

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

Prepared for:
849413 Ontario Ltd.

5-Storey Apartment Building

27-31 Blake Street
Barrie, Ontario L4M 1J7

SITEPLANTECH INC.
YOUR URBAN REDEVELOPMENT SOURCE

July 23, 2021
Project No.: 20-006

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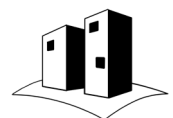
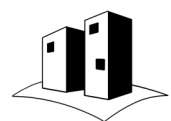


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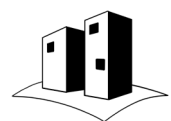
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Submission History

Submission	Date	Issued For	Issued To
1	Nov. 30, 2020	RZA/SPA	City of Barrie
2	July 23, 2021	RZA/SPA	City of Barrie



1.0 INTRODUCTION

1.1 Purpose

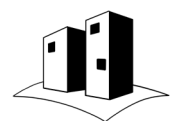
SITEPLANTECH was retained by 849413 Ontario Ltd. to prepare a Functional Servicing and Stormwater Management Report, in support of a Rezoning and Site Plan Application, to investigate water supply, sanitary sewerage and storm drainage for a proposed development located at 27-31 Blake Street in Barrie, Ontario.

The purpose of this report is to provide site specific information for the municipality's review with respect to the adequacy of the existing infrastructure to support the proposed development.

1.2 Background Information

The following documents were requested and made available to SITEPLANTECH for our review and forms the basis of this report:

- Author unknown, Young & Young Surveying Inc. (2018, July 12), Topographic Plan of All of Lot 7 and Part of Lots 6 and 8 (18-B7198). [Technical drawing].
- Michael Koutsoulas, Studio K Architects (2019, October 1), Blake Street Apartments (No. A102, A103, A104, A201, A203). [Technical drawing].
- Sanitary Sewage Collection System Policies and Design Guidelines, Engineering Department, City of Barrie, 2017.
- Storm Drainage and Stormwater Management Policies and Design Guidelines, City of Barrie, Final, Updated August 11, 2020.
- Water Transmission and Distribution Policies and Design Guidelines, Engineering Department, City of Barrie, 2017.
- Author unknown, Hutchison Environmental Sciences Ltd., (2012, March 30) Phosphorous Budget Toll in Support of Sustainable Development for the Lake Simcoe Watershed.
- T.M. Prokopec, City of Barrie Engineering Department (1987, May), Blake Street – Phase 1 New Construction (1987-011-006 PP, 1987-011-008 PP, 1987-011-010 PP, 1987-011-013 PP, 1993-009-002 STM D Plan) [Technical drawing].
- LSRCA Phosphorus Offsetting Policy, dated September 2017.
- LSRCA Technical Guidelines for Stormwater Management Submissions, effective date September 1, 2016.



1.3 Site Description

The subject site is approximately 2,424 square metres (0.24 hectares) and is currently occupied by 2 detached residential dwellings. The site is bounded by:

- Blake Street to the north;
- Existing high density residential buildings to the east and west; and,
- Existing low density residential dwellings to the south.

The site is located within the LSRCA'S Barrie Creeks sub-watershed which drains directly to Kempenfelt Bay in Lake Simcoe.

1.4 Proposed Development

The proposed development will consist of a 5-storey residential apartment with a 2-level underground parking garage and will front on Blake Street. The residential use building will include a mix of one- and two-bedroom suites yielding 35 units. Access to the underground parking garage will be provided from the site access on Blake Street. Please refer to the site plan and site statistics in **Appendix A** for additional information.

1.5 Easements and Land Conveyances

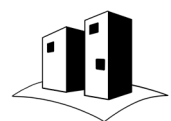
The following easements are registered on title:

- An existing sewer easement located in the southeast corner of the site, as described in instrument BA39577; and,
- An existing right-of-way easement located in the northeast corner of the site, as described in instrument RO1392442.

The City of Barrie has requested the following land conveyance:

- A 2.0m road widening along the entire Blake Street frontage. The total dedicated area being approximately 85.9m².

No new easements are required in order develop this property. The existing right-of-way easement will be maintained while the sewer easement will not be required and will be removed from title.



2.0 SERVICING TERMS OF REFERENCE AND METHODOLOGY

2.1 Terms of Reference

This report was prepared in accordance with the City of Barrie's Engineering Standards, Policies and Guidelines as well as the Lake Simcoe Region Conservation Authority (LSRCA) Technical Guidelines for Stormwater Management Submissions, the specifics of which are outlined below:

2.2 Methodology: Stormwater Management

The modified rational method will be used to calculate runoff rates and target release rates from the site based on Intensity-Duration-Frequency (IDF) rainfall curves from the City of Barrie's stormwater management policies.

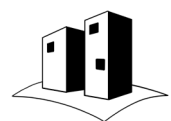
We will provide a detailed account of the pre- and post-development conditions and comment on opportunities to reduce peak flows in accordance with the LSRCA's requirements, the site-specific requirements of which are summarized as follows:

- Peak flow control: Control the 100-year post-development peak flows to the 5-year pre-development peak flows;
- The runoff C_{100} for the 100-year storm event shall be $C_{100} = 1.25 * C_5$;
- Volume control: Site specific volume control is not applicable as the site's redevelopment will not create 0.5 Ha or more of impervious surfaces. Run-off reduction alternatives may be explored;
- TSS removal: Long-term average of 80% TSS removal is required;
- Phosphorus loading: Target of "net zero" phosphorous increase, recommended minimum 80% reduction
- Erosion control: Shall be designed as per the Erosion and Sedimentation Control Guidelines for Urban Construction (2006).

Detailed servicing and grading plans will be prepared based on the recommendations of this report.

2.3 Methodology: Sanitary Drainage

The sanitary sewage discharge from the site will be determined using sanitary sewer design sheets that consider the land use and building statistics as supplied by the design team. The calculated values will provide peak sanitary flow discharge that considers infiltration.



The City of Barrie’s sanitary sewage collection system policies and design guidelines recommends using a population per unit (PPU) of 1.67 for high density apartment dwellings. However, given that the unit breakdown is known, it is our opinion that the proposed sanitary discharge flows from the site should be calculated based on the more conservative approach outlined in **Table 1** below:

Table 1: Sanitary Flow Criteria

Use	PPU	Flow
1-bdrm	1.67	225 L/c/d
2-bdrm	2.34	225 L/c/d

The existing and proposed site generated flows will be compared, and recommendations will be made to address capacity issues identified, if applicable.

2.4 Methodology: Water Supply

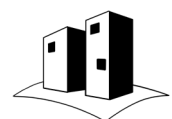
The existing and proposed domestic water demands from the site will be determined in accordance with the municipality’s criteria and the Ontario Building Code (OBC), as applicable, as per **Table 2** below.

Table 2: Water Demands Criteria

Use	Flow
Multi-unit	225 L/c/d

The development will be fully sprinklered in accordance with OBC and NFPA 13 requirements.

Pressure and flow testing was conducted at hydrants on Blake Street. Fire suppression calculations, in accordance with the Fire Underwriters Survey (FUS) Guidelines, will be undertaken to determine the minimum flow required at 150 KPa for fire protection, the results of which will be compared to the hydrant flow test to confirm adequate supply.



3.0 STORMWATER MANAGEMENT

All calculations and figures pertaining to the information summarized in the following sections are found in **Appendix B**.

3.1 Existing Drainage System

The property fronts an existing 450 mm and 600mm diameter conc. storm sewer system that is located near south curb of Blake Street and drains east towards St. Vincent then south through St. Vincent Square Park and ultimately outlets to Lake Simcoe.

Surface drainage from the existing residential dwellings drain south overland through private lands and outlet to Kempenfelt Drive where it is capture by an existing storm sewer that also outlets to Lake Simcoe.

The site does not receive external drainage. Refer to the pre-development drainage area **Figure 201** for the site drainage details.

3.2 Existing Runoff

The pre-development runoff conditions were calculated based on the City's criteria and will be used to determine net flow reduction from the site. The pre-development runoff from the site is summarized in **Table 3** below:

Table 3: Pre-Development Runoff

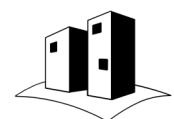
Return Period	Drainage Area (Ha)	Runoff C	Q (L/s)
2-Year	0.24	0.41	23.1
5-Year	0.24	0.41	30.3
100-Year	0.24	0.41	50.1

3.3 Allowable Release Rate

The allowable release rate to the municipal sewer is proposed to be equal to or less than the pre-development 5-year storm return period with a runoff coefficient of 0.41. The calculated allowable release rate is summarized in **Table 4** below:

Table 4: Allowable Release Rate

Drainage Area	Drainage Area (Ha)	Runoff C	5-year Release Rate (L/s)
101	0.24	0.41	29.2



3.4 Proposed Drainage

Although the site currently drains south through private lands, it is proposed to redirect storm run-off to the Blake Street infrastructure since securing an easement through private lands for a storm sewer was not feasible. As the drainage area outlet will be modified, an assessment of the existing Blake Street infrastructure was prepared to determine its adequacy for receiving additional flows. Please refer to **Section 3.11** below for further discussions.

All roof and area drains were designed to drain by gravity to the quantity control chamber, the details of which is described in **Section 3.5** below. Roof drains will outlet to the water balance chamber, while podium area drains will be directed to the filtration system prior to entering the stormwater management storage control chamber. Due to the need to match perimeter grades, flow from the two proposed catchbasin will need to be pumped to the water balance section of the stormwater management chamber.

3.5 Quantity Control

As shown in **Table 5** below, the 100-year post-development discharge rate from the subject development will be controlled such that the total release rate does not exceed the allowable target release rate. Refer to **Figure 202**.

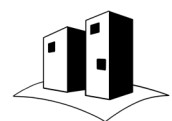
Table 5: Post-Development Release Rates

Storm Event	Total Allow. Release Rate (L/s)	Uncontrolled Release Rate (L/s)	Controlled Release Rate (L/s)	Total Site Release Rate (L/s)
100 Year	29.2	0.6	26.2	26.8

In total, 59.9 m³ of active storage is required to meet the allowable release rate. Quantity controls will be provided by a cast-in-place stormwater management (SWM) chamber located on the P1 level of the underground parking garage. The P1 level finished grade is expected to be approximately 231.10 and the existing storm sewer on Blake Street has a recorded invert of 232.93 at the proposed connection location. As such stormwater inside the storage tank will be pumped to the control structure, where flows will drain by gravity to the Blake Street storm sewer. For redundancy and precautionary measures, a two pump system should be installed within the storage chamber.

In order to ensure that the control structure operates as designed and that the SWM chamber is size appropriately, the pumps' discharge will need to be designed at minimum to the controlled release rate flow of 26.2 L/s.

The 100-year storm event will be over-controlled (to account for uncontrolled flows) by a 150 mm orifice tube located at the outlet of the SWM chamber. Approximately 108 m³ is available for



storage purposes – the SWM chamber’s footprint had to be oversized to ensure proper functioning of the filtration system described in **Section 3.6** and **3.8** below. Details and sections of the SWM chamber, filtration system, control structure and orifice are provided on **Plan 001** and **Plan 101** , found in **Appendix E**.

To further protect the building against a complete system failure, the stormwater management tank will be equipped with a perforated manhole lid accessible from finished grade to provide an emergency overland release point that also provides inspection and maintenance access to the SWM chamber. The site will be graded in such a way that overland flow relief (emergency) will be directed to Blake Street to the north. Refer to **Plan 401** for grading details.

3.6 Quality Control

As per LSRCA’s requirements quality controls must achieve a minimum of 80% total suspended solids (TSS) removal. The development will consist of green roofs, rooftop/terraces, perimeter landscaped and asphalt surfaces each having an effective removal rate as outlined in **Table 6** below:

Table 6: Effective TSS Removal Rate

Surface Type	Effective Removal Rate
Asphalt	0%
Roof	90%
Green roof/Landscape	100%

Based on the Effective TSS removal calculations, the proposed development will achieve a net TSS removal of 61%, therefore it is proposed to treat run-off from the asphalted areas with a filtration system (6-phosphosorb StormFilter cartridges). This runoff will be treated by the filtration system prior to entering the active storage component of the SWM chamber.

The proposed filtration system has documented evidence that it can achieve a TSS removal rate of 80% from the treated area (refer to NJDEP certification included). Based on this removal rate and our calculations, the proposed treatment train approach combined with the filtration system will achieve an overall net TSS removal of 89%. Refer to **Plan 101** for further information.

3.7 Water Balance

To retain the 5mm storm event based on the site area of 0.24 hectare, would require on-site water retention volume of 11.8 m³. An initial abstraction of 1mm from asphalt surfaces and the roof ballast and 5mm from grassed areas will provide an initial abstraction volume reduction of 4.6m³. Therefore, a net water balance volume of 7.2m³ is proposed to reduce run-off. This volume of



water will be used by the landscaping irrigation system and will be consumed within a maximum period of 72 hours as per the landscape consultant confirmation letter included in the appendix.

The 7.2m³ water balance volume will be provided in the stormwater chamber as a separate compartment. Refer to **Plans 002** and **Plan 101** found in **Appendix E** for details. Details of the pumping and rainwater re-use system will be provided by the mechanical consultant at the building permit stage.

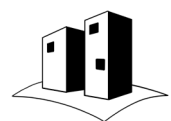
3.8 Phosphorus Loading

3.8.1. Phosphorus Mitigation

In accordance with the Lake Simcoe Region Conservation Authority (LSRCA) Technical Guidelines for Stormwater Management (Section 2.3.2) a recommended minimum of 80% reduction in phosphorus loading is required. An analysis of the pre- and post-development phosphorous loading from the proposed development was prepared, in consideration with the LSRCA's Phosphorus Offsetting Policy dated September 2017, a summary of which follows.

The analysis was conducted using the MOE Phosphorous Budget Tool using agreed upon pre-development land-uses and considers a treatment-train approach, consisting of surface vegetation, filtration system (doubling as the TSS removal filtration system) and storage facilities. Refer to **Figure 203** outlining a schematic of the treatment train design approach. The proposed NJDEP-certified Contech Stormfilter with PhosphoSorb will provide 80% phosphorous removal from the treated drainage area. Please refer to certification letter and design information.

In addition to the proposed treatment train approach, erosion and sediment control procedures will be implemented to reduce sediment transportation during construction. Refer to **Section 7.0** below for additional details.



Considering the above, a net reduction in phosphorous loading for the proposed development is achieved; a summary of the Phosphorous Budget Tool results is outlined in **Table 7** below:

Table 7: Post Development P-Load Summary

Stage	P-Load (kg/yr)
Pre-development	0.31
Post-development	0.31
BMP credits	-0.12
Post-Development P-Load	0.19
Construction P-Load	0.02
Net Post-Development P-Load	0.21 (31% reduction)

Based on the proposed development's treatment train approach the MOECP P-Load Development summary recommends approving the development as site specific appropriate. The full report is found in the appendices.

3.8.2. Phosphorus Offsetting Fee Calculation

Although post-development phosphorus loading from the development is reduced by 31%, the post-development conditions do not achieve the "Zero Phosphorus" target as such, the developer is required to provide phosphorus offsetting to the LSRCA in accordance with the following calculation:

- Post-development P load: 0.31 kg/yr.
- Post-development P-Load reduction: 0.12 kg/yr.
- Net to achieve Zero-Phosphorus (P): 0.19 kg/yr.

$$\begin{aligned}
 \text{Offsetting contribution} &= P * 2.5 * \$35,000/\text{kg/yr} \\
 &= 0.19 \text{ kg/yr} * 2.5 * \$35,000/\text{kg/yr} \\
 &= \$16,625
 \end{aligned}$$



3.9 100-Year Capture

To ensure that the 100-year flows are captured from areas susceptible to overland flow, area drains within the courtyard and main drive aisle were modelled as horizontal orifice plates assuming a 50% blockage. A summary of the design flows and inlet capacity is summarized in **Table 8** below:

Table 8: 100-Year Capture Points

Drainage ID	Area (m ²)	100-Year Flow (L/s)	Max Head (m)	Inlet Capacity (L/s)
AD 1	685	30.9	0.20	40.8
CB1	190	2.9	0.23	170.0
CB2	205	3.1	0.23	170.0

Area drains with a total grate open area of 0.067m² (such as Zurn Z662-HF or approved equal) will capture the flow adequately when 50% blockage has occurred while catchbasins CB1 and CB2 are sufficient to ensure 100-year capture from the landscaped areas.

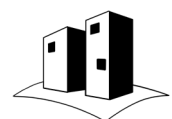
The 100-year capture from the roof areas will be performed by uncontrolled roof drains outleting to the SWM chamber.

3.10 Proposed Storm Connection

It is proposed to connect the development to the Blake Street infrastructure. The storm sewer on Blake Street is relatively shallow therefore, in order to ensure an adequate sewer depth at the property limit, the development must connect to the existing 450 mm diameter concrete storm sewer via a 1.0m long 150mm orifice tube and a 200 mm diameter service connection with a grade of 1.0%. Refer to **Drawing 101** found in **Appendix E** for the details related to the service connection.

3.11 Blake Street Capacity Review

Hydraulic grade line analysis and right-of-way capacity calculations were prepared based on the City of Barrie's record drawings to determine the capacity and adequacy of the existing dual-drainage storm system (minor/major flows) to accept the flows generated from the proposed development.



3.11.1. Methodology and Terms of Reference

The sewers downstream of the development to Lake Simcoe, as shown on **Plan 204**, were reviewed. Specifically, the following segments were analyzed:

- MH1 – MH2: A 450mm diameter concrete sewer with a gradient of 0.20%;
- MH2 – MH3: A 600mm diameter concrete sewer with a gradient of 0.20%;
- MH3 – MH4: A 600mm diameter concrete sewer with a gradient of 0.45%;
- MH4 – MH5: A 750mm diameter concrete sewer with a gradient of 4.60%;
- MH5 – MH6: A 750mm diameter concrete sewer with a gradient of 5.60%;
- MH6 – MH7: A 750mm diameter concrete sewer with a gradient of 3.80%, and;
- MH7 – Outfall: A 500mm diameter concrete sewer with a gradient exceeding 30%.

The sewer analysis was based on the following criteria:

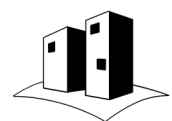
- Sub-sewershed determined from CAD file obtained from the City of Barrie (plan 1993-009-002 STM D);
- A time of concentration (t_c) of 10 minutes was used for ID 101 corresponding to the first sewer segment. Actual t_c for the remaining drainage areas were determined using the Airport Method;
- Sewer capacity is based on actual pipe sizes
- It is assumed that the minor flows (Q5) are capture by the existing storm infrastructure and that major flows (Q100-Q5) are forced to the surface.

3.11.2. Pre-Development Conditions

It is understood that there are no storm connections to the existing Blake Street sewer from weeping tiles or existing developments. Under existing condition, the site contributes neither minor nor major storm flows to the Blake Street infrastructure.

The Blake Street sewershed was sub-divided into approximate drainage areas each contributing to the analyzed sewer segments noted above. In general, run-off from the sewershed flows overland to Blake Street where the 5-year flows are conveyed by the storm sewers and surplus runoff is conveyed by the right-of-way (ROW).

The pre-development condition storm design sheet and hydraulic grade line analysis (HGL) demonstrates that existing minor flows exceed the Blake Street storm sewer capacity and that an HGL develops between from MH1 to MH4. In general, the developed HGL is below the road centreline. It is noted that the existing HGL downstream along the Blake Street storm sewer is less than 1.8m below centreline due to the shallowness of the infrastructure.



Furthermore, the design sheet indicates that the 750mm diameter sewer through St. Vincent Square Park (MH4-MH6) is sized to convey the 100-year storm event, the surcharge and HGL are thus eliminated south of MH4.

Based on the existing ROW cross section and our calculations, major flows ponding during the 100-year storm event will vary along the analyzed area from 0.04m below the road centreline (approximately 0.07m above the gutter line) between MH1-MH2, up to the centreline elevation (approximately 0.11 above the gutter line) between MH3-MH4.

The following **Table 9** summarizes the pre-development conditions of the receiving Blake Street infrastructure.

Table 9: Pre-Development HGL and Major Flow Elevation Summary

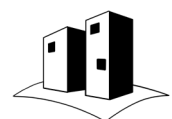
MH ID	Q_5 (m ³ /s)	Q_{cap} (m ³ /s)	HGL Elev. (m below CL)	$Q_{100} - Q_5$ (m ³ /s)	Major Flow Elev. (m below CL)
MH1-MH2	0.127	0.127	1.40	0.083	0.04
MH2-MH3	0.299	0.274	1.25	0.202	0.02
MH3-MH4	0.479	0.412	1.17	0.319	0.00
MH4-MH5	1.306	2.378	-	0.909	-

There are existing conditions east of the site where surface water may not be entirely contained within the right-of-way, notably:

- The east and west driveway of 35 Blake Street and the circular driveway at 41 Blake: These driveways are located at a section of Blake Street where the maximum expected overland flow elevation is 0.09m above the gutter elevation. The driveways are reverse-sloped and the existing conditions are such that overland flow may overtop the curb cut and drain south through private lands.
- The driveway at 55 Blake: This driveway is located at a section of Blake Street where the maximum expected overland flow elevation is 0.11m above the gutter elevation. This driveway is located immediately west of an existing road sag. Based on our observations, overland flow from the south portion of the ROW is directed through this driveway towards Kempenfelt Drive.

3.11.3. Post-Development Conditions

As a conservative measure in the post-development condition, the site was modeled as a constant external flow. We adjusted the flow rate per hectare to reflect the allowable release rate of approximately 29L/s.



The post-development storm design sheet and HGL analysis indicate that the added flow from the site will increase the HGL by a range of approximately 0.04 to 0.06 meters. The pre and post HGL was plotted on the provided plan and profiles and demonstrates that the HGL remains below the boulevard catchbasins and does not surface anywhere along Blake Street.

Since the proposed development site will be self-contained (i.e. all flows up to the 100-year event will be captured) and the HGL remains below the surface, the major flows ponding during the 100-year storm event will remain unchanged as compared to pre-development conditions.

The following **Table 10** summarizes the post-development conditions to the receiving Blake Street infrastructure combined sewer

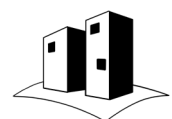
Table 10: Post-Development HGL and Major Flow Elevation Summary

MH ID	Q_5 (m ³ /s)	Q_{cap} (m ³ /s)	HGL Elev. (m below CL)	$Q_{100} - Q_5$ (m ³ /s)	Major Flow Elev. (m below CL)
MH1-MH2	0.156	0.127	1.34	0.083	0.04
MH2-MH3	0.328	0.274	1.21	0.202	0.02
MH3-MH4	0.508	0.412	1.12	0.319	0.00
MH4-MH5	1.335	2.387	-	0.909	-

3.11.4. Conclusions and Recommendations

The analysis conducted indicates that the addition of the site flows will not create additional flooding downstream of the proposed development. It is recognized however that the existing conditions do pose a certain amount of risk to the properties at 35, 41 and 55 Blake Street with respect to flooding from major flows at the ROW. The following are improvements that will be implemented to provide protection to the adjacent development to the east:

- The driveways at 35 Blake Street will be regraded such that overland flow is contained within the right-of-way thereby improving the existing condition.



4.0 SANITARY DRAINAGE

All calculations and figures pertaining to the information summarized in the following sections are found in **Appendix C**.

There is an existing sanitary easement located at the southeast corner of the site. This easement will not be used and can be removed from title.

4.1 Existing Sanitary Drainage System

An existing 250mm diameter PVC sanitary sewer is located on Blake Street and drains east towards St. Vincent then south through St. Vincent Square Park to Kempenfelt Drive. The Blake Street sewer is located approximately along the centre line of pavement. The existing dwellings are serviced from this sewer.

4.2 Existing Sanitary Flows

Based on the criteria outlined in **Section 2.3**, the site contributes a peak sanitary flow of approximately 0.09 L/s to the local infrastructure.

4.3 Proposed Sanitary Flows

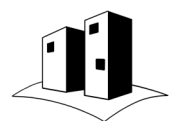
The proposed sanitary discharge flows from the site were calculated based on the City of Barrie's modified criteria outlined in **Section 2.3**, the proposed building and site information. A total peak design flow of 0.8 L/s was calculated for the proposed development.

4.4 Proposed Sanitary Connection

The sanitary effluent from the above-grade portion of the development will discharge by gravity, while all sanitary flows from below grade portion of the development (i.e. parking garage) will be pumped to the outlet.

All Sanitary flow from the proposed development will outlet to the existing 250mm sanitary sewer at Blake Street.

A cast-in-place control manhole, forming part of the foundation structure will be provided at the property line. A new 200 mm sanitary sewer service connection with a grade of 2.0% will be constructed and will be adequate to safely convey the calculated design flow of 0.8 L/s to the municipal infrastructure. The proposed lateral connection to the municipal main will be made with a riser as shown on **Drawing 101** in **Appendix E**.



5.0 WATER SUPPLY

All calculations and figures pertaining to the information summarized in the following sections are found in **Appendix D**.

5.1 Existing System

An existing 250 mm diameter ductile iron (DI) watermain is located on the north side of Blake Street, 2.5m offset from the road centreline.

The existing properties are serviced from Blake Street with 19mm copper service connections. Please refer to **Drawing 101** found in **Appendix E** for additional information.

A hydrant flow test was performed by Jackson Waterworks on the Blake Street infrastructure on July 15, 2019. The test results indicate the watermain is operating at a static pressure of approximately 440 KPa (64 PSI), and that the available flow at 140 KPa (20 PSI) is approximately 17,960 L/min (4,745 USGPM).

5.2 Existing Water Demands

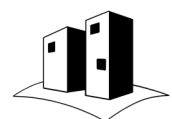
Based on the criteria outlined in **Section 2.4** above, the existing average day domestic water consumption is approximately 0.02 L/s (maximum day demand of 0.7 L/min) from the Blake Street infrastructure.

5.3 Proposed Water Supply Requirements

The estimated water consumption was calculated as per the criteria outlined in **Section 2.4** above. The proposed average day domestic water consumption rate is estimated to be 0.2 L/s (maximum day demand of approximately 33,170 L/d).

Water Supply for Public Fire Protection calculations, as per the Fire Underwriters Survey (FUS), were undertaken to determine the minimum requirement to provide adequate fire suppression. According to our calculations, a minimum fire suppression flow of approximately 7,840 L/min (2,070 USGPM) will be required for the subject development. According to the flow test referenced above, the Max Day + Fire Flow rate of approximately 7,865 L/min (2,077 USGPM) is available at a pressure which exceeds the minimum FUS requirements.

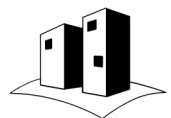
The municipal water system therefore has adequate flow and pressure to satisfy the water demands of the proposed development.



5.4 Proposed Water Connection

As the height of the proposed building does not exceed 84.0m, the development may be serviced by a single fire supply. Therefore, the proposed building will be serviced with separate services including a 150mm fire and a 100mm domestic water connection. Each proposed service will connect to the existing 250mm diameter DI watermain on Blake Street with tapping sleeve and valves.

Refer to **drawing 101** found in **Appendix E** for additional details.



6.0 SITE GRADING

Please refer to **Drawing 401** found in **Appendix E** for additional information pertaining to the grading details discussed below.

6.1 Existing Grades

The site is covered by sod, roofs and gravel/asphalted driveways from the existing residential dwellings occupying the site. In general, surface drainage is directed to the south and overland flow spills onto adjacent private properties as indicated on the pre-development drainage area **Figure 201** found in **Appendix B**. The topography of the surrounding areas indicates the subject site is self-contained and does not accept external drainage from adjacent developments.

The site's topography is such that there is an approximate 3.5m grade difference from high to low point.

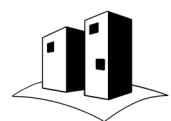
6.2 Proposed Grades

A review of the perimeter site grades suggests that the first-floor elevation of the proposed buildings should be set to approximately 235.00. Grade differences around the perimeter of the building will be accommodated by extending the foundation walls as needed. Grading along the easter, southern and western edges of the property will be such that all surface flows will be captured, except for the tree-protection area (refer to **Section 3.9**). The proposed grading of the site perimeter will be compatible with the adjacent developments.

Due to existing conditions at the developments to the east and west, a "standard" boulevard grading cannot be achieved for the entire frontage. The sidewalk elevation at the western property limit is approximately 0.50m below the existing top of curb and at grade with the top of curb at the eastern limits. Approximately half of the site frontage will be graded to provide a 2% sloped boulevard (the eastern portion) while the remaining will be graded to match existing elevations without exceeding a 5% sidewalk slope.

It is proposed to re-grade the driveway at 35 Blake Street to protect it from overland flooding as well as improving traffic circulation near the shared property limit.

The development of this site and will not adversely impact adjacent lands.

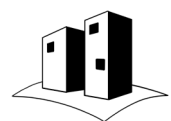


7.0 EROSION AND SEDIMENT CONTROL

To ensure stormwater runoff during the construction phase does not transport sediment to the existing municipal infrastructure, temporary catchbasin sediment control devices are proposed on Blake Street along the site frontage. In addition, a temporary sediment control fence will be erected around the site perimeter and a temporary construction access (mud mat) will be built at the construction entrance on Blake Street.

Furthermore, all new drainage structures including catchbasins, area drains, manhole and SWM chamber will be cleaned of accumulated construction silt and will be disposed of at an approved location.

These measures will be designed and constructed in accordance to the "Erosion and Sediment Control Guideline for Urban Construction" document (December 2006). These measures, as well as any additional information pertaining to ESC Controls, are detailed on **Drawing 601** found in **Appendix E**. All reasonable measures will be taken to ensure sediment loading to the adjacent properties and municipal right-of-way is minimized both during and following construction.



8.0 CONCLUSIONS AND RECOMMENDATIONS

This report is to be read in conjunction with the application submission material for the project proposal known as Blake Street Apartments, 27-31 Blake Street. We conclude and recommend the following:

8.1 STORMWATER MANAGEMENT

Peak runoff rates for the proposed development were designed to be less than or equal to the existing condition by implementing onsite SWM controls. Stormwater storage will be implemented to achieve this and will be provided by on-site storage and a 150 mm orifice plate. A total storage volume of 59.9 m³ is required to meet quantity controls.

Quality controls will be achieved through a treatment train approach that includes a filtration system. An overall TSS removal efficiency of 89% is achieved.

A net 38% reduction in phosphorous loading will be achieved using the filtration system. In order to achieve Zeo-Phosphorus an offset contribution to the LSRCA will be required in the amount of \$16,625.00.

A volume of 7.2 m³ will be retained within the SWM chamber and will be re-used as part of the site's irrigation requirements within 72 hours.

The addition of the site flows to the Blake Street storm infrastructure will not adversely affect downstream properties nor will it increase flooding risks downstream.

8.2 SANITARY DRAINAGE

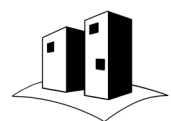
The sanitary discharge from the proposed development will be directed to Blake Street. This infrastructure has adequate capacity to support the proposed development flows.

8.3 WATER SUPPLY

The existing watermain has adequate capacity to supply the Max Day + Fire Flow rate of approximately 7,865 L/min (2,077 USGPM) at 140 Kpa (20 PSI) required for the proposed development.

8.4 SITE GRADING

The proposed grading is compatible with existing elevations at the property limit, and will not adversely affect adjacent properties.



8.5 EROSION AND SEDIMENT CONTROL

ESC measures were designed as per the "Erosion and Sediment Control Guideline for Urban Construction" document (December 2006). Provided that these measures are well maintained during construction, these will be adequate to keep sediments from entering the municipal infrastructure during construction.

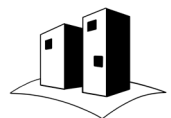
Respectfully submitted,

SITEPLANTECH INC.



Pascal Monat, P.Eng.
Principal

P:\20-006 - 27-31 Blake St. - Barrie\Reports and Drawings\Reports\20-006 - FSR - SWM.docx



Appendix A

Background Information

Pascal Monat

From: michael@studiokarchitects.ca
Sent: October 9, 2020 12:43 PM
To: pmonat@siteplantech.com
Cc: 'Leatherville Fashions'; 'Andreh Custantin'
Subject: RE: 27-31 Blake Street
Attachments: 2020_10_09 Floor Plans.pdf

Hi Pascal,

As requested, please see attached floor plans and stats below.

Ground Floor:

1 Bedroom: 2
2 Bedroom: 5

Level 2:

1 Bedroom: 2
2 Bedroom: 5

Level 3:

1 Bedroom: 2
2 Bedroom: 5

Level 4:

1 Bedroom: 2
2 Bedroom: 5

Level 5:

1 Bedroom: 4
2 Bedroom: 3

Hopefully this is sufficient for your purposes.

Michael Koutsoulis OAA, MArch
Principal



A: 3950 14th Avenue, Suite 205, Markham, Ontario, L3R 0A9

T: [416 554 7751](tel:4165547751)

E: michael@studiokarchitects.ca

check out our new website: www.studiokarchitects.ca

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From: michael@studiokarchitects.ca <michael@studiokarchitects.ca>

Sent: October 9, 2020 11:08 AM

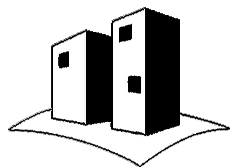
To: pmonat@siteplantech.com

Cc: 'Leatherville Fashions' <leatherville@gmail.com>; Andreh Custantin <andreh@studiokarchitects.ca>

Subject: RE: 27-31 Blake Street

Appendix B

Storm Data

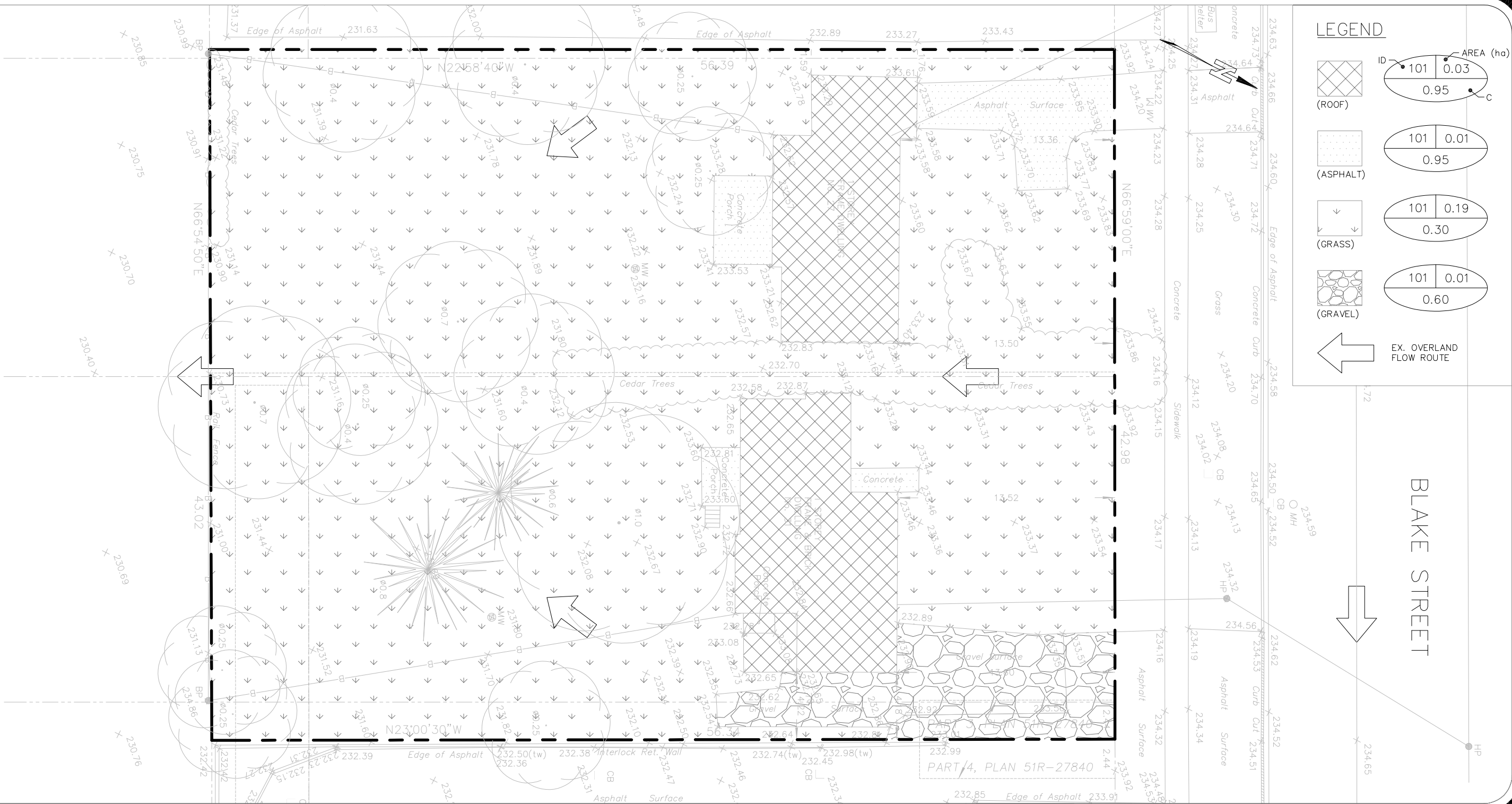


SITEPLANTECH INC.
339 – 16 ELGIN ST.
THORNHILL, ON
L3T 4T4

BLAKE STREET APARTMENTS
27–31 BLAKE ST.
BARRIE, ON

PRE-DEVELOPMENT
DRAINAGE PLAN

DATE: OCT. 2020	PROJECT No.: 20-006
SCALE: 1:250	FIGURE No.: 201



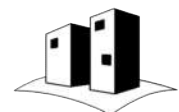
**PRE-DEVELOPMENT
RUNOFF COEFFICIENT**

Drainage Area 101

Surface Type	C	A (Ha)	A*C
Asphalt	0.95	0.01	0.01
Roof	0.95	0.03	0.03
Gravel	0.60	0.01	0.01
Grass	0.30	0.19	0.06
Composite C		0.24	0.41

Summary

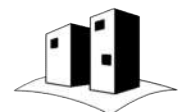
Drainage Area	C	A (Ha)	A*C
101	0.41	0.24	0.10
TOTAL		0.24	0.41



**NET DEVELOPABLE
AREA CALCULATION**

Summary of Land Conveyances Adjustments

	Existing (m²)	Adjustments (m²)	Net Area (m²)
Site Area	2,423.68	0.00	2,423.68
Road Widening	0.00	-85.94	-85.94
TOTAL	2,423.68	-85.94	2,337.74



ALLOWABLE RELEASE RATE CALCULATION

IDF set: Barrie

Return Period	<i>a</i>	<i>T_c</i>	<i>b</i>	<i>c</i>
2-Year	678.1	10	4.70	0.781
5-Year	853.6	10	4.70	0.766
100-Year	1426.4	10	5.27	0.759

Where:
$$I = \frac{a}{(t_c + b)^c}$$

Pre-Development Runoff Volume¹

Return Period	Area (Ha)	Composite C	I (mm/hr)*	Q (L/s)
2-Year	0.24	0.41	83.11	23.1
5-Year	0.24	0.41	108.92	30.3
100-Year	0.24	0.41	180.15	50.1

¹ Based on existing site area

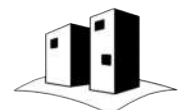
Control Storm 5-Year

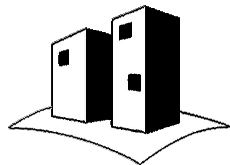
Allowable Release Rate Calculation²

Drainage Area	Area (Ha)	Composite C	I (mm/hr)*	Q (L/s)
101	0.23	0.41	108.92	29.2

Where:
$$Q = \frac{CIA}{360}$$

² Based on net developable area





SITEPLANTECH INC.
339 – 16 ELGIN ST.
THORNHILL, ON
L3T 4T4

BLAKE STREET APARTMENTS
27–31 BLAKE ST.
BARRIE, ON

POST-DEVELOPMENT DRAINAGE PLAN

DATE: OCT. 2020

PROJECT No.: 20-006

SCALE: 1:250

FIGURE No.: 202

**POST-DEVELOPMENT
RUNOFF COEFFICIENT**

Drainage Area 210

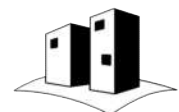
Surface Type	C	A (Ha)	A*C
Asphalt	0.90	0.094	0.08
Roof	0.90	0.086	0.08
Grass	0.30	0.052	0.02
Composite C		0.23	0.77

Drainage Area 220

Surface Type	C	A (Ha)	A*C
Grass	0.30	0.003	0.00
Composite C		0.00	0.30

Summary

Drainage Area	C	A (Ha)	A*C
210	0.77	0.232	0.18
220	0.30	0.003	0.00
TOTAL		0.24	0.76



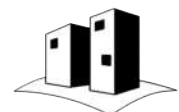
STORMWATER MANAGEMENT QUANTITY CONTROL SUMMARY

100-Year Summary Matrix

Drainage Area	201	210	220	Total
Bldg ID	A			
C	0.00	0.77	0.30	-
A (Ha)	0.00	0.23	0.00	0.24
Q_{Release} (L/s)	0.0	26.2	0.5	26.6
Storage (m³)	0.0	41.4	0.0	41.4
Vol. Avail.				
(m³)	0.0	108.0	-	108.0
Orifice	Roof	150	Uncontrolled	-
Q_{Orifice} (L/s)	-	26.2	-	-
Unctrld Q				
(L/s)	-	-	0.5	-
Orifice type	-	TUBE	-	-

5-Year Summary Matrix

Drainage	201	210	220	Total
Bldg ID	A			
C	0.00	0.77	0.30	-
A (Ha)	0.00	0.23	0.00	0.24
Q_{Release} (L/s)	0.0	26.2	0.3	26.5
Storage (m³)	0.0	16.5	0.0	16.5
Vol. Avail.				
(m³)	0.0	108.0	-	108.0
Orifice	Roof	150	Uncontrolled	-
Q_{Orifice} (L/s)	-	26.2	-	-
Unctrld Q				
(L/s)	-	-	0.3	-
Orifice type	-	TUBE	-	-



MODIFIED RATIONAL METHOD STORAGE CALCULATIONS

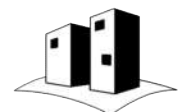
Drainage Area 210	
Area (Ha)	0.23
C	0.77
AC	0.18
T _c (min)	10.0
T incr. (min)	5
Q ₁ (l/s)	26.2
Req. vol. (m ³)	41.4

Barrie	100-Year
a=	1426.408
b=	5.273
c=	0.759

Notes:

Stage Storage Summary

T (min)	I (mm/hr)	Q (l/s)	Total Vol.	Ext. Vol. (m³)	Rel. Vol. (m³)	Storage (m³)
10	180.2	88.9	53.4	0.0	15.7	37.7
15	145.3	71.7	64.6	0.0	23.6	41.0
20	122.9	60.7	72.8	0.0	31.4	41.4
25	107.2	52.9	79.4	0.0	39.3	40.1
30	95.4	47.1	84.8	0.0	47.2	37.7
35	86.3	42.6	89.5	0.0	55.0	34.5
40	79.0	39.0	93.6	0.0	62.9	30.7
45	72.9	36.0	97.2	0.0	70.7	26.5
50	67.9	33.5	100.5	0.0	78.6	21.9
55	63.6	31.4	103.5	0.0	86.4	17.1
60	59.8	29.5	106.3	0.0	94.3	12.0
65	56.6	27.9	108.9	0.0	102.2	6.8
70	53.7	26.5	111.3	0.0	110.0	1.3
75	51.1	25.2	113.6	0.0	117.9	-4.3
80	48.8	24.1	115.7	0.0	125.7	-10.0
85	46.8	23.1	117.8	0.0	133.6	-15.8
90	44.9	22.2	119.7	0.0	141.5	-21.8
95	43.2	21.3	121.5	0.0	149.3	-27.8
100	41.6	20.5	123.3	0.0	157.2	-33.9
105	40.2	19.8	125.0	0.0	165.0	-40.1
110	38.9	19.2	126.6	0.0	172.9	-46.3
115	37.6	18.6	128.2	0.0	180.8	-52.6
120	36.5	18.0	129.7	0.0	188.6	-59.0
125	35.4	17.5	131.1	0.0	196.5	-65.4



MODIFIED RATIONAL METHOD STORAGE CALCULATIONS

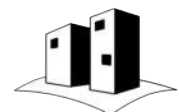
Drainage Area 210	
Area (Ha)	0.23
C	0.77
AC	0.18
T _c (min)	10.0
T incr. (min)	5
Q ₁ (l/s)	26.2
Req. vol. (m ³)	16.5

Barrie	5-Year
a=	853.608
b=	4.699
c=	0.766

Notes:

Stage Storage Summary

T (min)	I (mm/hr)	Q (l/s)	Total Vol.	Ext. Vol. (m³)	Rel. Vol. (m³)	Storage (m³)
10	108.9	53.8	32.3	0.0	15.7	16.5
15	87.0	43.0	38.7	0.0	23.6	15.1
20	73.2	36.1	43.4	0.0	31.4	11.9
25	63.6	31.4	47.1	0.0	39.3	7.8
30	56.4	27.9	50.1	0.0	47.2	3.0
35	50.9	25.1	52.8	0.0	55.0	-2.3
40	46.5	22.9	55.1	0.0	62.9	-7.8
45	42.8	21.2	57.1	0.0	70.7	-13.6
50	39.8	19.7	59.0	0.0	78.6	-19.6
55	37.2	18.4	60.7	0.0	86.4	-25.8
60	35.0	17.3	62.2	0.0	94.3	-32.1
65	33.1	16.3	63.7	0.0	102.2	-38.5
70	31.4	15.5	65.0	0.0	110.0	-45.0
75	29.8	14.7	66.3	0.0	117.9	-51.6
80	28.5	14.1	67.5	0.0	125.7	-58.3
85	27.3	13.5	68.6	0.0	133.6	-65.0
90	26.1	12.9	69.7	0.0	141.5	-71.8
95	25.1	12.4	70.7	0.0	149.3	-78.6
100	24.2	12.0	71.7	0.0	157.2	-85.5
105	23.4	11.5	72.7	0.0	165.0	-92.4
110	22.6	11.1	73.6	0.0	172.9	-99.3
115	21.8	10.8	74.4	0.0	180.8	-106.3
120	21.2	10.5	75.3	0.0	188.6	-113.3
125	20.5	10.1	76.1	0.0	196.5	-120.4



MODIFIED RATIONAL METHOD STORAGE CALCULATIONS

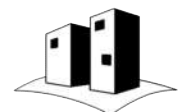
Drainage Area 220	
Area (Ha)	0.00
C	0.30
AC	0.00
T _c (min)	10.0
T incr. (min)	2
Q ₁ (l/s)	0.5
Req. vol. (m ³)	0.0

Barrie	100-Year
a=	1426.408
b=	5.273
c=	0.759

Notes:

Stage Storage Summary

T (min)	I (mm/hr)	Q (l/s)	Total Vol.	Ext. Vol. (m³)	Rel. Vol. (m³)	Storage (m³)
10	180.2	0.5	0.3	0.0	0.3	0.0
12	164.1	0.4	0.3	0.0	0.3	0.0
14	151.0	0.4	0.3	0.0	0.4	-0.1
16	140.1	0.4	0.3	0.0	0.4	-0.1
18	130.9	0.3	0.4	0.0	0.5	-0.1
20	122.9	0.3	0.4	0.0	0.5	-0.2
22	116.0	0.3	0.4	0.0	0.6	-0.2
24	109.9	0.3	0.4	0.0	0.6	-0.3
26	104.6	0.3	0.4	0.0	0.7	-0.3
28	99.8	0.2	0.4	0.0	0.8	-0.3
30	95.4	0.2	0.4	0.0	0.8	-0.4
32	91.5	0.2	0.4	0.0	0.9	-0.4
34	88.0	0.2	0.4	0.0	0.9	-0.5
36	84.7	0.2	0.5	0.0	1.0	-0.5
38	81.7	0.2	0.5	0.0	1.0	-0.6
40	79.0	0.2	0.5	0.0	1.1	-0.6
42	76.4	0.2	0.5	0.0	1.1	-0.7
44	74.1	0.2	0.5	0.0	1.2	-0.7
46	71.9	0.2	0.5	0.0	1.2	-0.7
48	69.8	0.2	0.5	0.0	1.3	-0.8
50	67.9	0.2	0.5	0.0	1.4	-0.8
52	66.1	0.2	0.5	0.0	1.4	-0.9
54	64.4	0.2	0.5	0.0	1.5	-0.9
56	62.8	0.2	0.5	0.0	1.5	-1.0



ORIFICE AND AVAILABLE STORAGE CALCULATIONS

$$Q_{orifice} = C_d A (2gh)^{1/2}$$

Type	TUBE
Location	MH1
Size	150 mm
Area	0.018 m ²
C _d	0.8

Drainage Area 210 Orifice Calcs

	Elev. (m)	h (m)	Q (m ³ /s)
Inv.	233.70	0.00	0.00
MH TOP	234.90	1.13	0.066
5-yr W.L.	233.95	0.18	0.026
100-yr W.L.	233.95	0.18	0.026

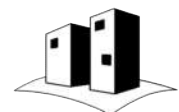
SWM Tank Storage

L* (m)	W* (m)	D (m)	Vol. (m ³)
-	-	2.60	108.0
Total underground storage available			108.0

MH storage

Dia. (mm)	A (m ²)	D (m)	Vol. (m ³)
1,200	1.13	0.0	0.0
Total MH storage available			0.0

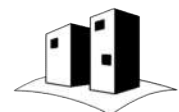
* Irregular shaped tank



**WATER BALANCE
CALCULATIONS**

Runoff Volume Summary

Surface type	A (Ha)	Depth (mm)	Vol. (m ³)	IA depth (mm)	IA Vol. (m ³)	Runoff Vol. (m ³)
Asphalt	0.09	5	4.7	1	0.9	3.8
Roof	0.09	5	4.3	1	0.9	3.4
Green Roof	0.00	5	0.0	5	0.0	0.0
Grass	0.06	5	2.8	5	2.8	0.0
Total	0.24		11.8		4.6	7.2



EFFECTIVE TSS REMOVAL CALCULATIONS

Untreated TSS Removal Summary

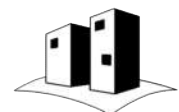
Drainage Area	Surface Type	A (Ha)	Removal Rate	Net for Treatment	Treatment Type	Rate	Effective Removal
210	Asphalt	0.094	0%	100%			0%
	Rooftops	0.086	90%	10%	1		90%
	Green roof	0.000	100%	100%	2		
	Grass	0.052	100%	0%			100%
220	Grass	0.003	100%	0%	3		100.0%
Total		0.235					56%

Treated TSS Removal Summary

Drainage Area	Surface Type	A (Ha)	Removal Rate	Net for Treatment	Treatment Type	Rate	Effective Removal
210	Asphalt	0.094	0%	100%	4	80%	80%
	Rooftops	0.086	90%	10%	1	50%	95%
	Green roof	0.000	100%	100%	2		
	Grass	0.052	100%	0%			100%
220	Grass	0.003	100%	0%	3		100%
Total		0.241					88%

Treatment Type Legend:

- 1 - Inherently clean runoff
- 2 - Green roof
- 3 - Untreated
- 4 - Oil grit separator



100-YEAR CAPTURE CALCULATIONS

IDF set: Hamilton

Return Period	<i>a</i>	<i>T_c</i>	<i>b</i>	<i>c</i>
100-Year	1426.4	10	5.27	0.759

Where:
$$I = \frac{a}{(t_c + b)^c}$$

Area 210 100-year flow

Drainage ID	Area (m ²)	Composite C	I (mm/hr)*	Q (L/s)
AD1	685	0.90	180.15	30.9
CB1	190	0.30	180.15	2.9
CB2	205	0.30	180.15	3.1

Where:
$$Q = \frac{CIA}{360}$$

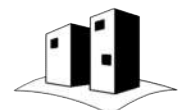
$$Q_{orifice} = C_d A (2gh)^{1/2}$$

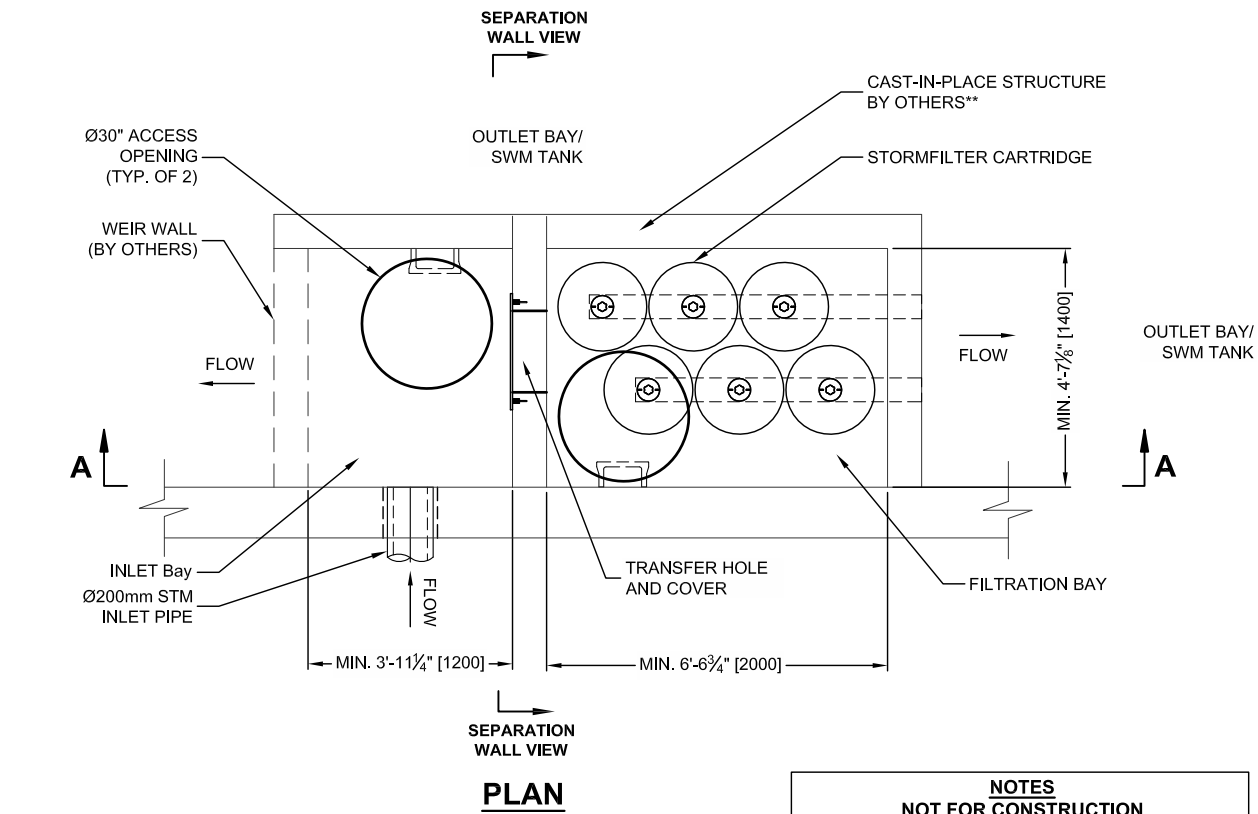
Type	PLATE
Model	Zurn Z662-HF
Grate Open Area	665 cm ²
1/2 Area*	0.033 m ²
C _d	0.62

Drainage ID	AD Elev. (m)	Max W.L.	h (m)	Q _{in} (L/s)
AD1	160.55	160.68	0.20	40.8
CB1 ⁺	231.15	231.38	0.23	170.0
CB2 ⁺	230.50	230.73	0.23	170.0

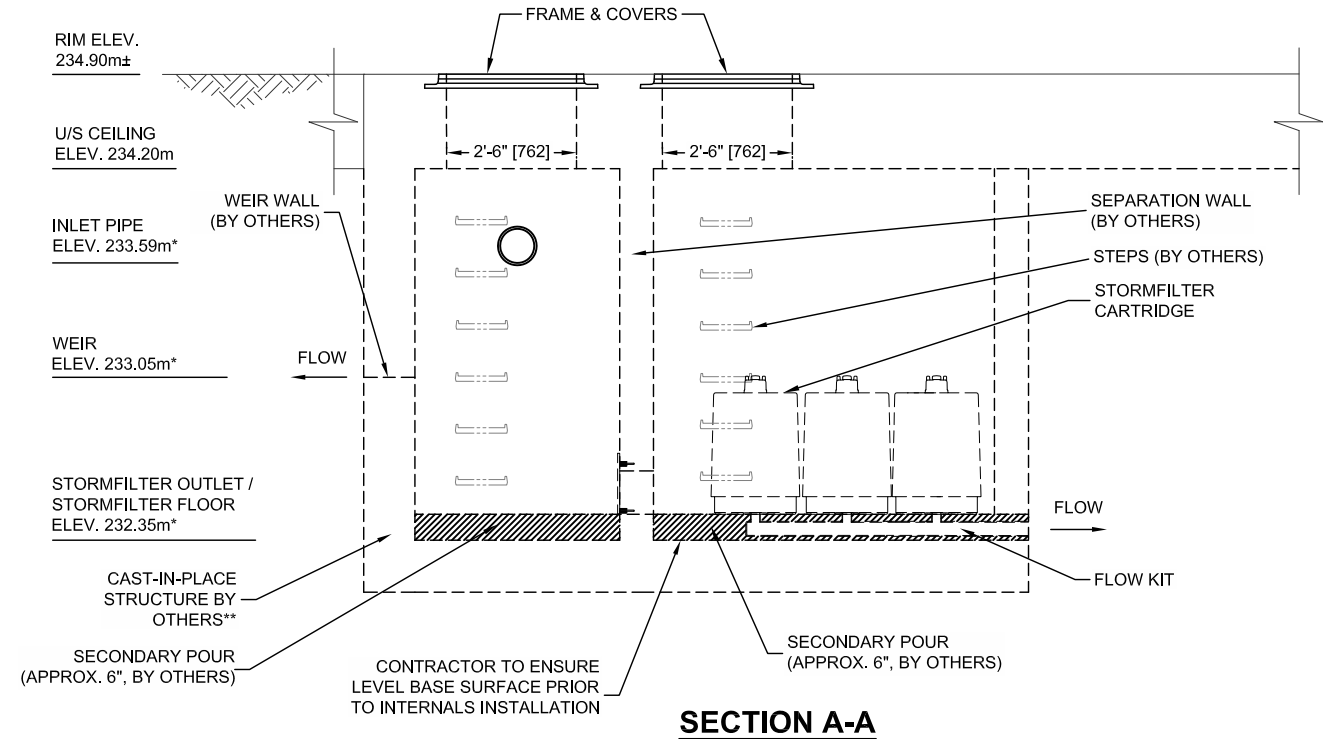
* Assumes 50% blockage

⁺ Refer to MTO Inlet Capacity Chart 4.19

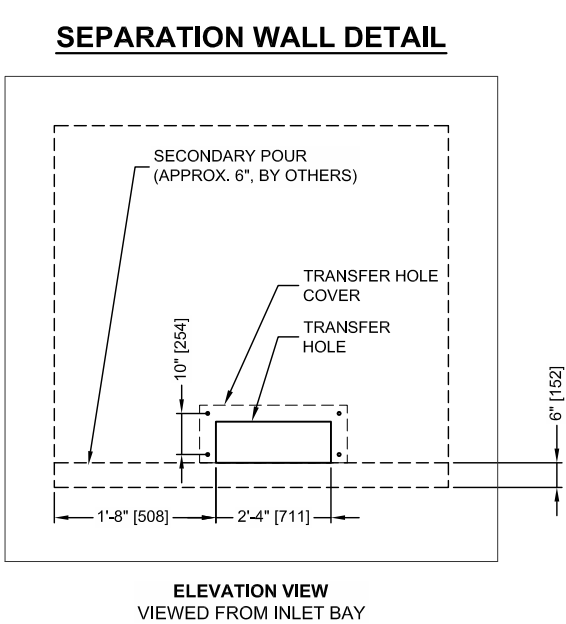




NOTES
NOT FOR CONSTRUCTION
* CRITICAL ELEVATIONS.
** STRUCTURAL DESIGN BY OTHERS.
MINIMUM INTERNAL DIMENSIONS TO REMAIN.
*** INLET & OUTLET PIPE SIZE, LOCATION
AND MATERIAL TO BE CONFIRMED.



STORMFILTER DESIGN TABLE					
• THE PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD. • THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION. • ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.					
CARTRIDGE HEIGHT	27"		18"		LOW DROP
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft² 1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10 5



SITE SPECIFIC DATA REQUIREMENTS			
STRUCTURE ID			*
WATER QUALITY FLOW RATE (cfs)			*
PEAK FLOW RATE (cfs)			*
RETURN PERIOD OF PEAK FLOW (yrs)			*
# OF CARTRIDGES REQUIRED			*
CARTRIDGE FLOW RATE			*
MEDIA TYPE (CSF, PERLITE, ZPG)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*
INLET BAY RIM ELEVATION			*
FILTER BAY RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

PERFORMANCE SPECIFICATION
FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES.** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS.**
SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM).** SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

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, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
C. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
D. CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.



CONTECH
PROPOSAL
DRAWING

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

27-31 BLAKE STREET, BARRIE, ON.
PEAK DIVERSION STORMFILTER
CAST-IN-PLACE STANDARD DETAIL



Determining Number of Cartridges for Flow Based Systems

Date

11/18/2020

Black Cells = Calculation

Site Information

Project Name

27-31 Blake St.

Project Location

Barrie, ON

OGS ID

OGS

Drainage Area, Ad

0.21 ac (0.084 ha)

Impervious Area, Ai

0.21 ac

Pervious Area, Ap

0.00

% Impervious

100%

Runoff Coefficient, Rc

0.90

Treatment storm flow rate, Q_{treat}

0.10 cfs (2.73 L/s)

Peak storm flow rate, Q_{peak}

1.33 cfs (37.8 L/s)

Filter System

Filtration brand

StormFilter

Cartridge height

18 in

Specific Flow Rate

1.00 gpm/ft²

Flow rate per cartridge

7.50 gpm

SUMMARY

Number of Cartridges

6

Media Type

Phosphosorb

Event Mean Concentration (EMC)

150 mg/L

Annual TSS Removal

80%

Percent Runoff Capture

90%

Recommend one SFPD0806 vault



E C H E L O N
E N V I R O N M E N T A L

505 Hood Road Unit 26 Markham ON L3R 5V6
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

June 1, 2021

Mr. Pascal Monat, P.Eng.
SITEPLANTECH Inc.
16 Elgin Street, Suite 339
Markham, ON
L3R 4T4

RE: **Stormwater Management StormFilter Design**
27 – 31 Blake Street, Barrie, ON

Dear Pascal,

On behalf of the manufacturer, Contech Engineered Solutions, they have advised the following parameters should be met if the flow downstream of a Stormwater Management StormFilter is to be pumped:

- the Stormwater Management StormFilter should experience little to no tailwater during the treatment storm event
- the water level in the Stormwater Management StormFilter outlet bay should be no more than 150mm above the outlet invert during the treatment storm event
- the water level in the Stormwater Management StormFilter outlet bay should be no more than 300mm above the outlet invert during the peak storm event

If the above parameters are met, the StormFilter Treatment System will operate normally as designed.

If you require further information, please feel free to contact me at your convenience.

Sincerely,

Natalie Wong
Project Manager, Echelon Environmental
E: Natalie@echelonenvironmental.ca
O: 905-948-0000

BLAKE ST.

WATER BALANCE

STORAGE
FILTRATION

ROOF

PODIUM

ADJACENT DEVELOPMENT

SITE BOUNDARY

LEGEND

- ▶— FLOW OF WATER
□ CATCH BASIN

SITEPLANTECH INC.
339 - 16 ELGIN ST.
THORNHILL, ON
L3T 4T4

TREATMENT
TRAIN FLOW
DIAGRAM

DATE:	NOV. 2020	PROJECT No.:	20-006
SCALE:	N.T.S.	FIGURE No.:	203

Project DEVELOPMENT Summary

DEVELOPMENT: Blake St. Apartments

Subwatershed: Barrie Creeks

Total Pre-Development Area (ha):	0.2360	Total Pre-Development Phosphorus Load (kg/yr):	0.31
----------------------------------	---------------	--	-------------

Pre-Development Land Use	Area (ha)	P coeff. (kg/ha)	P Load (kg/yr)
High Intensity - Residential	0.236	1.32	0.31

POST-DEVELOPMENT LOAD

Post-Development Land Use	Area (ha)	P coeff. (kg/ha)	Best Management Practice applied with P Removal Efficiency	P Load (kg/yr)
High Intensity - Residential	0.063	1.32	Dry swales <i>Landscaped areas above podium and site perimeter</i>	0.08
High Intensity - Residential	0.086	1.32	Underground Storage <i>roof of building</i>	0.09
High Intensity - Residential	0.087	1.32	Sorbative media interceptors <i>Hard surfaces with filtration system</i>	0.02

Post-Development Area Altered:	0.24					P Load (kg/yr)
Total Pre-Development Area:	0.24					
Unaffected Area:	0					
			Pre-Development:	0.31		
			Post-Development:	0.31		
			Change (Pre - Post):	0.00		
			0% Net Reduction in Load			
			Post-Development (with BMPs):	0.19		
			Change (Pre - Post):	0.12		
			38% Net Reduction in Load			

DEVELOPMENT: Blake St. Apartments
Subwatershed: Barrie Creeks

CONSTRUCTION PHASE LOAD

Site-Specific Input:		Constant / Lookup:	
		Calculation:	
Sub Area:	Site Development		
Duration of Construction (months):	12	R (rainfall / runoff for Lake Simcoe)	90
Duration of Exposed Soil (months):	2	K (soil erodability factor):	0.08
Surface Slope Gradient (%):	0.5	NN (determined by slope):	0.2
Length of Slope (m):	125	BMP prevention Efficiency:	99%
Slope Area (ha):	0.24	BMP capture Efficiency:	69%
% slope erosion prevention applied to:	2	LS (slope length gradient factor):	0.68
% slope runoff capture applied to:	3	C (portion of year of exposed soil):	0.17
Subwatershed Soil [P] (kg/kg):	0.0004	P (prevention + capture):	1.05
		Soil Loss (kg/year):	457.0419
		Phosphorus Load (kg):	0.18

Developed AREA (ha): 0.23999999464

Total

Construction Phase Phosphorus Load with BMPs (kg):	0.18
Construction Phase Phosphorus Load no BMPs (kg):	0.17

SUMMARY WITH IMPLEMENTATION OF BMPs

	P Load (kg/yr)
Pre-Development:	0.31
Construction Phase Amortized Over 8 Years :	0.02
Post-Development:	0.19
Post-Development + Amortized Construction:	0.22
Pre-Development Load - Post-Development Load:	0.12
Conclusion:	38% Reduction in Load
Pre-Development Load - (Post-Development + Amortized Construction Load):	0.10
Conclusion:	31% Reduction in Load
Based on a comparison of Pre-Development and Post-Development loads, and in consideration of Construction Phase loads, the Ministry would encourage the Municipality to:	
Approve development as site specific appropriate.	



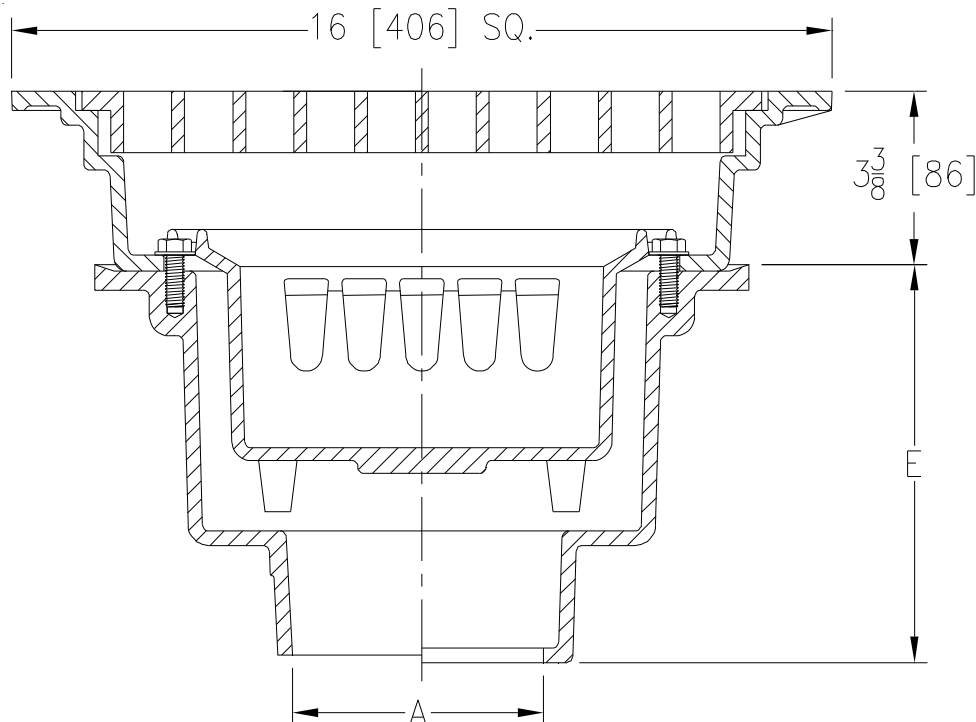
Z662-HF

SPECIFICATION SHEET

16 [406] SQUARE TOP HEAVY-DUTY DRAIN W/ HIGH FLOW DUCTILE IRON GRATE

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



A Pipe Size	Approx. Wt. Lbs. [kg]	Grate Open Area Sq. In. [cm ²]
3, 4 [76, 102]	86 [30]	103 [665]
5, 6 [127, 152]	89 [40]	

ENGINEERING SPECIFICATION: ZURN Z662-HF

16 [406] Square top drain, Dura-Coated cast iron body with bottom outlet, seepage pan and combination membrane flashing clamp and frame for heavy-duty high flow ductile iron grate with suspended sediment bucket.

OPTIONS (Check/specify appropriate options)

PIPE SIZE

3 thru 6 [76 thru 152]
3, 4, 6 [76, 102, 152]
3 [76]
4 thru 6 [102 thru 152]
3 thru 6 [76 thru 152]
3, 4 [76, 102]

(Specify size/type) OUTLET

_____ IC Inside Caulk
_____ IG Inside Gasket
_____ IP Threaded
_____ IP Threaded
_____ NH No-Hub
_____ NL Neo-Loc

'E' BODY HT. DIM.

7-3/4 [197]
7-3/4 [197]
6-1/16 [154]
6-5/16 [160]
7-13/16 [198]
7-3/16 [183]

PREFIXES

_____ Z D.C.C.I. Body and Top*
_____ ZB D.C.C.I Body w/ Polished Bronze Top (Add 3/16 [5] to 3-3/8 [86] and 11/16 [17] to 16 [406] Dim.)
_____ ZN D.C.C.I Body w/ Polished Nickel Bronze Top (Add 3/16 [5] to 3-3/8 [86] and 11/16 [17] to 16 [406] Dim.)

SUFFIXES

_____ -LY (Less) Sediment Bucket
_____ -SS Stainless Mesh Liner for Bucket
_____ -TC Neo-Loc Test Cap Gasket (3 [76] - 4 [102] NL Bottom Outlet Only)
_____ -TS Top Secured with Slotted Screws
_____ -V Backwater Valve (See Z1099)
_____ -VP Vandal-Proof Secured Top
_____ -YA Aluminum Sediment Bucket
_____ -90 90° Threaded Side Outlet Body

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

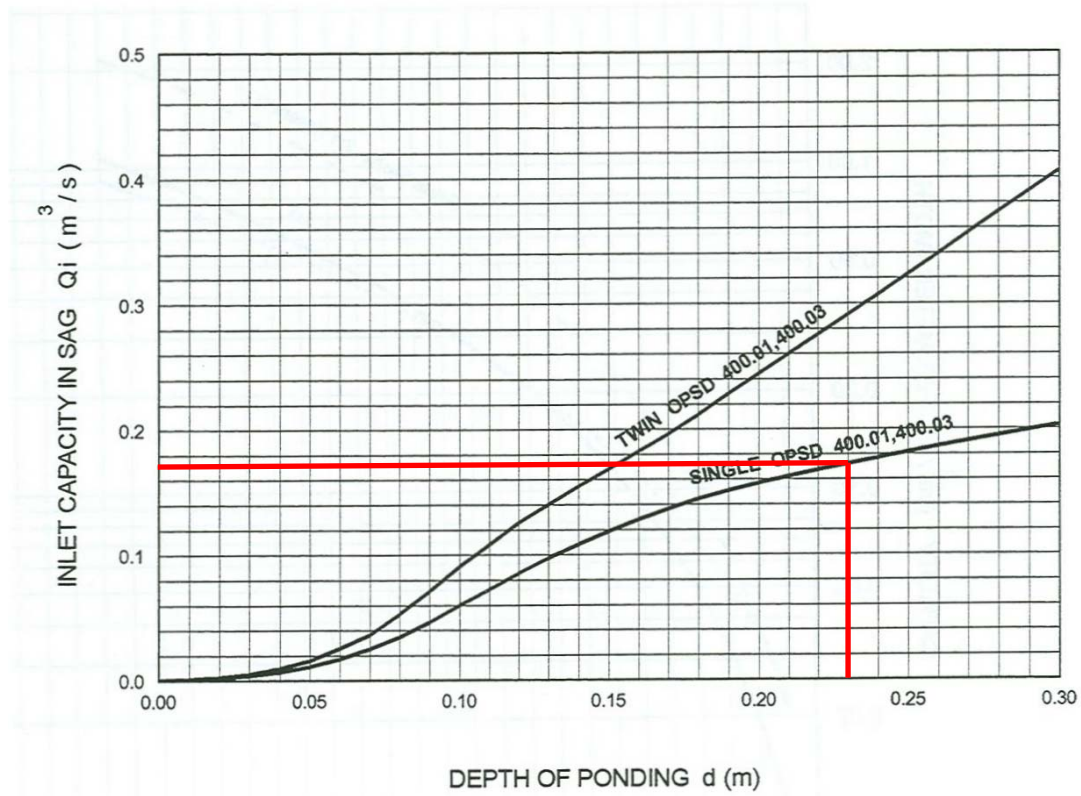
REV. D DATE: 11/8/10 C.N. NO. 120329

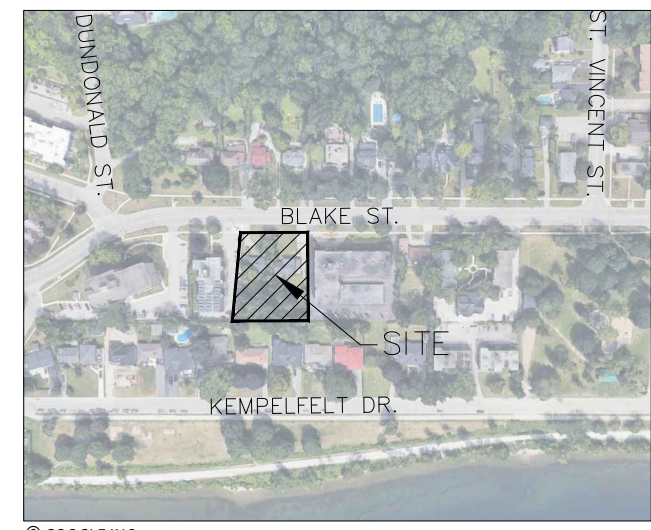
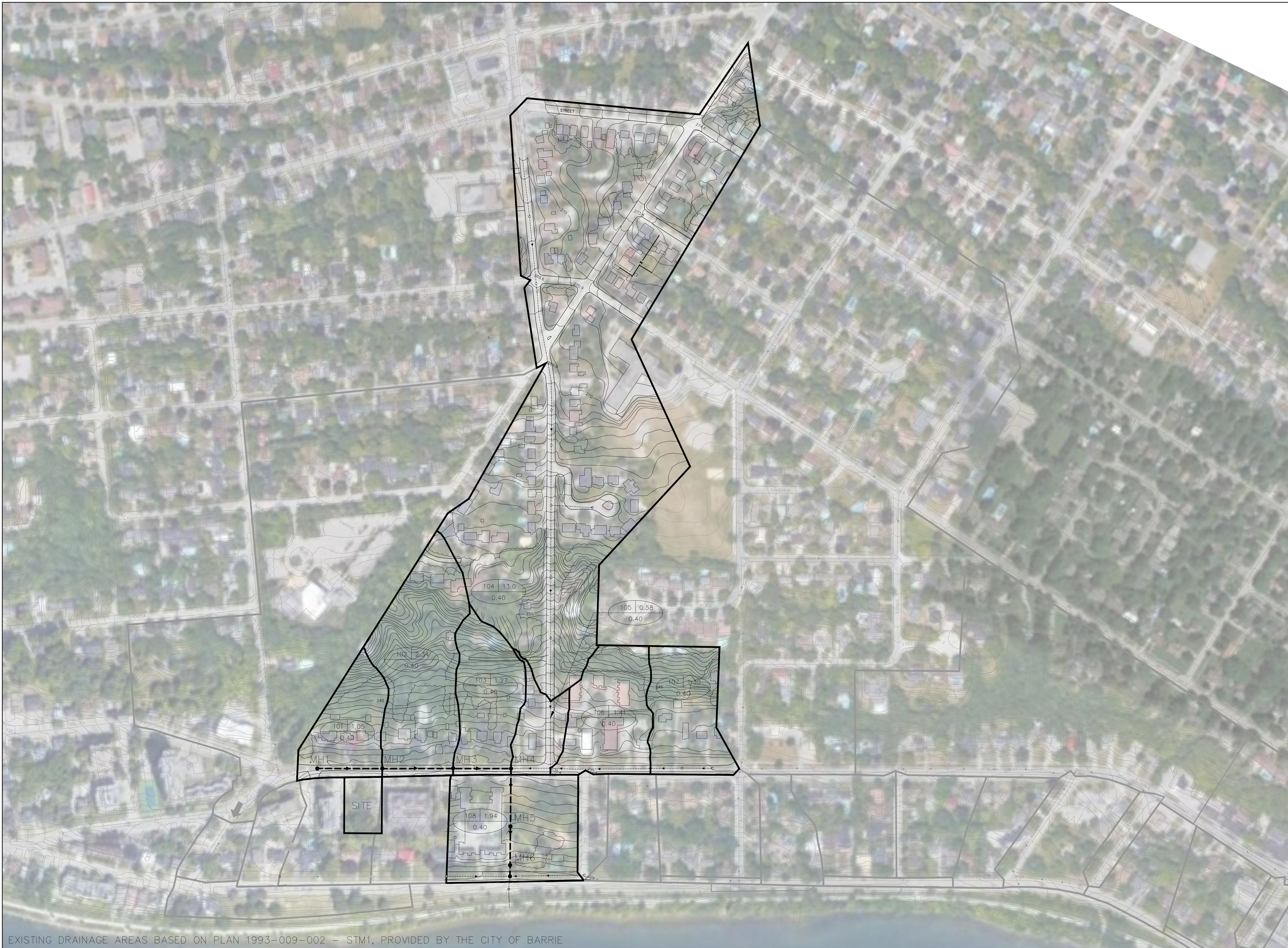
DWG. NO. 82668 PRODUCT NO. Z662-HF

ZURN INDUSTRIES, LLC ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514

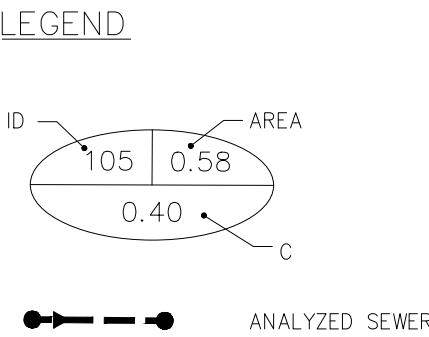
Phone: 814/455-0921 ♦ Fax: 814/454-7929 ♦ World Wide Web: www.zurn.com

In Canada: ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V1L2 ♦ Phone: 905/405-8272 Fax: 905/405-1292

Design Chart 4.19: Inlet Capacity at Road Sag



LOCATION PLAN
N.T.S.



SURVEY INFO.
YOUNG & YOUNG
SURVEYING
2 HOLLAND DR.
BARRIE, ON L7E 1E1
PHONE: (905) 951-6000
FAX: (905) 857-4811

BENCHMARK
ELEVATIONS SHOWN HEREON
ARE GEODETIC AND ARE
RELATED TO CITY OF
BARRIE BENCHMARK NO.
03120030003, HAVING A
PUBLISHED ELEVATION OF
241.011 METRES.

SITE PLAN INFO.
STUDIO K ARCHITECTS
3950 14TH AVENUE
SUITE 205
MARKHAM, ON L3R 0A9
PHONE: (416) 554-7751

LIST OF DRAWINGS
001 DETAILS PLAN
101 SERVING PLAN
401 GRADING PLAN
601 ESC PLAN

1. ISSUED FOR RZA/SPA	11/30/20	LPM
NO. ISSUE	MM/DD/YY	BY



SITEPLANTECH INC.
339 - 16 ELGIN ST.
MARKHAM, ON L3T 4T4
PHONE: (416) 270-7515

BLAKE STREET APARTMENTS
27-31 BLAKE ST.
BARRIE, ON

EXTERNAL DRAINAGE
AREA PLAN

PROJECT No.:
20-006

DRAWING:
204

EXISTING DRAINAGE AREAS BASED ON PLAN 1993-009-002 - STM1, PROVIDED BY THE CITY OF BARRIE

Q₁₀₀ - Q₅ Storm Design
Pre-Development Conditions
27-31 Blake Street
Barrie, ON

Rainfall Intensity (i) = $\frac{A}{(T_c+B)^c}$

Starting T_c (min)= 10

5-Year
A= 853.6
B= 4.7
c= 0.766

100-Year
A= 1426.4
B= 5.27
c= 0.759

Project: Pre-Development Conditions
Project No. 20-006
Date: 5-Oct-20
Designed By: LPM

P:\20-006 - 27-31 Blake St. - Barrie\Calculations\20-006 - Blake St STM PRE DS Q100-Q5.xlsm\Design

LOCATION			FLOW DATA								EXTERNAL FLOWS				DESIGN FLOWS			PIPE DATA					TIME OF CONC.	ACCUM. TIME OF CONC.	CAPACITY
STREET	MAINTENANCE HOLE		AREA	RUNOFF COEFF.	"AR"	ACCUM. "AR"	I ₅	Q ₅	I ₁₀₀	Q ₁₀₀	AREA	FLOW RATE	EXT. FLOW	ACCUM. EXT. FLOW	Q _{Stot}	Q _{100tot}	Q _{100tot} - Q _{Stot}	LENGTH	SLOPE	PIPE DIAMETER	FULL FLOW CAPACITY	FULL FLOW VELOCITY			
	FROM	TO																							
			(ha)	(R)			(mm/hr)	(m3/s)	(mm/hr)	(m3/s)	(ha)	(l/s/ha)	(m3/s)	(m3/s)	(m3/s)	(m3/s)	(m3/s)	(m)	(%)	(mm)	(m3/s)	(m/s)	(min)	(min)	Qdes/Qcap
Blake Street	MH1	MH2	1.05	0.40	0.42	0.42	108.92	0.127	180.18	0.210	0.000	0.000	0.000	0.000	0.127	0.210	0.083	62.0	0.20	450	0.127	0.802	1.29	11.29	100%
	MH2	MH3	2.34	0.40	0.94	1.36	79.42	0.299	133.05	0.501	0.000	0.000	0.000	0.000	0.299	0.501	0.202	94.0	0.20	600	0.274	0.971	1.61	19.11	109%
	MH3	MH4	1.27	0.40	0.51	1.86	92.48	0.479	154.06	0.798	0.000	0.000	0.000	0.000	0.479	0.798	0.319	66.0	0.45	600	0.412	1.457	0.76	14.26	116%
Blake Street	EXT	MH4	16.29	0.40	6.52	6.52	51.58	0.934	87.47	1.583	0.000	0.000	0.000	0.000	0.934	1.583	0.650	51.0	2.00	750	1.574	3.564	0.24	34.54	59%
Easement	MH4	MH5	1.94	0.40	0.78	9.16	51.34	1.306	87.07	2.214	0.000	0.000	0.000	0.000	1.306	2.214	0.909	71.2	4.60	750	2.387	5.405	0.22	34.76	55%
	MH5	MH6	0.00	0.00	0.00	9.16	51.12	1.300	86.71	2.205	0.000	0.000	0.000	0.000	1.300	2.205	0.905	46.8	5.60	750	2.633	5.963	0.13	34.89	49%
	MH6	MH7	0.00	0.00	0.00	9.16	50.99	1.297	86.49	2.200	0.000	0.000	0.000	0.000	1.297	2.200	0.903	13.2	3.80	750	2.169	4.912	0.04	34.93	60%
Lake Simcoe	MH7	OUTFALL	4.11	0.40	1.64	10.80	50.95	1.528	86.42	2.593	0.000	0.000	0.000	0.000	1.528	2.593	1.064	12.0	32.50	500	2.152	10.963	0.02	34.95	71%

Hydraulic Grade Line Analysis
Pre-Development Conditions
27-31 Blake Street
Barrie, ON

Project: Pre-Development Conditions
Project No. 20-006
Date: 05-Oct-20
Designed By: LPM

LOCATION			INVERTS		FLOW	PIPE DATA								HEAD LOSS CALCULATIONS							HYDRAULIC GRADE LINE				
STREET	FROM (U/S)	TO (D/S)	U/S (m)	D/S (m)	Q ₅ (L/s)	Dia. (mm)	L (m)	MANNING'S 'n'	PIPE AREA (m2)	HYD. RAD ^{2/5}	S (%)	Q _{cap} (L/s)	Q ₅ /Q _{cap} (%)	L/D	f	V _f	V ² /2g	TOTAL PIPE LOSS (m)	MH LOSS (m)	TOTAL LOSS (m)	HGL (U/S) (m)	HGL SURCHARGE ABOVE U/S (m)	HGL (D/S) (m)	MH TOP (U/S) (m)	HGL DEPTH TO SURFACE (U/S) (m)
Blake Street	MH1	MH2	233.200	233.076	127.1	450	62.0	0.013	0.159	0.233	0.20	127.4	1.00	137.778	0.027	0.799	0.033	0.123	0.00	0.12	233.651	0.001	233.526	235.05	1.399
	MH2	MH3	232.928	232.740	299.2	600	94.0	0.013	0.283	0.282	0.20	274.5	1.09	156.667	0.025	1.058	0.057	0.223	0.00	0.23	233.566	0.038	233.340	234.82	1.254
	MH3	MH4	232.617	232.320	478.8	600	66.0	0.013	0.283	0.282	0.45	411.7	1.16	110.000	0.025	1.694	0.146	0.401	0.01	0.41	233.329	0.112	232.920	234.50	1.171
Blake Street	EXT	MH4	232.890	231.870	933.6	750	51.0	0.013	0.442	0.328	2.00	1573.6	0.59	68.000	0.023	2.113	0.228	0.359	0.01	0.37	233.640	0.000	232.620	234.40	0.760
Easement	MH4	MH5	231.725	228.450	1305.8	750	71.2	0.013	0.442	0.328	4.60	2386.5	0.55	94.933	0.023	2.956	0.445	0.980	0.33	1.31	232.475	0.000	229.200	234.40	1.925
	MH5	MH6	228.360	225.720	1300.2	750	46.8	0.013	0.442	0.328	5.60	2633.2	0.49	62.400	0.023	2.943	0.441	0.638	0.02	0.66	229.110	0.000	226.470	230.60	1.490
	MH6	MH7	224.922	224.420	1296.9	750	13.2	0.013	0.442	0.328	3.80	2169.1	0.60	17.600	0.023	2.936	0.439	0.179	0.02	0.20	225.672	0.000	225.170	227.80	2.128
Lake Simcoe	MH7	OUTFALL	224.420	220.500	1528.5	500	20.0	0.013	0.196	0.250	32.50	2151.5	0.71	40.000	0.027	7.784	3.089	3.277	0.15	3.43	224.920	0.000	100.000	227.20	2.280

**INITIAL T_c CALCULATIONS
(AIRPORT METHOD)**

Drainage ID	101
k	3.26
Length (L)	152
Runnoff coefficient (C)	0.4
Upstream elevation (m)	255.0
downstream elevation (m)	236.0
Elevation change (m)	19.0
Slope (S)	12.5%
Tc (min.)	12.2

Drainage ID	102
k	3.26
Length (L)	270
Runnoff coefficient (C)	0.4
Upstream elevation (m)	263.0
downstream elevation (m)	236.0
Elevation change (m)	27.0
Slope (S)	10.0%
Tc (min.)	17.5

Drainage ID	103
k	3.26
Length (L)	178
Runnoff coefficient (C)	0.4
Upstream elevation (m)	257.0
downstream elevation (m)	236.0
Elevation change (m)	21.0
Slope (S)	11.8%
Tc (min.)	13.5

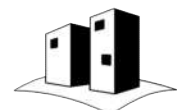
Drainage ID	104
k	3.26
Length (L)	665
Runnoff coefficient (C)	0.4
Upstream elevation (m)	274.0
downstream elevation (m)	240.0
Elevation change (m)	34.0
Slope (S)	5.1%
Tc (min.)	34.3

Drainage ID	105
k	3.26
Upstream elevation (m)	240.0
downstream elevation (m)	236.0
Elevation change (m)	4.0
Slope (S)	5.3%
Tc (min.)	11.5

Drainage ID	106
k	3.26
Upstream elevation (m)	251.0
downstream elevation (m)	236.0
Elevation change (m)	15.0
Slope (S)	10.7%
Tc (min.)	12.3

Drainage ID	107
k	3.26
Length (L)	140
Runnoff coefficient (C)	0.4
Upstream elevation (m)	253.0
downstream elevation (m)	236.0
Elevation change (m)	17.0
Slope (S)	12.1%
Tc (min.)	11.8

Where:
$$t_c = \frac{k(1.1 - C)L^{0.5}}{S^{0.33}}$$

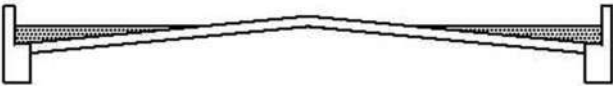


R.O.W CAPACITY AND FLOW DEPTH CALCULATION

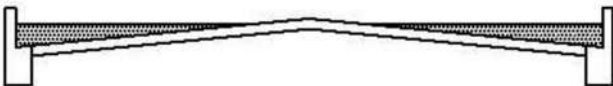
THEORETICAL R.O.W. CAPACITY CALCULATIONS

Area (A)	1.16 m ²		
Wetted Perimeter (Wp)	12.31 m	Hydraulic Radius (R)	0.094 m
Slope (S)	0.34%	Friction Slope (S _f)	0.003 m/m
Manning (n)	0.015		
Channel capacity (Q)	0.93 m ³ /s	Velocity (V)	0.802 m/s
Elev. above road CL	0.050 m	(Above crown)	

FLOW DEPTH CALCULATIONS MH1-MH2

Solve for Q _{100 - 5} of	0.08 m ³ /s		
Area (A)	0.22 m ²		
Wetted Perimeter (Wp)	6.71 m		
Slope (S)	0.34%		
Manning (n)	0.015		
Channel capacity (Q)	0.08 m ³ /s		
		Velocity (V)	0.392 m/s
Elev. above road CL	-0.040 m	(Below crown)	

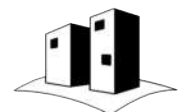
FLOW DEPTH CALCULATIONS MH2-MH3

Solve for Q _{100 - 5} of	0.20 m ³ /s		
Area (A)	0.41 m ²		
Wetted Perimeter (Wp)	9.23 m		
Slope (S)	0.34%		
Manning (n)	0.015		
Channel capacity (Q)	0.20 m ³ /s		
		Velocity (V)	0.485 m/s
Elev. above road CL	-0.020 m	(Below crown)	

FLOW DEPTH CALCULATIONS MH3-MH4

Solve for Q _{100 - 5} of	0.32 m ³ /s		
Area (A)	0.58 m ²		
Wetted Perimeter (Wp)	10.98 m		
Slope (S)	0.34%		
Manning (n)	0.015		
Channel capacity (Q)	0.32 m ³ /s		
		Velocity (V)	0.545 m/s
Elev. above road CL	-0.002 m	(Below crown)	

Where: $Q = \frac{A * R^{2/3} * S^{1/2}}{n}$



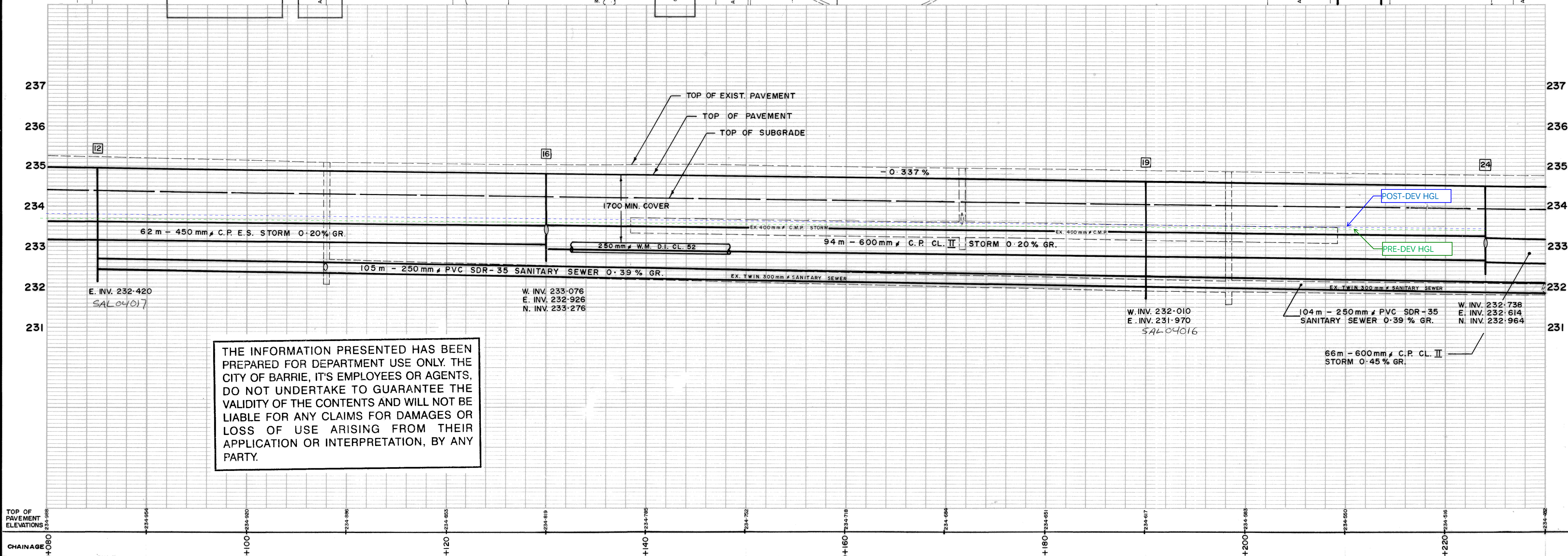
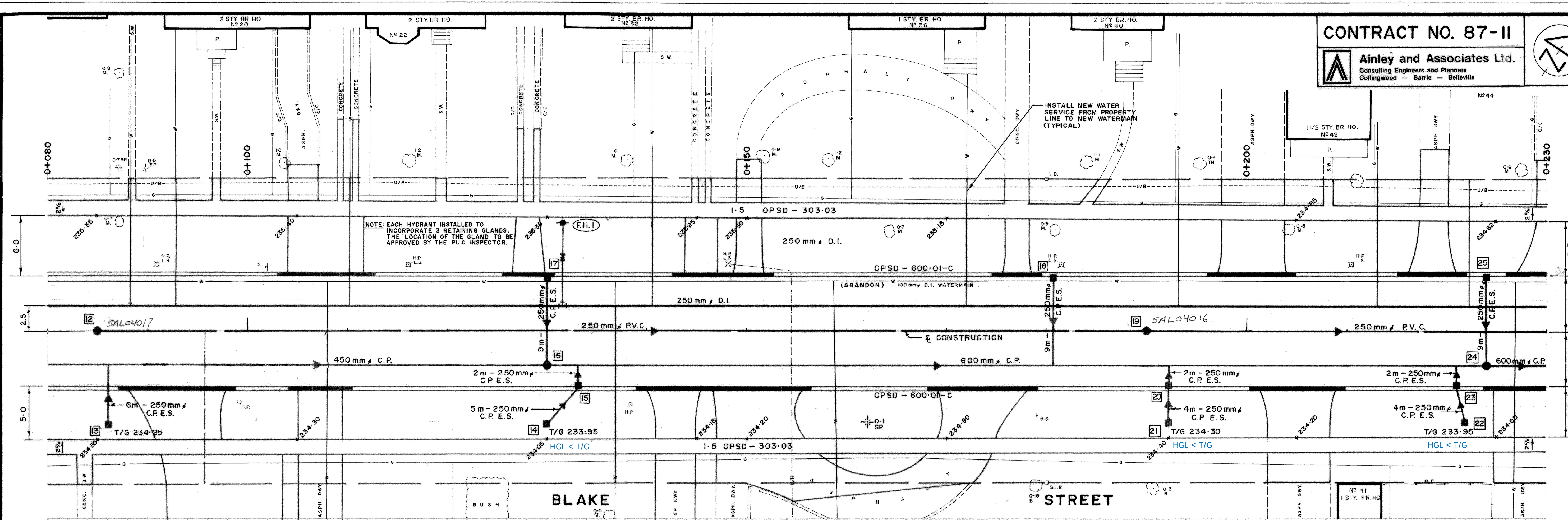
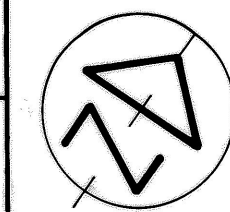
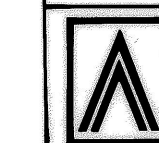
Q₁₀₀ - Q₅ Storm Design Post-Development Conditions 27-31 Blake Street Barrie, ON			
Rainfall Intensity (i) = $\frac{A}{(T_c+B)^c}$	5-Year A= 853.6 B= 4.7 c= 0.766	100-Year A= 1426.4 B= 5.27 c= 0.759	Project: Post-Development Conditions Project No. 20-006 Date: 5-Oct-20 Designed By: LPM
Starting T_c (min)= 10			P:\20-006 - 27-31 Blake St. - Barrie\Calculations\20-006 - Blake St STM POST DS Q100-Q5.xlsm\Design

[illegible]

**Hydraulic Grade Line Analysis
Post-Development Conditions
27-31 Blake Street
Barrie, ON**

**Project: Post-Development Conditions
Project No. 20-006
Date: 05-Oct-20
Designed By: LPM**

[illegible]



THE INFORMATION PRESENTED HAS BEEN PREPARED FOR DEPARTMENT USE ONLY. THE CITY OF BARRIE, ITS EMPLOYEES OR AGENTS, DO NOT UNDERTAKE TO GUARANTEE THE VALIDITY OF THE CONTENTS AND WILL NOT BE LIABLE FOR ANY CLAIMS FOR DAMAGES OR LOSS OF USE ARISING FROM THEIR APPLICATION OR INTERPRETATION, BY ANY PARTY.

GENERAL NOTES

1. OPSD-100 SERIES FOR SYMBOLS AND ABBREVIATION LEGEND.
2. PLACE ALL C.B. LATERALS AT 2.00% GR. UNLESS OTHERWISE NOTED.
3. STORM SEWER CLASS "B-1" GRANULAR 'A' BEDDING, COVER, NATIVE BACKFILL.
4. SANITARY SEWER CLASS "B" GRANULAR 'A' BEDDING, COVER, NATIVE BACKFILL.
5. WATERMAIN CLASS "B" GRANULAR 'A' BEDDING, COVER, NATIVE BACKFILL.
6. ALL UNDERGROUND UTILITY LOCATIONS TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR.
7. ASPHALT DRIVEWAY REINSTATEMENT TO BE 50mm H.L.3 OVER 150mm GRANULAR 'A'.
8. CONCRETE DRIVEWAY REINSTATEMENT TO BE 150mm CONCRETE OVER 150mm GRANULAR 'A'.
9. ----- U/B ----- DENOTES UNDERGROUND BELL CABLE.
9. ----- U/B/D ----- DENOTES CONCRETE ENCASED BELL DUCTS.

BENCH MARKS

NO	REVISIONS	DATE	APPROVED
1	PER FIRST SUBMISSION	JUNE/87	I.N.
2	PER P.U.C. COMMENTS	JULY/87	I.N.
3	WATERMAIN RE-ALIGNMENT	OCT/87	J.D.J.

NO	REVISIONS	DATE	APPROVED
1	PER FIRST SUBMISSION	JUNE/87	I.N.
2	PER P.U.C. COMMENTS	JULY/87	I.N.
3	WATERMAIN RE-ALIGNMENT	OCT/87	J.D.J.

CITY OF BARRIE
APPROVED

 DATE: 1987-08-07
 T. M. PROKOPEC
 CITY ENGINEER

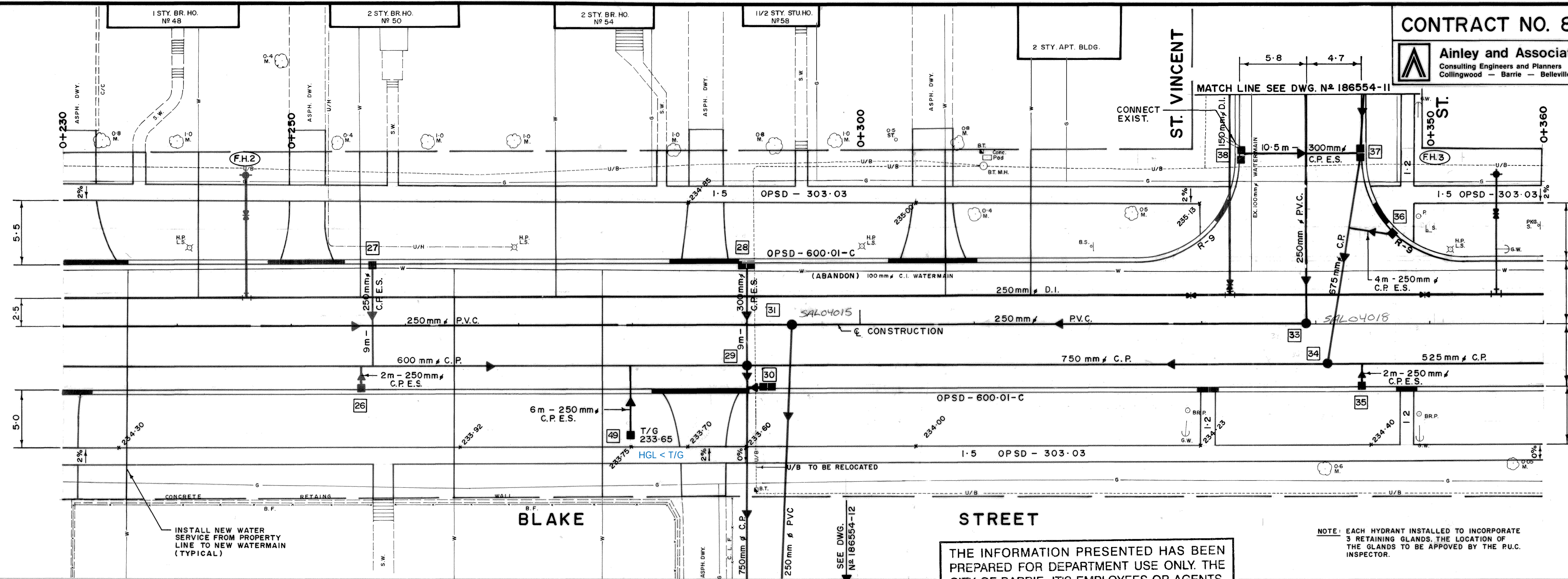
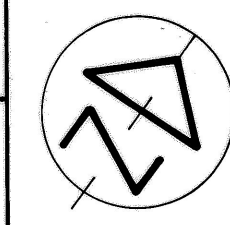
BLAKE STREET-PHASE I
NEW CONSTRUCTION

STA. 0+080 TO STA. 0+230


CITY OF BARRIE
ENGINEERING DEPARTMENT

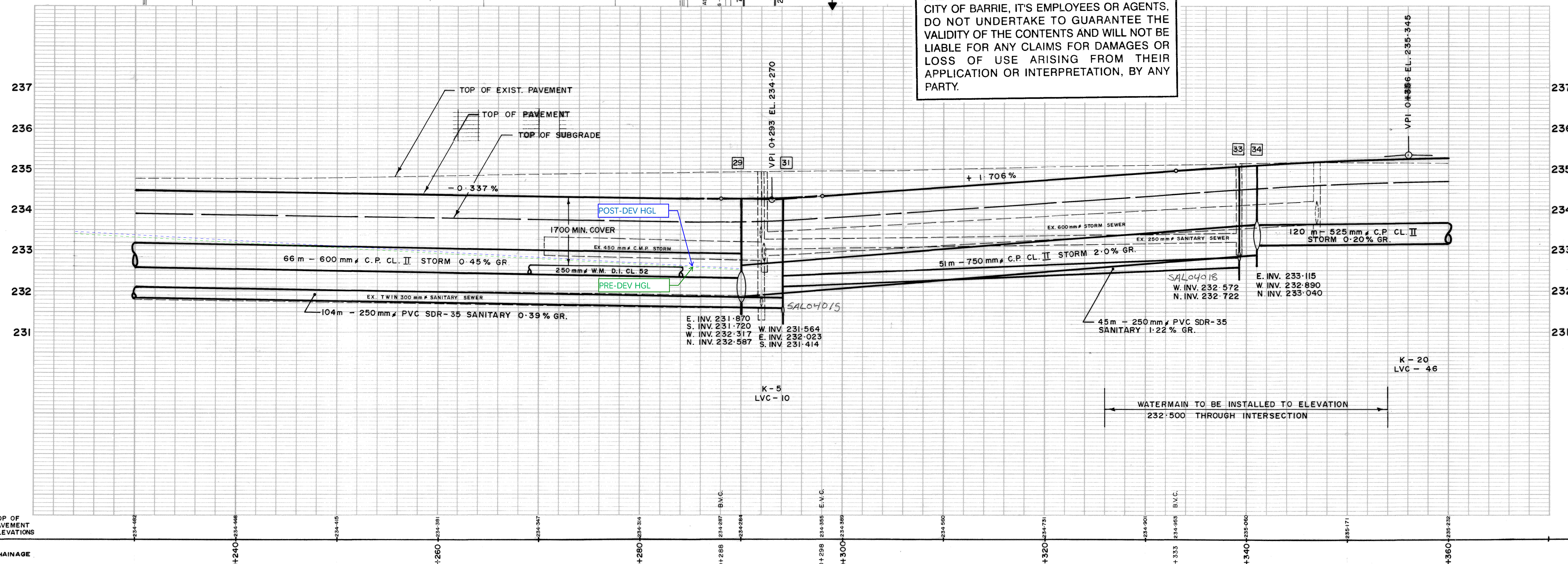
DESIGN I.N.	SCALE HOR: 1:200	VERT: 1:50
DRAWN L.B./K.G.	REVIEWED T.M.P.	DRAWING NO.
DATE MAY 1987	SHEET NO.	18 6554 - 5

1987-011-006 87-11



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NOTE: EACH HYDRANT INSTALLED TO INCORPORATE 3 RETAINING GLANDS. THE LOCATION OF THE GLANDS TO BE APPROVED BY THE P.U.C. INSPECTOR.



GENERAL NOTES

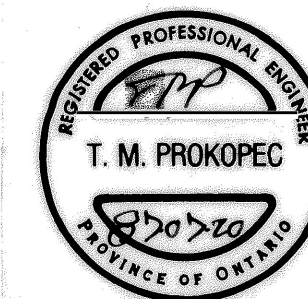
- OPSD - 100 SERIES FOR SYMBOLS AND ABBREVIATION LEGEND.
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- U/B DENOTES UNDERGROUND BELL CABLE.
- U/B/D DENOTES CONCRETE ENCASED BELL DUCTS.

BENCH MARKS

CH	DESCRIPTION	ELEVATION
1	BLAKE ST. CORNER	234.482
2	BLAKE ST. CORNER	234.482
3	BLAKE ST. CORNER	234.482
4	BLAKE ST. CORNER	234.482
5	BLAKE ST. CORNER	234.482
6	BLAKE ST. CORNER	234.482
7	BLAKE ST. CORNER	234.482
8	BLAKE ST. CORNER	234.482
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95	BLAKE ST. CORNER	234.482
96	BLAKE ST. CORNER	234.482
97	BLAKE ST. CORNER	234.482
98	BLAKE ST. CORNER	234.482
99	BLAKE ST. CORNER	234.482
100	BLAKE ST. CORNER	234.482

NO	REVISIONS	DATE	APPROVED
1	RELOCATION OF HYDRANT	OCT/87	J.D.J.
2	WATERMAIN RE-ALIGNMENT	OCT/87	J.D.J.
3	STM. & SAN. SEWER RE-ALIGNMENT	OCT/87	J.D.J.
4	PER P.U.C. COMMENTS	JULY/87	I.N.
5	PER FIRST SUBMISSION	JUNE/87	I.N.

CITY OF BARRIE
APPROVED
 DATE 1987-08-07
 CITY ENGINEER



**BLAKE STREET - PHASE I
 NEW CONSTRUCTION**
 STA. 0+230 TO STA. 0+360

CITY OF BARRIE
CITY OF BARRIE
 ENGINEERING DEPARTMENT
 DESIGN I.N. SCALE HOR. 1:200 VERT. 1:50
 DRAWN L.B./K.G. REVIEWED T.M.P. DRAWING NO. 186554-7
 DATE MAY 1987 SHEET NO.



State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control

Division of Water Quality

Mail Code 401-02B

Post Office Box 420

Trenton, New Jersey 08625-0420

609-633-7021 Fax: 609-777-0432

http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE

Governor

KIM GUADAGNO

Lt. Governor

BOB MARTIN

Commissioner

December 14, 2016

Derek M. Berg
Director - Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Laboratory Certification
Stormwater Management StormFilter® (StormFilter) by Contech Engineered Solutions LLC
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the StormFilter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the StormFilter System by Contech Engineered Solutions LLC at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 2.12 gpm/sf of effective filtration treatment area.
2. The StormFilter System shall be installed using the same configuration as the unit tested by NJCAT, and sized in accordance with the criteria specified in item 6 below.
3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the StormFilter, which is attached to this document. However, it is recommended to review the maintenance website at <http://www.conteches.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2813&PortalId=0&DownloadMethod=attachment> for any changes to the maintenance requirements.
6. Sizing Requirements:

The example below demonstrates the sizing procedure for a StormFilter System.

Example: A 0.25 acre impervious site is to be treated to 80% TSS removal using a StormFilter System. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

The calculation of the minimum number of cartridges for use in the StormFilter System is based upon both the MTFR and the maximum inflow drainage area. It is necessary to calculate the required cartridges using both methods and to rely on the method that results in the highest minimum number of cartridges determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the StormFilter System in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the maximum drainage area:

1. Five (5) 12" cartridges,
2. Three (3) 18" cartridges, or
3. Two (2) 27" cartridges

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes

i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)

c=0.99 (runoff coefficient for impervious)

$Q=ciA=0.99 \times 3.2 \times 0.25 = 0.79$ cfs = 0.79×448.83 gpm = 354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the MTFR:

1. Thirty-six (36) 12" cartridges,
2. Twenty-four (24) 18" cartridges, or
3. Sixteen (16) 27" cartridges

The MTFR Evaluation results will be used since that method results in the higher minimum number of cartridges determined by the two methods.

The sizing table corresponding to the available system models are noted below:

TABLE 1 STORMFILTER CARTRIDGE HEIGHTS AND NEW JERSEY TREATMENT CAPACITIES

StormFilter Cartridge Heights and New Jersey Treatment Capacities				
StormFilter Cartridge Height	Filtration Surface Area (sq.ft)	MTFR ¹ (GPM)	Mass Capture Capacity (lbs)	Maximum Allowable Inflow Area ² (acres)
Low Drop (12")	4.71	10	36.3	0.061
18"	7.07	15	54.5	0.09
27"	10.61	22.5	81.8	0.136

Notes:

1. MTFR calculated based on 4.72×10^{-3} cfs/sf (2.12 gpm/sf) of effective filtration treatment area.

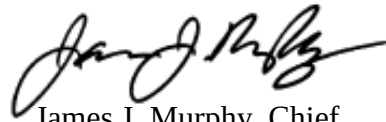
2. Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of

indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

Sincerely,

A handwritten signature in black ink, appearing to read "James J. Murphy".

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File

Richard Magee, NJCAT

Vince Mazzei, NJDEP - DLUR

Ravi Patraju, NJDEP - BES

Gabriel Mahon, NJDEP - BNPC

Shashi Nayak, NJDEP - BNPC

StormFilter Inspection and Maintenance Procedures



Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. Inspection

- Inspection of the vault interior to determine the need for maintenance.

2. Maintenance

- Cartridge replacement
- Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..





Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
 - a. If $>4"$ of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
 - a. If $>1/4"$ of accumulation, maintenance is required.
3. Submerged cartridges.
 - a. If $>4"$ of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
 - a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
 - a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
 - a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
 - a. If pronounced scum line (say $\geq 1/4"$ thick) is present above top cap, maintenance is required.



Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

- A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

- B. Remove the used cartridges (up to 250 lbs. each) from the vault.



Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

- C. Set the used cartridge aside or load onto the hauling truck.
- D. Continue steps a through c until all cartridges have been removed.

Method 2:

- A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.
- B. Unscrew the cartridge cap.
- C. Remove the cartridge hood and float.
- D. At location under structure access, tip the cartridge on its side.
- E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.
- F. Set the empty, used cartridge aside or load onto the hauling truck.
- G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.



Inspection Report

Date: Personnel:

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

System Observations

Months in Service: _____

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?): _____

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:



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Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

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Appendix C

Sanitary Data

SANITARY FLOW CALCULATIONS

Existing Flows			
	No. Of Units	PPU	
Population	2	3.13	6 persons
Site Area			0.24 ha
Average Residential Wastewater Flow			225 L/cap/day
Harmon Peaking Factor			4.0
Existing Development - Total Peak Flow			0.07 L/s
Infiltration (0.1 L/s/ha)			0.02 L/s
Total Existing Peak Flow			0.09 L/s

Proposed Flows			
Commercial GFA			0 m ²
Commercial Wastewater Flow			180,000 L/Fl. Ha/Day
	Unit Type	No. Of Units	PPU*
	1-bdrm	12	1.67
	2-bdrm	23	2.34
			74 persons
Average Residential Wastewater Flow			225 L/cap/day
Site Area			0.24 ha
Harmon Peaking Factor			4.0
Proposed Development - Total Peak Flow			0.77 L/s
Infiltration (0.1 L/s/ha)			0.02 L/s
Total Proposed Peak Flow			0.8 L/s

Pipe Data						
LENGTH (m)	PIPE DIA. (mm)	SLOPE (%)	FULL FLOW CAP. (L/s)	FULL FLOW VEL. (m/s)	ACTUAL VEL. (m/s)	% Full
10.0	200	2.0%	48.4	1.5	0.5	2%

* PPU for high density developments should be 1.67, however this appears to be underestimated for a development consisting mostly of 2 bedroom apartments.



Appendix D

Water Data

JACKSON WATERWORKS



Telephone: 905.229.3176
Toll Free: 800.734.5732
email: jww@bellnet.ca
Website: www.jacksonwaterworks.ca

Mr. Altaf Ahmad
Hides International Ltd.
13390 Yonge Street
Richmond Hill Ontario **L4E 2P6**

17 July 2019

Jackson Waterworks has recently completed fire hydrant flow testing at 27 Blake Street in Barrie.

We define the Test Hydrants as the ones being flowed, and the Base Hydrant as the one where static and residual pressures are recorded. Wherever possible, we inspect the secondary valve for the Test Hydrants to make sure it is in the fully open position. Likewise, we count the number of turns needed to open the Test Hydrants (to make sure it is opening completely).

The secondary valve for the Test Hydrant could not be located for inspection at the time of the test.

Testing was completed in accordance with NFPA 291 guidelines.

There were no irregularities to report.

Trusting this meets with your approval, we are...

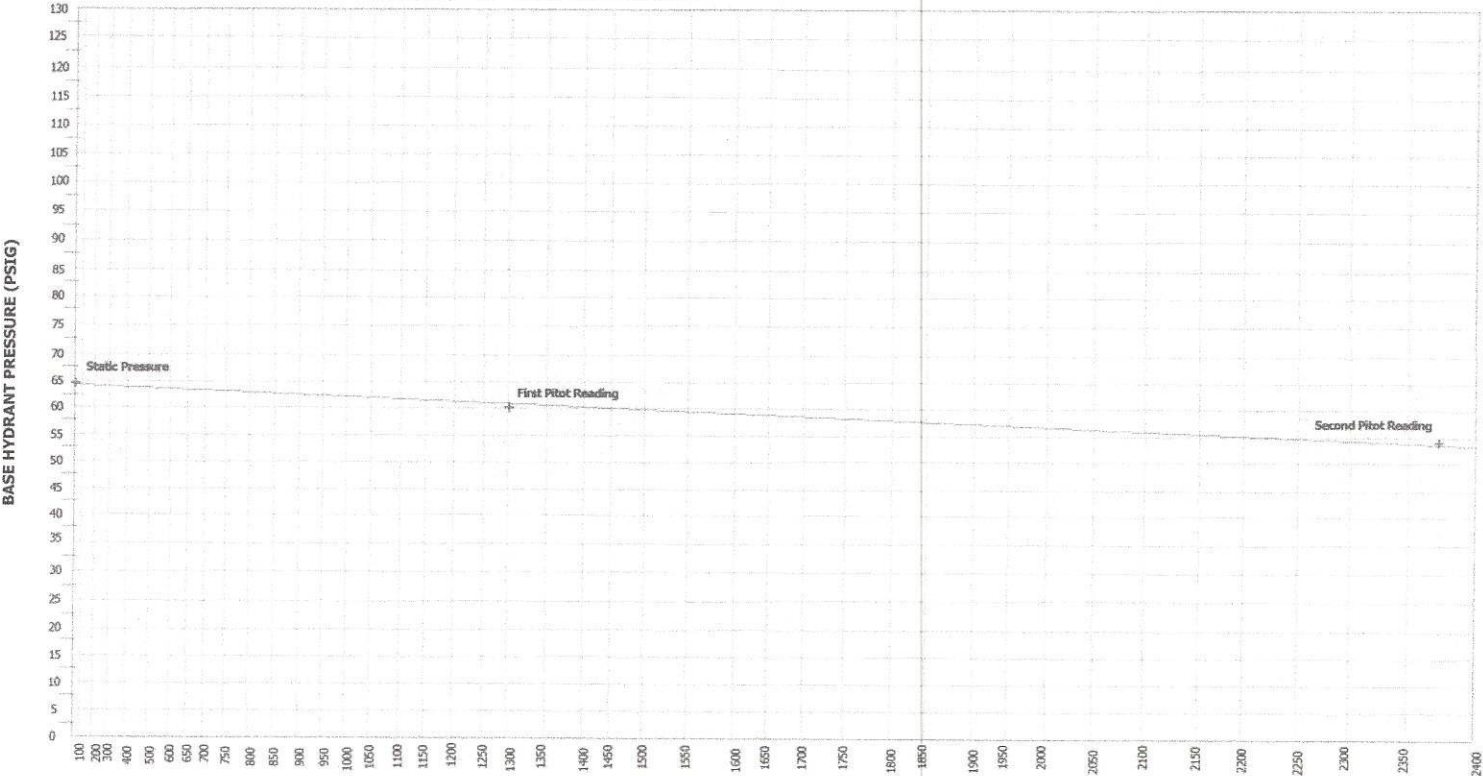
Yours truly,

Mark Schmidt
Jackson Waterworks

7104 Canborough Road, Dunnville, ON N1A 2W1



FIRE HYDRANT FLOW TEST RESULTS TEST #1 of 1



TEST HYDRANT FLOW (USGPM)

No. of Ports Open	Port Dia. (in)	Pitot Reading (psig)	Pitot Conversion (usgpm) Conversion Factor = 0	Residual Pressure (psig)
1	2.50	60	1300	60
2	2.50	50/50	2372	54
3	2.50			
4	2.50			
THEORETICAL FLOW @ 20psi			4745	

Test Date	15 July 2019
Test Time	11:00am
Pipe Diameter (in)	6
Static Pressure (psig)	64
Secondary Valve Position	Not Located (Buried)

Site Information		
Site Name or Developer Name	849413Ontario Ltd.	Engineer/Architect: Hides International Ltd.
Site Address/Municipality	27 Blake Street, Barrie	Test Hydrant Make & Model: Daigle D67M
Location of Test Hydrant(s)	In Front of 32 Blake Street	
Location of Base Hydrant	In Front of 48 Blake Street	
Comments	Testing has been completed in accordance with NFPA-291 guidelines wherever and whenever possible and practical. Conversion factors for pitot tube readings may have been used depending on hose nozzle internal design and installation profile. Refer to attached cover letter for additional information.	
Verified By	 Mark Schmidt	

7104 Canborough Road, Dunnville, ON N1A 2W1

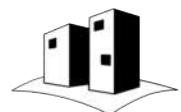
**EXISTING DOMESTIC FLOW
CALCULATION WORKSHEET**

Residential Use

Unit Type	No. of Units	PPU	L/c/d	Avg. Day (L/d)
Detached home	2	3.13	225	1,409
Residential Use Avg. Day (L/d)				1,409

Peak Flows (Per MOECP)

Criteria	Peaking Factor	Flow
Avg. day (L/s)	1.00	0.02
Min (L/s)	0.84	0.01
Max Hr (L/hr)	2.40	141
Max Day (L/d)	1.80	2,536



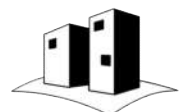
**PROPOSED DOMESTIC FLOW
CALCULATION WORKSHEET**

Residential Use

Unit Type	No. of Units	PPU	L/c/d	Avg. Day (L/d)
2-Bdrm	35	2.34	225	18,428
Residential Use Avg. Day (L/d)				18,428

Peak Flows (Per MOECP Standards)

Criteria	Peaking Factor	Flow
Avg. day (L/s)	1.00	0.21
Min (L/s)	0.84	0.18
Max Hr (L/hr)	2.40	1,843
Max Day (L/d)	1.80	33,170



WATERMAIN SIZING AND HEADLOSS CALCULATION WORKSHEET

Fire Watermain Sizing and Headloss Calculation

P (kPa)	EL. (m)	HGL (m)	Q (m ³ /s)	D (mm)	A (m ²)	V (m/s)	Fitting	L (m)	K (unitless)	H _f (kPa)	H _L (m)	EL. (m)	HGL (m)	P (kPa)	P (PSI)
441.3	231.75	276.73	0.131	150	0.018	7.4	-	0.5			0.25	231.75	276.48	438.8	63.6
							Gate Valve		0.2	0.557				438.3	63.6
438.3	231.75	276.43	0.131	150	0.018	7.4	-	19.0			9.41	231.75	267.02	346.0	50.2

Domestic Watermain Sizing

Use	Q _{avg day} (L/s)	Q _{min} (L/s)	Q _{max} (L/s)	Q _{min} (m ³ /s)	Q _{max} (m ³ /s)	Dia. (mm)	A (m ²)	V _{min} (m/s)	V _{max} (m/s)
Res.	0.21	0.18	0.51	0.000	0.001				
I/C/I	-	-	-	-	-				
Total	0.213	0.179	0.512	0.000	0.001	100	0.008	0.023	0.065

Volume of Watermains

Dia (mm)	Area (m ²)	Length (m)	Volume (m ³)	Volume (L)
100	0.01	19.5	0.153	153.2
-	-	-	-	-
Total watermain volume			0.153	153.2

0.20	Hours for water turnover
11.97	Minutes for water turnover

FIRE FLOW CALCULATION WORKSHEET

PROJECT INFORMATION		
Address	27-31 Blake Street Barrie, ON	Notes: Assumes properly protected vertical openings
OBC Occupancy	Group C - Residential 3.2.2.43	
Building Footprint	730 sm	
No. of Storeys	5 plus mechanical penthouse	

BASE FLOW CALCULATION				CREDITS	CHARGES	Q (L/min)
A=	Effective area		3,595 m ²			
C=	Non-combustible		0.8			
F=	Required fire flow	$F=220C\sqrt{A}$	10,553 L/min.			
"F"	Rounded to nearest 1,000		11,000 L/min.			11,000
FLOW 'F' ADJUSTMENTS				CREDITS	CHARGES	Q (L/min)
Occupancy Adjustments (F')		%				
	Non-combustible	-25%	-2,750	-2750		8,250
Exposure Adjustments (E)						
	Exposure	Sep. (m)	Charge			
	N	35	5%			
	E	28	10%			
	S	35	5%			
	W	14	15%			
E = Total Exposure Charge			35%		2,888	11,138
Sprinkler Adjustments (S)						
	Sprinklered as per NFPA 13	Yes	-2,475	-2475		8,663
	Standard Water Supply	Yes	-825	-825		7,838
	Fully supervised watersupply	No	0			7,838
REQUIRED FLOW (F''=F'+E+S)			(L/min)			7,838
			(USGPM)			2,070



**MUNICIPAL SUPPLY
CALCULATION WORKSHEET**

Hydrant Flow Test Input

Location	Test No.	P _s (PSI)	P _r (PSI)	Q _r (USGPM)
32 Blake Street	1	64	60	1,300
	2	64	54	2,372

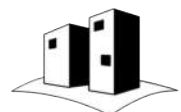
Theoretical Flow Calculation

Location	Test No.	P _f (PSI)	Q _f (USGPM)
32 Blake Street	1	20	4,746
	2	20	5,279

Where $Q_f = Q_r \left[\frac{P_s - P_f}{P_s - P_r} \right]^{0.54}$

Max Day + Fire Check

Max Day (USGPM)	F'' (USGPM)	Max Day + F'' (USGPM)	Q ₂₀ (USGPM)	Check
6	2,070	2,077	4,746	OK



Appendix E

Engineering Drawings