2.5	0.0	0.0	55.9	5.2	11.9	0.0	0.0
65	31.0	2.3	2.3	0.0	0.0	52.6	4.9	11.9	0.0	0.0
70	29.4	2.2	2.2	0.0	0.0	49.8	4.7	11.9	0.0	0.0
75	27.9	2.1	2.1	0.0	0.0	47.3	4.4	11.9	0.0	0.0
80	26.6	2.0	2.0	0.0	0.0	45.0	4.2	11.9	0.0	0.0
85	25.4	1.9	1.9	0.0	0.0	43.0	4.0	11.9	0.0	0.0
90	24.3	1.8	1.8	0.0	0.0	41.1	3.8	11.9	0.0	0.0
95	23.3	1.7	1.7	0.0	0.0	39.4	3.7	11.9	0.0	0.0
100	22.4	1.7	1.7	0.0	0.0	37.9	3.5	11.9	0.0	0.0
105	21.6	1.6	1.6	0.0	0.0	36.5	3.4	11.9	0.0	0.0
110	20.8	1.6	1.6	0.0	0.0	35.2	3.3	11.9	0.0	0.0

5-year $Q_{attenuated}$	**7.57 L/s**	**100-year $Q_{attenuated}$**	**11.90 L/s**
5-year Max. Storage Required	**0.1 m^3**	**100-year Max. Storage Required**	**2.9 m^3**
Est. 5-year Storage Elevation	**73.91 m**	**Est. 100-year Storage Elevation**	**74.53 m**

Area ID A103-C
Available Sub-surface Storage
Maintenance Structures

ID	CB 103C				
Structure Dia./Area (mm/mm²)	360				
T/L*	74.00				
INV	72.50				
Depth	1.50				
$V_{structure}$ (m³)	0.2				

Sewers

ID				
Storage Pipe Dia (mm)				
L (m)				
V_{sewer} (m³)				

*Top of lid or max ponding elevation = 74.42

Total Subsurface Storage (m³) 0.2

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m²)**	**(m)**	**(m)**	**(m³)**	**(m³)**	**(L/s)**	**(hr)**
Orifice INV	72.50		0.00			0.0	0.0	0.00
T/L	74.00	0	1.50	1.50	0.2	0.2	4.6	0.01
0.15m Ponding	74.15	76	1.65	0.15	4.1	4.2	4.8	0.25
0.30m Ponding	74.30	245.0	1.80	0.15	22.8	27.1	5.0	1.50

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CB 103C TEMPEST LMF 65**
Total Area 0.083 ha
C 0.68 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**
(min)	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m³)**	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m³)**
10	104.2	16.3	4.8	11.5	6.9	178.6	35.0	5.0	30.0	18.0
15	83.6	13.1	4.8	8.3	7.5	142.9	28.0	5.0	23.0	20.7
20	70.3	11.0	4.8	6.2	7.4	120.0	23.5	5.0	18.5	22.2
25	60.9	9.5	4.8	4.7	7.1	103.8	20.4	5.0	15.4	23.1
30	53.9	8.5	4.8	3.6	6.5	91.9	18.0	5.0	13.0	23.5
35	48.5	7.6	4.8	2.8	5.9	82.6	16.2	5.0	11.2	23.5
40	44.2	6.9	4.8	2.1	5.1	75.1	14.7	5.0	9.8	23.4
45	40.6	6.4	4.8	1.5	4.2	69.1	13.5	5.0	8.6	23.1
50	37.7	5.9	4.8	1.1	3.2	64.0	12.5	5.0	7.6	22.7
55	35.1	5.5	4.8	0.7	2.3	59.6	11.7	5.0	6.7	22.2
60	32.9	5.2	4.8	0.3	1.2	55.9	11.0	5.0	6.0	21.5
65	31.0	4.9	4.8	0.0	0.2	52.6	10.3	5.0	5.3	20.9
70	29.4	4.6	4.6	0.0	0.0	49.8	9.8	5.0	4.8	20.1
75	27.9	4.4	4.4	0.0	0.0	47.3	9.3	5.0	4.3	19.3
80	26.6	4.2	4.2	0.0	0.0	45.0	8.8	5.0	3.8	18.5
85	25.4	4.0	4.0	0.0	0.0	43.0	8.4	5.0	3.4	17.6
90	24.3	3.8	3.8	0.0	0.0	41.1	8.1	5.0	3.1	16.7
95	23.3	3.7	3.7	0.0	0.0	39.4	7.7	5.0	2.8	15.7
100	22.4	3.5	3.5	0.0	0.0	37.9	7.4	5.0	2.5	14.8
105	21.6	3.4	3.4	0.0	0.0	36.5	7.2	5.0	2.2	13.8
110	20.8	3.3	3.3	0.0	0.0	35.2	6.9	5.0	1.9	12.7

5-year $Q_{attenuated}$	**4.83 L/s**	**100-year $Q_{attenuated}$**	**4.97 L/s**
5-year Max. Storage Required	**7.5 m³**	**100-year Max. Storage Required**	**23.5 m³**
Est. 5-year Storage Elevation	**74.17 m**	**Est. 100-year Storage Elevation**	**74.28 m**

Area ID A103-D
Available Sub-surface Storage
Maintenance Structures

ID	**CB103D**				
Structure Dia./Area (mm/mm²)	360				
T/L*	74.00				
INV	72.50				
Depth	1.50				
$V_{structure}$ (m³)	0.2				

Sewers

ID				
Storage Pipe Dia (mm)				
L (m)				
V_{sewer} (m³)				0.0

*Top of lid or max ponding elevation = 74.42

Total Subsurface Storage (m³) 0.2

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m²)**	**(m)**	**(m)**	**(m³)**	**(m³)**	**(L/s)**	**(hr)**
Orifice INV	72.50		0.00			0.0	0.0	0.00
T/L	74.00	0	1.50	1.50	0.2	0.2	8.9	0.01
0.15m Ponding	74.15	53	1.65	0.15	2.9	3.1	9.3	0.09
0.30m Ponding	74.30	150.0	1.80	0.15	14.6	17.7	9.6	0.51

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CB 103D TEMPEST LMF 90**
Total Area 0.067 ha
C 0.72 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**
(min)	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m³)**	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m³)**
10	104.2	16.3	9.3	7.0	4.2	178.6	35.0	9.6	25.4	15.2
15	83.6	13.1	9.3	3.8	3.4	142.9	28.0	9.6	18.4	16.6
20	70.3	11.0	9.3	1.7	2.0	120.0	23.5	9.6	13.9	16.7
25	60.9	9.5	9.3	0.2	0.3	103.8	20.4	9.6	10.8	16.2
30	53.9	8.5	8.5	0.0	0.0	91.9	18.0	9.6	8.4	15.2
35	48.5	7.6	7.6	0.0	0.0	82.6	16.2	9.6	6.6	13.9
40	44.2	6.9	6.9	0.0	0.0	75.1	14.7	9.6	5.1	12.4
45	40.6	6.4	6.4	0.0	0.0	69.1	13.5	9.6	4.0	10.7
50	37.7	5.9	5.9	0.0	0.0	64.0	12.5	9.6	3.0	8.9
55	35.1	5.5	5.5	0.0	0.0	59.6	11.7	9.6	2.1	6.9
60	32.9	5.2	5.2	0.0	0.0	55.9	11.0	9.6	1.4	4.9
65	31.0	4.9	4.9	0.0	0.0	52.6	10.3	9.6	0.7	2.9
70	29.4	4.6	4.6	0.0	0.0	49.8	9.8	9.6	0.2	0.7
75	27.9	4.4	4.4	0.0	0.0	47.3	9.3	9.6	0.0	0.0
80	26.6	4.2	4.2	0.0	0.0	45.0	8.8	9.6	0.0	0.0
85	25.4	4.0	4.0	0.0	0.0	43.0	8.4	9.6	0.0	0.0
90	24.3	3.8	3.8	0.0	0.0	41.1	8.1	9.6	0.0	0.0
95	23.3	3.7	3.7	0.0	0.0	39.4	7.7	9.6	0.0	0.0
100	22.4	3.5	3.5	0.0	0.0	37.9	7.4	9.6	0.0	0.0
105	21.6	3.4	3.4	0.0	0.0	36.5	7.2	9.6	0.0	0.0
110	20.8	3.3	3.3	0.0	0.0	35.2	6.9	9.6	0.0	0.0

5-year $Q_{attenuated}$	**9.32 L/s**	**100-year $Q_{attenuated}$**	**9.58 L/s**
5-year Max. Storage Required	**4.2 m³**	**100-year Max. Storage Required**	**16.7 m³**
Est. 5-year Storage Elevation	**74.16 m**	**Est. 100-year Storage Elevation**	**74.29 m**

Area ID A106
Available Sub-surface Storage
Maintenance Structures

ID	CB 106A				
Structure Dia./Area (mm/mm^2)	360				
T/L*	73.02				
INV	71.52				
Depth	1.50				
$V_{structure}$ (m^3)	0.2				

Sewers

ID				
Storage Pipe Dia (mm)				
L (m)				
V_{sewer} (m^3)				

*Top of lid or max ponding elevation = 73.20

Total Subsurface Storage (m^3) 0.2

Stage Attenuated Areas Storage Summary

	Stage	Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	71.52		0.00			0.0	0.0	0.00
T/L	73.00	0	1.48	1.48	0.2	0.2	6.1	0.01
0.10m Ponding	73.10	57	1.58	0.10	2.1	2.3	6.3	0.10
0.20m Ponding	73.20	235.0	1.68	0.10	13.6	15.8	6.5	0.68

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CB 106A TEMPEST LMF 75**
Total Area 0.229 ha
C 0.20 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	13.3	6.3	6.9	4.2	178.6	28.4	6.5	21.9	13.1
15	83.6	10.6	6.3	4.3	3.9	142.9	22.7	6.5	16.2	14.6
20	70.3	8.9	6.3	2.6	3.1	120.0	19.1	6.5	12.6	15.1
25	60.9	7.7	6.3	1.4	2.1	103.8	16.5	6.5	10.0	15.0
30	53.9	6.9	6.3	0.5	1.0	91.9	14.6	6.5	8.1	14.6
35	48.5	6.2	6.2	0.0	0.0	82.6	13.1	6.5	6.6	13.9
40	44.2	5.6	5.6	0.0	0.0	75.1	12.0	6.5	5.5	13.1
45	40.6	5.2	5.2	0.0	0.0	69.1	11.0	6.5	4.5	12.1
50	37.7	4.8	4.8	0.0	0.0	64.0	10.2	6.5	3.7	11.0
55	35.1	4.5	4.5	0.0	0.0	59.6	9.5	6.5	3.0	9.9
60	32.9	4.2	4.2	0.0	0.0	55.9	8.9	6.5	2.4	8.6
65	31.0	3.9	3.9	0.0	0.0	52.6	8.4	6.5	1.9	7.3
70	29.4	3.7	3.7	0.0	0.0	49.8	7.9	6.5	1.4	6.0
75	27.9	3.5	3.5	0.0	0.0	47.3	7.5	6.5	1.0	4.6
80	26.6	3.4	3.4	0.0	0.0	45.0	7.2	6.5	0.7	3.2
85	25.4	3.2	3.2	0.0	0.0	43.0	6.8	6.5	0.3	1.7
90	24.3	3.1	3.1	0.0	0.0	41.1	6.5	6.5	0.0	0.3
95	23.3	3.0	3.0	0.0	0.0	39.4	6.3	6.5	0.0	0.0
100	22.4	2.9	2.9	0.0	0.0	37.9	6.0	6.5	0.0	0.0
105	21.6	2.7	2.7	0.0	0.0	36.5	5.8	6.5	0.0	0.0
110	20.8	2.6	2.6	0.0	0.0	35.2	5.6	6.5	0.0	0.0

5-year $Q_{attenuated}$	**6.33 L/s**	**100-year $Q_{attenuated}$**	**6.49 L/s**
5-year Max. Storage Required	**4.2 m^3**	**100-year Max. Storage Required**	**15.1 m^3**
Est. 5-year Storage Elevation	**73.11 m**	**Est. 100-year Storage Elevation**	**73.19 m**

Area ID A125

Available Sub-surface Storage

Maintenance Structures

ID	DCB125A	DCBMH125			
Structure Dia./Area (mm/mm^2)	720	1200			
T/L*	74.12	74.12			
INV	72.62	72.24			
Depth	1.50	1.88			
$V_{structure}$ (m^3)	0.8	2.1			

Sewers

ID	450mm			U/G STORG.*
Storage Pipe Dia (mm)	450			
L (m)	31.8			
V_{sewer} (m^3)	5.1			215.0
	*Top of lid or max ponding elevation =			74.42

Total Subsurface Storage (m^3) 223.0

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	72.36		0.00			0.0	0.0	0.00
Storage Pipe INV	72.91		0.55	0.55	0.6	0.6	7.0	0.02
Storage Pipe SL	73.12		0.75	0.20	107.7	108.4	8.0	3.76
Storage Pipe OBV	73.32		0.96	0.20	107.7	216.1	8.9	6.74
T/L	74.12	0	1.76	0.80	6.9	223.0	12.0	5.16
0.15m Ponding	74.27	511	1.91	0.15	26.2	249.2	12.6	5.49
0.30m Ponding	74.42	1636.0	2.06	0.15	153.1	402.3	13.0	8.60

* V=Incremental storage volume

**V_{acc}=Total surface and sub-surface

† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CBMH125A TEMPEST LMF 100**

Total Area 0.706 ha

C 0.88 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	179.8	8.6	171.2	102.7	178.6	350.2	10.0	340.2	204.1
25	60.9	105.1	8.6	96.5	144.7	103.8	203.7	10.0	193.7	290.5
40	44.2	76.3	8.6	67.7	162.4	75.1	147.4	10.0	137.4	329.7
55	35.1	60.6	8.6	52.0	171.6	59.6	116.9	10.0	106.9	352.9
70	29.4	50.7	8.6	42.1	176.8	49.8	97.6	10.0	87.6	368.1
85	25.4	43.8	8.6	35.2	179.4	43.0	84.2	10.0	74.2	378.6
100	22.4	38.7	8.6	30.1	180.4	37.9	74.3	10.0	64.3	386.0
115	20.1	34.7	8.6	26.1	180.2	34.0	66.7	10.0	56.7	391.1
130	18.3	31.6	8.6	23.0	179.2	30.9	60.6	10.0	50.6	394.6
145	16.8	29.0	8.6	20.4	177.4	28.4	55.6	10.0	45.6	396.8
160	15.6	26.8	8.6	18.2	175.1	26.2	51.5	10.0	41.5	398.0
175	14.5	25.0	8.6	16.4	172.4	24.4	47.9	10.0	37.9	398.3
190	13.6	23.5	8.6	14.8	169.3	22.9	44.9	10.0	34.9	397.9
205	12.8	22.1	8.6	13.5	165.8	21.6	42.3	10.0	32.3	396.9
220	12.1	20.9	8.6	12.3	162.1	20.4	40.0	10.0	30.0	395.4
235	11.5	19.8	8.6	11.2	158.2	19.3	37.9	10.0	27.9	393.5
250	10.9	18.9	8.6	10.3	154.0	18.4	36.1	10.0	26.1	391.1
265	10.4	18.0	8.6	9.4	149.7	17.6	34.4	10.0	24.4	388.4
280	10.0	17.2	8.6	8.6	145.2	16.8	32.9	10.0	22.9	385.4
295	9.6	16.5	8.6	7.9	140.5	16.1	31.6	10.0	21.6	382.1
320	9.0	15.5	8.6	6.9	132.4	15.1	29.6	10.0	19.6	376.1

5-year $Q_{attenuated}$	**8.60 L/s**	**100-year $Q_{attenuated}$**	**12.99 L/s**
5-year Max. Storage Required	**180.4 m^3**	**100-year Max. Storage Required**	**398.3 m^3**
Est. 5-year Storage Elevation	**73.25 m**	**Est. 100-year Storage Elevation**	**74.42 m**

Summary of Release Rates and Storage Volumes

Control Area	Drainage Area (Ha)	Inlet Control Device	5-Year Release Rate (L/s)	5-Year Required Storage (m^3)	100-Year Release Rate (L/s)	100-Year Required Storage (m^3)	100-Year Available Storage (m^3)
Unattenuated Areas (U1)	0.039		4.2	0.0	8.9	0.0	0.0
Roof Controls (BLDG-A)	0.444		22.4	67.8	29.6	151.6	351.5
Roof Controls (BLDG B)	0.092		4.7	14.0	6.2	31.3	73.0
Attenutated Areas (A118+A119)	0.693	TEMPEST LMF 105	14.5	152.7	15.8	359.4	483.5
Attenutated Areas (A120)	0.212	TEMPEST LMF 45	2.6	56.8	2.8	140.0	145.8
Attenutated Areas (A100)	0.321	TEMPEST LMF 45	2.1	18.8	2.2	50.2	96.1
Attenutated Areas (A109+A110)	0.849	75mm dia	9.5	126.1	19.1	311.9	316.1
Attenutated Areas (A122)	1.072	82mm dia	19.6	254.9	20.6	598.9	621.8
Attenutated Areas (A123)	0.093	TEMPEST LMF 60	2.8	1.6	2.9	5.9	6.6
Attenutated Areas (A103-A)	0.025	75mm dia	5.9	0.1	12.1	0.2	0.5
Attenutated Areas (A103-B)	0.039	TEMPEST LMF 100	7.6	0.1	11.9	2.9	3.2
Attenutated Areas (A103-C)	0.083	TEMPEST LMF 65	4.8	7.5	5.0	23.5	27.1
Attenutated Areas (A103-D)	0.067	TEMPEST LMF 90	9.3	4.2	9.6	16.7	17.7
Attenutated Areas (A106)	0.229	TEMPEST LMF 75	6.3	4.2	6.5	15.1	15.8
Attenutated Areas (A125)	0.706	TEMPEST LMF 100	8.6	180.4	13.0	398.3	402.3
Total	**4.964**		**124.9**	**889.0**	**166.3**	**2106.0**	**2561.1**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A118, A119
Available Sub-surface Storage
Maintenance Structures

ID	CBMH 118	CBMH 119	CB 118A	CB 119A
Structure Dia./Area (mm/mm^2)	1200	1200	360	360
T/L*	73.85	73.85	73.85	73.85
INV	71.82	71.48	72.35	72.35
Depth	2.03	2.37	1.50	1.50
$V_{structure}$ (m^3)	2.3	2.7	0.2	0.2

Sewers

ID	250mm	375mm		U/G STORG.
Storage Pipe Dia (mm)	250	375		
L (m)	39.5	38		
V_{sewer} (m^3)	1.9	4.2		143.0

*Top of lid or max ponding elevation = 74.15

Total Subsurface Storage (m^3) 154.5

Stage Attenuated Areas Storage Summary

	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
		Surface Storage			Surface and Subsurface Storage			
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	71.48		0.00			0.0	0.0	0.00
Storage Pipe INV	72.64		1.16	1.16	1.3	1.3	10.8	0.03
Storage Pipe SL	72.85		1.37	0.21	71.7	73.0	11.6	1.75
Storage Pipe OBV	73.05		1.57	0.20	71.7	144.8	12.2	3.30
T/L	73.85	1	2.37	0.80	9.7	154.5	15.0	2.86
0.15m Ponding	74.00	880	2.52	0.15	45.9	200.4	15.6	3.57
0.30m Ponding	74.15	3124	2.67	0.15	283.1	483.5	16.0	8.39

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **CBMH 119 TEMPEST LMF 105**
Total Area 0.693 ha
C 0.88 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

t_c	i	Q_{actual}‡	$Q_{release}$	Q_{stored}	V_{stored}
	2-year				
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	76.8	130.1	9.7	120.4	72.2
20	52.0	88.1	9.7	78.4	94.1
30	40.0	67.8	9.7	58.1	104.6
40	32.9	55.7	9.7	46.0	110.3
50	28.0	47.5	9.7	37.8	113.4
60	24.6	41.6	9.7	31.9	114.8
70	21.9	37.1	9.7	27.4	115.1
80	19.8	33.6	9.7	23.9	114.7
90	18.1	30.7	9.7	21.0	113.6
100	16.7	28.4	9.7	18.7	112.0
110	15.6	26.4	9.7	16.7	110.0
120	14.6	24.7	9.7	15.0	107.7
130	13.7	23.2	9.7	13.5	105.2
140	12.9	21.9	9.7	12.2	102.4
150	12.3	20.8	9.7	11.1	99.5
160	11.7	19.7	9.7	10.0	96.3
170	11.1	18.8	9.7	9.1	93.0
180	10.6	18.0	9.7	8.3	89.6
190	10.2	17.3	9.7	7.6	86.1
200	9.8	16.6	9.7	6.9	82.4
210	9.4	15.9	9.7	6.2	78.7
220	9.1	15.4	9.7	5.7	74.9
230	8.8	14.8	9.7	5.1	71.0
240	8.5	14.4	9.7	4.7	67.0

2-year $Q_{attenuated}$ 9.70 L/s
2-year Max. Storage Required 115.1 m^3
Est. 2-year Storage Elevation 72.73 m*
**No ponding in the 2-year storm*

Area ID A120
Available Sub-surface Storage
Maintenance Structures

ID		MH 120	CB 120A		
Structure Dia./Area (mm/mm^2)		1200	360		
T/L*		74.29	73.95		
INV		71.97	72.45		
Depth		2.32	1.50		
$V_{structure}$ (m^3)		2.6	0.2		

Sewers

ID	250mm			U/G STORG.*
Storage Pipe Dia (mm)	250			
L (m)	17.7			
V_{sewer} (m^3)	0.9			49.0

*Top of lid or max ponding elevation = 74.25

Total Subsurface Storage (m^3) 52.7

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage (m)	Ponding (m^2)	h_o (m)	delta d (m)	V* (m^3)	V_{acc}** (m^3)	$Q_{release}$† (L/s)	$V_{drawdown}$ (hr)
Orifice INV	71.97		0.00			0.0	0.0	0.00
Storage Pipe INV	72.09		0.12	0.12	0.1	0.1	0.4	1.00
Storage Pipe SL	72.66		0.69	0.57	25.1	25.3	1.0	7.02
Storage Pipe OBV	73.23		1.26	0.57	25.1	50.4	1.2	11.67
T/L	73.95	1	1.98	0.72	2.3	52.7	2.6	5.63
0.15m Ponding	74.10	228	2.13	0.15	12.2	64.9	2.7	6.68
0.30m Ponding	74.25	930.0	2.28	0.15	80.9	145.8	2.8	14.47

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **MH 120 TEMPEST LMF 45**
Total Area 0.212 ha
C 0.82 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	2-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	76.8	37.1	1.0	36.0	21.6
35	36.1	17.4	1.0	16.4	34.4
60	24.6	11.9	1.0	10.8	38.9
85	18.9	9.1	1.0	8.1	41.3
110	15.6	7.5	1.0	6.5	42.7
135	13.3	6.4	1.0	5.4	43.5
160	11.7	5.6	1.0	4.6	43.9
185	10.4	5.0	1.0	4.0	44.1
210	9.4	4.5	1.0	3.5	44.1
235	8.6	4.2	1.0	3.1	43.9
260	8.0	3.8	1.0	2.8	43.6
285	7.4	3.6	1.0	2.5	43.1
310	6.9	3.3	1.0	2.3	42.6
335	6.5	3.1	1.0	2.1	42.1
360	6.1	3.0	1.0	1.9	41.4
385	5.8	2.8	1.0	1.8	40.7
410	5.5	2.7	1.0	1.6	40.0
435	5.3	2.6	1.0	1.5	39.2
460	5.1	2.4	1.0	1.4	38.4
485	4.8	2.3	1.0	1.3	37.5
510	4.7	2.2	1.0	1.2	36.6
535	4.5	2.2	1.0	1.1	35.7
560	4.3	2.1	1.0	1.0	34.8
585	4.2	2.0	1.0	1.0	33.8
610	4.0	1.9	1.0	0.9	32.8

2-year $Q_{attenuated}$ **1.05 L/s**
2-year Max. Storage Required **44.1 m^3**
Est. 2-year Storage Elevation **73.07 m**
*No ponding in the 2-year storm

RIOCAN
Lincoln Fields - 2525 Carling Avenue
Proposed Conditions
2-year Storm Storage Calculations

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A122
Available Sub-surface Storage
Maintenance Structures

ID	CBMH 122	DCB 122A	DCB 122B
Structure Dia./Area (mm/mm^2)	1200	720	720
T/L*	71.70	71.70	71.70
INV	69.77	70.20	70.20
Depth	1.93	1.50	1.50
$V_{structure}$ (m^3)	2.2	0.8	0.8

Sewers

ID	250mm			U/G STORG.*
Storage Pipe Dia (mm)	250			
L (m)	69.6			
V_{sewer} (m^3)	3.4			202.0

*Top of lid or max ponding elevation = 72.00

Total Subsurface Storage (m^3) 209.2

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	69.91							
Storage Pipe INV	70.49		0.58	0.58	0.7	0.7	10.9	0.02
Storage Pipe SL	70.70		0.78	0.20	101.2	101.9	12.6	2.24
Storage Pipe OBV	70.90		0.99	0.21	101.2	203.2	14.2	3.97
T/L	71.70	2	1.79	0.80	6.0	209.2	19.1	3.04
0.15m Ponding	71.85	1,367	1.94	0.15	70.9	280.1	19.9	3.91
0.30m Ponding	72.00	3333	2.09	0.15	341.8	621.8	20.6	8.37

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **CBMH 122** **DIA** 82
Total Area 1.072 ha
C 0.87 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	2-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	76.8	199.0	13.8	185.1	111.1
25	45.2	117.0	13.8	103.2	154.7
40	32.9	85.1	13.8	71.3	171.1
55	26.2	67.8	13.8	54.0	178.0
70	21.9	56.8	13.8	42.9	180.3
85	18.9	49.1	13.8	35.2	179.7
100	16.7	43.4	13.8	29.5	177.2
115	15.0	39.0	13.8	25.1	173.4
130	13.7	35.5	13.8	21.6	168.6
145	12.6	32.6	13.8	18.7	163.1
160	11.7	30.2	13.8	16.3	156.8
175	10.9	28.1	13.8	14.3	150.1
190	10.2	26.4	13.8	12.5	143.0
205	9.6	24.9	13.8	11.0	135.5
220	9.1	23.5	13.8	9.7	127.6
235	8.6	22.3	13.8	8.5	119.5
250	8.2	21.3	13.8	7.4	111.2
265	7.8	20.3	13.8	6.5	102.6
280	7.5	19.4	13.8	5.6	93.9
295	7.2	18.6	13.8	4.8	85.0
310	6.9	17.9	13.8	4.1	75.9

2-year $Q_{attenuated}$ **13.85 L/s**
2-year Max. Storage Required **180.3 m^3**
Est. 2-year Storage Elevation **70.85 m**
*No ponding in the 2-year storm

Area ID A125
Available Sub-surface Storage
Maintenance Structures

ID	DCB125A	DCBMH125			
Structure Dia./Area (mm/mm^2)	720	1200			
T/L*	74.12	74.12			
INV	72.62	72.24			
Depth	1.50	1.88			
$V_{structure}$ (m^3)	0.8	2.1			

Sewers

ID	450mm			U/G STORG.*
Storage Pipe Dia (mm)	450			
L (m)	31.8			
V_{sewer} (m^3)	5.1			215.0
	*Top of lid or max ponding elevation =			74.42

Total Subsurface Storage (m^3) 223.0

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m^2)**	**(m)**	**(m)**	**(m^3)**	**(m^3)**	**(L/s)**	**(hr)**
Orifice INV	72.36		0.00			0.0	0.0	0.00
Storage Pipe INV	72.91		0.55	0.55	0.6	0.6	7.0	0.02
Storage Pipe SL	73.12		0.75	0.20	107.7	108.4	8.0	3.76
Storage Pipe OBV	73.32		0.96	0.20	107.7	216.1	8.9	6.74
T/L	74.12	0	1.76	0.80	6.9	223.0	12.0	5.16
0.15m Ponding	74.27	511	1.91	0.15	26.2	249.2	12.6	5.49
0.30m Ponding	74.42	1636.0	2.06	0.15	153.1	402.3	13.0	8.60

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per IPEX TEMPEST LMF flow curves graph

Orifice Location **CBMH125A TEMPEST LMF 100**
Total Area 0.706 ha
C 0.88 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	2-year				
t_c	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**
(min)	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**
10	76.8	132.5	8.1	124.4	74.6
25	45.2	77.9	8.1	69.8	104.7
40	32.9	56.7	8.1	48.6	116.6
55	26.2	45.2	8.1	37.0	122.2
70	21.9	37.8	8.1	29.7	124.6
85	18.9	32.7	8.1	24.6	125.2
100	16.7	28.9	8.1	20.8	124.6
115	15.0	26.0	8.1	17.8	123.0
130	13.7	23.6	8.1	15.5	120.8
145	12.6	21.7	8.1	13.6	118.0
160	11.7	20.1	8.1	12.0	114.9
175	10.9	18.7	8.1	10.6	111.4
190	10.2	17.6	8.1	9.4	107.6
205	9.6	16.6	8.1	8.4	103.6
220	9.1	15.7	8.1	7.5	99.3
235	8.6	14.9	8.1	6.7	94.9
250	8.2	14.2	8.1	6.0	90.3
265	7.8	13.5	8.1	5.4	85.6
280	7.5	12.9	8.1	4.8	80.7
295	7.2	12.4	8.1	4.3	75.8
320	6.7	11.6	8.1	3.5	67.3

2-year $Q_{attenuated}$ **8.14 L/s**
2-year Max. Storage Required **125.2 m^3**
Est. 2-year Storage Elevation **73.15 m**
*No ponding in the 2-year storm

										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**I**	**Q***	**DIA**	**Slope**	**Length**	**$A_{hydraulic}$**	**R**	**Velocity**	**Qcap**	**Time Flow**	**Q / Q full**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**	**(-)**
Receiving Storm Sewer Outlet									*166.3*	600	0.132	87.6	0.283	0.150	0.79	223.1	1.9	0.75
									** Maximum flows from subject site controlled to the allowable release rate of 166.3 L/s*									
									**Minimum slope assumed for conservative estimate of existing sewer's capacity*									

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Ottawa

Manning 0.013

	LOCATION		AREA (Ha)				FLOW				SEWER DATA								
			5 YEAR				Time of	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	FLOW (min)	Q/Q full
A109	109	110	0.534	0.53	0.79	0.79	10.00	76.81	104.19	82	375	375	CONC	0.75	58.0	151.8	1.37	0.70	0.54
A110	110	112	0.315	0.64	0.56	1.35	10.70	74.21	100.62	136	375	375	CONC	1.70	18.4	228.6	2.07	0.15	0.59
To STM 112						1.35	10.85												
EX-3	113	112	0.735	0.90	1.84	1.84	10.00	76.81	104.19	192	450	450	CONC	1.50	6.8	349.2	2.20	0.05	0.55
To STM 112						1.84	10.05												
To STM 123	112	123			0.00	3.19	10.85	73.68	99.90	318	750	750	CONC	0.20	48.1	497.9	1.13	0.71	0.64
						3.19	11.56												
A122	122	123	1.072	0.87	2.59	2.59	10.00	76.81	104.19	270	750	750	CONC	0.30	30.0	609.8	1.38	0.36	0.44
To STM 123						2.59	10.36												
A123	123	114	0.094	0.20	0.05	5.83	11.56	71.28	96.61	563	900	900	CONC	0.30	58.8	991.5	1.56	0.63	0.57
	114	116			0.00	5.83	12.19	69.30	93.89	575	900	900	CONC	0.30	14.4	991.5	1.56	0.15	0.58
To STM 116						5.83	12.35												
A118	118	119	0.343	0.88	0.84	0.84	10.00	76.81	104.19	87	375	375	PVC	0.75	36.6	151.8	1.37	0.44	0.58
BLDG A*										30									
A119	119	107	0.349	0.88	0.85	1.69	10.44	75.14	101.91	202	525	525	CONC	0.75	28.5	372.4	1.72	0.28	0.54
To STM 107						1.69	10.72												
A125	125	104	0.706	0.88	1.73	1.73	10.00	76.81	104.19	180	525	525	PVC	0.50	37.7	304.1	1.40	0.45	0.59
To STM 104						1.73	10.45												
BLDG B*										6									
A103(A)+A103(B)	103	104	0.064	0.75	0.13	0.13	10.00	76.81	104.19	20	250	250	PVC	0.75	38.2	51.5	1.05	0.61	0.39
To STM 104						0.13	10.61												
A100	100	101	0.321	0.25	0.22	0.22	10.00	76.81	104.19	23	375	375	PVC	0.85	43.7	161.6	1.46	0.50	0.14
A103(C)+A103(D)	101	104	0.150	0.70	0.29	0.51	10.50		101.64	59	450	450	PVC	0.85	18.1	262.9	1.65	0.18	0.22
To STM 104						0.51	10.68												
From STM125						1.73	10.45												
From STM103						0.13	10.61												
From STM101						0.51	10.68												
	104	105			0.00	2.38	10.68	74.29	100.74	246	600	600	CONC	0.30	57.1	336.3	1.19	0.80	0.73
To STM 105						2.38	11.48												
A120	120	105	0.212	0.82	0.48	0.48	10.00	76.81	104.19	50	450	450	CONC	0.60	17.3	220.8	1.39	0.21	0.23
To STM105						0.48	10.21												
	105	106				2.86	11.48	71.56	96.98	284	750	750	CONC	0.30	42.3	609.8	1.38	0.51	0.46
A106	106	107	0.229	0.20	0.13	2.99	11.99	69.92	94.74	289	750	750	CONC	0.35	37.7	658.6	1.5	0.42	0.44
To STM 107						2.99	12.41												
From STM 119						1.69	10.72												
	107	108			0.00	4.68	12.41	68.64	92.97	471	825	825	CONC	0.60	90.5	1111.9	2.1	0.7	0.42
	108	116			0.00	4.68	13.14	66.55	90.10	458	825	825	CONC	0.65	6.0	1157.3	2.2	0.0	0.40
To STM 116						4.68	13.18												
From STM 114						5.83	12.35												
From STM 108						4.68	13.18												
	116	117			0.00	10.51	13.18	66.42	89.93	981	1050	1050	CONC	0.50	7.8	1930.9	2.2	0.1	0.51

*** Building Flow Equal to the 100-Year Controlled Release Rate**

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Vel

Designed: B.N.C.
Checked: S.L.M.
Dwg. Reference: SWM-1

PROJECT: Lincoln Fields Shopping Centre
LOCATION: 2525 Carling Avenue **City of Ottawa**
File Ref:
Date: 2019-11-05
Sheet No. SHEET 1 OF 1

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST by StormTech
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

2525 Carling Ave - Lincoln Fields

A118/A119

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

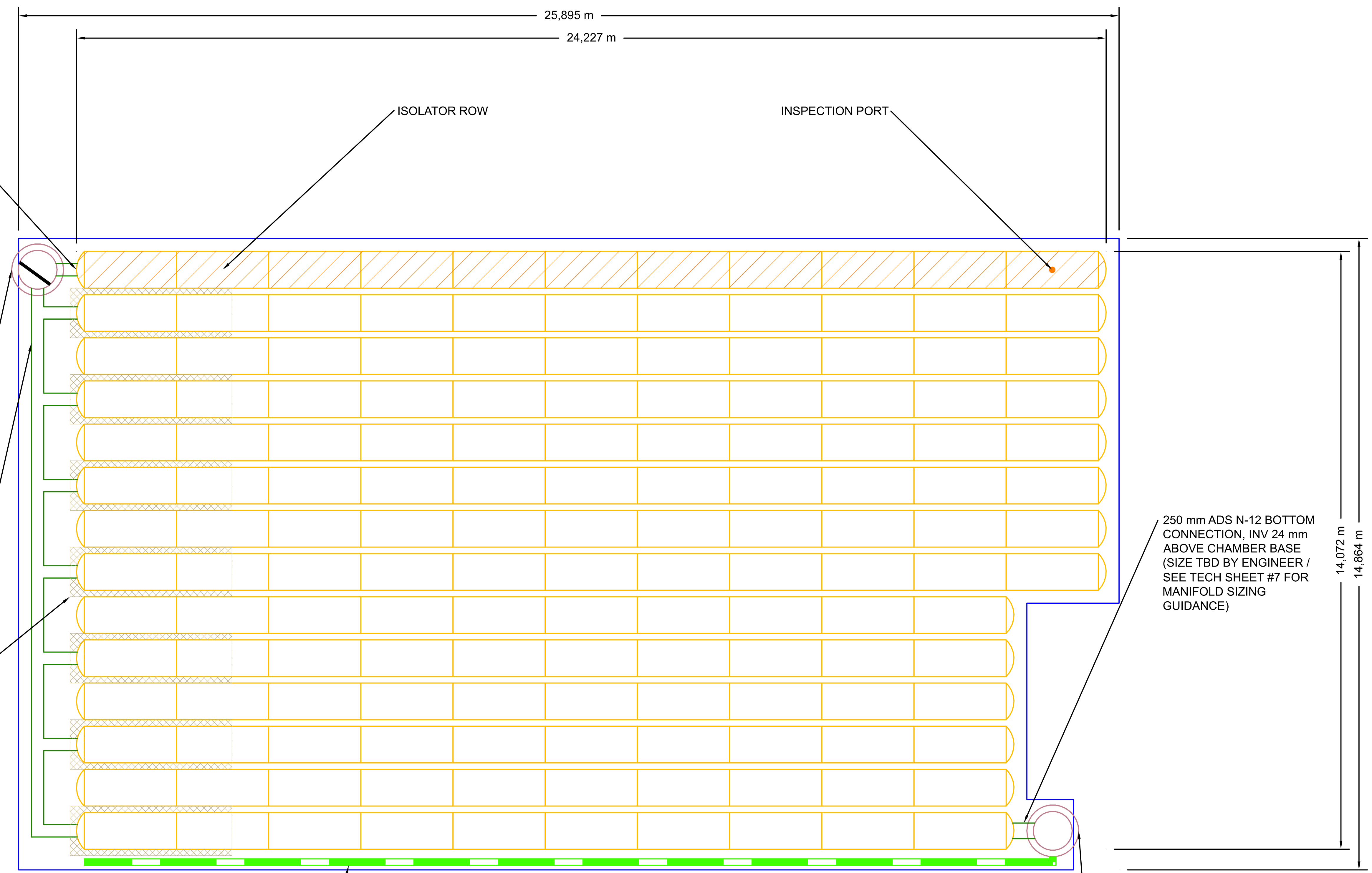
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

(148) STORMTECH SC-310 CHAMBERS
(28) STORMTECH SC-310 END CAPS
INSTALLED WITH 152 mm COVER STONE, 152 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 143 m³
AREA OF SYSTEM: 373 m²
PERIMETER OF SYSTEM: 84 m



2525 Carling Ave - Lincoln Fields
A118/A119

DATE: 09/26/2019 | DRAWN: as
PROJECT #: Tool | CHECKED: ---

REV	DRW	CHK	DESCRIPTION

StormTech® Detention · Retention · Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS® ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NOT TO SCALE

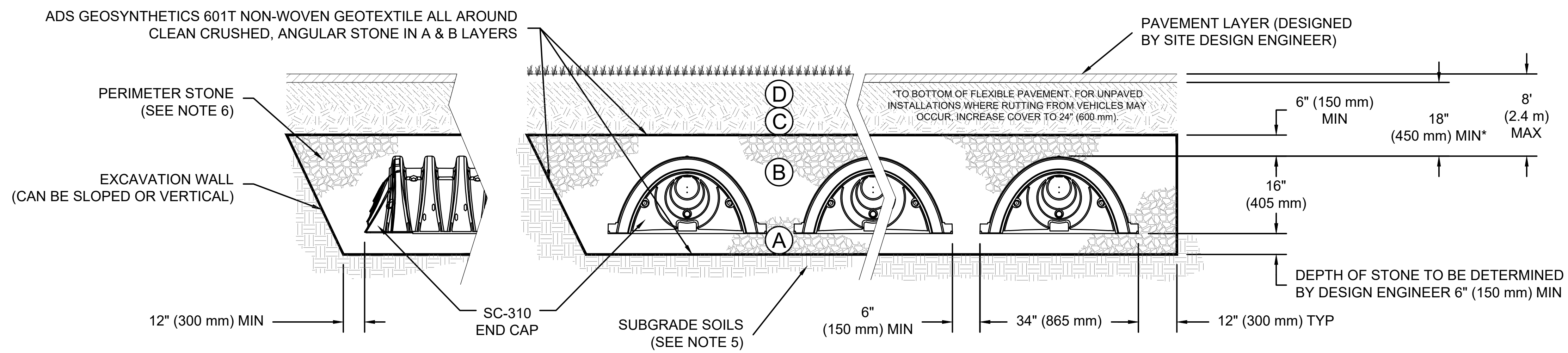
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

SHEET
2 OF 5

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-310 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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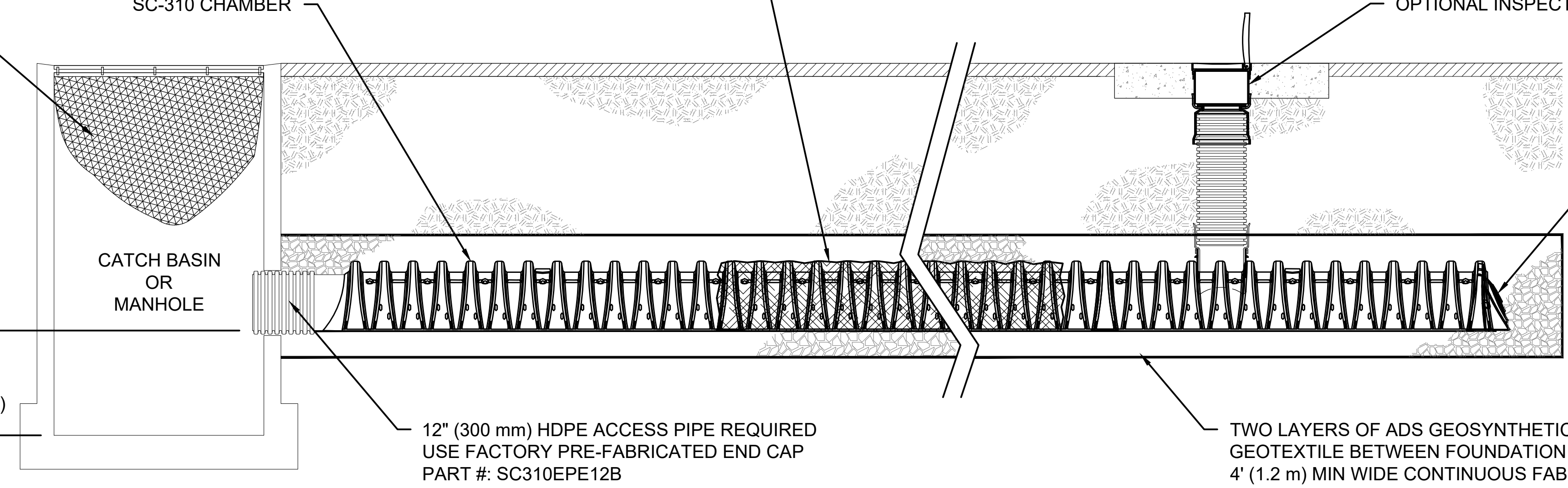


SC-310 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT

A. INSPECTION PORTS (IF PRESENT)
- A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
- A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
- A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
- A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
- A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

B. ALL ISOLATOR ROWS
- B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
- B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
  - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
  - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
- B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

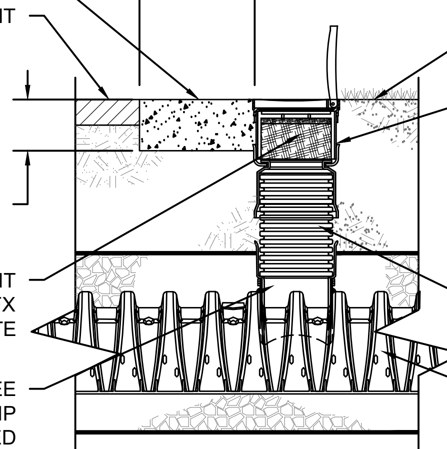
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-310 6" INSPECTION PORT DETAIL

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UNDERDRAIN DETAIL

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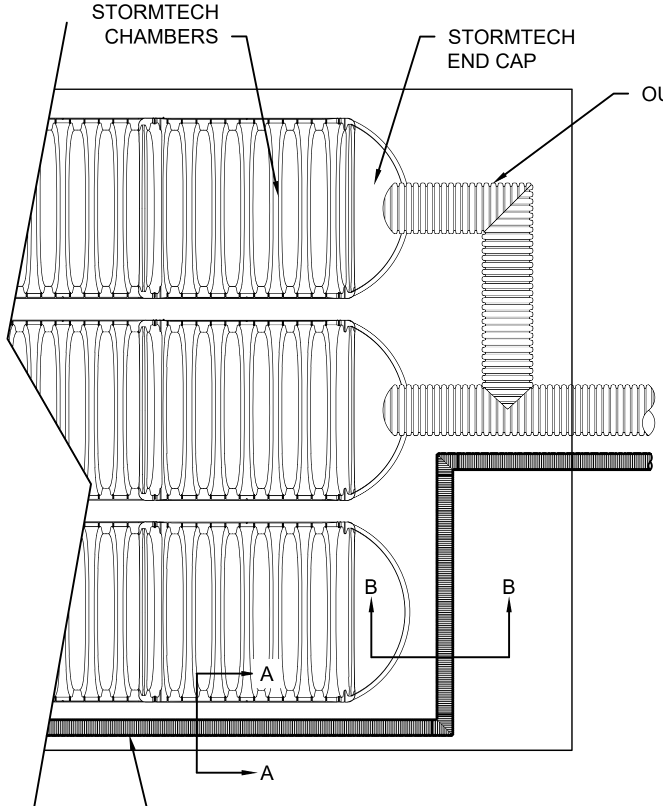
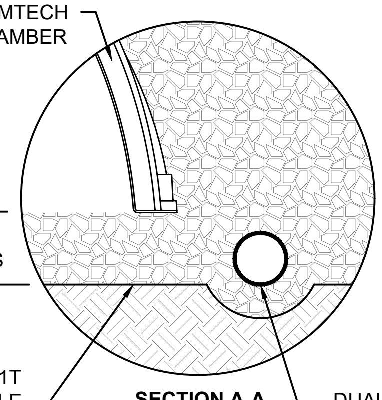
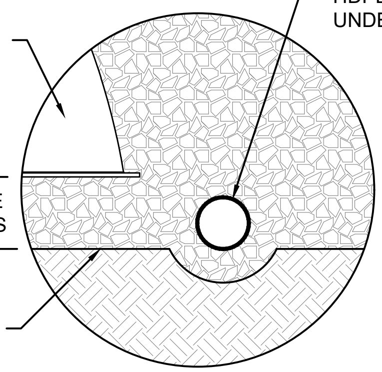




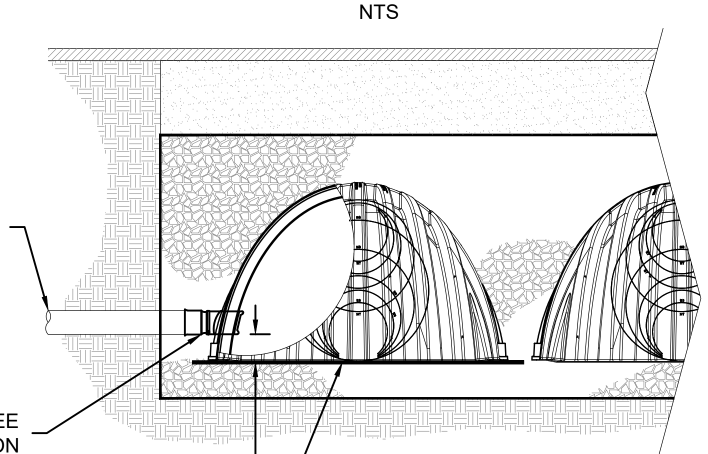
SECTION A-A



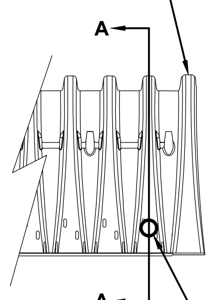
SECTION B-B

INSERTA TEE DETAIL

NTS



SECTION A-A



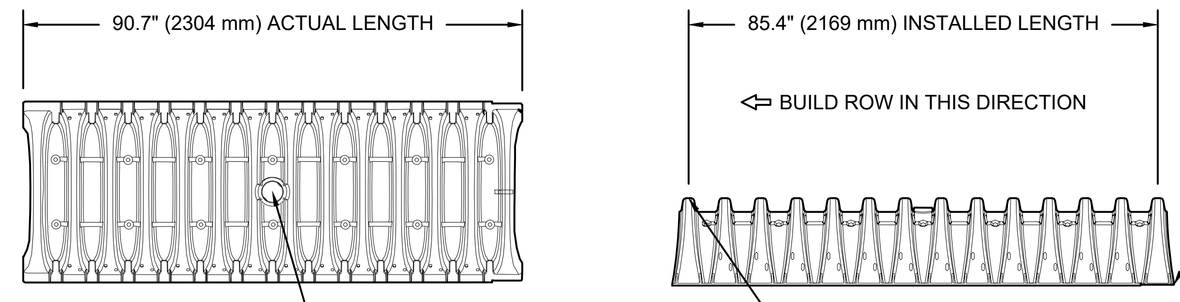
SIDE VIEW

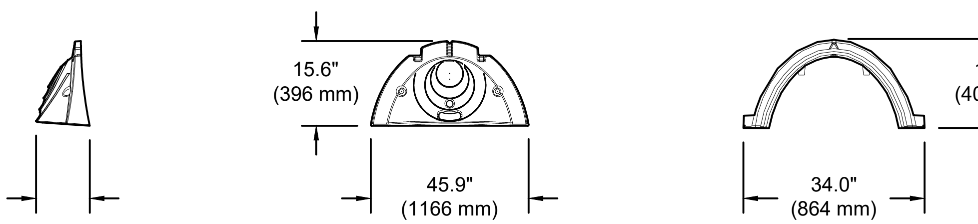
CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

SC-310 TECHNICAL SPECIFICATION

NTS

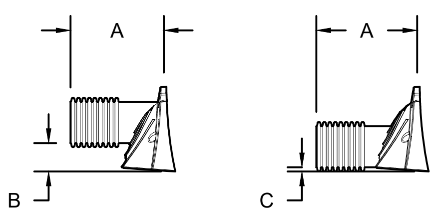




NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	34.0" X 16.0" X 85.4"	(864 mm X 406 mm X 2169 mm)
CHAMBER STORAGE	14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC310EPE06T / SC310EPE06TPC	6" (150 mm)	9.6" (244 mm)	5.8" (147 mm)	---
SC310EPE06B / SC310EPE06BPC			---	0.5" (13 mm)
SC310EPE08T / SC310EPE08TPC	8" (200 mm)	11.9" (302 mm)	3.5" (89 mm)	---
SC310EPE08B / SC310EPE08BPC			---	0.6" (15 mm)
SC310EPE10T / SC310EPE10TPC	10" (250 mm)	12.7" (323 mm)	1.4" (36 mm)	---
SC310EPE10B / SC310EPE10BPC			---	0.7" (18 mm)
SC310EPE12B	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310EPE12B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310EPE12B THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

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STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

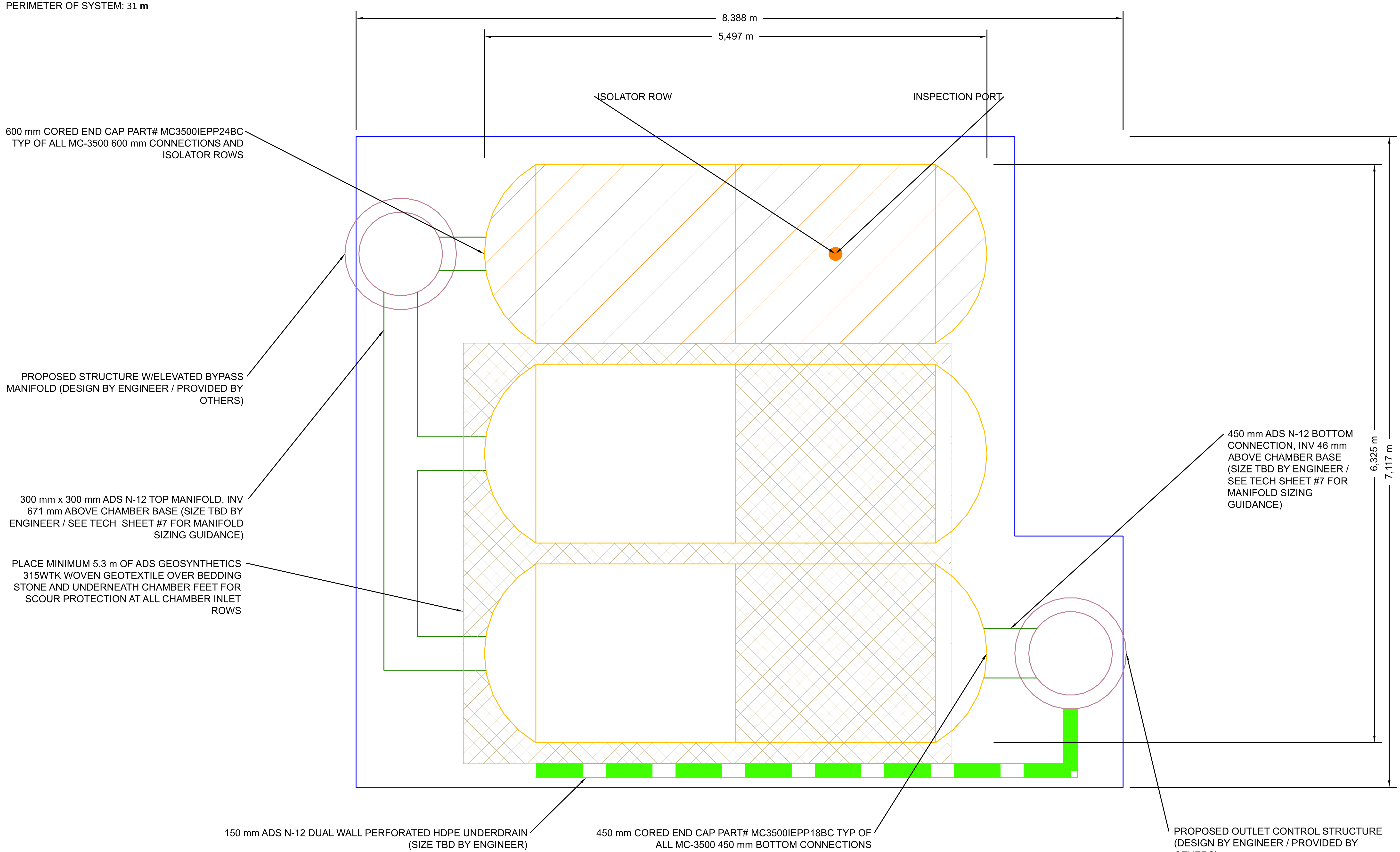
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

(6) STORMTECH MC-3500 CHAMBERS
(6) STORMTECH MC-3500 END CAPS
INSTALLED WITH 305 mm COVER STONE, 229 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 49 m³
AREA OF SYSTEM: 55 **m²**
PERIMETER OF SYSTEM: 31 **m**



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NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
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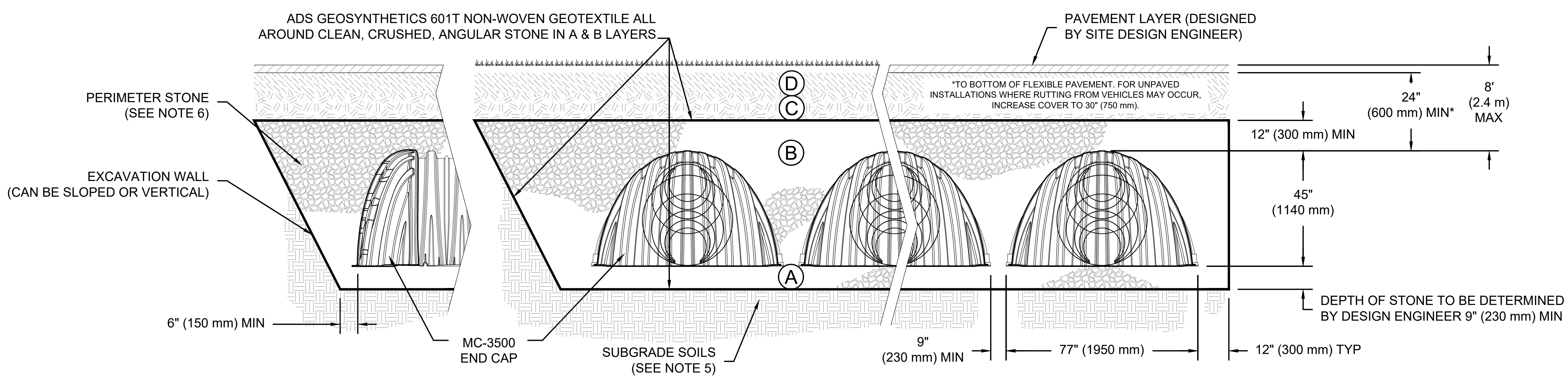
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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PROJECT #: Tool | CHECKED: ---

REV | DRW | CHK | DESCRIPTION

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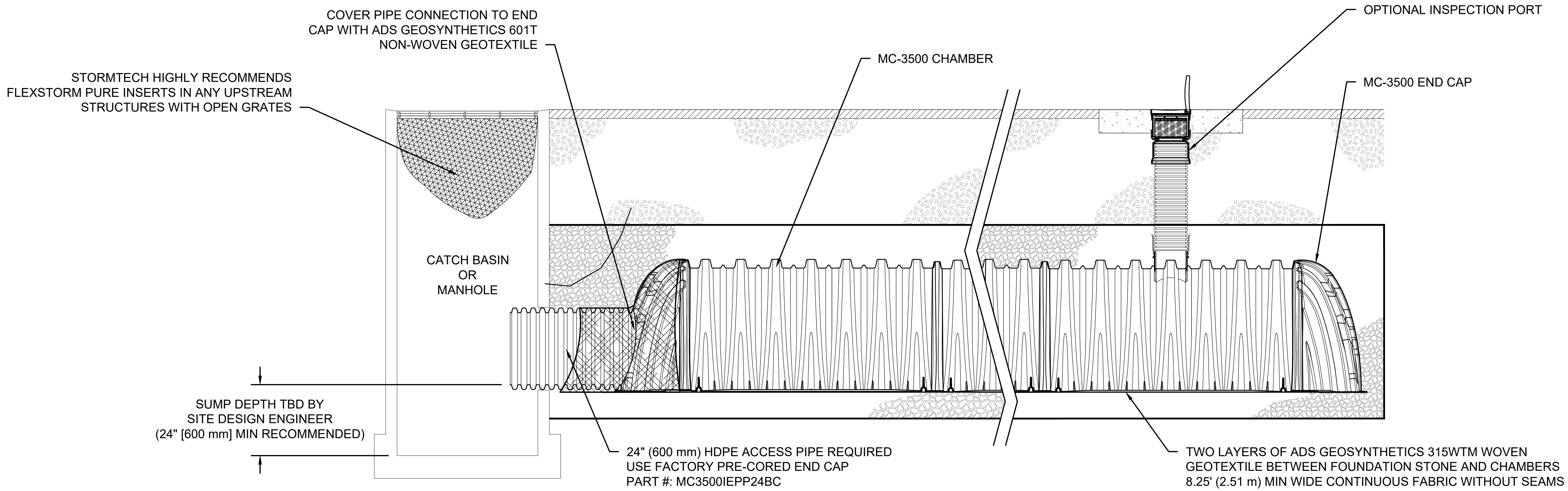


MC-3500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

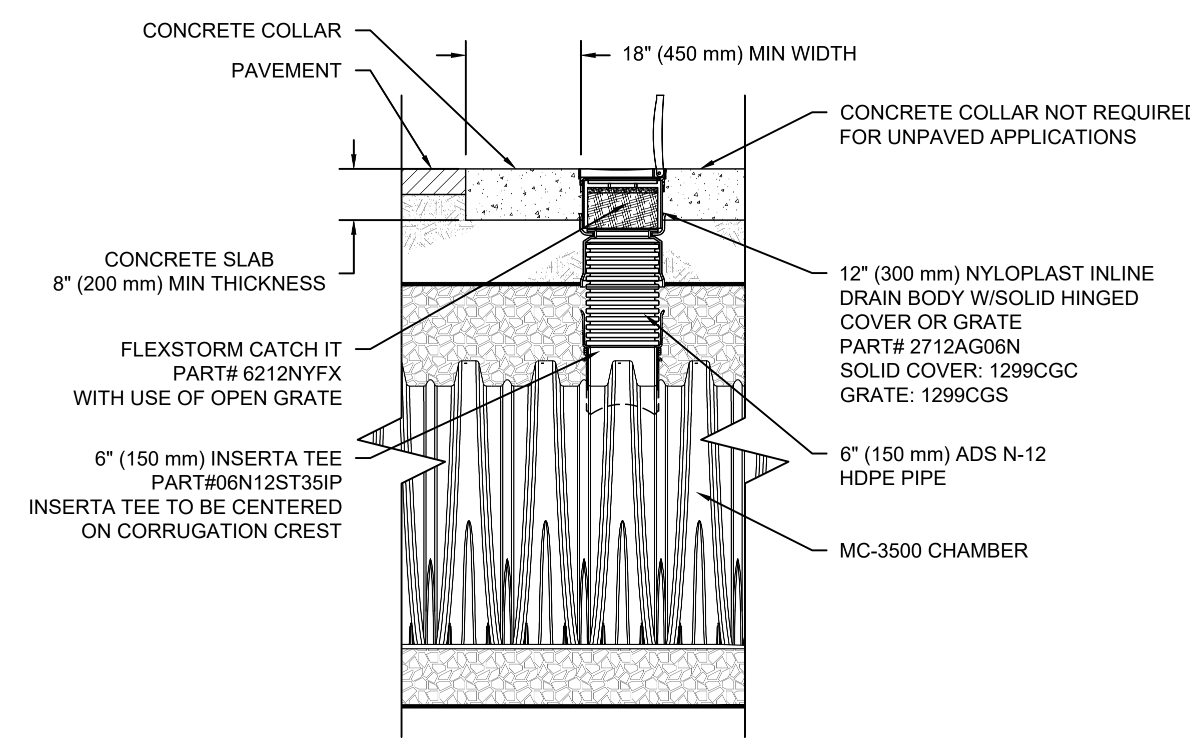
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-3500 6" INSPECTION PORT DETAIL
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UNDERDRAIN DETAIL

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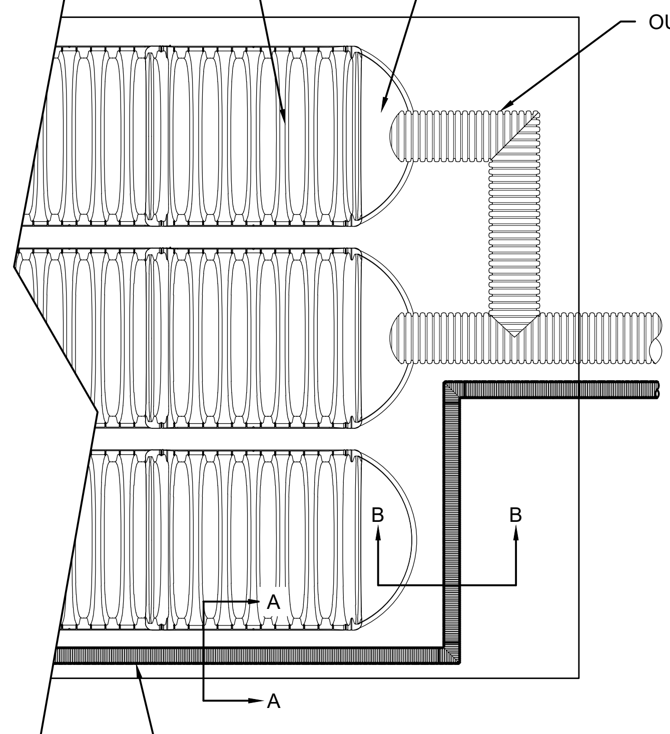
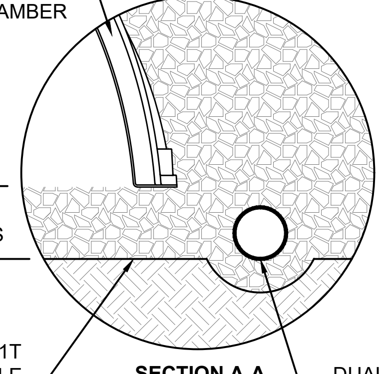
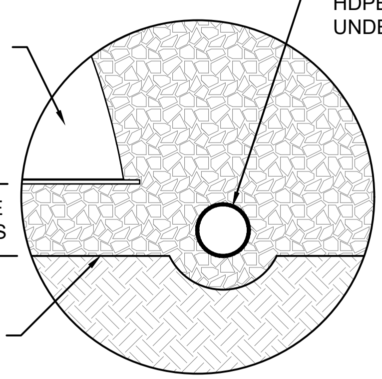


NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 mm) TYP FOR SC-310 SYSTEMS
6" (150 mm) TYP FOR SC-740, DC-780, MC-3500 & MC-4500 SYSTEMS



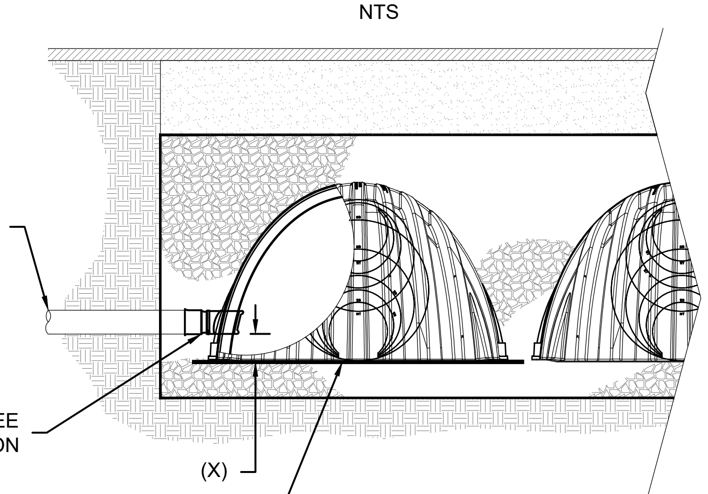
SECTION A-A



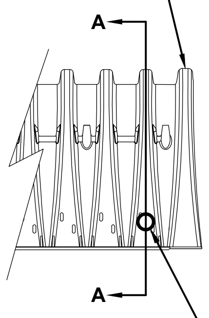
SECTION B-B

INSERTA TEE DETAIL

NTS



SECTION A-A



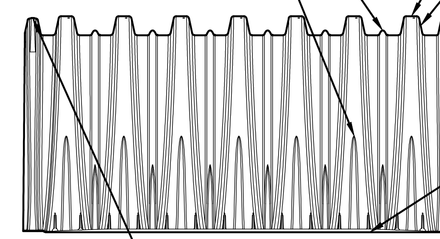
SIDE VIEW

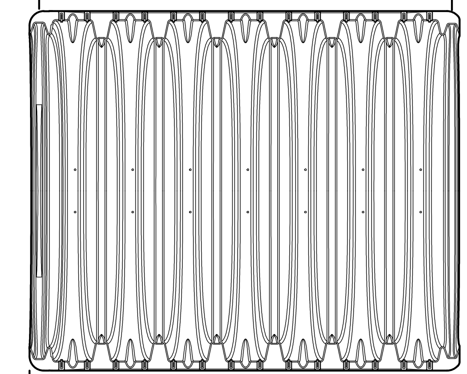
CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

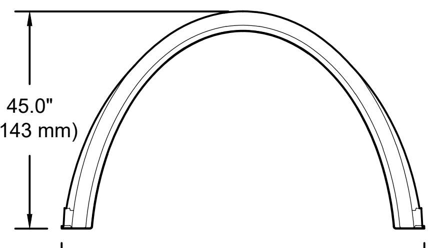
NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

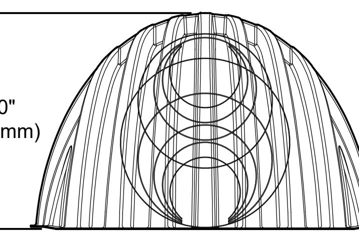
MC-3500 TECHNICAL SPECIFICATION

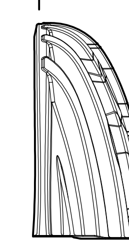
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	178.9 CUBIC FEET	(5.06 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

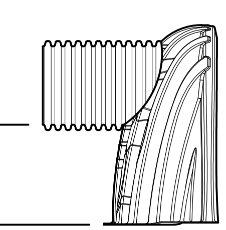
NOMINAL END CAP SPECIFICATIONS

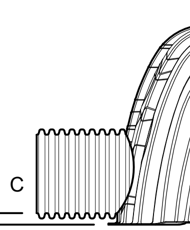
SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 22.5"	(1956 mm X 1143 mm X 571 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	46.0 CUBIC FEET	(1.30 m³)
WEIGHT	50.0 lbs.	(22.7 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP30BC	30" (750 mm)	---	





NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.

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MC-SERIES END CAP INSERTION DETAIL

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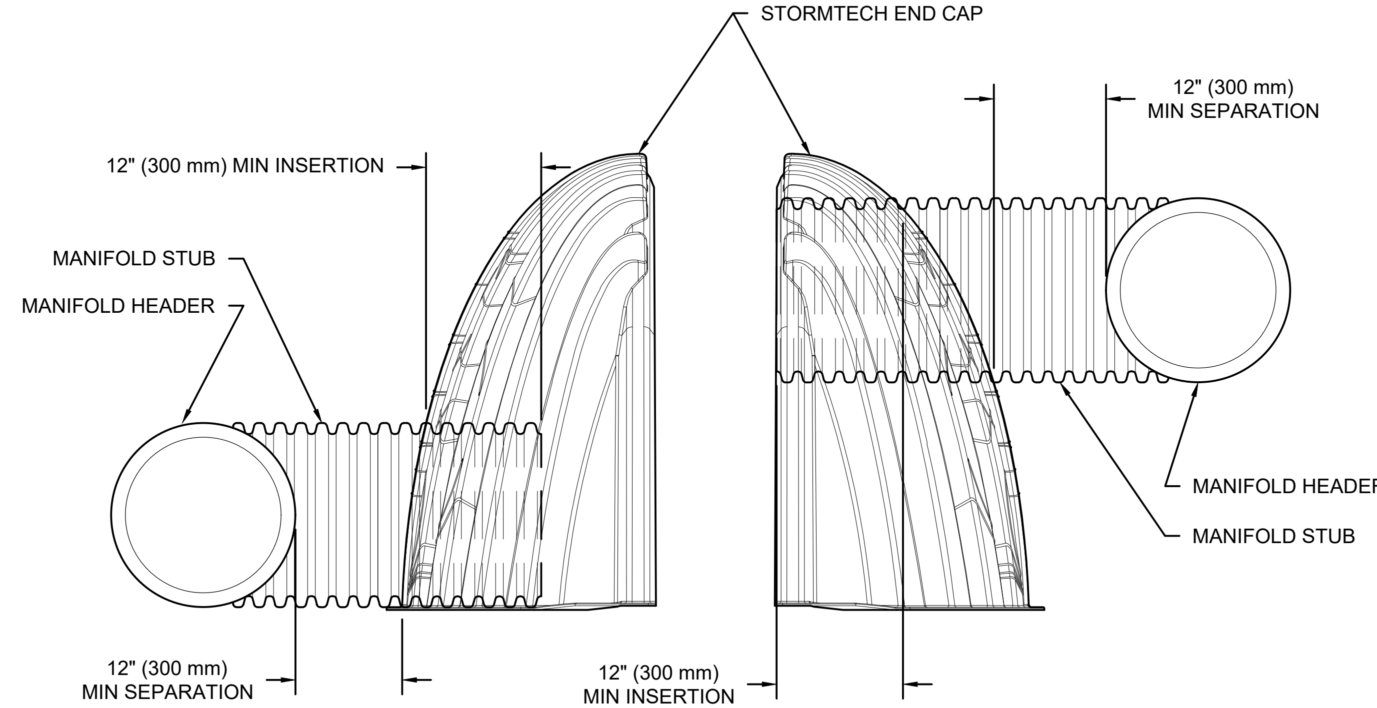

NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

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STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

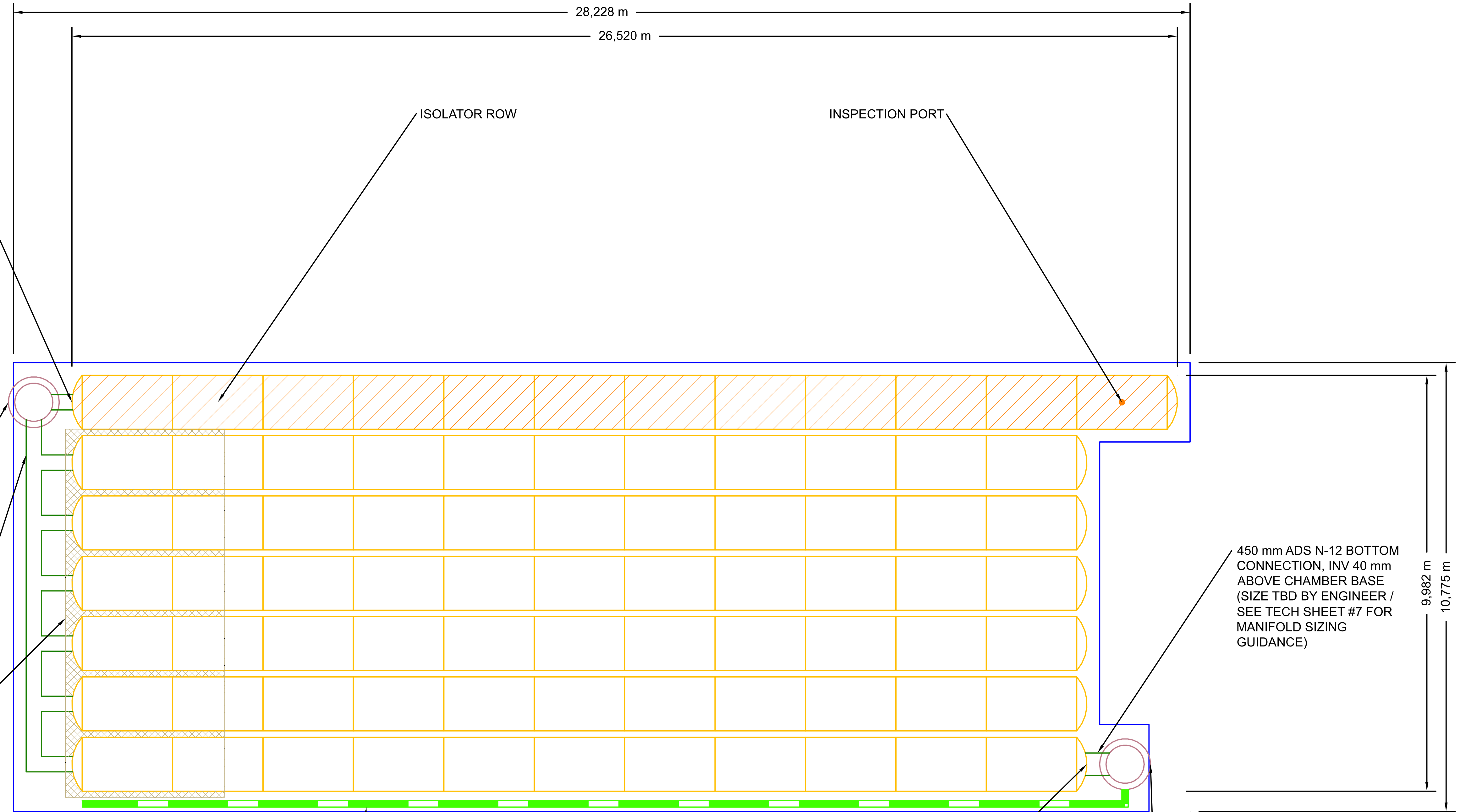
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(78) STORMTECH SC-740 CHAMBERS
(14) STORMTECH SC-740 END CAPS
INSTALLED WITH 152 mm COVER STONE, 305 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 201 m³
AREA OF SYSTEM: 287 **m²**
PERIMETER OF SYSTEM: 80 **m**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



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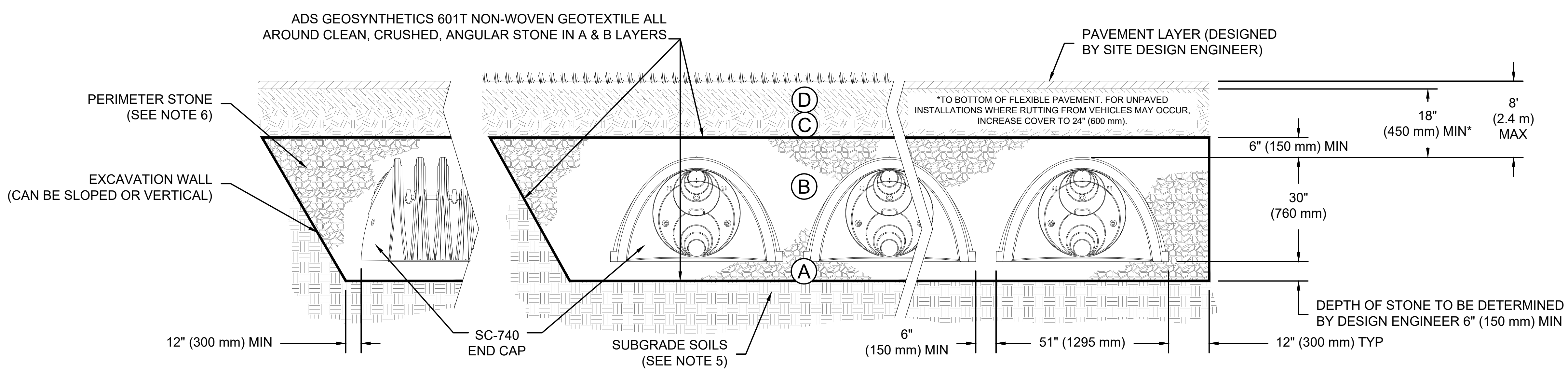
NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-740 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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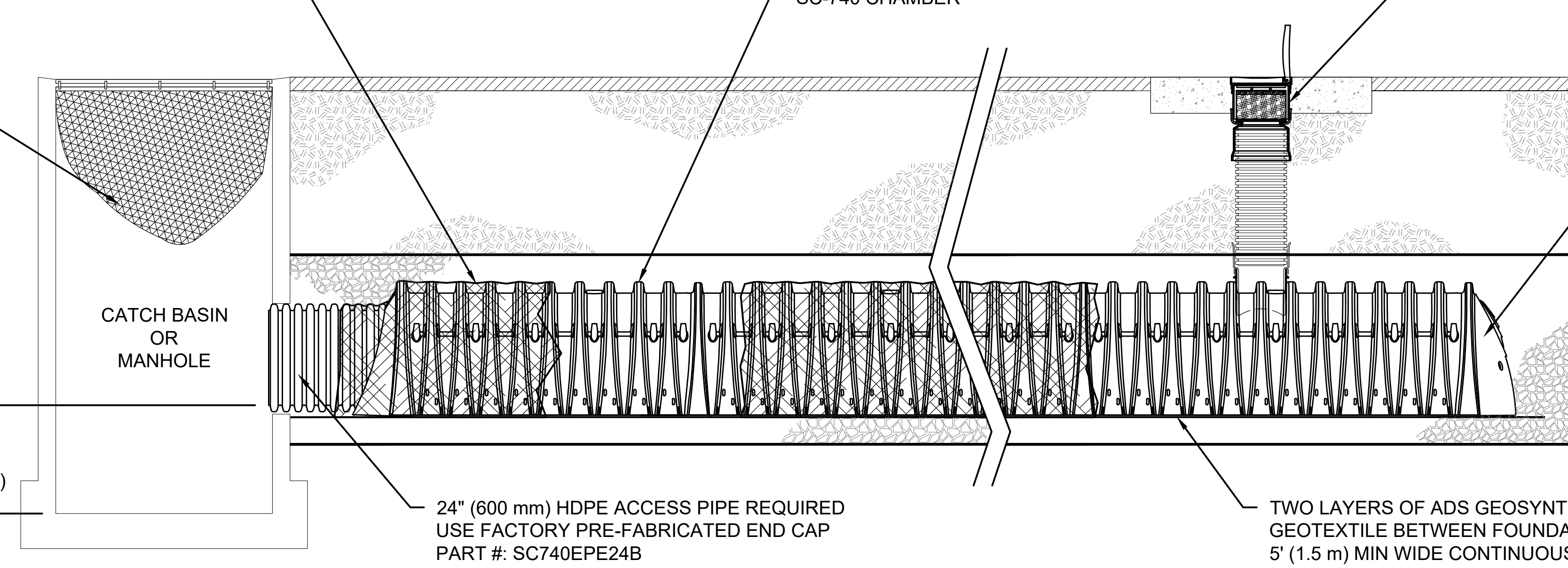


SC-740 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

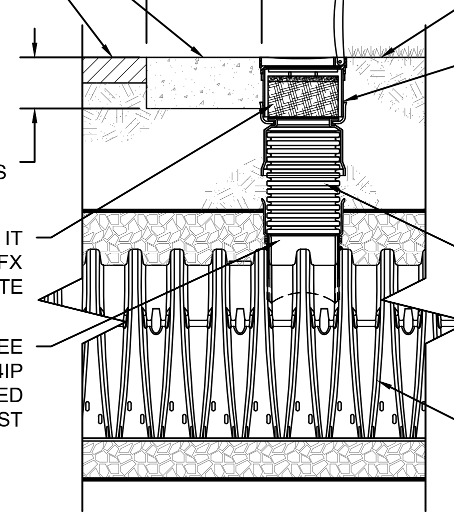
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-740 6" INSPECTION PORT DETAIL

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UNDERDRAIN DETAIL

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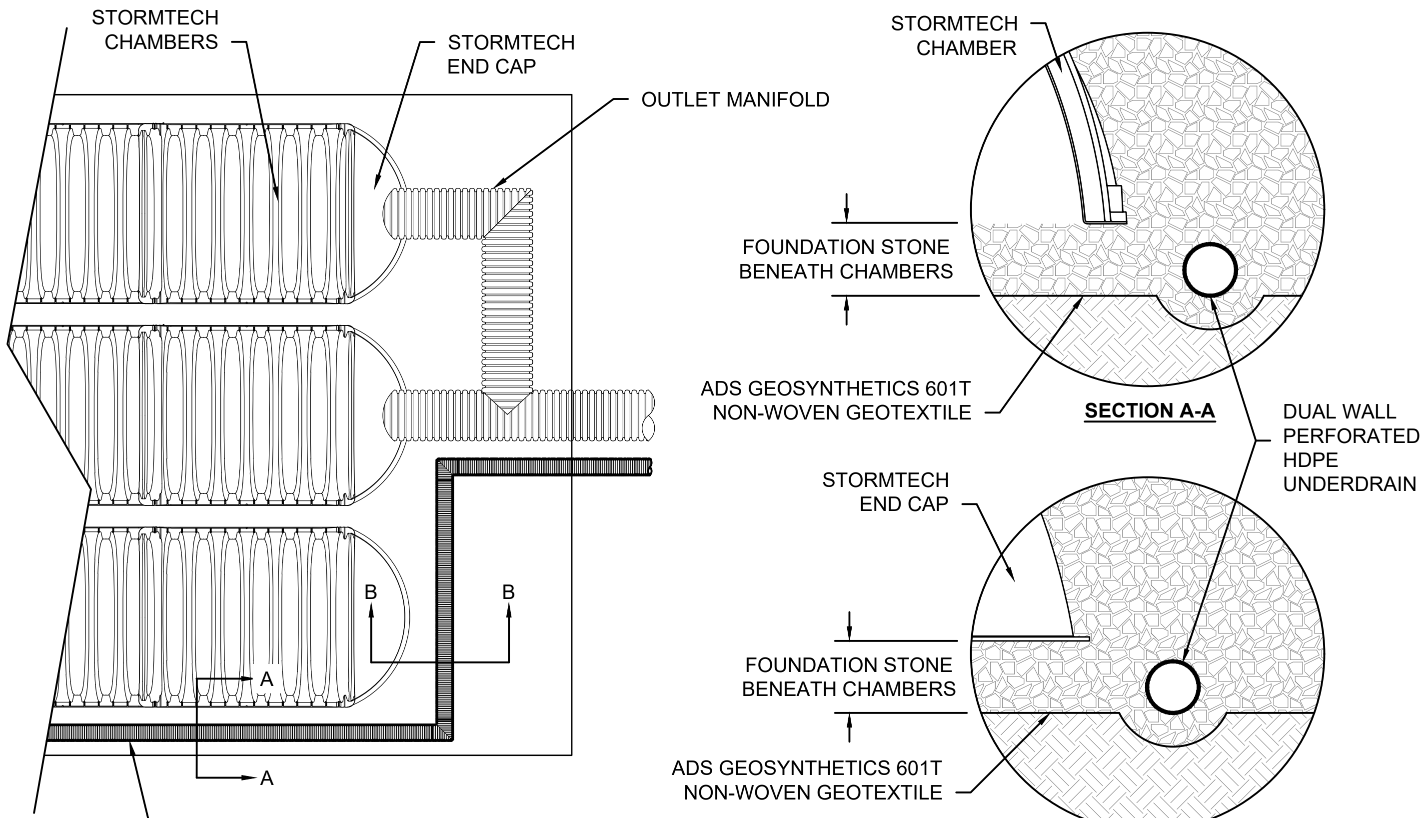
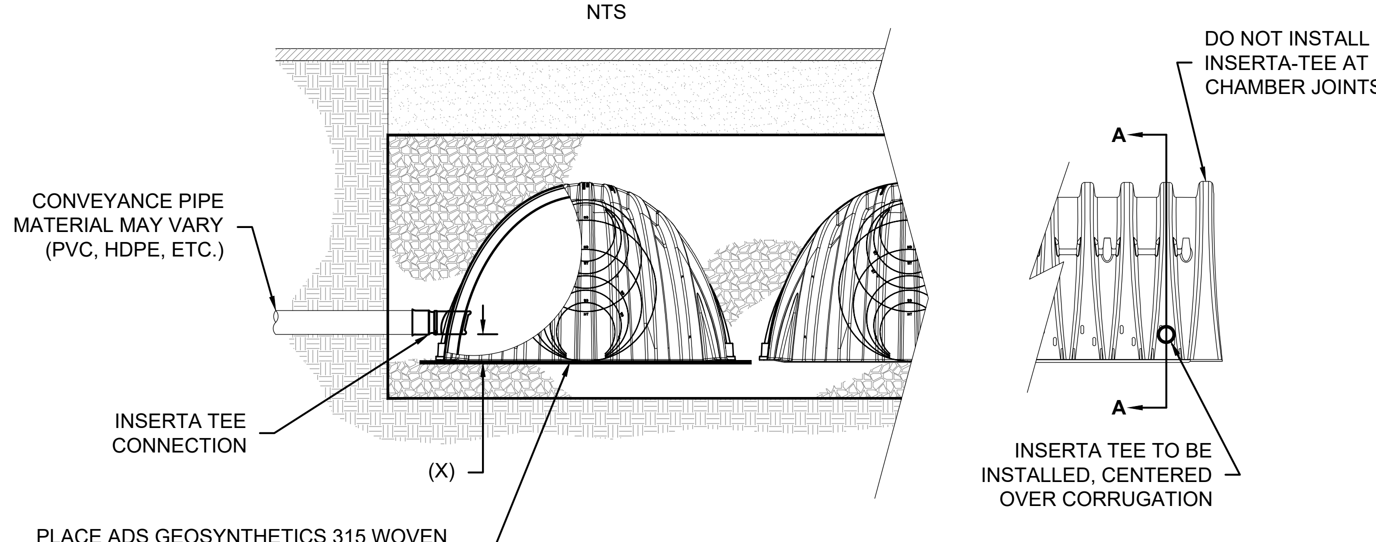


INSERTA TEE DETAIL

NTS

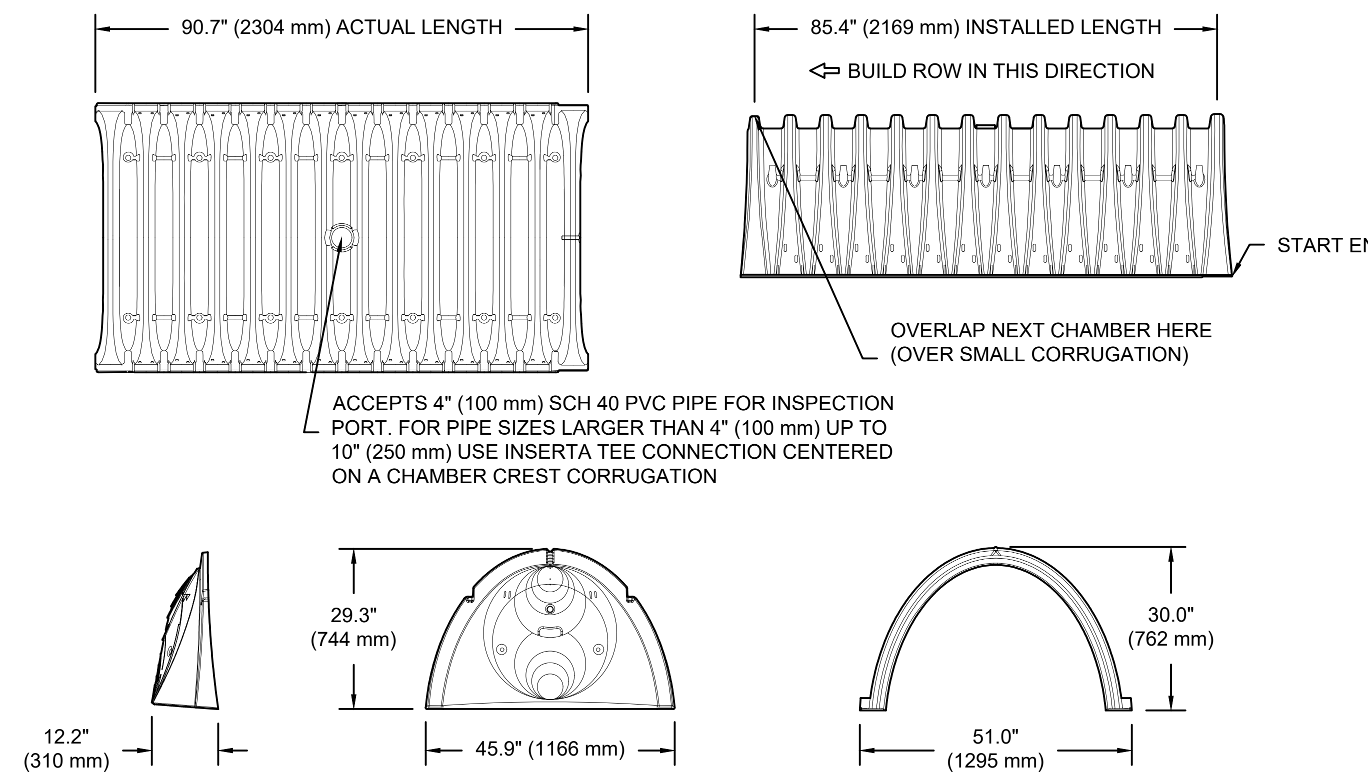


CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

SC-740 TECHNICAL SPECIFICATION

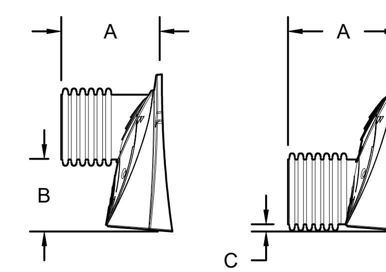
NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

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STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
    a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
    b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
    c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

    STORMTECH RECOMMENDS 3 BACKFILL METHODS:
    - STONESHOOTER LOCATED OFF THE CHAMBER BED.
    - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
    - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
    - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
    - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
    - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

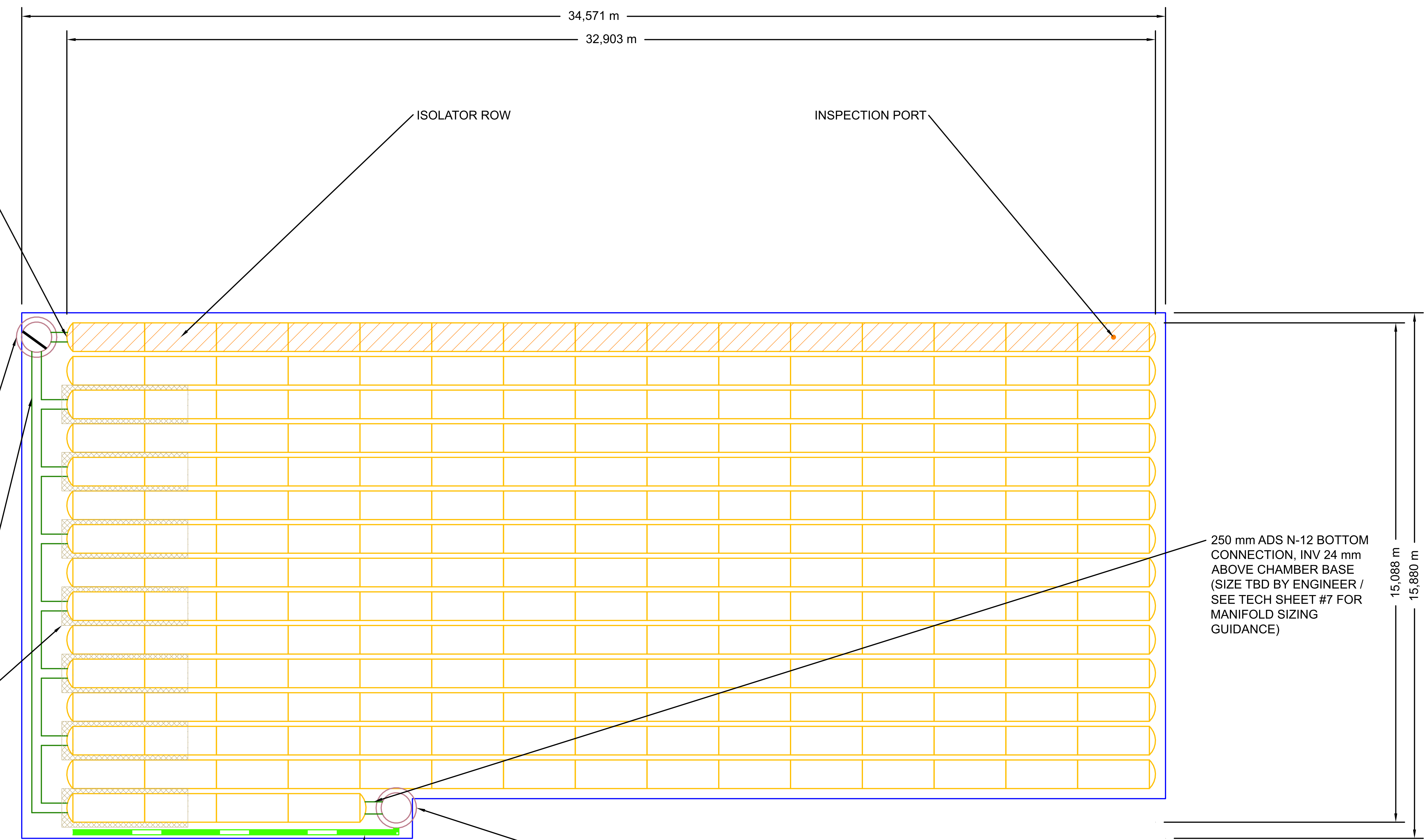
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

(214) STORMTECH SC-310 CHAMBERS
(30) STORMTECH SC-310 END CAPS
INSTALLED WITH 152 mm COVER STONE, 152 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 202 m³
AREA OF SYSTEM: 522 **m²**
PERIMETER OF SYSTEM: 101 **m**



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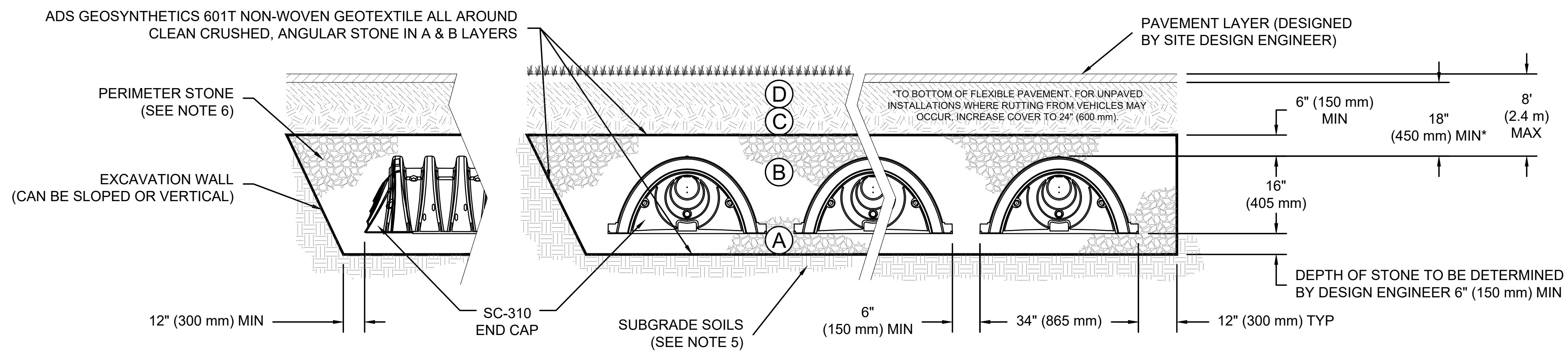
ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2][3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-310 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922 "STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
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6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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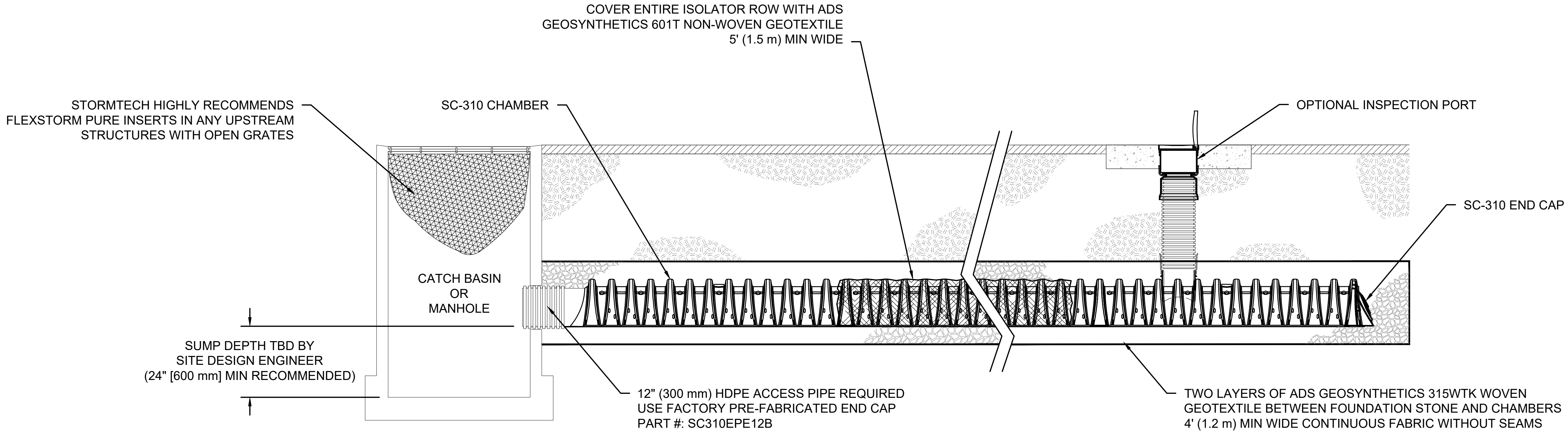


SC-310 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT

- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS

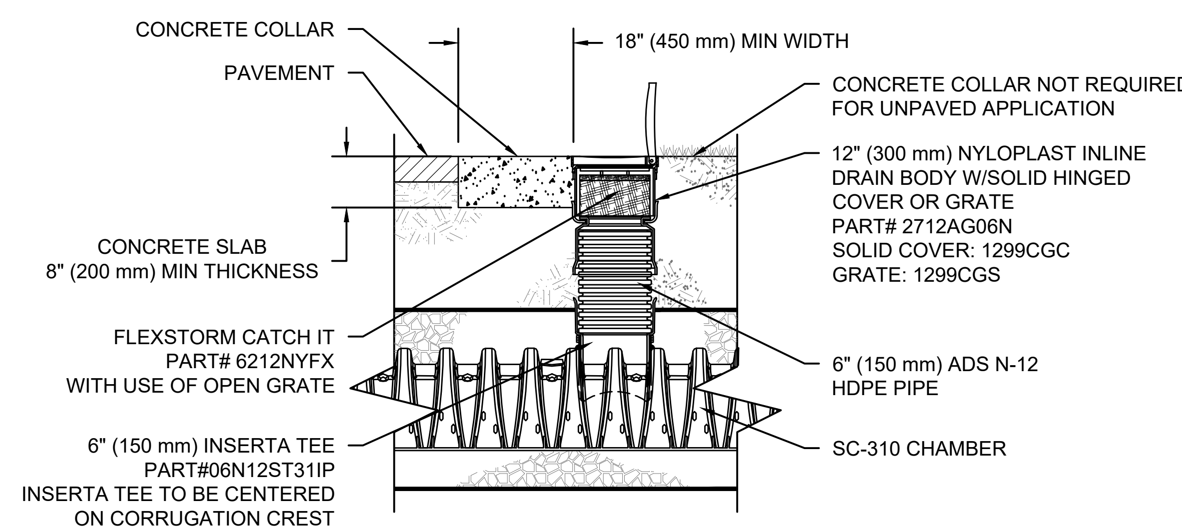
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-310 6" INSPECTION PORT DETAIL

NTS

2525 Carling Ave - Lincoln Fields
A122

DATE:	09/26/2019	DRAWN:	as
PROJECT #:	Tool	CHECKED:	---

REV	DRW	CHK	DESCRIPTION

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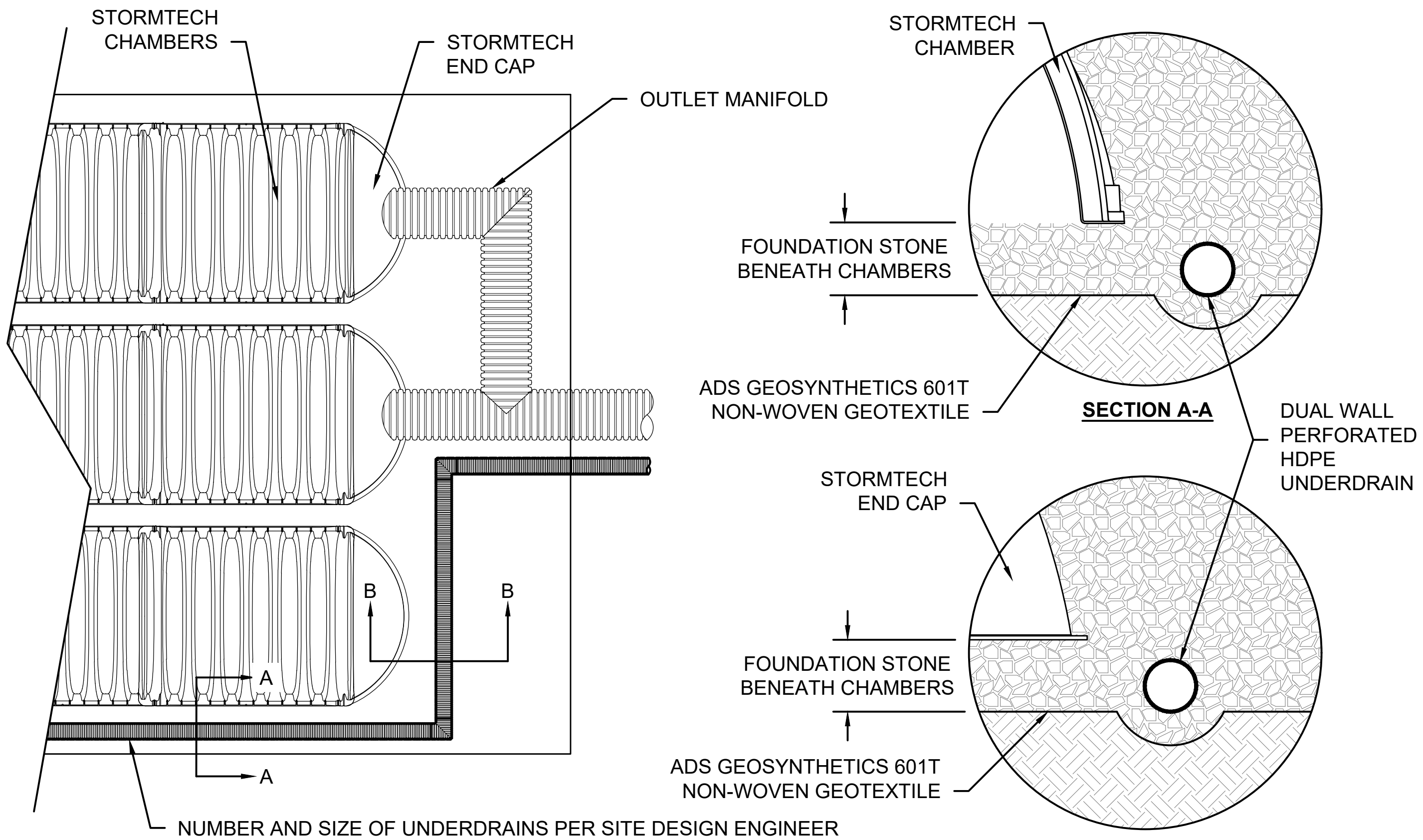
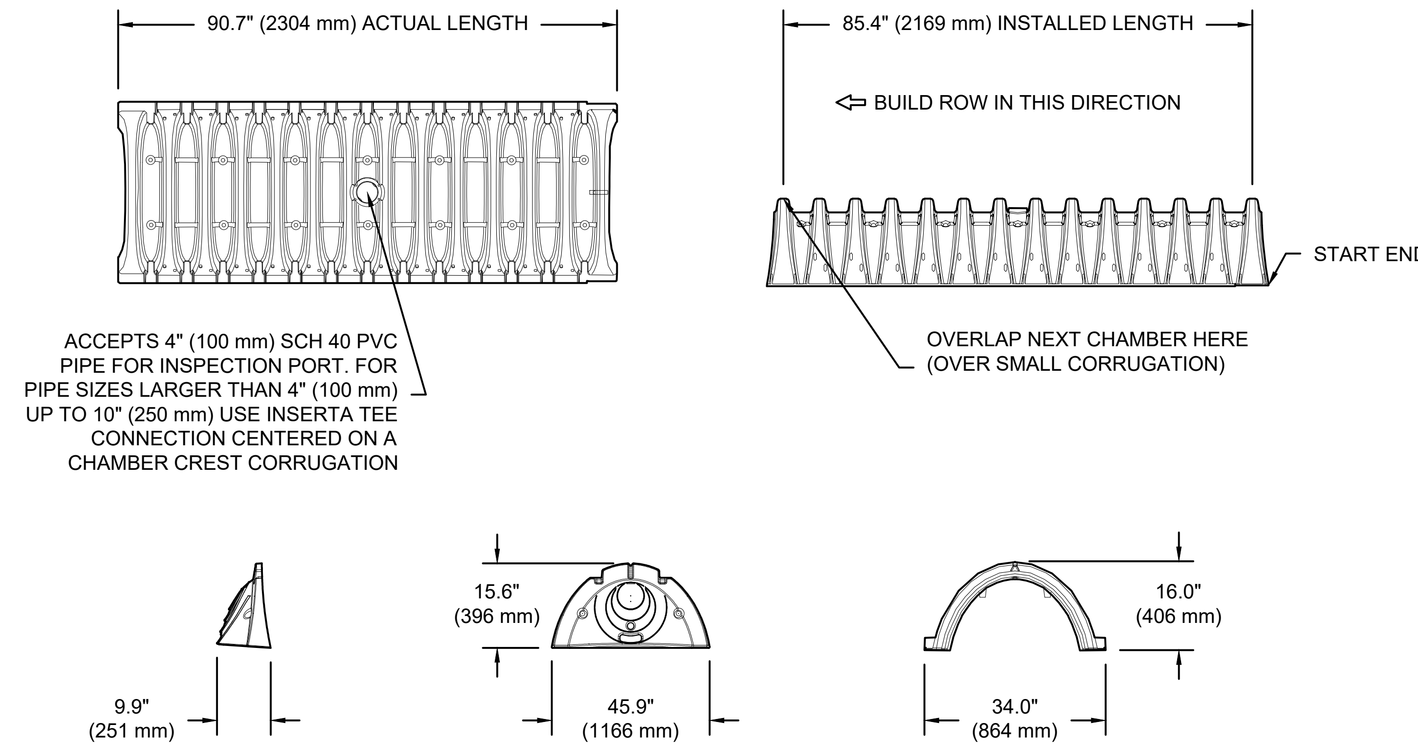


SC-310 TECHNICAL SPECIFICATION
NTS

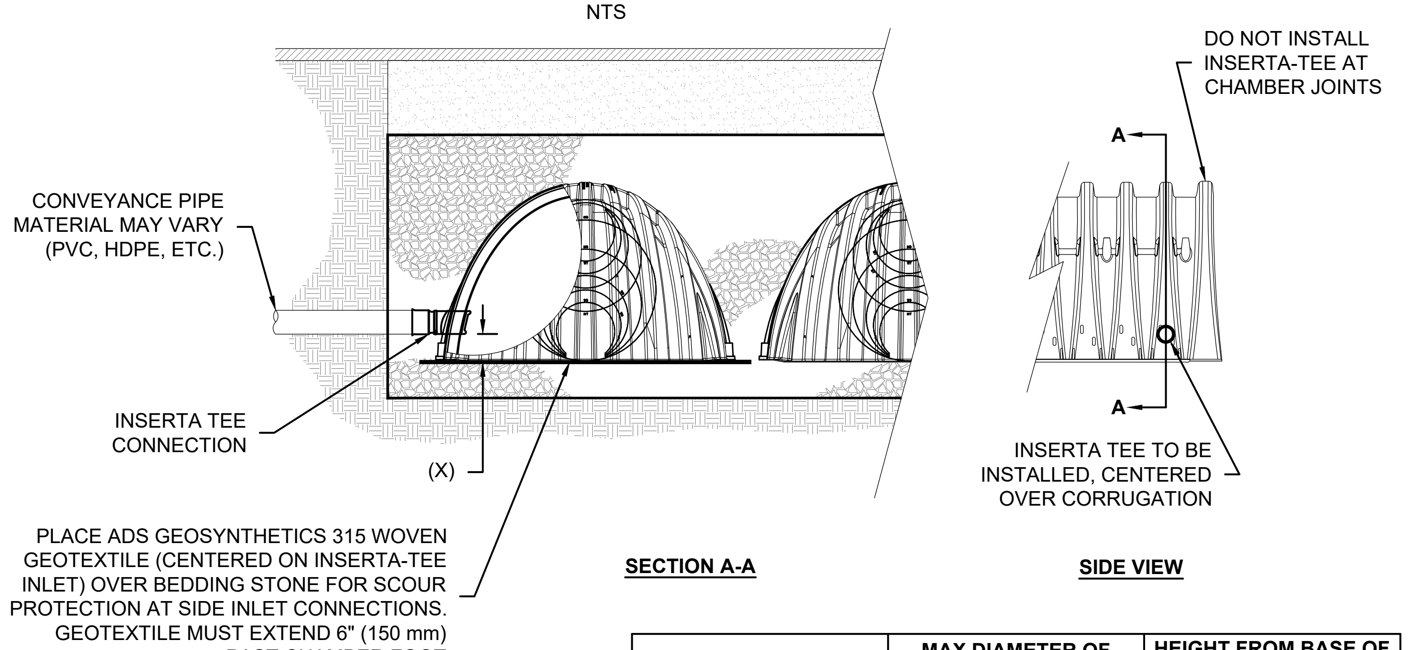


NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	34.0" X 16.0" X 85.4"	(864 mm X 406 mm X 2169 mm)
CHAMBER STORAGE	14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

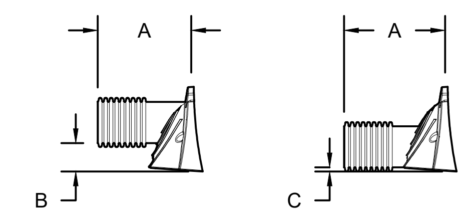
*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS

INSERTA TEE DETAIL
NTS



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC310EPE06T / SC310EPE06TPC	6" (150 mm)	9.6" (244 mm)	5.8" (147 mm)	---
SC310EPE06B / SC310EPE06BPC			---	0.5" (13 mm)
SC310EPE08T / SC310EPE08TPC	8" (200 mm)	11.9" (302 mm)	3.5" (89 mm)	---
SC310EPE08B / SC310EPE08BPC			---	0.6" (15 mm)
SC310EPE10T / SC310EPE10TPC	10" (250 mm)	12.7" (323 mm)	1.4" (36 mm)	---
SC310EPE10B / SC310EPE10BPC			---	0.7" (18 mm)
SC310EPE12B	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310EPE12B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310EPE12B THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

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STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740, SC-310, OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN POLYPROPYLENE OR POLYETHYLENE RESINS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET ASTM F2922 (POLYETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 OR ASTM F2922 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310/SC-740 SYSTEM

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/SC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH SC-310 & SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

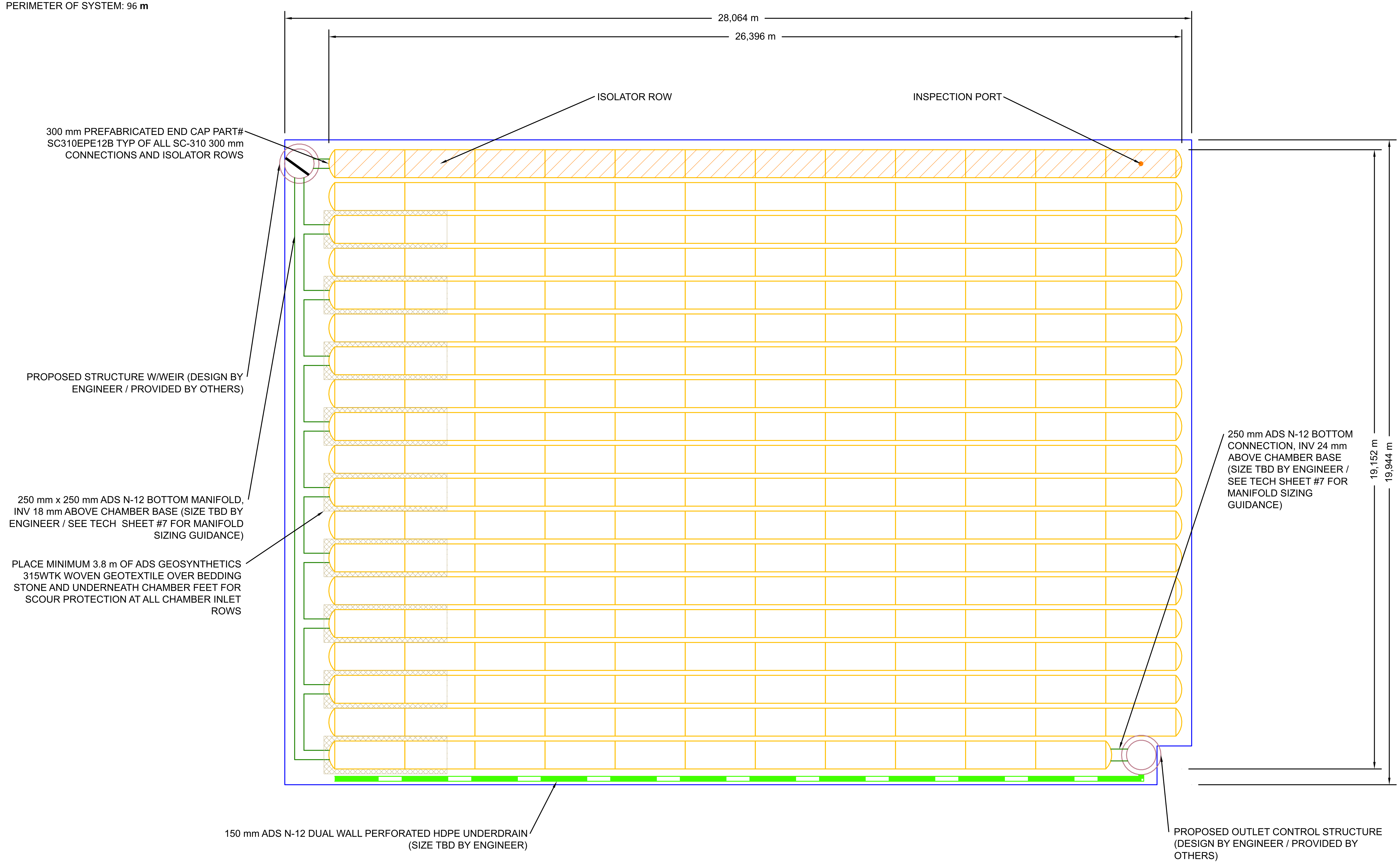
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

(227) STORMTECH SC-310 CHAMBERS
(38) STORMTECH SC-310 END CAPS
INSTALLED WITH 152 mm COVER STONE, 152 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 216 m³
AREA OF SYSTEM: 558 **m²**
PERIMETER OF SYSTEM: 96 **m**



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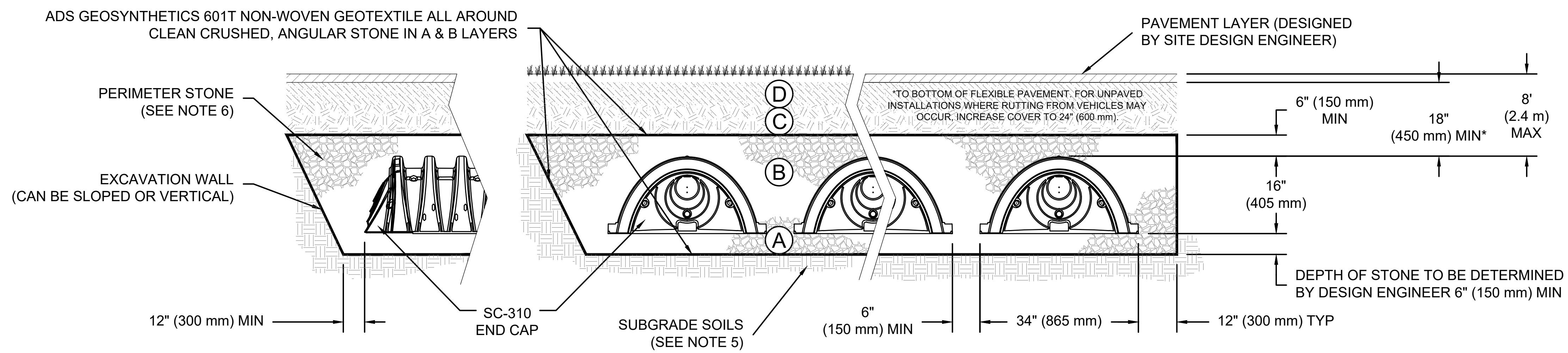
NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. SC-310 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS", OR ASTM F2922
"STANDARD SPECIFICATION FOR POLYETHYLENE (PE) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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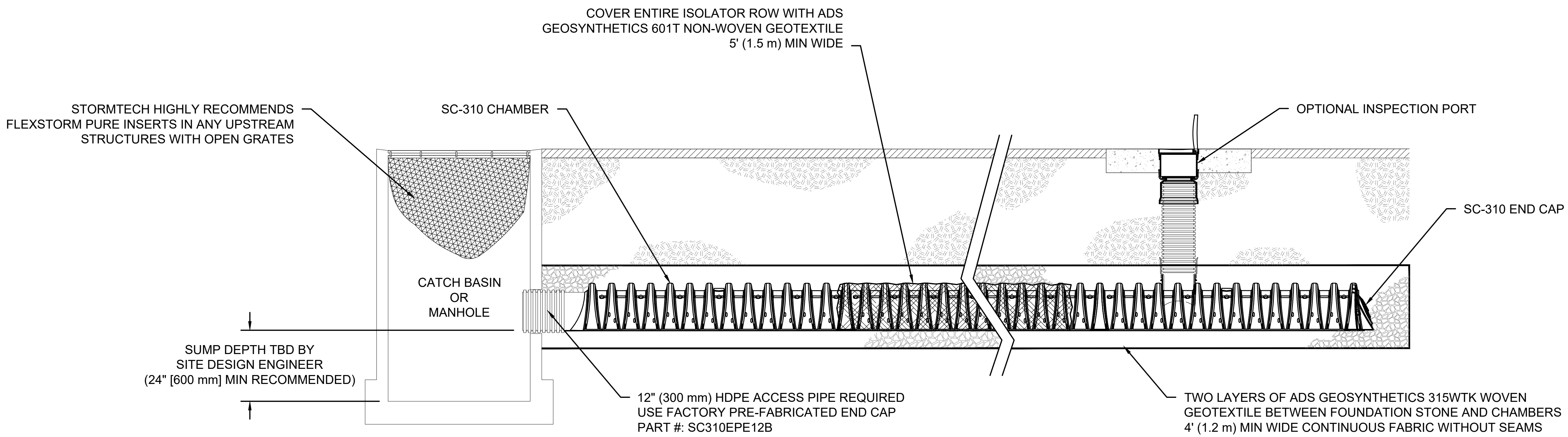


SC-310 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

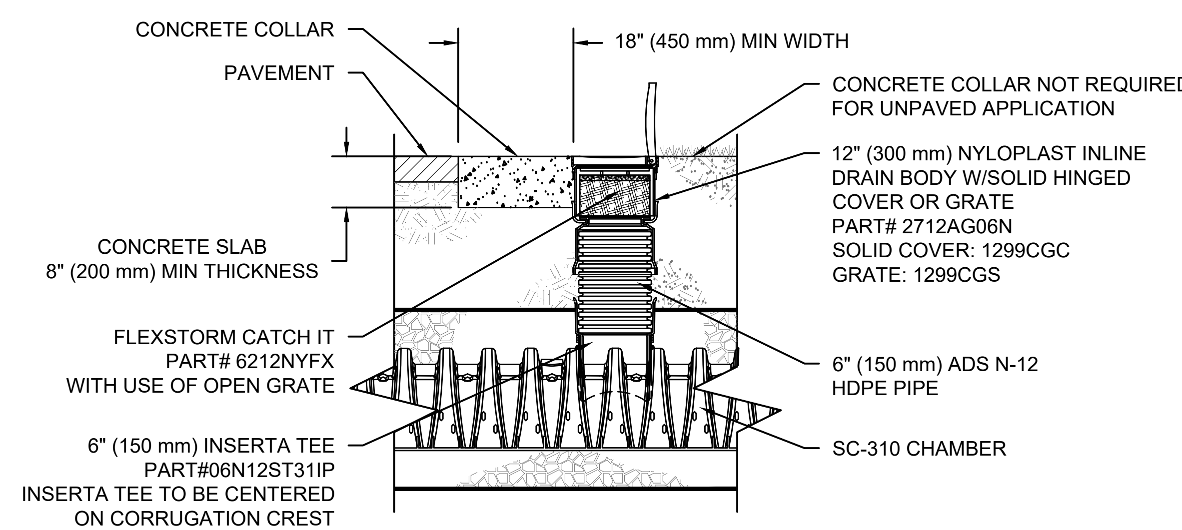
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



SC-310 6" INSPECTION PORT DETAIL

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UNDERDRAIN DETAIL

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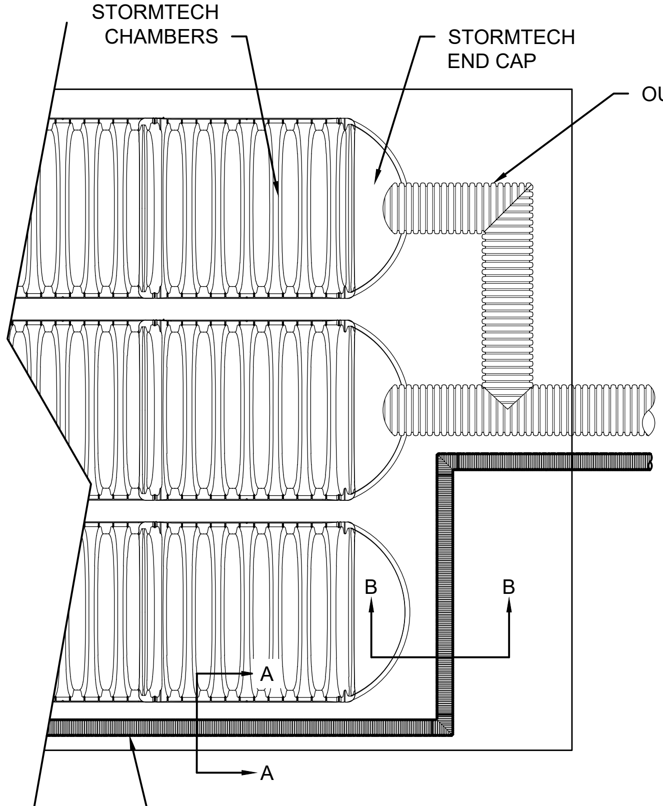
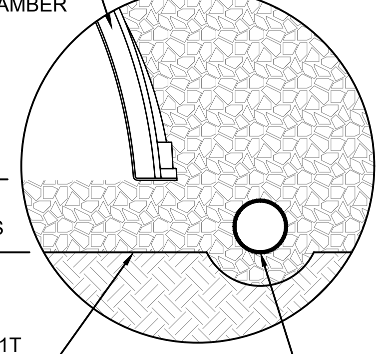
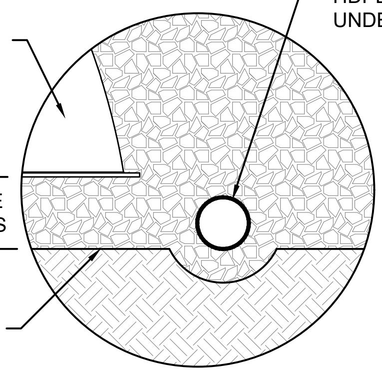


NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 mm) TYP FOR SC-310 SYSTEMS
6" (150 mm) TYP FOR SC-740, DC-780, MC-3500 & MC-4500 SYSTEMS



SECTION A-A



SECTION B-B

SC-310 TECHNICAL SPECIFICATION

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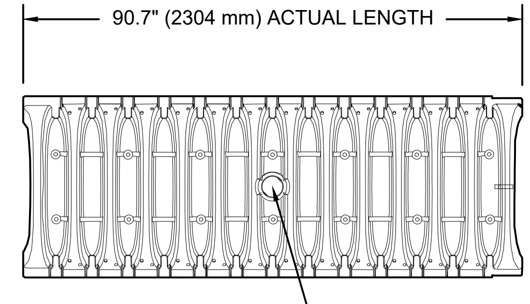

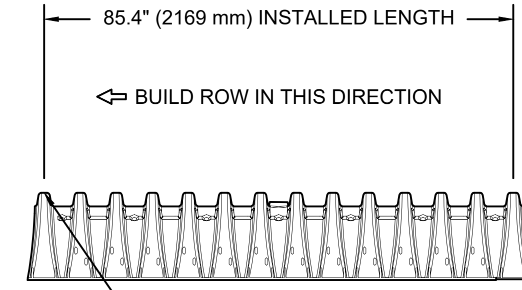

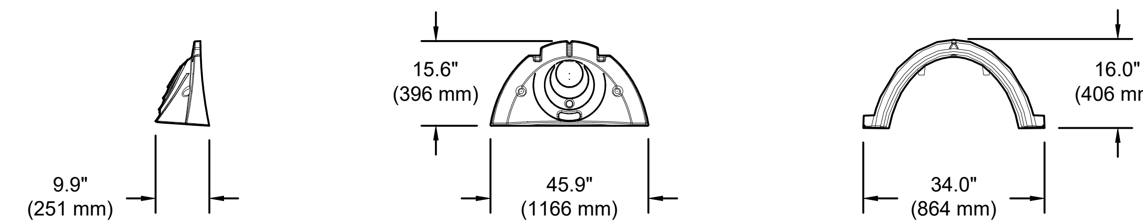

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MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS

INSERTA TEE DETAIL

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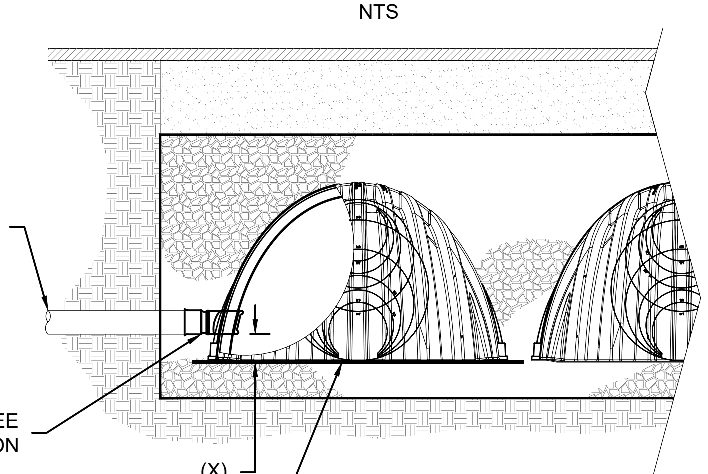
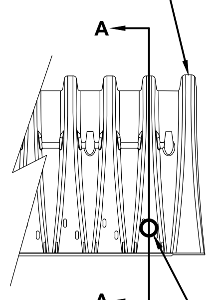


SECTION A-A



SIDE VIEW

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
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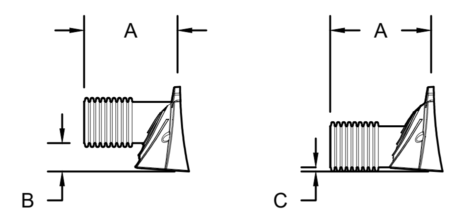
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.



STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC310EPE06T / SC310EPE06TPC	6" (150 mm)	9.6" (244 mm)	5.8" (147 mm)	---
SC310EPE06B / SC310EPE06BPC			---	0.5" (13 mm)
SC310EPE08T / SC310EPE08TPC	8" (200 mm)	11.9" (302 mm)	3.5" (89 mm)	---
SC310EPE08B / SC310EPE08BPC			---	0.6" (15 mm)
SC310EPE10T / SC310EPE10TPC	10" (250 mm)	12.7" (323 mm)	1.4" (36 mm)	---
SC310EPE10B / SC310EPE10BPC			---	0.7" (18 mm)
SC310EPE12B	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310EPE12B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310EPE12B THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

2525 Carling Ave - Lincoln Fields
A125

DATE: 09/26/2019
DRAWN: as
PROJECT #: Tool
CHECKED: ---

REV	DRW	CHK	DESCRIPTION

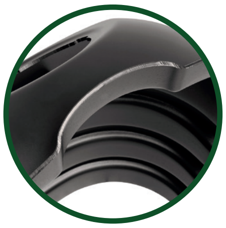
StormTech
Detention • Retention • Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

STORMTANK® THE PREMIER MULTI-SOLUTION PROVIDER

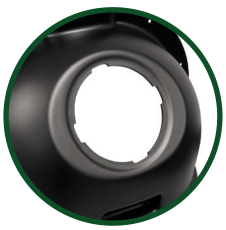
The Shield

Brentwood's StormTank Shield provides a low-cost solution for stormwater pretreatment by reducing pollutant discharge through gross sediment removal and oil/water separation. Once the Shield is installed, any contaminants with a density less than water are prevented from exiting the inlet. This improves treatment efficiency by increasing the flow length and time of concentration vital to particle settling.



Anti-Siphon Vent

Vortexes and siphoning are prevented by the built-in vent, which requires no additional parts or connections.

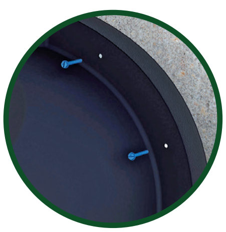


Access Port

The access port and slim profile simplify the cleaning process and ensure that nothing obstructs the discharge.

Hand Grip

The built-in hand grip makes the Shield easy to handle during the installation process.



Easy Installation

Pre-drilled mounting holes allow the Shield to be easily fastened over the outlet pipe. Conveniently available in 18-, 24-, and 30-inch sizes.

MADE IN THE USA

Additional StormTank Products:

The Module

The Brentwood StormTank Module is a subsurface stormwater storage unit load-rated for use under surfaces such as parking lots, athletic fields, and parks.

The Pack

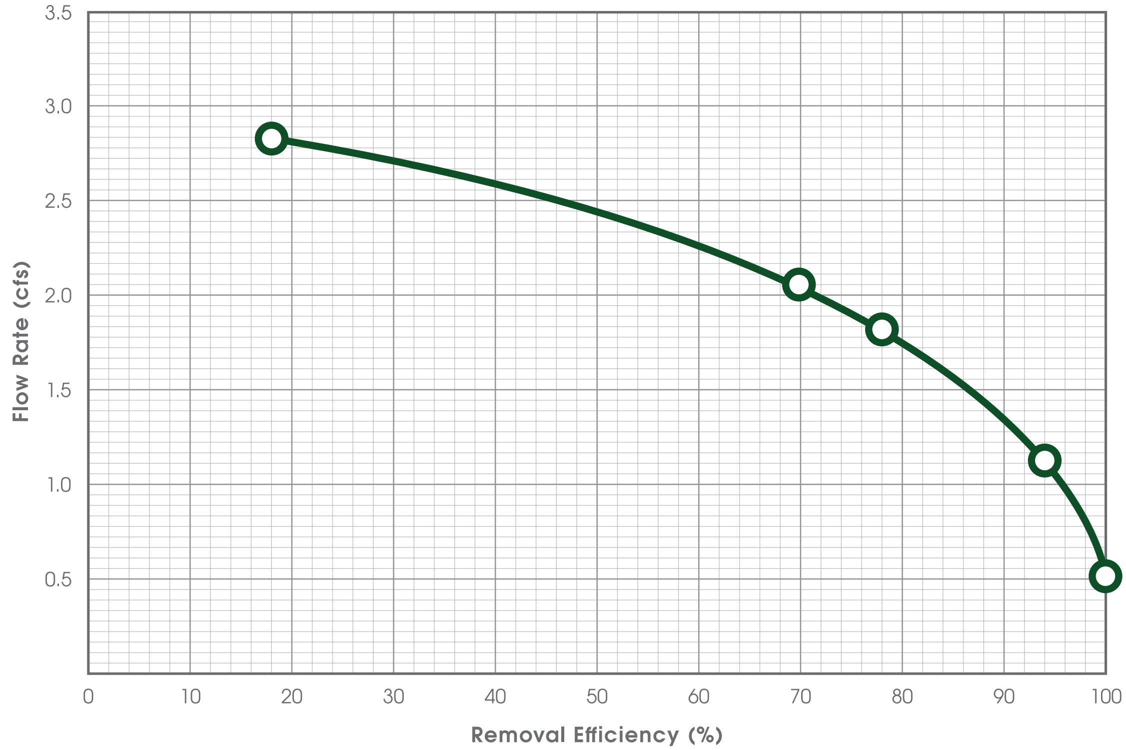
The StormTank Pack is the light-duty solution for subsurface stormwater management.

BRENTWOOD®

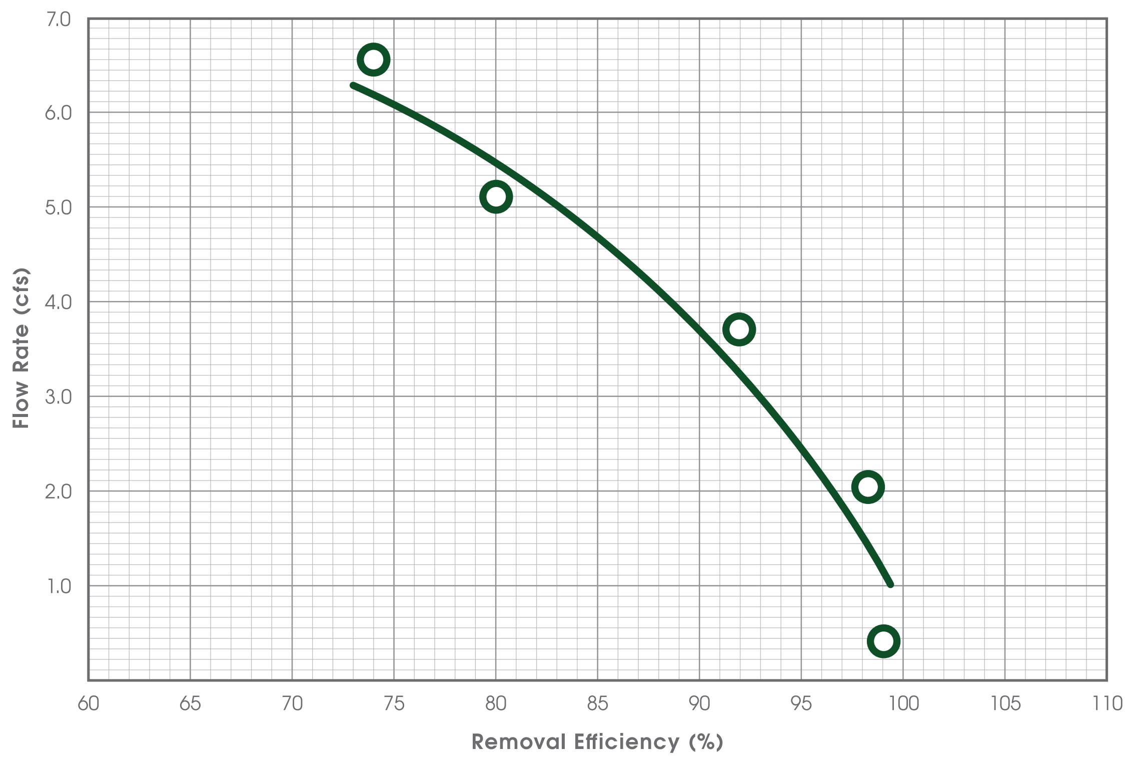
BRENTWOOD INDUSTRIES, INC.
brentwoodindustries.com
stormtank@brentw.com
+1.610.374.5109

REMOVAL EFFICIENCY CURVES

STKS-18, 4'x2' Tank, 1/16" Particles @ 200 mg/L



STKS-24, 4'x4' Tank, 1/16" Particles @ 200 mg/L



Stormceptor® FORTERRA

Detailed Stormceptor Sizing Report – OGS 1

Project Information & Location			
Project Name	2525 Carling Ave.	**Project Number**	-
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	12/16/2018
Designer Information		**EOR Information (optional)**	
Name	Brandon O'Leary	**Name**	Brandon Chow
Company	Forterra	**Company**	David Schaeffer Engineering Ltd.
Phone #	905-630-0359	**Phone #**	
Email	brandon.oleary@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	OGS 1
Recommended Stormceptor Model	EFO10
TSS Removal (%) Provided	81
Particle Size Distribution (PSD)	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

EFO Sizing Summary			
EFO Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**	**Standard EFO Hydrocarbon Storage Capacity**
EFO4	53	54	265 L (70 gal)
EFO6	67	76	610 L (160 gal)
EFO8	75	87	1070 L (280 gal)
EFO10	81	92	1670 L (440 gal)
EFO12	84	95	2475 L (655 gal)
Parallel Units / MAX	Custom	Custom	Custom

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

OVERVIEW

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

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	4093
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1784.7
Elevation (ft)	370	**Total Infiltration (mm)**	3136.5
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	16056.9

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

ONLINE APPLICATION

Stormceptor EF's internal bypass and patent-pending scour prevention technology has demonstrated very effective retention of pollutants in third-party testing and verification following the Canadian ETV's **Procedure for Laboratory Testing of Oil-Grit Separators.** Sediment scour prevention demonstrated an effluent concentration of less than 10 mg/L for sediment particles ranging from 1 to 1,000 microns, even during peak influent flow rates associated with infrequent high intensity storm events. While Stormceptor EF will capture oil, only the Stormceptor EFO configuration has been third-party tested and verified to retain greater than 99% of captured oil. Based on these verified performance attributes, the most efficient and widely accepted application of Stormceptor EF is an online configuration, which allows all upstream conveyance flows to enter and exit the unit. The online application eliminates the need for costly additional bypass structures, piping and installation expense.

FLOW ENTRANCE OPTIONS

Single Inlet Pipe – A common design which includes one inlet pipe and one outlet pipe. A 90-degree (maximum) bend is also accepted with this configuration.

Inlet Grate – Allows surface runoff to enter the unit from grade. The inlet grate option can also be used in conjunction with one inlet pipe or multiple inlet pipes. A removable flow deflector is added in the Stormceptor EF4/EFO4.

Maximum Pipe Diameter		
Model	Inlet (in/mm)	Outlet (in/mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

Multiple Inlet Pipe – Allows for multiple inlet pipes of various diameters to enter the unit.

Maximum Pipe Diameter		
Model	Inlet (in/mm)	Outlet (in/mm)
EF4 / EFO4	18 / 457	24 / 610
EF6 / EFO6	30 / 762	36 / 915
EF8 / EFO8	42 / 1067	48 / 1220
EF10 / EFO10	60 / 1524	72 / 1828
EF12 / EFO12	60 / 1524	72 / 1828

Drainage Area	
Total Area (ha)	2.75
Imperviousness %	85

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	OGS 1

Site Details

Drainage Area	
Total Area (ha)	2.75
Imperviousness %	85
Oil Spill Capture Volume (L)	

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Surface Characteristics	
Width (m)	332.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (L/s)	0

Maintenance Frequency	
Maintenance Frequency (months) >	12

Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	Build Up/ Wash-off

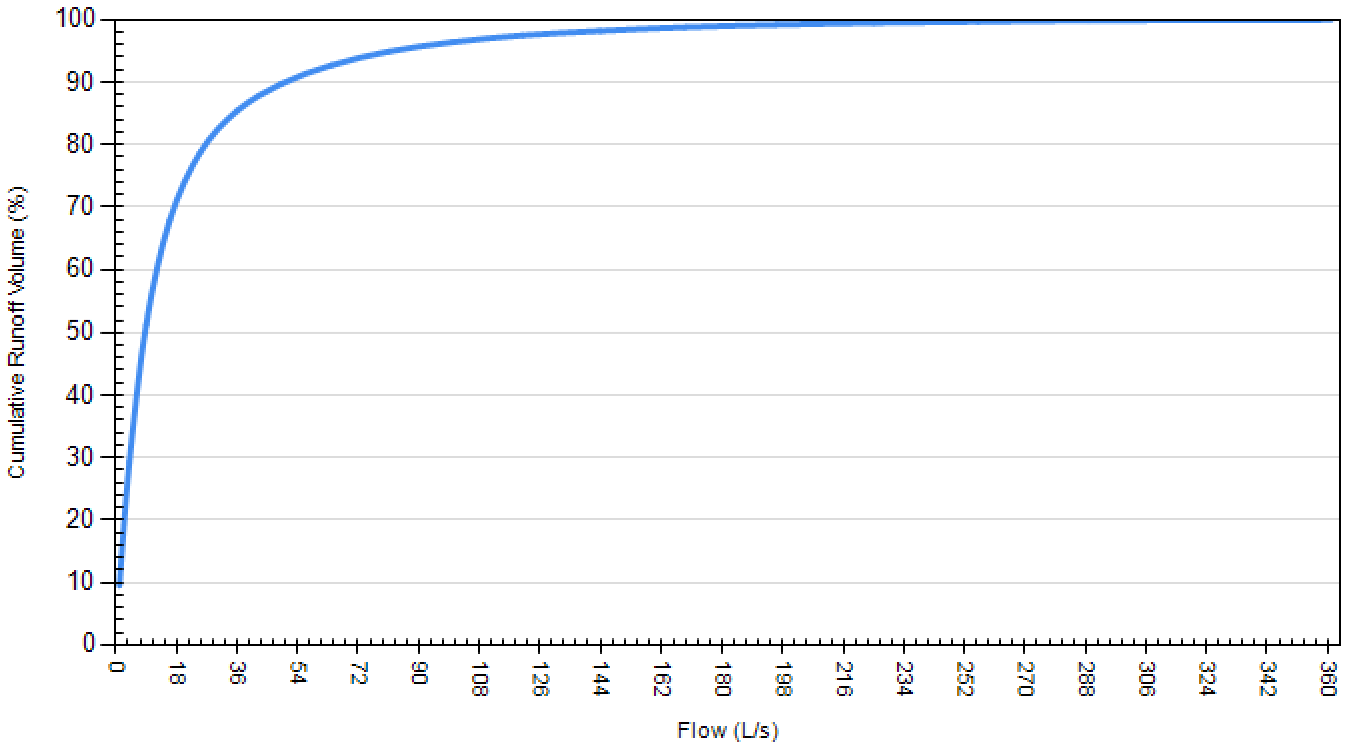
Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

TSS Availability Parameters	
Availability Constant A	0.057
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

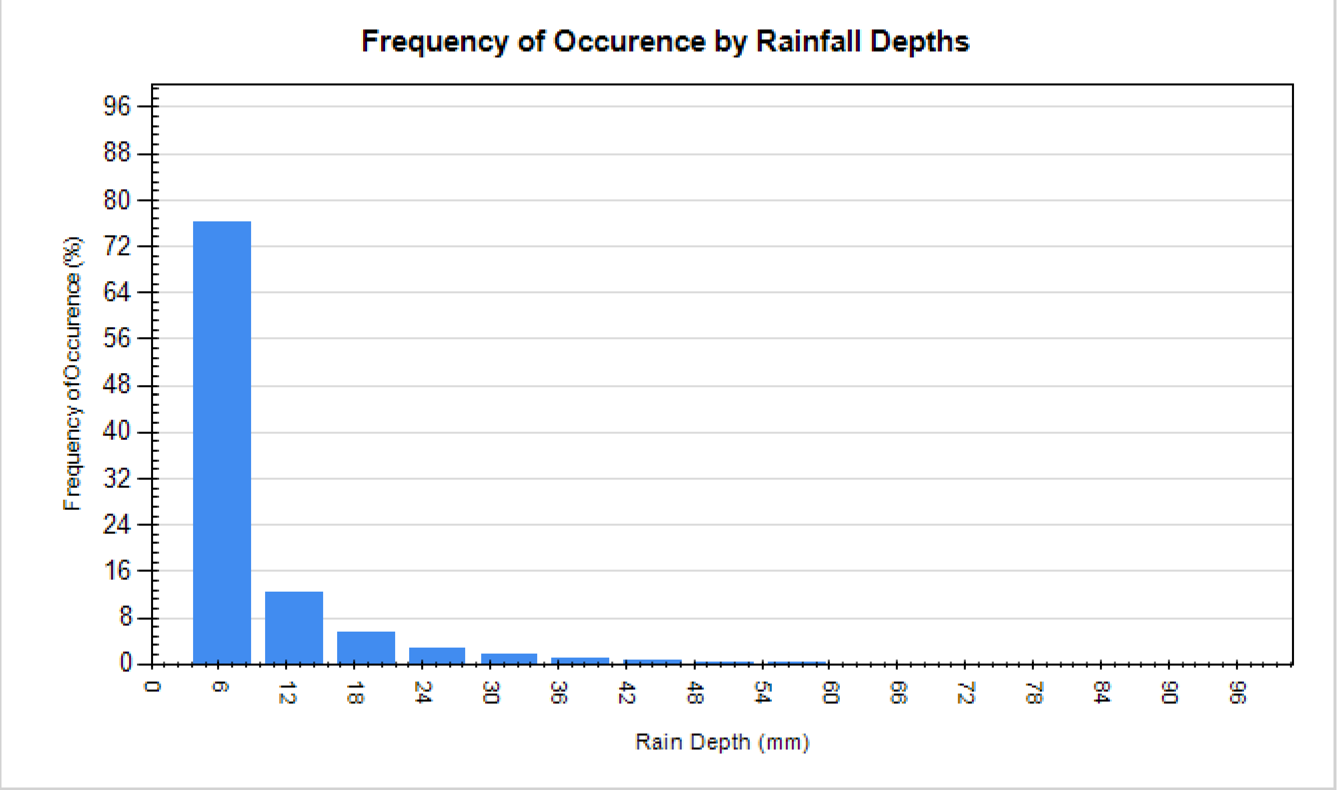
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	42252	401502	9.5
4	130103	313670	29.3
9	227857	216041	51.3
16	301290	142470	67.9
25	349374	94374	78.7
36	378974	64810	85.4
49	398145	45605	89.7
64	411571	32183	92.7
81	421129	22622	94.9
100	427712	16042	96.4
121	432474	11277	97.5
144	435923	7829	98.2
169	438389	5362	98.8
196	440216	3536	99.2
225	441623	2128	99.5
256	442601	1150	99.7
289	443115	635	99.9
324	443378	373	99.9
361	443564	187	100.0

Cumulative Runoff Volume by Runoff Rate

For area: 2.75(ha), imperviousness: 85.00%, rainfall station: OTTAWA MACDONALD-CARTIER INT'L A



Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	3113	76.1	5230	24.9
12.70	501	12.2	4497	21.4
19.05	225	5.5	3469	16.5
25.40	105	2.6	2317	11.0
31.75	62	1.5	1765	8.4
38.10	35	0.9	1206	5.8
44.45	28	0.7	1163	5.5
50.80	12	0.3	557	2.7
57.15	7	0.2	378	1.8
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



Stormceptor® FORTERRA

Detailed Stormceptor Sizing Report – OGS 2

Project Information & Location			
Project Name	2525 Carling Ave.	**Project Number**	-
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	12/16/2018
Designer Information		**EOR Information (optional)**	
Name	Brandon O'Leary	**Name**	Brandon Chow
Company	Forterra	**Company**	David Schaeffer Engineering Ltd.
Phone #	905-630-0359	**Phone #**	
Email	brandon.oleary@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	OGS 2
Recommended Stormceptor Model	EFO10
TSS Removal (%) Provided	80
Particle Size Distribution (PSD)	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

EFO Sizing Summary			
EFO Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**	**Standard EFO Hydrocarbon Storage Capacity**
EFO4	52	52	265 L (70 gal)
EFO6	66	75	610 L (160 gal)
EFO8	73	86	1070 L (280 gal)
EFO10	80	92	1670 L (440 gal)
EFO12	83	95	2475 L (655 gal)
Parallel Units / MAX	Custom	Custom	Custom

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

OVERVIEW

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

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	4093
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1764.5
Elevation (ft)	370	**Total Infiltration (mm)**	3345.1
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	15868.5

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

ONLINE APPLICATION

Stormceptor EF's internal bypass and patent-pending scour prevention technology has demonstrated very effective retention of pollutants in third-party testing and verification following the Canadian ETV's **Procedure for Laboratory Testing of Oil-Grit Separators.** Sediment scour prevention demonstrated an effluent concentration of less than 10 mg/L for sediment particles ranging from 1 to 1,000 microns, even during peak influent flow rates associated with infrequent high intensity storm events. While Stormceptor EF will capture oil, only the Stormceptor EFO configuration has been third-party tested and verified to retain greater than 99% of captured oil. Based on these verified performance attributes, the most efficient and widely accepted application of Stormceptor EF is an online configuration, which allows all upstream conveyance flows to enter and exit the unit. The online application eliminates the need for costly additional bypass structures, piping and installation expense.

FLOW ENTRANCE OPTIONS

Single Inlet Pipe – A common design which includes one inlet pipe and one outlet pipe. A 90-degree (maximum) bend is also accepted with this configuration.

Inlet Grate – Allows surface runoff to enter the unit from grade. The inlet grate option can also be used in conjunction with one inlet pipe or multiple inlet pipes. A removable flow deflector is added in the Stormceptor EF4/EFO4.

Maximum Pipe Diameter		
Model	Inlet (in/mm)	Outlet (in/mm)
EF4 / EFO4	24 / 610	24 / 610
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

Multiple Inlet Pipe – Allows for multiple inlet pipes of various diameters to enter the unit.

Maximum Pipe Diameter		
Model	Inlet (in/mm)	Outlet (in/mm)
EF4 / EFO4	18 / 457	24 / 610
EF6 / EFO6	30 / 762	36 / 915
EF8 / EFO8	42 / 1067	48 / 1220
EF10 / EFO10	60 / 1524	72 / 1828
EF12 / EFO12	60 / 1524	72 / 1828

Drainage Area	
Total Area (ha)	3.00
Imperviousness %	84

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	OGS 2

Site Details

Drainage Area	
Total Area (ha)	3.00
Imperviousness %	84
Oil Spill Capture Volume (L)	

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Surface Characteristics	
Width (m)	346.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (L/s)	0

Maintenance Frequency	
Maintenance Frequency (months) >	12

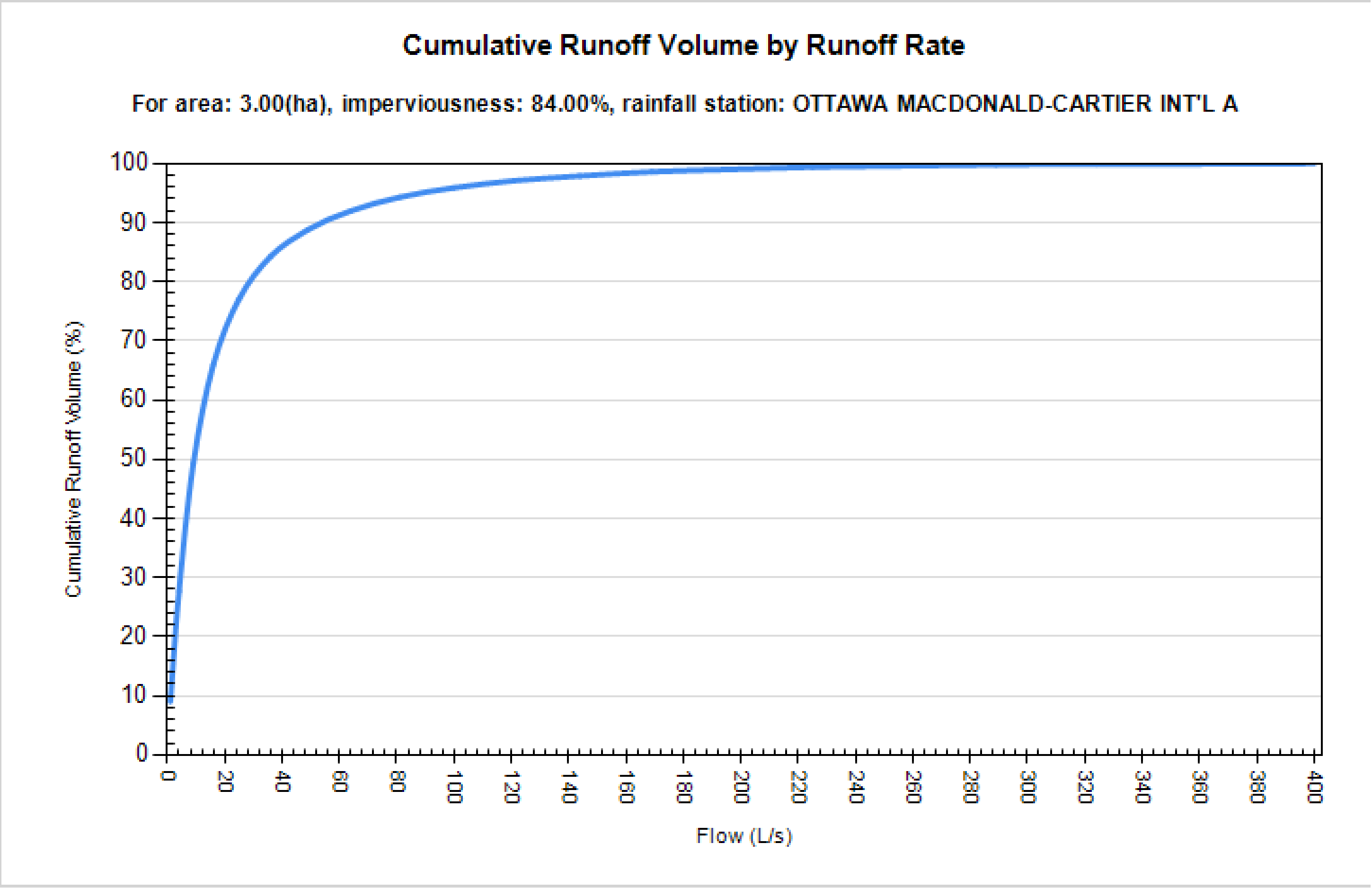
Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	Build Up/ Wash-off

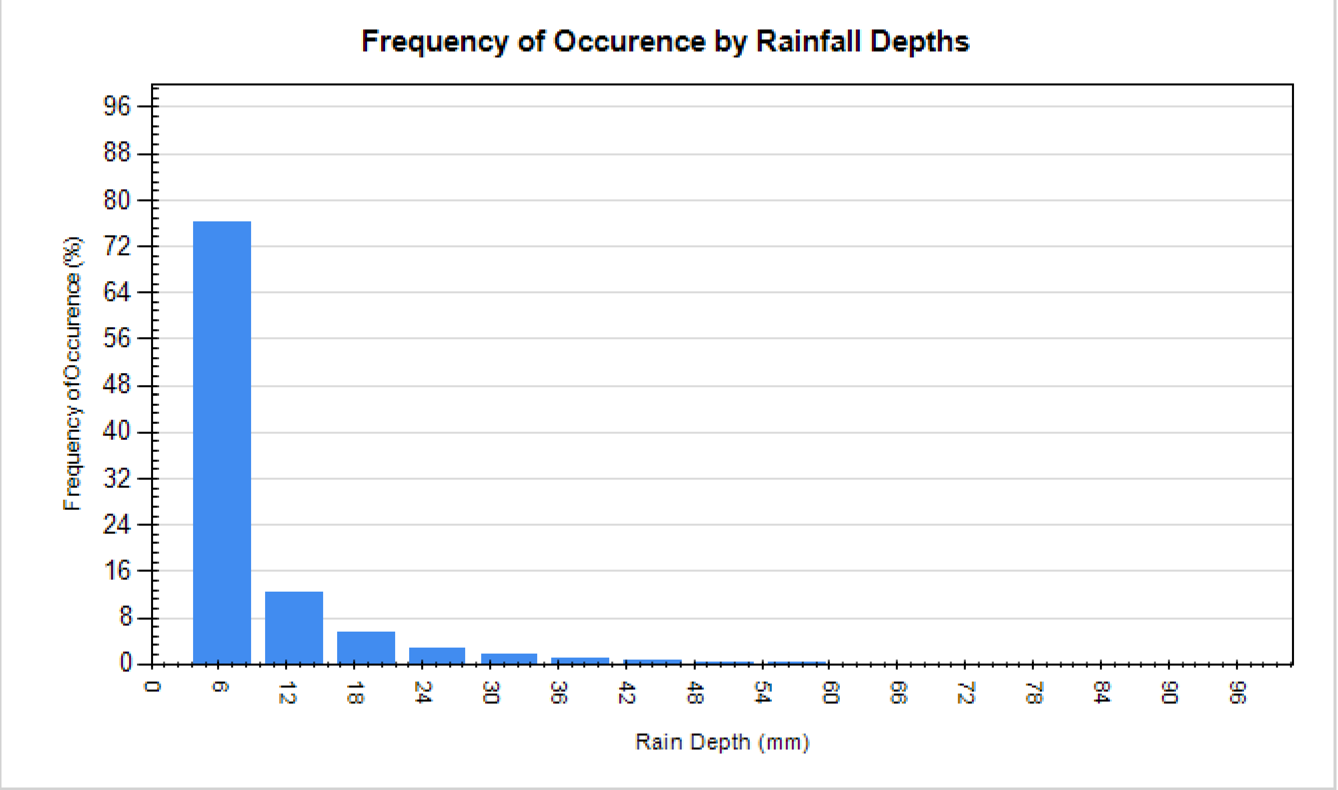
Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

TSS Availability Parameters	
Availability Constant A	0.057
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

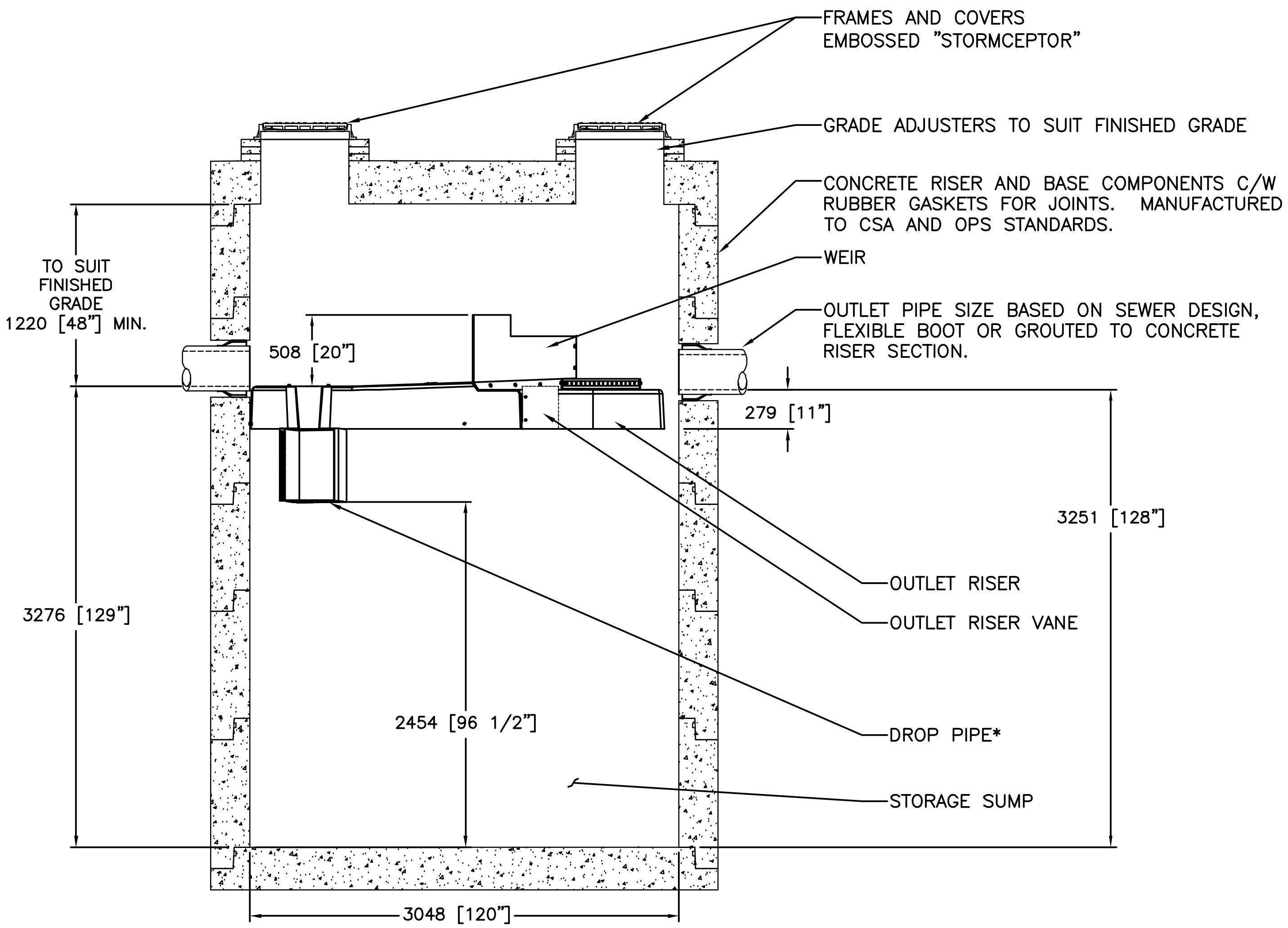
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m^3)	Volume Over (m^3)	Cumulative Runoff Volume (%)
1	42952	435242	9.0
4	132529	345665	27.7
9	235839	242491	49.3
16	315473	162703	66.0
25	368816	109333	77.1
36	402902	75296	84.3
49	424680	53470	88.8
64	439903	38258	92.0
81	450897	27258	94.3
100	458664	19498	95.9
121	464163	13993	97.1
144	468274	9884	97.9
169	471254	6902	98.6
196	473416	4742	99.0
225	475111	3045	99.4
256	476349	1807	99.6
289	477181	975	99.8
324	477580	576	99.9
361	477826	330	99.9
400	477993	163	100.0


Cumulative Runoff Volume by Runoff Rate
For area: 3.00(ha), imperviousness: 84.00%, rainfall station: OTTAWA MACDONALD-CARTIER INT'L A
Cumulative Runoff Volume (%)
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Flow (L/s)

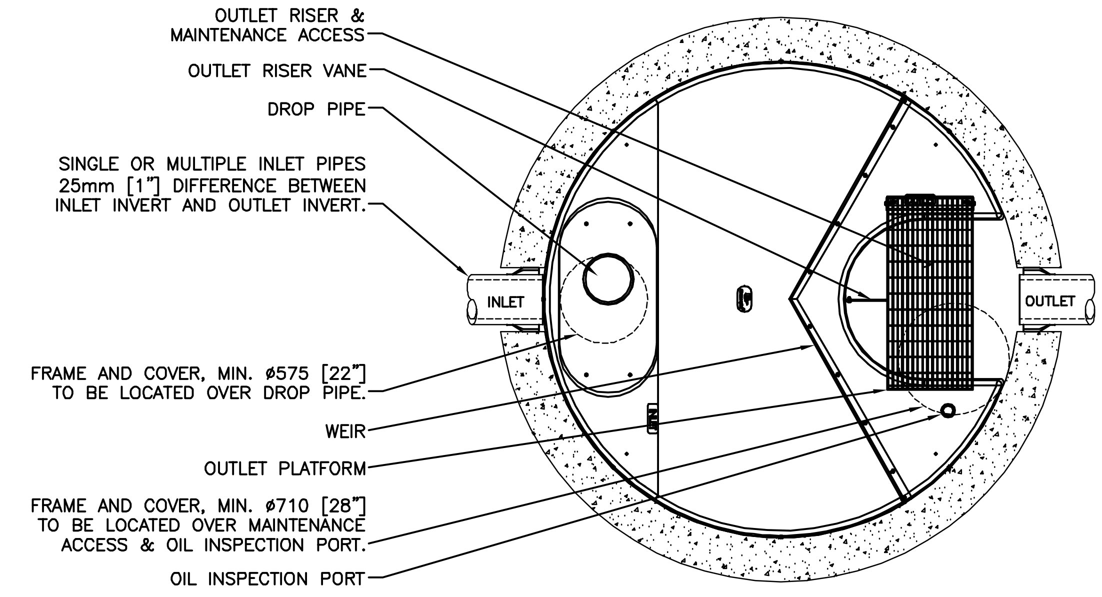
Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3113	76.1	5230	24.9
12.70	501	12.2	4497	21.4
19.05	225	5.5	3469	16.5
25.40	105	2.6	2317	11.0
31.75	62	1.5	1765	8.4
38.10	35	0.9	1206	5.8
44.45	28	0.7	1163	5.5
50.80	12	0.3	557	2.7
57.15	7	0.2	378	1.8
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



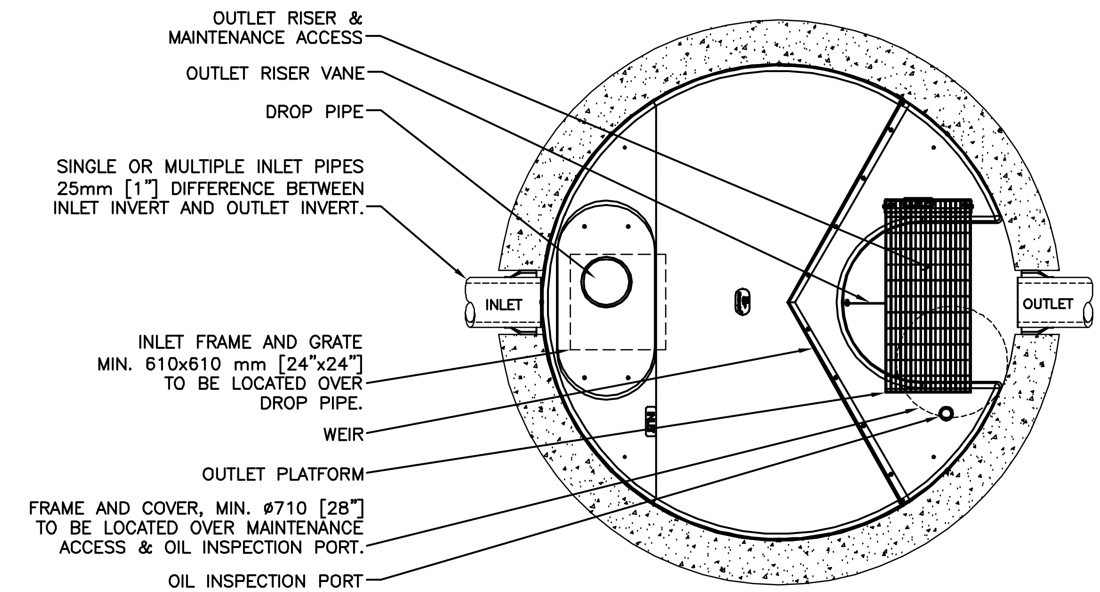
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF10 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO10 (OIL CAPTURE CONFIGURATION).

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

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

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO10				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately for re-evaluation of the design. Imbrium accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

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

Stormceptor® EF

SCALE = NTS

imbrium®

DATE: 10/24/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO10	SEQUENCE No.: *
SHEET: 1 OF 1	

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS

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

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

1.2.2 For ALL projects, the following reference standards apply:

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

1.3 SHOP DRAWINGS

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

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

1.4 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

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

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

PART 2 – PRODUCTS

2.1 GENERAL

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

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

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

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

2.2 PRECAST CONCRETE SECTIONS

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

2.3 GASKETS

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

2.4 JOINTS

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

2.5 FRAMES AND COVERS

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

2.6 PRECAST CONCRETE

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

2.7 FIBERGLASS

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

2.8 OGS POLLUTANT STORAGE

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

2.9 LADDERS

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

2.10 INSPECTION

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 HYDROLOGY AND RUNOFF VOLUME

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

3.3 ANNUAL (TSS) SEDIMIMENT LOAD AND STORAGE CAPACITY

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

Annual sediment volume calculations shall be performed using the projected average annual treated runoff volume, a typical sediment bulk density of 1602 kg/m^3 (100 lbs/ft^3) and an assumed Event Mean

Concentration (EMC) of 125 mg/L TSS in the runoff, or as otherwise determined by the Engineer of Record.

Example calculation for a 1.3-hectares parking lot site:

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

Annual Runoff Volume:

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

Annual Sediment Mass and Sediment Volume Load Calculation:

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

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

Table 1 – Annual Mass Sediment Loading by Land Use

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

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

3.4 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in Table 2, Section 3.5, and based on third-party performance testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** Sizing shall be determined using historical rainfall data (as specified in Section 3.2) and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 3.3.

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

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

- Canadian ETV or ISO 14034 ETV Verification Statement which verifies third-party performance testing conducted in accordance with the **Procedure for Laboratory Testing of Oil-Grit Separators,** including the Light Liquid Re-entrainment Simulation Testing.
- Equal or better sediment (TSS) removal of the PSD specified in Table 2 at equivalent surface loading rates, as compared to the OGS device specified herein.
- Equal or better Light Liquid Re-entrainment Simulation Test results (using low-density polyethylene beads as a surrogate for light liquids such as oil and fuel) at equivalent

surface loading rates, as compared to the OGS device specified herein. However, an alternative OGS device shall not be allowed as a substitute if the Light Liquid Re-entrainment Simulation Test was performed with screening components within the OGS device that are effective at retaining the low-density polyethylene beads, but would not be expected to retain light liquids such as oil and fuel.

- Equal or greater sediment storage capacity, as compared to the OGS device specified herein.
- Supporting documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.5 PARTICLE SIZE DISTRIBUTION (PSD) FOR SIZING

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

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

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

3.6 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

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

3.7 DESIGN ACCOUNTING FOR BYPASS

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

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

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

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

3.8 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

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

3.9 PETROLEUM HYDROCARBONS AND FLOATABLES STORAGE CAPACITY

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

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

3.10 SURFACE LOADING RATE SCALING OF DIFFERENT MODEL SIZES

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

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

PART 4 – INSPECTION & MAINTENANCE

The OGS manufacturer shall provide an Owner's Manual upon request.

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

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

4.3 Inspection and pollutant removal from below the OGS's insert shall be conducted as a periodic maintenance practice using a standard maintenance truck and vacuum apparatus, and shall be easily conducted from finished grade through a Frame and Cover of at least 22-inches (560 mm) in diameter, and through an access opening to the OGS device's sump with a minimum 16-inches diameter (406 mm).

4.4 No confined space for sediment removal or inspection of internal components shall be required for normal operation, annual inspection or maintenance activity.

PART 5 – EXECUTION

5.1 <u>PRECAST CONCRETE INSTALLATION</u>

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

5.2 <u>EXCAVATION</u>

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

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

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

5.3 <u>BACKFILLING</u>

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

5.4 <u>OGS WATER QUALITY DEVICE CONSTRUCTION SEQUENCE</u>

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

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

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

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

5.5 <u>DROP PIPE AND OIL INSPECTION PIPE</u>

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

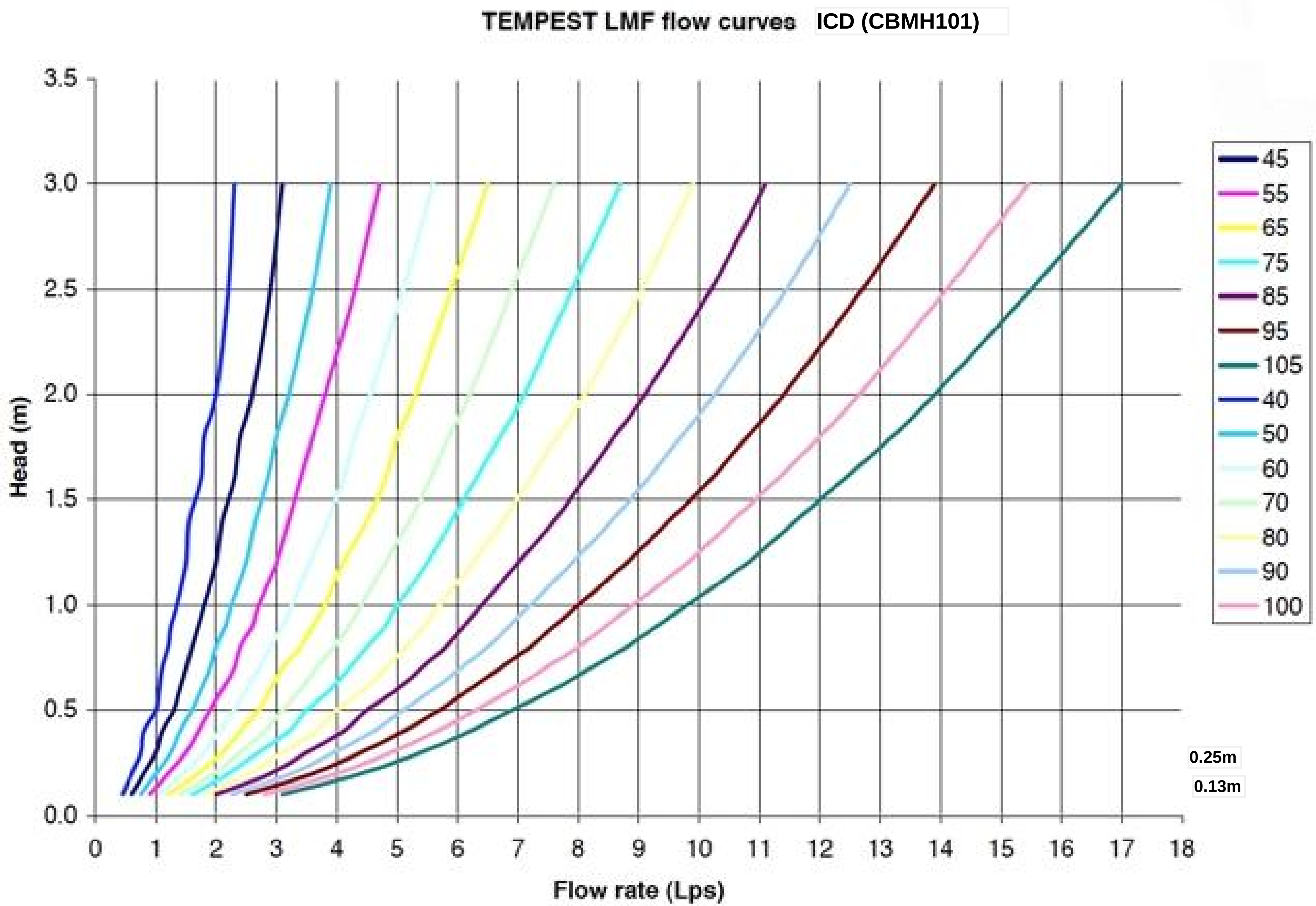
5.6 <u>INLET AND OUTLET PIPES</u>

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

5.7 <u>FRAME AND COVER OR FRAME AND GRATE INSTALLATION</u>

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

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


TEMPEST LMF flow curves
ICD (CBMH101)
Head (m)
Flow rate (Lps)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
45
55
65
75
85
95
105
40
50
60
70
80
90
100
0.25m
0.13m

Zurn Roof Drains

Control-Flo . . . Today's Successful Answer to More

THE ZURN "CONTROL-FLO CONCEPT"

Originally, Zurn introduced the scientifically- advanced "Control-Flo" drainage principle for dead-level roofs. Today, after thousands of successful applications in modern, large dead-level roof areas, Zurn engineers have adapted the comprehensive "Control-Flo" data to **sloped roof** areas.

WHAT IS "CONTROL-FLO"?

It is an advanced method of removing rain water off dead-level or sloped roofs. As contrasted with conventional drainage practices, which attempt to drain off storm water as quickly as it falls on the roof's surface, "Control- Flo" drains the roof at a controlled rate. Excess water accumulates on the roof under controlled conditions... then drains off at a lower rate after a storm abates.

CUTS DRAINAGE COSTS

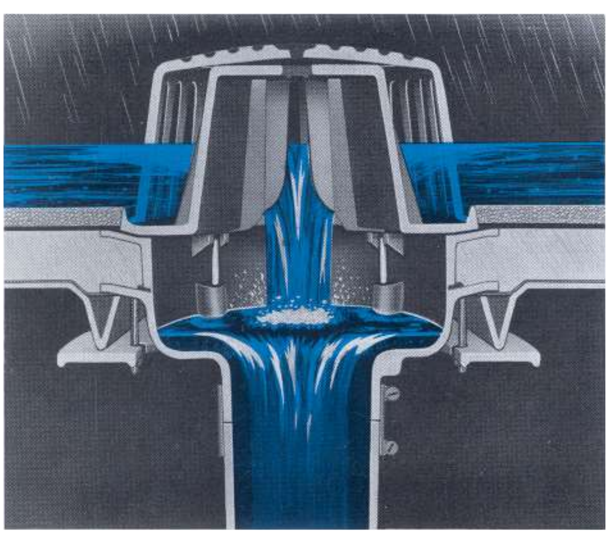
Fewer roof drains, smaller diameter piping, smaller sewer sizes, and lower installation costs are possible with a "Control-Flo" drainage system because roof areas are utilized as temporary storage reservoirs.

REDUCES PROBABILITY OF STORM DAMAGE

Lightens load on combination sewers by reducing rate of water drain from roof tops during severe storms thereby reducing probability of flooded sewers, and consequent backflow into basements and other low areas.

THANKS TO EXCLUSIVE ZURN "AQUA-WEIR" ACTION

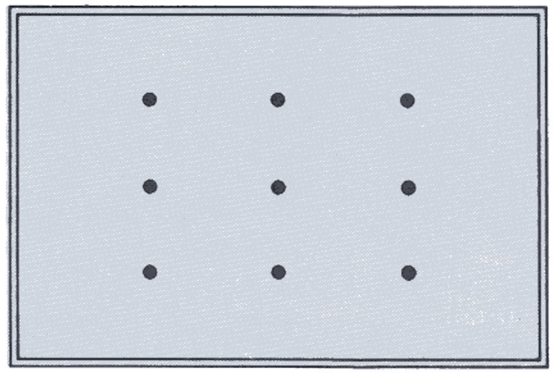
Key to successful "Control-Flo" drainage is a unique, scientifically-designed weir containing accurately calibrated notches with sides formed by parabolic curves which provide flow rates directly proportional to the head. Shape and size of notches are based on pre- determined flow rates, and all factors involved in roof drainage to assure permanent regulation of drainage flow rates for specific geographic locations and rainfall intensities.



DEFINITION

DEAD LEVEL ROOFS

A dead-level roof for purposes of applying the Zurn "Control-Flo" drainage principle is one which has been designed for zero slope across its entire surface.



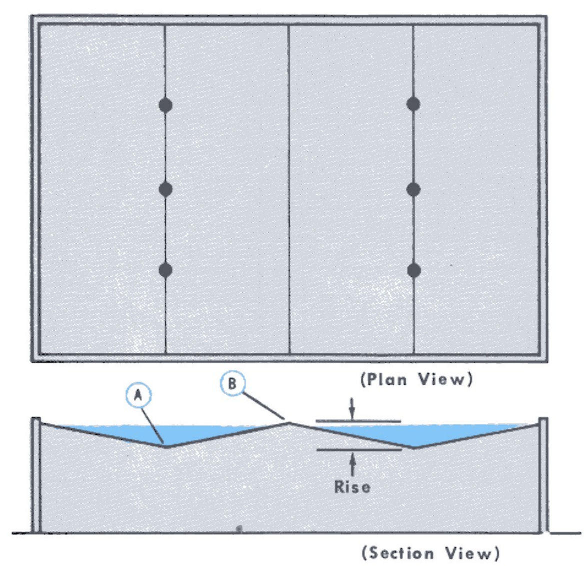
(Plan View)

(Section View)

SLOPED ROOFS

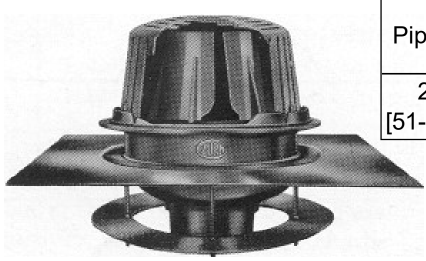
A sloped roof is one designed commonly with a shallow slope. The Zurn "Control-Flo" drainage system can be applied to any slope which results in a total rise up to 6"... and data can be calculated for rises exceeding 6".

The total rise of a roof as calculated for "Control-Flo" application is defined as the vertical increase in height in inches, from the low point or valley of a sloping roof (A) to the top of the sloping section (B). (Example: a roof that slopes 1/8" per foot having a 24-foot span would have a rise of 24 x 1/8 or 3")

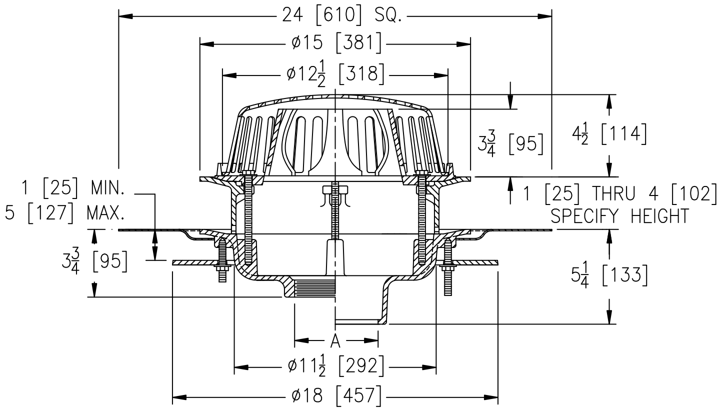


Economical Roof Drainage Installation

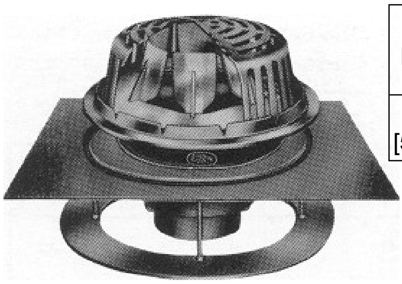
SPECIFICATION DATA



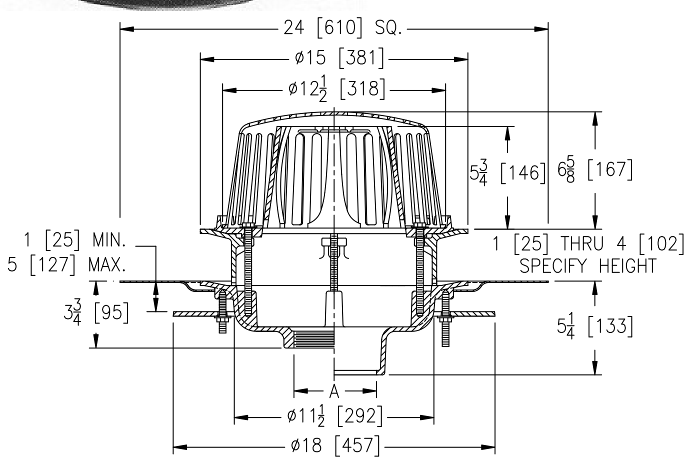
A Pipe Size	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm²]
2-3-4 [51-76-102]	56 [25]	103 [665]



ENGINEERING SPECIFICATION: ZURN Z105-C-E-R 15" Diameter "Control-Flo" roof drain for dead-level roof construction, Dura-Coated cast iron body, "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard, static extension, secondary clamping collar with O-ring, Poly-Dome, roof sump receiver and underdeck clamp. All data shall be verified proportional to flow rates.



A Pipe Size	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm²]
2-3-4 [51-76-102]	60 [27]	148 [955]



ENGINEERING SPECIFICATION: ZURN Z105-C-E-R-10 "Control-Flo" roof drain for Sloped Roof construction, Dura-Coated cast iron body, "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/gravel guard and 6 5/8 [168] high Aluminum dome. All data shall be verified proportional to flow rates.

ROOF DESIGN RECOMMENDATIONS

Basic roofing design should incorporate protection that will prevent roof overloading by installing adequate overflow scuppers in parapet walls.

GENERAL RECOMMENDATIONS

On dead-level roofs, our general recommendations are to design for a 3" depth for the 10-year storm. In this case, even the 100-year storm will not result in a maximum depth of 6". A 6" depth represents a roof load of 31.2 pounds per square foot which approximates the 30 pound per square foot factor commonly used in roof design.

NOTE: A more conservative practice used by a few engineers in the past, depending upon other design considerations, has been to design for the 3" depth with the 25, 50, or even 100-year storm . . . and to also lower scuppers to 5" or 4" above roof level. In either case, the final determination rests with the engineering personnel responsible for this phase of the design.

GENERAL RECOMMENDATIONS

On sloping roofs, we again recommend a 3" design depth for the l0-year storm, but by 3" we refer to an equivalent depth of 3". An equivalent depth is the depth of water attained at the drains that results in the same roof stresses as those realized on a dead-level roof. In all cases this equivalent depth is almost equal to that attained by using the same notch area rating for the different rises to 6". With the same depth of water at the drain the roof stresses will decrease with increasing total rise. Therefore, it would be possible to have a depth in excess of 6" at the drain on a sloping roof without exceeding stresses normally encountered in a 6" depth on a dead-level roof. However, it is recommended that scuppers be placed to limit the maximum water depth on any roof to 6" to prevent the over flow of the weirs on the drains and consequent overloading of drain piping.

NOTE: An equivalent depth is that depth of water attained at the drains at the lowest line or valley of the roof with all other conditions such as notch area and rainfall intensity being equal. For Galveston, Texas a notch area of 1800 square feet results in a 3" depth on a **dead-level** roof for a 10-year storm. For the same notch area and a 10-year storm, equivalent depths for a 2", 4", and 6" rise respectively on a **sloped roof** would be 3.4", 3.8", and 4.6". Roof stresses will be approximately equal in all cases.

Control-Flo Drain Selection is Quick and Easy . .

The exclusive Zurn “Selecta-Drain”. Chart (pages 6, 7, 8, 9) tabulates recommended selection data for several hundred localities in the United States. It constitutes your best assurance of sure, safe, economical additional data for your Zurn “Control-Flo” systems for your specific geographical area.

If the “Selecta-Drain” Chart doesn’t not suit your specific design criteria, write directly to Zurn Industries, Inc. Field Service Engineering, Specification Drainage Operations, Erie, Pa for additional date for your locality. Listed below is additional information pertinent to proper engineering of the “Control-Flo” system.

ROOF USED AS TEMPORARY RETENTION

The key to economical “Control-Flo” drainage is the utilization of large roof areas to temporarily store the maximum amount of water without overloading average roofs or creating excessive drain down time during periods of heavy rainfall.

The data shown in the “Selecta-Drain” Chart, which takes all these factors into consideration, represents only one point on a series of curves prepared for each locality and was determined after careful study and research as imparting optimum economy in design.

ROOF LOADING AND RUN-OFF RATES

The values for notch areas selected from the design curves were based on a 3" head on a dead-level roof for the 10-year storm. In low rainfall localities the area per notch was limited to 25,000 square feet to keep the drain down time within reasonable limits. The same area for each respective locality was used for the various roof rises for sloping roofs.

Extensive studies show that stresses due to water load on a sloping roof for any fixed set of conditions are very nearly the same as those on a dead-level roof. A sloping roof tends to concentrate more water in the valleys and increase the water depth at this point. The greater depth around the drain leads to a faster run-off rate, particularly a faster early run-off rate. As a result, the total volume of water stored on the roof is less, and the total load on the sloping roof is less. By using the same area on the sloping roof as on the dead-level roof the increase in roof stresses due to increased water depth in the valleys is offset by the decrease in the total load due to less water stored. The net result is the maximum roof stresses are approximately the same for single span, rise and fixed set of conditions. A fixed set of conditions would be the same notch area, the same frequency storm, and the same locality.

NOTCH FLOW AND WATER DEPTH

The flow through each notch of the “Control-Flo” weir is 10 GPM per inch of head. To compute the depth of water in inches at the drain, obtain the total flow for any fixed set of conditions and locale from the “Selecta-Drain” Chart and divide by 10. For example, for Anniston, Alabama the discharge rates are 30, 35, 39 and 43 GPM for the 10, 25, 50 and 100-year storms respectively on a dead-level roof.

Since the possibility of exceeding 4.3" of water exists only once every 100 years, the drains can be sized to carry 43 GPM per notch and scuppers can be set at a height of 4.3" above the roof to prevent overloading the drains if a worse than 100-year storm occurs. On a similar basis, drain pipe sizes and scupper heights can be selected for various roof slopes and storm frequencies.

ADDITIONAL NOTCH RATINGS

The “Selecta-Drain” Chart along with Tables I and II enables the engineer to select “Control-Flo” Drains and drain pipe sizes for most applications. The “Selecta-Drain” Chart and Tables I and II are computed for a proportional flow weir that is sized to give a flow of 10 GPM per inch of head. However, this data can be applied to other sizes of proportional flow weirs by simple multiplication or division. For example, if a similar weir that is sized to give a flow of 5 GPM per inch is substituted for the 10 GPM per inch weir, the notch area and discharge in GPM would be divided by two, and this opening would be given a 7’2 notch area rating.

PROPER DRAIN LOCATION

The following good design practice is recommended for selecting the proper number of “Control-Flo” drains for a given area.

On dead-level roofs, drains should be located no further than 50 feet from each edge of the roof to assure good run-off regardless of wind direction. Weir should be flush with roof surface, not recessed.
On sloping roofs, drains should be located in the valleys at a distance no greater than 50 feet from each end of the valleys. Weir should be flush with the valley roof surface, not recessed.
On large roof areas, drains should not be spaced at a distance greater than 200 feet.

FLOW CONTROL ROOF DRAINAGE DECLARATION

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

Permit Application No.

Project Name: LINCOLN FIELDS - PHASE 1

Building Location: 2525 CARLING AVE

Municipality:

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

M1. ☐ Conventionally drained roof (no flow control roof drains used).

M2. ☑ Flow control roof drains meeting the following conditions have been incorporated in this design:

(a) the maximum drain down time does not exceed 24h,
(b) one or more scuppers are installed so that the maximum depth of water on the roof cannot exceed 150mm,
(c) drains are located not more than 15m from the edge of roof and not more than 30m from adjacent drains, and
(d) there is at least one drain for each 900 sq.m.

M3. ☐ A flow control drainage system that does not meet the minimum drainage criteria described in M2 has been incorporated in this design.

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: MICHAEL J. ST. LOUIS

Firm: SMITH + ANDERSEN

Phone #: 613-230-1186

City: OTTAWA Province: ONTARIO

LICENSED PROFESSIONAL ENGINEER — 19/06/13 — M. J. ST. LOUIS 40382509 — 14400 — PROVINCE OF ONTARIO

Mechanical Engineer's Seal

S1. ☒ The design parameters incorporated into the overall structural design are consistent with the information provided by the Mechanical Engineer in M2. Loads due to rain are not considered to act simultaneously with loads due to snow as per Sentence 4.1.7.3 (3) OBC.

S2. ☐ The structure has been designed incorporating the additional structural loading due to rain acting simultaneously with the snow load. The design parameters are consistent with the control flow drainage system designed by the mechanical engineer.

PROFESSIONAL SEAL APPLIED BY:

Practitioner's Name: RICHARD CUNLIFFE

Firm: CUNLIFFE & ASSOCIATES

Phone #: 613 729-7242

City: OTTAWA Province: ON

LICENSED PROFESSIONAL ENGINEER — R. I. CUNLIFFE — 19/06/13 — PROVINCE OF ONTARIO

Structural Engineer's Seal

SOAKAWAYS, INFILTRATION TRENCHES AND CHAMBERS

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

GENERAL DESCRIPTION

Soakaways are rectangular or circular excavations lined with geotextile fabric and filled with clean granular stone or other void forming material that receive runoff from a perforated pipe inlet and allow it to infiltrate into the native soil. They typically service individual lots and receive only roof and walkway runoff but can also be designed to receive overflows from rainwater harvesting systems. Soakaways can also be referred to as infiltration galleries, dry wells or soakaway pits.

Infiltration trenches are rectangular trenches lined with geotextile fabric and filled with clean granular stone or other void forming material. Like soakaways, they typically service an individual lot and receive only roof and walkway runoff. This design variation on soakaways is well suited to sites where available space for infiltration is limited to narrow strips of land between buildings or properties, or along road rights-of-way. They can also be referred to as infiltration galleries or linear soakaways.

Infiltration chambers are another design variation on soakaways. They include a range of proprietary manufactured modular structures installed underground, typically under parking or landscaped areas that create large void spaces for temporary storage of stormwater, allowing it to infiltrate into the underlying native soil. Structures typically have open bottoms, perforated side walls and optional underlying granular stone reservoirs. They can be installed individually or in series in trench or bed configurations. They can infiltrate roof, walkway, parking lot and road runoff with adequate pretreatment. Due to the large volume of underground void space they create in comparison to a soakaway of the same dimensions, and the modular nature of their design, they are well suited to sites where available space for other types of BMPs is limited, or where it is desirable for the facility to have little or no surface footprint (e.g., high density development contexts). They can also be referred to as infiltration tanks.

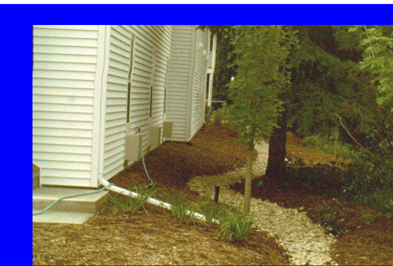
DESIGN GUIDANCE

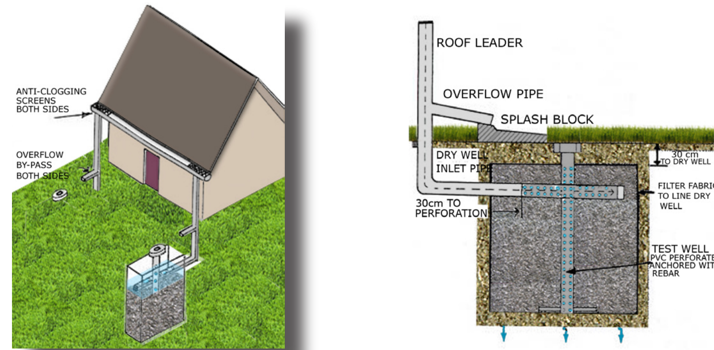
MONITORING WELLS
Capped vertical non-perforated pipes connected to the inlet and outlet pipes are recommended to provide a means of inspecting and flushing them out as part of routine maintenance. A capped vertical standpipe consisting of an anchored 100 to 150 mm diameter perforated pipe with a lockable cap installed to the bottom of the facility is also recommended for monitoring the length of time required to fully drain the facility between storms. Manholes and inspection ports should be installed in infiltration chambers to provide access for monitoring and maintenance activities.

PRE-TREATMENT
It is important to prevent sediment and debris from entering infiltration facilities because they could contribute to clogging and failure of the system. The following pretreatment devices are options:

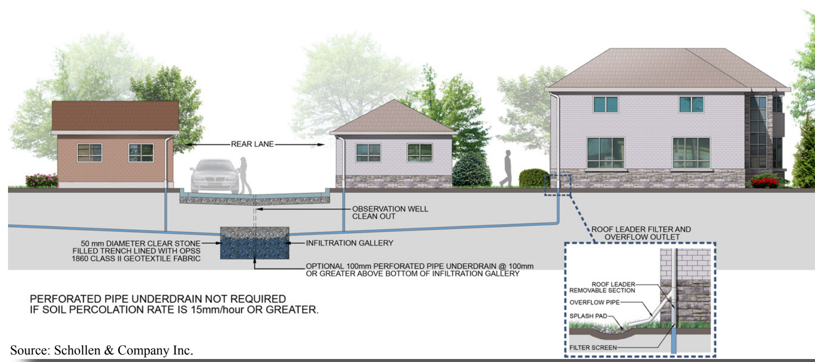
- Leaf screens: Leaf screens are mesh screens installed either on the building eavestroughs or roof downspouts and are used to remove leaves and other large debris from roof runoff.
- In-ground devices: Devices placed between a conveyance pipe and the facility (e.g., oil and grit separators, sedimentation chamber or goss traps), that can be designed to remove both large and fine particulate from runoff. A number of proprietary stormwater filter designs are available
- Vegetated filter strips or grass swales: Road and parking lot runoff can be pretreated with vegetated filter strips or grass swales prior to entering the infiltration practice

FILTER MEDIA
- Stone reservoir: Soakaways and infiltration trenches should be filled with uniformly-graded, washed stone that provides 30 to 40% void space. Granular material should be 50 mm clear stone
- Geotextile: A non-woven needle punched, or woven monofilament geotextile fabric should be installed around the stone reservoir of soakaways and infiltration trenches with a minimum overlap at the top of 300 mm. Woven slit film and non-woven heat bonded fabrics should not be used as they are prone to clogging. Specification of geotextile fabrics should consider the apparent opening size (AOS) for non-woven fabrics, or percent open area (POA) for woven fabrics, which affect the long term ability to maintain water flow. Other factors that need consideration include maximum forces to be exerted on the fabric, and the load bearing ratio, texture (i.e., grain size distribution) and permeability of the native soil in which they will be installed.





DRY WELL SYSTEM



INFILTRATION TRENCH BELOW A LANEWAY

INFILTRATION CHAMBER SYSTEM UNDER A PARKING LOT

GEOMETRY AND SITE LAYOUT
Soakaways and infiltration chambers can be designed in a variety of shapes, while infiltration trenches are typically rectangular excavations with a bottom width generally between 600 and 2400 mm. Facilities should have level or nearly level bed bottoms.

CONVEYANCE AND OVERFLOW
Inlet pipes to soakaways and infiltration trenches are typically perforated pipe connected to a standard non-perforated pipe or eavestrough that conveys runoff from the source area to the facility. The inlet and overflow outlet to the facility should be installed below the maximum frost penetration depth to prevent freezing. The overflow outlet can simply be the perforated pipe inlet that backs up when the facility is at capacity and discharges to a splash pad and pervious area at grade or can be a pipe that is at the top of the gravel layer and is connected to a storm sewer. Outlet pipes must have capacity equal to or greater than the inlet.

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefit
Soakaways, Infiltration Trenches and Chambers	Yes	Yes	Partial, depends on soil infiltration rate

CONSTRUCTION CONSIDERATIONS

SOIL DISTURBANCE AND COMPACTION: Before site work begins, locations of facilities should be clearly marked. Only vehicular traffic used for construction of the infiltration facility should be allowed close to the facility location.

EROSION AND SEDIMENT CONTROL: Infiltration practices should never serve as a sediment control device during construction. Construction runoff should be directed away from the proposed facility location. After the site is vegetated, erosion and sediment control structures can be removed.

COMMON CONCERNS

RISK OF GROUNDWATER CONTAMINATION
Most pollutants in urban runoff are well retained by infiltration practices and soils and therefore, have a low to moderate potential for groundwater contamination. To minimize risk of groundwater contamination the following management approaches are recommended:

- infiltration practices should not receive runoff from high traffic areas where large amounts of de-icing salts are applied (e.g., busy highways), nor from pollution hot spots;
- prioritize infiltration of runoff from source areas that are comparatively less contaminated such as roofs, low traffic roads and parking areas; and,
- apply sedimentation pretreatment practices (e.g., oil and grit separators) before infiltration of road or parking area runoff.

RISK OF SOIL CONTAMINATION
Available evidence from monitoring studies indicates that small distributed stormwater infiltration practices do not contaminate underlying soils, even after 10 years of operation.

ON PRIVATE PROPERTY
Property owners or managers will need to be educated on their routine maintenance needs, understand the long-term maintenance plan, and be subject to a legally binding maintenance agreement. An incentive program such as a storm sewer user fee based on the area of impervious cover on a property that is directly connected to a storm sewer could be used to encourage property owners or managers to maintain existing practices. Alternatively, infiltration practices could be located in an expanded road right-of-way or "stormwater easement" so that municipal staff can access the facility in the event it fails to function properly.

WINTER OPERATION
Soakaways, infiltration trenches and chambers will continue to function during winter months if the inlet pipe and top of the facility is located below the local maximum frost penetration depth.

OPERATION AND MAINTENANCE

Maintenance typically consists of cleaning out leaves, debris and accumulated sediment caught in pretreatment devices, inlets and outlets annually or as needed. Inspection via an monitoring well should be performed to ensure the facility drains within the maximum acceptable length of time (typically 72 hours) at least annually and following every major storm event (>25 mm). If the time required to fully drain exceeds 72 hours, drain via pumping and clean out the perforated pipe underdrain, if present. If slow drainage persists, the system may need removal and replacement of granular material and/or geotextile fabric.

SITE CONSIDERATIONS

Wellhead Protection
Facilities receiving road or parking lot runoff should not be located within two (2) year time-of-travel wellhead protection areas.

Site Topography
Facilities cannot be located on natural slopes greater than 15%.

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

Soil
Soakaways, infiltration trenches and chambers can be constructed over any soil type, but hydrologic soil group A or B soils are best for achieving water balance and channel erosion control objectives. If possible, facilities should be located in portions of the site with the highest native soil infiltration rates. Designers should verify the soil infiltration rate at the proposed location and depth through field measurement of hydraulic conductivity under field saturated conditions.

Drainage Area
Typically are designed with an impervious drainage area to treatment facility area ratio of between 5:1 and 20:1. A maximum ratio of 10:1 is recommended for facilities receiving road or parking lot runoff.

Pollution Hot Spot Runoff
To protect groundwater from possible contamination, runoff from pollution hot spots should not be treated by soakaways, infiltration trenches or chambers.

Setback from Buildings
Facilities should be setback a minimum of four (4) metres from building foundations.

Proximity to Underground Utilities
Local utility design guidance should be consulted to define the horizontal and vertical offsets. Generally, requirements for underground utilities passing near the practice will be no different than for utilities in other pervious areas. However, the designer should consider the need for long term maintenance when locating infiltration facilities near other underground utilities.

TORONTO AND REGION Conservation for The Living City

CVC CREDIT VALLEY CONSERVATION

Brandon Chow

To: Robert Verch
Subject: RE: 1803 Lincoln Fields-Comments on Site Plan package

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From: Robert Verch <rverch@rlaarchitecture.ca>
Sent: November 1, 2019 4:21 PM
To: Brandon Chow <BChow@dsel.ca>; Robert Freel <RFreel@dsel.ca>
Cc: Bria Aird <aird@fotenn.com>
Subject: 1803 Lincoln Fields-Comments on Site Plan package

Rexall
Brandon: our drawing show the scupper elevation at 84.8 metres ASL. 0.15 about the drain.

Rob

From: Brandon Chow <BChow@dsel.ca>
Sent: October-31-19 9:53 AM
To: Robert Verch <rverch@rlaarchitecture.ca>; Robert Freel <RFreel@dsel.ca>
Subject: RE: 1803 Lincoln Fields-Comments on Site Plan package

Hi Rob,

Would you be able to confirm the rooftop scupper elevations for the proposed buildings? This information will be required to address the comment below.
The 100-year roof storage depth on the proposed buildings is 0.1m.

C1. Please provide documentation from the Architect confirming the elevation of rooftop scuppers will be above the 100 year WSEL (refer to comments made in SSP-1), and that the scupper elevation will be specified in the Architectural drawing set.

Feel free to give me a call if any questions.

Thanks,

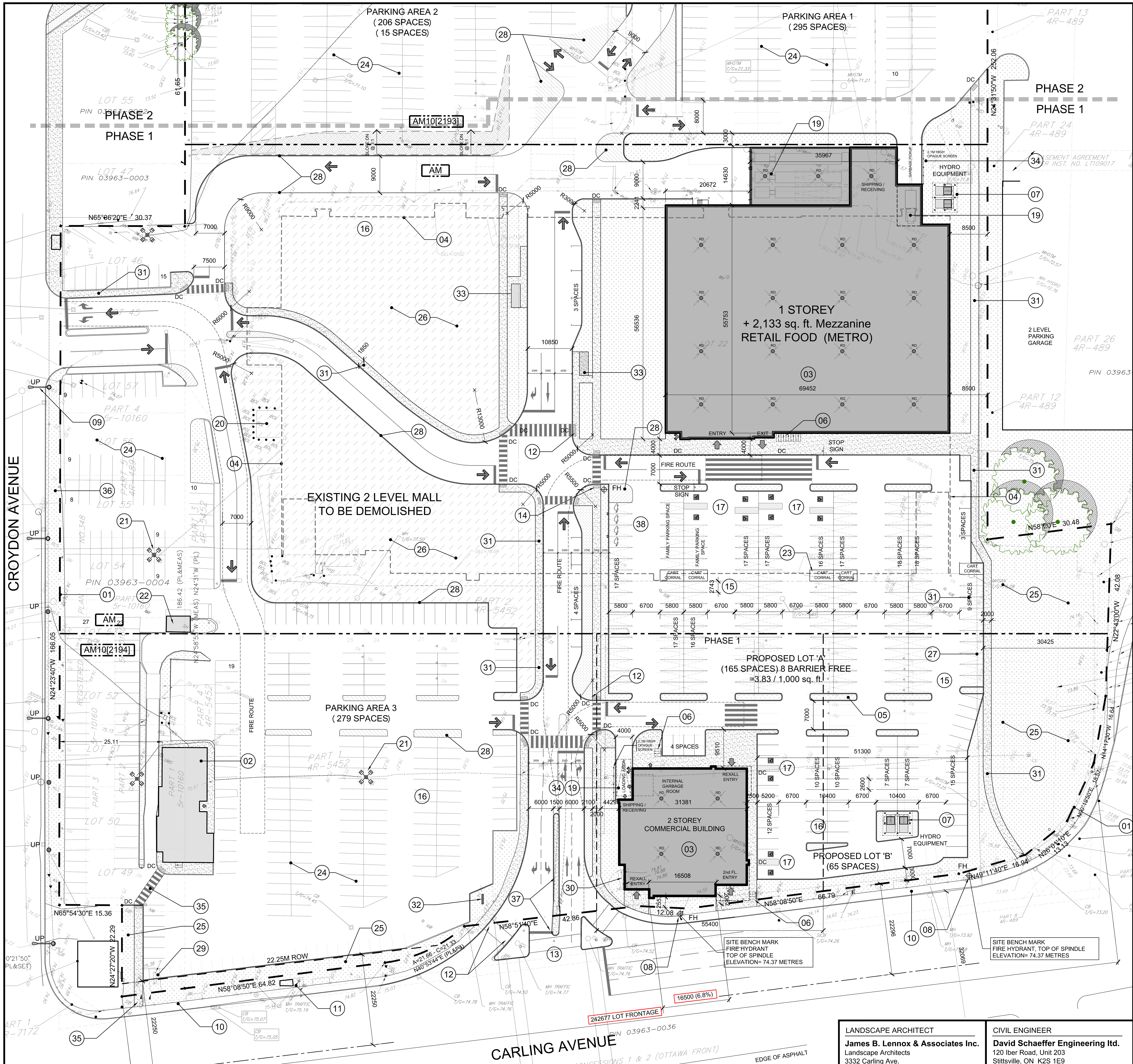
Brandon Chow
Project Coordinator / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.532
fax: (613) 836-7183
email: bchow@DSEL.ca

DRAWINGS / FIGURES



1 SP-2 SITE PLAN (PHASE 1)
SCALE = 1 : 400
SCALE 1: 400

DRAWING NOTES

1. PROPERTY LINE
2. EXISTING COMMERCIAL BUILDING
3. PROPOSED COMMERCIAL BUILDING
4. EXISTING 2 LEVEL COMMERCIAL MALL TO BE REMOVED
5. LANDSCAPE ISLAND WITH 150mm BARRIER CURB
6. BICYCLE PARKING SPACES (0.6 x 1.8M) WITH RACK
7. HYDRO EQUIPMENT
8. EXISTING FIRE HYDRANT
9. EXISTING UTILITY POLE - SOME WITH LIGHTS
10. EXISTING CONCRETE SIDEWALK WITH STREET CURB
11. EXISTING BUS STOP
12. TWSI TO BE LOCATED AND INSTALLED AS PER CITY REQUIREMENTS
13. EXISTING CONTROLLED INTERSECTION TO REMAIN
14. FIRE HYDRANT
15. TENANT PARKING SPACE (2.735 X 5.8 M)
16. STANDARD PARKING SPACE (2.6 X 5.2 M)
17. BARRIER FREE PARING SPACE
18. DEPRESSED CURB AND WALK
19. ENCLOSED GARBAGE / LOADING BAYS, CONCRETE FLOOR
20. EXISTING BUILDING UTILITIES TO BE REMOVED
21. EXISTING LIGHT STANDARD TO REMAIN
22. EXISTING GARBAGE ENCLOSER
23. CART CORRAL
24. EXISTING ASPHALT PARKING LOT TO REMAIN
25. EXISTING ASPHALT PARKING LOT TO BE RE-GRADE AS REQUIRED, REPLACE WITH SOFT LANDSCAPING TILL FINAL PHASE IS DEVELOPED
26. VACANT AREA LEFT OVER FROM MALL AND RE-GRADING, TO BE CLOSED OFF TILL NEXT PHASE
27. REMOVE EX. UNDERGROUND UTILITIES, SEE CIVIL
28. PAINTED ISLAND AND OR CURBS
29. EXISTING COMMERCIAL SIGN TO REMAIN
30. EXISTING COMMERCIAL SIGN TO BE REMOVED
31. INTERN PEDESTRIAN PATHWAY
32. PYLON SIGN WITH NEW LANDSCAPED ISLAND
33. BUS STOP WITH CONCRETE PAD AS PER CITY DETAILS
34. 2.1M HIGH OPAQUE SCREEN, SEE LANDSCAPE DWG.
35. 2.1M WIDE PEDESTRIAN CONNECTION
36. EXISTING PEDESTRIAN CONNECTION TO BE REMOVED
37. ADJUST EXISTING MEDIAN
38. ELECTRIC VEHICLE SPACE WITH CHARGING STATION
39. FAMILY PARKING SPACE WITH SIGNAGE

SITE PLAN SYMBOLS

- BUILDING OUTLINE
- CONCRETE WALK
- SOFT LANDSCAPING
- BIKE RACK
- TWO WAY VEHICLE CIRCULATION
- MAIN ENTRANCE
- SERVICE DOOR / FIRE EXIT
- PROPERTY LINE
- CHANGE IN ZONING
- PARKING LOT LIGHTING
- BARRIER FREE PARING SPACE AS PER PARKING BYLAW SECTION 3.1
  TYPE 'A' = 3.4M X 5.2M
  TYPE 'B' = 2.4M X 5.2M
  ACCESS AISLE = 1.5M WIDE
- BUILDING ROOF DRAINS

PROJECT DEVELOPER

RioCan
Real Estate Investment Trust
2300 Yonge Street, Suite 500,
Toronto Ontario M4P 1E4
Tel: 416-866-3033; 1-800-465-2733
Fax: 416-866-3020
E-Mail: Ctruong@riocan.com

LEGAL DESCRIPTION

TOPOGRAPHIC PLAN of
LOTS 45, 46, 50 TO 57 INCLUSIVE AND PART OF LOT 49
REGISTERED PLAN NO. 348 AND PART OF LOT 48, REGISTERED PLAN NO. 311 AND PART OF LOTS 22 & 23
CONCESSION 1 (OTTAWA FRONT)
(GEOGRAPHIC TOWNSHIP OF NEPEAN)
CITY OF OTTAWA

LANDSCAPE ARCHITECT

James B. Lennox & Associates Inc.
Landscape Architects
3332 Carling Ave.
Ottawa, Ontario K2H 5A8
Tel: 613-722-5168
Fax: 1-866-343-3942
Email: JL@jbla.ca

CIVIL ENGINEER

David Schaeffer Engineering ltd.
120 Iber Road, Unit 203
Stittsville, ON K2S 1E9
Tel: (613) 836-0856
Fax: (613) 836-7183
Email: rfreel@DSEL.ca

URBAN PLANNER

FoTenn Consultants Inc.
223 McLeod Street
Ottawa, ON Canada, K2P 0Z8
Tel.: (613) 730-5709
Fax: (613) 730-1136
E-Mail: morris@fotenn.com

PROJECT INFORMATION

ZONING	AM10[2193] - AM10[2194] - AM
SITE AREA	65,502 sq. m. (705,057) sq. ft.
BUILDING HEIGHT	VARIES WITH MAXIMUM 30.0 M

PROJECT STATISTICS

BUILDING HEIGHT	11.5 M
BUILDING FRONTAGE	12.4%
LOADING SPACE - COMMERCIAL RETAIL FOOD	2
LOADING SPACE - COMMERCIAL RETAIL / OFFICE	1
GLAZING ALONG THE FRONTAGE	52%
CARLING AVENUE FRONTAGE	242.677 M
RICHMOND ROAD FRONTAGE	226.786 M

GROSS BUILDING - AREAS
(CITY OF OTTAWA'S DEFINITION)

EXISTING AREAS	
MALL - LEASABLE RETAIL	23,203.7 sq. m. (249,762) sq. ft.
MALL - OFFICE	2,566.5 sq. m. (27,626) sq. ft.
BLDG. 3 - WENDY'S	339.7 sq. m. (3,657) sq. ft.
BLDG. 4 - PIZZA PIZZA	325.2 sq. m. (3,500) sq. ft.
TOTAL AREA	26,435.1 sq. m. (284,545) sq. ft.

PROPOSED AREAS	
BLDG. 1 - METRO COMMERCIAL FOOD	2,630.0 sq. m. (28,310) sq. ft.
BLDG. 2 - GROUND FL. COMMERCIAL RETAIL	753.0 sq. m. (8,105) sq. ft.
BLDG. 2 - SECOND FL. COMMERCIAL OFFICE	809.7 sq. m. (8,716) sq. ft.
BLDG. 3 - EXISTING WENDY'S	339.7 sq. m. (3,657) sq. ft.
BLDG. 4 - PIZZA PIZZA	325.2 sq. m. (3,500) sq. ft.
TOTAL AREA	4,857.6 sq. m. (52,287) sq. ft.

GROSS LEASABLE FLOOR AREA
(CITY OF OTTAWA'S DEFINITION)

PROPOSED AREAS	
BLDG. 1 - METRO COMMERCIAL FOOD	3,137.3 sq. m. (33,770) sq. ft.
BLDG. 2 - GROUND FL. COMMERCIAL RETAIL	791.5 sq. m. (8,520) sq. ft.
BLDG. 2 - SECOND FL. COMMERCIAL OFFICE	798.9 sq. m. (8,600) sq. ft.
BLDG. 3 - EXISTING WENDY'S	339.7 sq. m. (3,657) sq. ft.
BLDG. 4 - PIZZA PIZZA	325.2 sq. m. (3,500) sq. ft.
TOTAL AREA	5,392.6 sq. m. (58,045) sq. ft.

LOT COVERAGE

PAVED SURFACE =	50,583 sq. m.	77.23%
BUILDING FOOTPRINT =	5,903 sq. m.	9.01%
LANDSCAPE OPEN SPACE =	9,016 sq. m.	13.76%
TOTAL =	65,502 sq. m.	100.0%

PARKING LOT LANDSCAPE AREA

PARKING LOT AREA =	51,546 sq. m.
15% REQUIRED LANDSCAPE AREA =	7,732 sq. m.
LANDSCAPE AREA PROVIDED =	7,920 sq. m.

CAR PARKING EXISTING SITE

EXISTING TOTAL ON SITE (June 2018)	1,157

CAR PARKING TOTAL SITE

REQUIRED by ZONING BY-LAW

METRO	2,630.0 sq. m. (28,310) sq. ft.	- AREA 'Z' NOT REQUIRED	0
RETAIL - REXALL	753.0 sq. m. (8,105) sq. ft.	- AREA 'Z' NOT REQUIRED	0
OFFICE	809.7 sq. m. (8,716) sq. ft.	- AREA 'Z' NOT REQUIRED	0
WENDY'S	339.7 sq. m. (3,657) sq. ft.	- AREA 'Z' NOT REQUIRED	0
PIZZA PIZZA	325.2 sq. m. (3,500) sq. ft.	- AREA 'Z' NOT REQUIRED	0
TOTAL			0

MAXIMUM PARKING - AREA B, SCHEDULE 1

SHOPPING CENTER	4,857.6 sq. m. (52,287) sq. ft.	-3.6 PER 100m² OF G.F.A.	175

PROVIDED

EXISTING AREA '1'	295
EXISTING AREA '2'	221
EXISTING AREA '3'	279
PROPOSED LOT 'A'	170
PROPOSED LOT 'B'	65
PROPOSED LOT 'C' - CLOSED OFF	0
PROPOSED LOT 'D' - CLOSED OFF	0
TOTAL	1,030

BICYCLE PARKING

REQUIRED

METRO	2,630.0 sq. m. (28,310) sq. ft.	- 1.0 PER 500m² OF G.F.A.	13
RETAIL - REXALL	753.0 sq. m. (8,105) sq. ft.	- 1.0 PER 500m² OF G.F.A.	2
OFFICE	809.7 sq. m. (8,716) sq. ft.	- 1.0 PER 500m² OF G.F.A.	2
WENDY'S	339.7 sq. m. (3,657) sq. ft.	- 1.0 PER 500m² OF G.F.A.	1
PIZZA PIZZA	325.2 sq. m. (3,500) sq. ft.	- 1.0 PER 500m² OF G.F.A.	1
TOTAL			19

PROVIDED

METRO	10
RETAIL - REXALL	4
OFFICE	4
WENDY'S	4
PIZZA PIZZA	4
TOTAL	22

IT IS THE RESPONSIBILITY OF THE APPROPRIATE CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE AND TO REPORT ALL ERRORS AND/OR OMISSIONS TO THE ARCHITECT.

ALL CONTRACTORS MUST COMPLY WITH ALL PERTINENT CODES AND BY-LAWS.

THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.

DO NOT SCALE DRAWINGS.

NOTATION SYMBOLS:

- (00) INDICATES DRAWING NOTES, LISTED ON EACH SHEET.
- ◇00 INDICATES ASSEMBLIE TYPE; REFER TO TYPICAL ASSEMBLIES SCHEDULE.
- ⬡00 INDICATES WINDOW TYPE; REFER TO WINDOW ELEVATIONS AND DETAILS ON A900 SERIES.
- (000) INDICATES DOOR TYPE; REFER TO DOOR SCHEDULE AND DETAILS ON A900 SERIES.
- DETAIL NUMBER / TITLE / SCALE / DETAIL REFERENCE PAGE / DETAIL CROSS REFERENCE PAGE

No.	DESCRIPTION	DATE
10	REVISED AS PER SPC 4th ROUND COMMENTS	Oct. 24, 19
9	REVISED AS PER SPC 3rd ROUND COMMENTS	Sept 25, 19
8	ISSUED FOR PERMIT (MALL ALTERATION)	Sept 6, 19
7	ISSUED FOR MINOR VARIANCE	Aug. 23, 19
6	REVISED PARKING LOTS	Aug. 22, 19
5	ISSUED FOR PERMIT (BLDG B)	July 26, 19
4	REVISED AS PER SPC 1st ROUND COMMENTS	July 8, 19
3	REVISED AS PER SPC 1st ROUND COMMENTS	May 31, 19
2	ISSUED FOR SITE PLAN CONTROL	Dec. 19, 18
1	ISSUED TO CONSULTANTS	Sept 7, 18

REVISIONS:

ARCHITECT SEAL: ONTARIO ASSOCIATION OF ARCHITECTS — RODERICK LAHEY — LICENCE 4375
SEAL DATE: STAMP DATE

NORTH ARROW:

CLIENT:
RIOCAN

ARCHITECT:
rla/architecture
roderick lahey architect inc.
56 beech street, ottawa, ontario K1S 3J6
t.613.724.9932 f.613.724.1209 rlaarchitecture.ca

PROJECT TITLE:
LINCOLN FIELDS
2525 CARLING AVENUE
OTTAWA ONTARIO

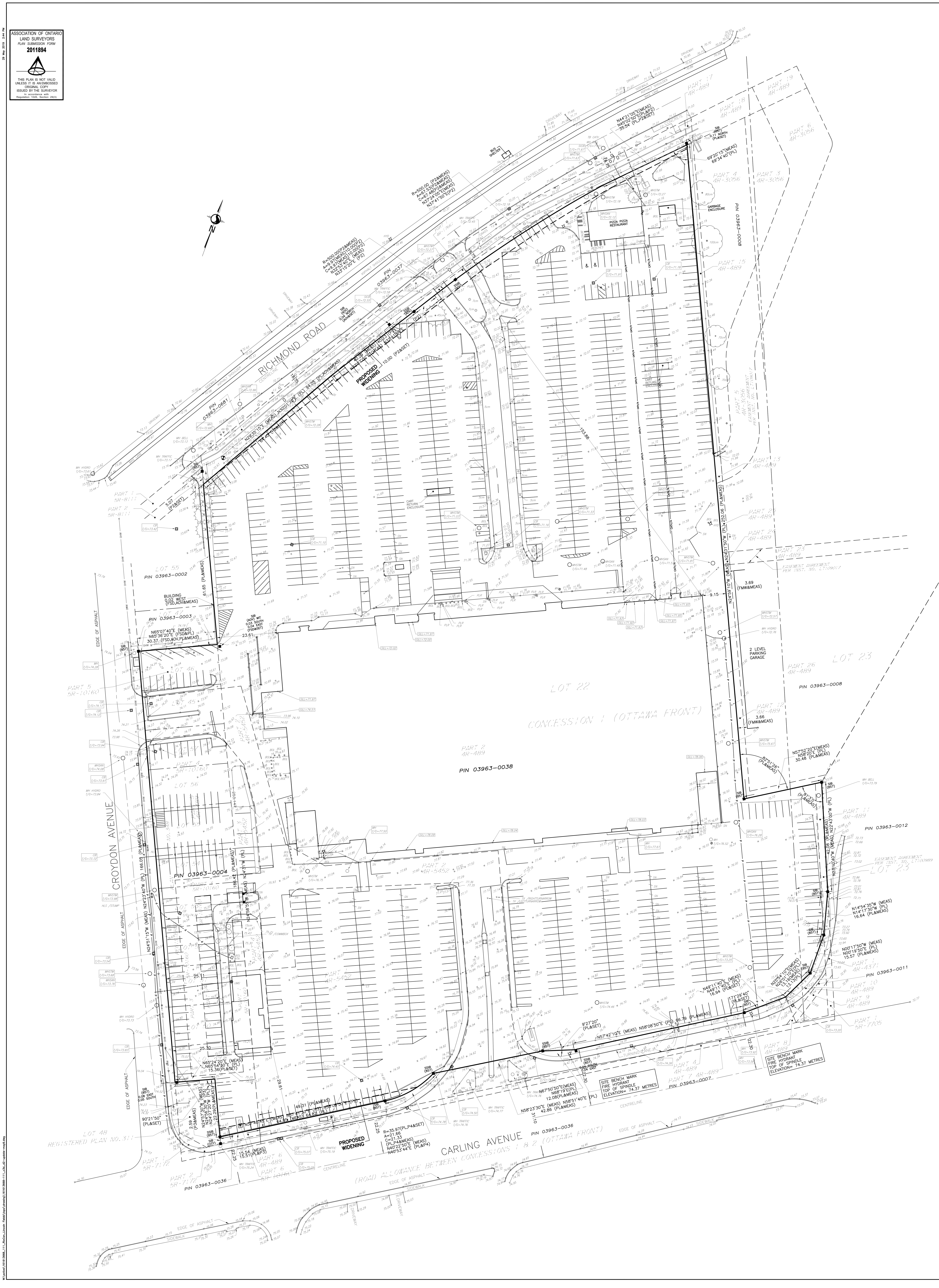
SHEET TITLE:
SITE PLAN
PHASE #1

DRAWN:	CHECKED:
RV	RV
SCALE: 1:400	SHEET No. SP-2
PROJECT No. 1803	

D07-12-18-0195

PAPER SIZE: ISO Full Bleed B1 (707.00 X 1000.00 MM) PLOT DATE: Tuesday, October 29, 2019 PLOT SCALE: 1:1 PEN STYLE: 0-RLA-MASTER-100%.ctb F:\2018\1803 - Lincoln Fields Master Plan (Rio Can)\01_Design Development\05 CAD\1803 Lincoln Field SP-1 Site Plan 2019 10 29.dwg

Plan No.: #17862



Stantec

Stantec Geomatics Ltd.
400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

TOPOGRAPHIC PLAN of

LOTS 45, 46, 50 TO 57 INCLUSIVE AND PART OF LOT 49 REGISTERED PLAN NO. 348 AND PART OF LOT 48 REGISTERED PLAN NO. 311 AND PART OF LOTS 22 & 23 CONCESSION 1 (OTTAWA FRONT)

(GEOGRAPHIC TOWNSHIP OF NEPEAN)

CITY OF OTTAWA

Scale 1:500

10 0 10 20 30 METRES

METRIC CONVERSION

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

HORIZONTAL DATUM NOTE

PROJECTION: UNIVERSAL TRANSVERSE MERCATOR (MTM, ZONE 9, CM76°30'W)
DATUM: NAD 83 (ORIGINAL)

DISTANCES ON THIS PLAN MAY BE CONVERTED TO GROUND DISTANCES BY DIVIDING BY A COMBINED SCALE FACTOR OF 0.99994.

VERTICAL DATUM NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM THE CAN-NET VRS NETWORK AND CITY OF OTTAWA MONUMENT N-62 HAVING AN ELEVATION OF 69.238 METRES.

SITE BENCH MARK ARE AS SHOWN.

BEARING NOTE

BEARINGS ARE GRID, DERIVED FROM THE CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76°30' WEST LONGITUDE MTM ZONE 9, NAD83(ORIGINAL).

19773035 N:5006060.42 E:324888.04
19680191 N:5033564.26 E:388064.94

LEGEND

	DENOTES	FOUND MONUMENTS
	"	SET MONUMENTS
IB	"	IRON BAR
IBø	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
ORP	"	OBSERVED REFERENCE POINT
PL	"	PLAN 4R-489
P2	"	PLAN 4R-17661
P3	"	PLAN 5R-7172
P4	"	PLAN 4R-5452
1303	"	L.V. HARTEN O.L.S.
857	"	FAIRHALL, MOFFATT & WOODLAND LTD.
ACU	"	AIR CONDITIONING UNIT
AN	"	ANCHOR
AP	"	AIR PUMP
ANT	"	ANTENNA
BH	"	BOREHOLE
BIB	"	HOSE BIB
BKR	"	BIKE RACK
BENCH	"	BENCH
BOL	"	BOLLARD
BOUL	"	BOULDER
CB	"	CATCH BASIN
DCB	"	DOUBLE CB
CBMH	"	CB MANHOLE
DCBMH	"	DOUBLE CB MANHOLE
CBSI	"	SIDE INLET CB
CHM	"	CHIMNEY
CSV	"	VALVE CURB STOP
DRN	"	DRAIN
EPOST	"	ELECTRICAL OUTLET
FP	"	FLAG POLE
FL	"	FLOOD LIGHT
FTF	"	FUEL TANK FILLER CAP
GC	"	GARBAGE CAN
GFL	"	PIPE FLANGE (GAS)
GFP	"	GAS FUEL PUMP
GP	"	POLE GUYWIRE
GSR	"	GAS SERVICE REGULATOR
GV	"	GAS VALVE
HIC	"	HICKENBOTTOM
HDS	"	HEADSTONE
HLS	"	LIGHT STANDARD HYDRO
HM	"	HYDRO METER
HTN	"	HYDRO TRANSFORMER
HW	"	HAND WELL
HYD	"	FIRE HYDRANT
JBX	"	JUNCTION BOX
MB	"	MAILBOX
MP	"	MONITORING PIN
MH	"	MAINTENANCE HOLE UNIDENTIFIED
MHB	"	MAINTENANCE HOLE BELL
MHF	"	MAINTENANCE HOLE FIBRE OPTIC
MHH	"	MAINTENANCE HOLE HYDRO
MHI	"	MAINTENANCE HOLE INVERT
MHSA	"	MAINTENANCE HOLE SANITARY
MHST	"	MAINTENANCE HOLE STORM
MHT	"	MAINTENANCE HOLE TRAFFIC
MW	"	MONITORING WELL
NPB	"	NEWS PAPER BOX
OLP	"	LIGHT STANDARD ORNAMENTAL
OW	"	OBSERVATION WELL
PKM	"	PARKING METER
PLBX	"	PULL BOX
PLQ	"	PLAQUE
PLR	"	PILLAR
PZ	"	PIEZIOMETER
RLC	"	RED LIGHT CAMERA
RWSL	"	RAILWAY SIGNAL LIGHT
RWSS	"	RAILWAY SWITCH STAND
SAT	"	SATELLITE DISH
SCLP	"	SCULPTURE
SCP	"	SUMP/CATCH PIT
SCV	"	SPRINKLER CONTROL VALVE
SH	"	SPRINKLER HEAD
SIA	"	SIAMESE CONNECTION
SN	"	SIGN
SPAN	"	SOLAR PANEL
SPT	"	SEPTIC TANK LID
TBL	"	TABLE
TB BELL	"	TERMINAL BOX - BELL
TB CATV	"	TERMINAL BOX - CABLE
TCB	"	TRAFFIC CONTROL BOX
TPIT	"	TEST PIT
TSL	"	TRAFFIC SIGNAL LIGHT
UMB	"	MARKER BELL UNDERGROUND
UMC	"	MARKER CABLE UNDERGROUND
UMG	"	MARKER GAS UNDERGROUND
UMO	"	MARKER OIL UNDERGROUND
UP	"	UTILITY POLE
VB	"	VALVE BOX
VC	"	VALVE CHAMBER
WV	"	WATER VALVE
	"	TREE STUMP
	"	TREE CONIFEROUS
	"	TREE DECIDUOUS

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 23rd DAY OF JUNE, 2017.

DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

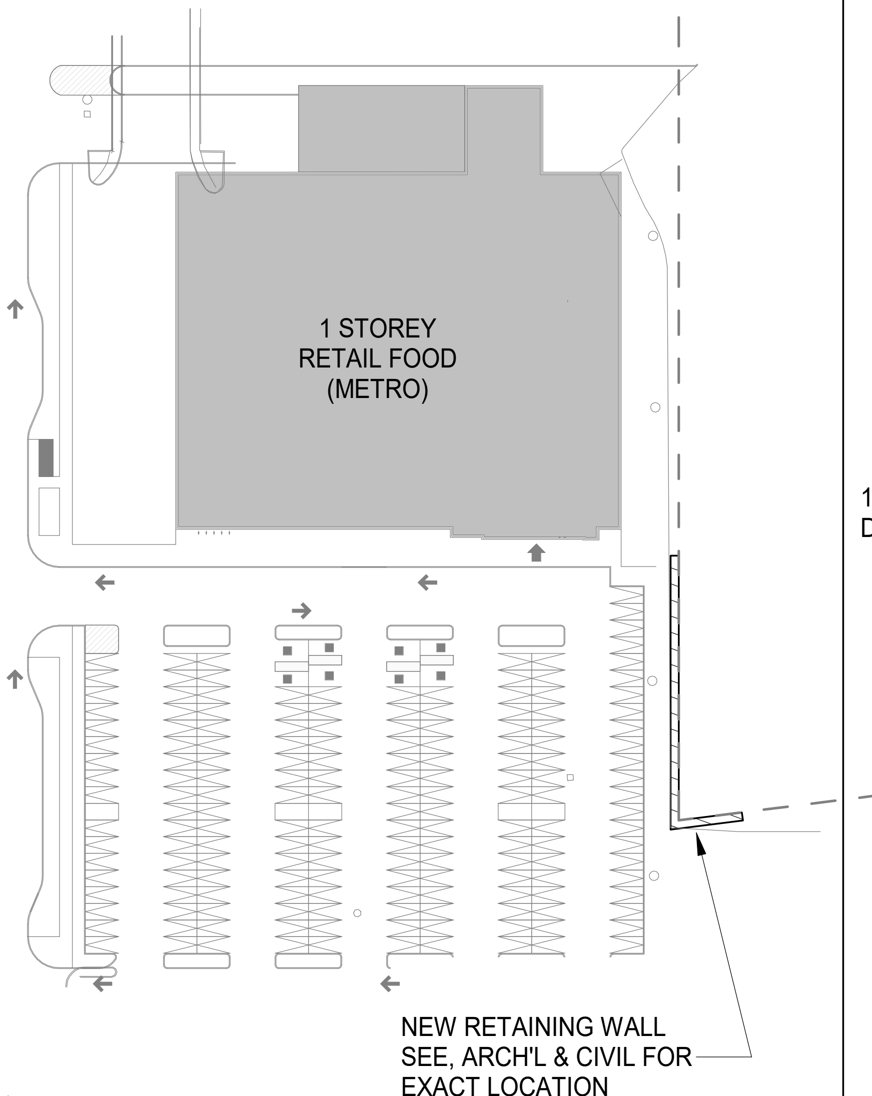
REVISION NOTES

1. TOPOGRAPHIC INFORMATION ALONG THE OTHER SIDE OF RICHMOND ROAD AND ALONG THE OTHER SIDE OF CARLING AENUE.
2. THE SURVEY WAS COMPLETED ON THE 30th DAY OF APRIL, 2019.

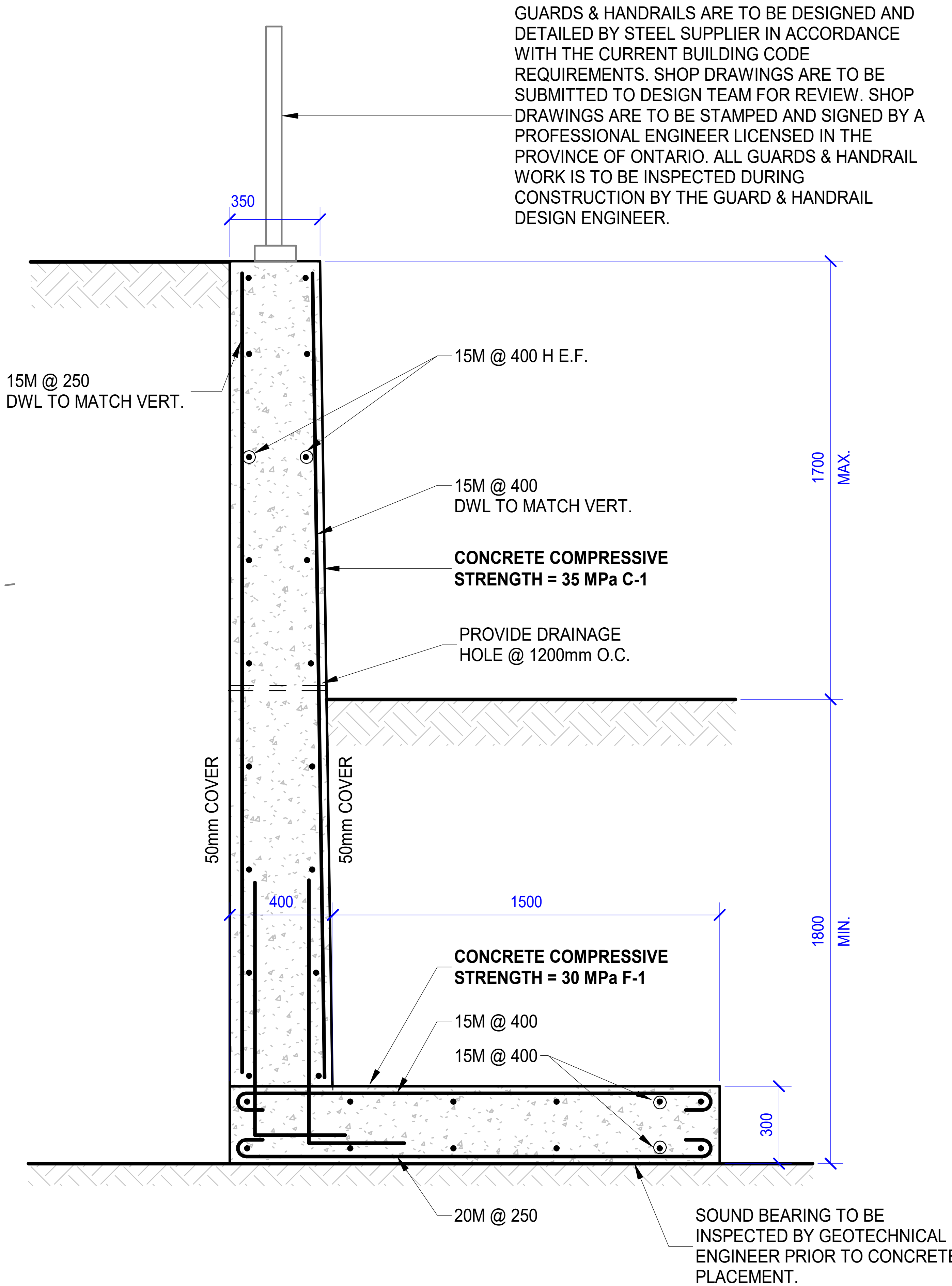
DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

DRAWN: CT/NJ CHECKED: BW PM: BW FIELD: ES/CA PROJECT No.: 161613668-111



KEY PLAN



No.	REVISION	DATE
1	ISSUED FOR PERMIT	2019-11-01

GENERAL NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS. ANY DISCREPANCY SHALL BE REPORTED TO THE ENGINEER
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL MATERIAL RELEVANT TO THE PROJECT
3. ADDITIONAL INFORMATION MAY BE ISSUED FOR CLARIFICATION TO ASSIST PROPER EXECUTION OF WORK. SUCH DRAWINGS WILL HAVE THE SAME MEANING AND INTENT AS IF THEY WERE INCLUDED WITH THE DRAWINGS IN THE CONTRACT DOCUMENTS
4. DO NOT SCALE DRAWINGS

TITLE:
NEW RETAINING WALL DETAIL

PROJECT:
LINCOLN FIELDS MALL
PARTIAL DEMOLITION

CLIENT:
RODERICK LAHEY ARCHITECT INC.

CUNLIFFE

CUNLIFFE & ASSOCIATES
CONSULTING STRUCTURAL ENGINEERS
102-1737 WOODWARD DR. OTTAWA ON. K2C 0P9
TEL (613) 729-7242 FAX (613) 728-1461
Email <cunliffe@cunliffe.ca>

STAMP

LICENSED PROFESSIONAL ENGINEER
2019-11-01
R. I. CUNLIFFE
PROVINCE OF ONTARIO

SCALE:	As indicated
DRAWN:	AM
REVIEWED:	R.C.
PROJ No.:	18-002
DWG. No.:	SK1