



Proposed Site Development

2477 Queensway Drive, Burlington ON

FSR + STORMWATER MANAGEMENT REPORT

Prepared for:

Riepma Consultants Inc.
13041 Highway #7
Georgetown ON L7G 4S4

Prepared by:

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June 10, 2016

Revised May 10, 2017

2nd Revision December 14, 2017

File No. 2016-023

1.0 INTRODUCTION

MGM Consulting Inc. has been retained by Reipma Consultants Inc. to prepare a Functional Servicing and Stormwater Management Report in support of a Rezoning Application for the proposed site development located at 2477 Queensway Drive in the City of Burlington, Ontario. The proposal includes for a new 4 storey building, a 2 storey addition to the existing building, new paved driveway and access to Queensway Drive, new concrete walkways and related site works.

The objective of the report is to provide details on the required site grading, municipal servicing (storm, sanitary and water) and stormwater management features for the development, as required to adequately service the area to be developed, to provide a basis for the detailed grading, site servicing, and stormwater management design which will follow upon review of this documentation by the City of Burlington Technical Services staff.

2.0 EXISTING CONDITIONS

2.1 EXISTING TOPOGRAPHY & ABOVEGROUND FEATURES

The existing site includes a 2 storey building and a small garage building located on a 0.304 ha site fronting on Queensway Drive. The site abuts existing highways and roadways with the QEW to the north, Queensway Drive to the south and west and Guelph Line to the east. Elevations within the site range from 104.0 m along the north west of the site to 103.5 m along the south east fronting Queensway Drive. The site general slopes from north west to south east with drainage conveyed towards Queensway Drive. The majority of the site is currently grassed with the remainder occupied by the existing buildings and asphalt driveway and gravel parking areas.

2.2 EXISTING MUNICIPAL SERVICING

Information on the existing municipal servicing in the vicinity of the proposed site development was provided by City of Burlington technical staff. Based on the available information sources, the existing municipal services relevant to the current proposal include;

- A 300mm diameter sanitary sewer on Queensway Drive which flows from north east to south west with elevations ranging from of 99.3 to 99.1
- A 450mm diameter storm sewer running along Queensway Drive, fronting the proposed development draining from north west to south east with invert elevations in the order of 101.76 m to 101.65m
- A 150 mm diameter watermain running along Queensway Drive, fronting the proposed development.

Existing servicing as identified above is indicated on drawing CV-1.

3.0 PROPOSED SITE DEVELOPMENT

3.1 SITE SERVICING

3.1.1 Sanitary Servicing

A new 200mm sanitary service consistent with current Region standards is proposed, connecting to the

existing Municipal 300mm sanitary sewer on Queensway Drive.

The proposed sanitary servicing is indicated on drawing CV-1.

3.1.2 Domestic Water Supply

A domestic water supply typically required for a building of this size would be in the order of 50 mm in diameter. This assumption would need to be confirmed by a mechanical engineer during the detailed design stage based on occupancy loading and fixture requirements.

3.1.3 Fire Protection

A private hydrant will be required within the site to provide charging of the siamese connection in the event of a fire.

All internal watermain connections are to be carried out in accordance with Region of Halton requirements. Pressure and flow tests should be carried out on the existing hydrant locations to confirm adequate flow and pressure as required for fire protection purposes

Domestic water and fire protection servicing will connect to the existing 300mm watermain on Queensway Drive.

The proposed water servicing is indicated on drawing CV-1.

3.1.4 Storm Servicing

The proposed minor storm system for the site will consist of a series of underground storm sewers which will convey flows from the site to the existing 450mm municipal storm sewer Queensway Drive.

The proposed internal storm servicing is indicated on drawing CV-1.

4.0 SEDIMENT & EROSION CONTROL MEASURES DURING CONSTRUCTION

In order to control any release of sediments and erosion during construction, the following measures should be incorporated into the site development procedures:

1. Silt control fencing should be installed around the perimeter of any areas to be disturbed as required to contain sediments that are carried in stormwater runoff.
2. All existing catchbasins in the vicinity of the site, and all new catchbasins, should have sediment controls installed over the grates until the site is stabilized. Filter fabric should be regularly inspected and replaced as required.
3. Any required dewatering of the site as required for the building construction should incorporate sediment and debris screens at the inlet of the pumping system and sediment settling facilities at discharge points, to prevent sediment discharges to the municipal drainage system.
4. A mud mat should be constructed at the construction entrance location which will assist in the removal of mud from the wheels of construction equipment leaving the site. This feature will need to be maintained throughout the construction period.
5. Any mud tracked onto adjacent municipal or private roads should be cleaned from the roads on a daily basis.

5.0 STORMWATER MANAGEMENT

5.1 Proposed Minor Storm System

The proposed minor system has been designed to convey the 5 year flow, without surcharging, which is consistent with current City of Burlington standards. The internal storm system will consist of a series of underground storm sewers, manholes and catch basins as indicated on the attached Site Servicing & Grading Plan, CV-1. A new 300 mm diameter storm service connection is proposed in the north west corner of the site, outletting to the existing 450 mm diameter storm sewer on Queensway Drive.

5.2 Proposed Stormwater Rate Controls and Site Storage

Stormwater rate controls are proposed as required to control the post development 100 year peak flows to below the existing 5 year peak flow rate. The required controlled flows from the site are achieved with the installation of a 120mm diameter orifice plate, installed on the outlet of MH2. Detailed stormwater management calculations are included in Appendix A.

5.3 Emergency Overflow

During severe storm events, or when an outlet is blocked, emergency overland flow will occur from the site at an elevation of 103.46 m. through the proposed pedestrian entrance to the Queensway Drive right of way. The overflow elevation provided is approximately 390 mm below the proposed finished floor elevation of the proposed building and approximately 1340 mm below the finished floor of the proposed addition to the existing building, and 1490mm below the finished floor of the existing building.

5.4 Proposed Stormwater Quality Controls

Quality controls are to be provided as required to achieve “enhanced” (Level 1) protection, which is equivalent to providing for 80% removal of the total suspended solids on an annual loading basis. The required quality controls are proposed and will be provided with the installation of a Stormceptor Model STC 300 oil/grit separator.

Modelling for the proposed treatment unit is included in Appendix B. As indicated, the proposed unit will provide for an estimated removal of 85% of the total suspended solids on an annual loading basis.

6.0 SUMMARY

The following summarizes the proposed stormwater management features for the subject site;

- Grading within the site is to be completed such that emergency storm flows are conveyed from the site to the adjacent municipal right of way without flooding existing or proposed buildings,
- Sanitary servicing for the site can be provided by a gravity sanitary sewer system and a connection to the existing 300 mm sanitary sewer on Queensway Drive,
- Water servicing as required for domestic supply and fire protection can be provided with a connection to the existing 300 mm watermain on Queensway Drive,

-
- Storm servicing would include a series of on-site manholes and catchbasins and an underground storm system, outletting to the existing 450 mm diameter storm sewer on Queensway Drive,
 - A proposed package treatment unit is proposed at the outlet from the internal storm system, as required to provide Level 1 quality treatment,
 - Sufficient on-site storage has been provided, as required, within the storm sewer system, and aboveground in paved areas to a maximum ponding depth of 300 mm.
 - Surface ponding will only occur during storm events that exceed the 5 year storm.
 - Sediment and erosion controls are proposed during construction as required to control the transportation of sediments off site, and to control erosion during construction.

Prepared by:

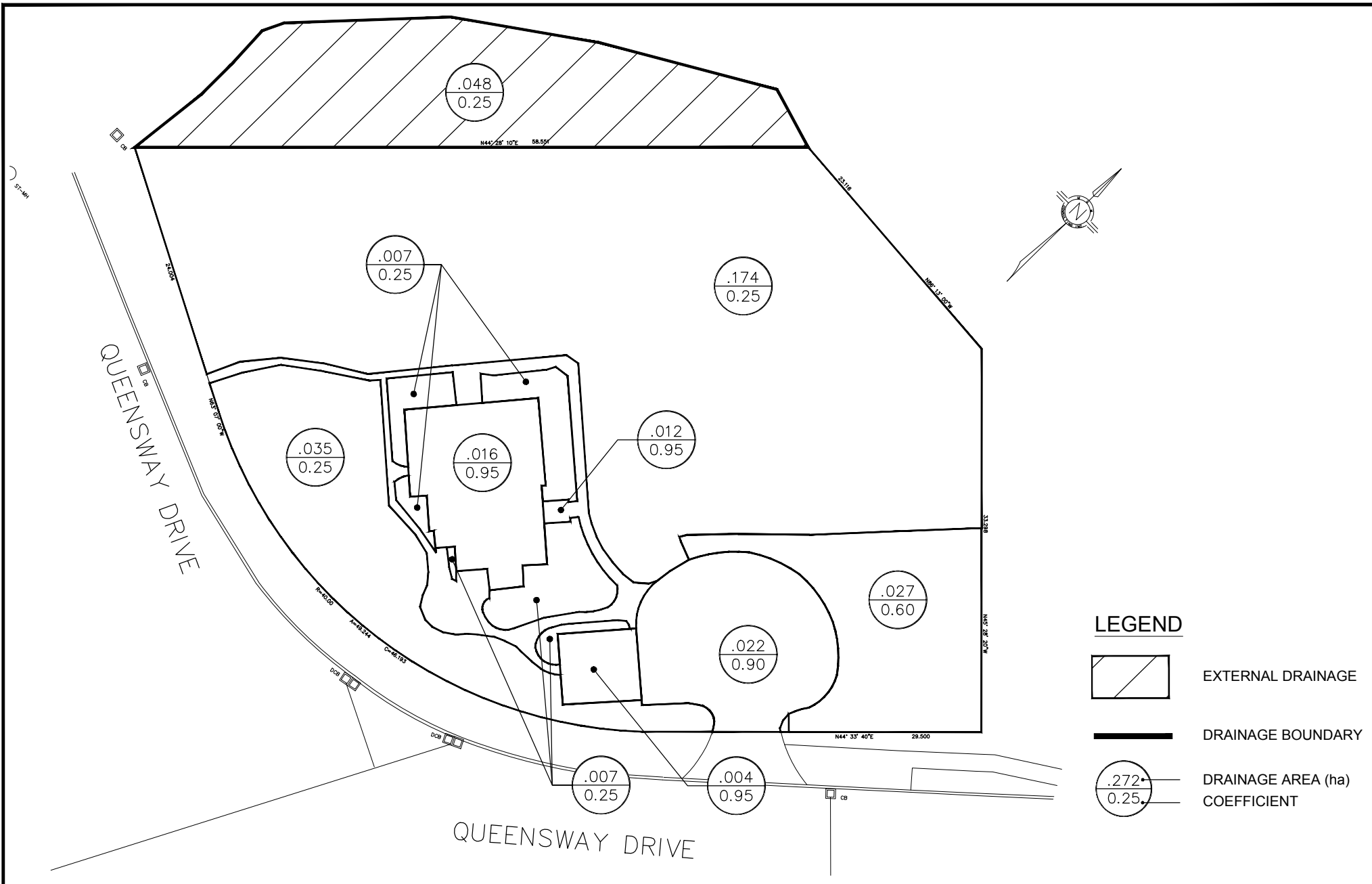
MGM Consulting Inc



Blair Nock, CET



M.L. Stairs, P.Eng.

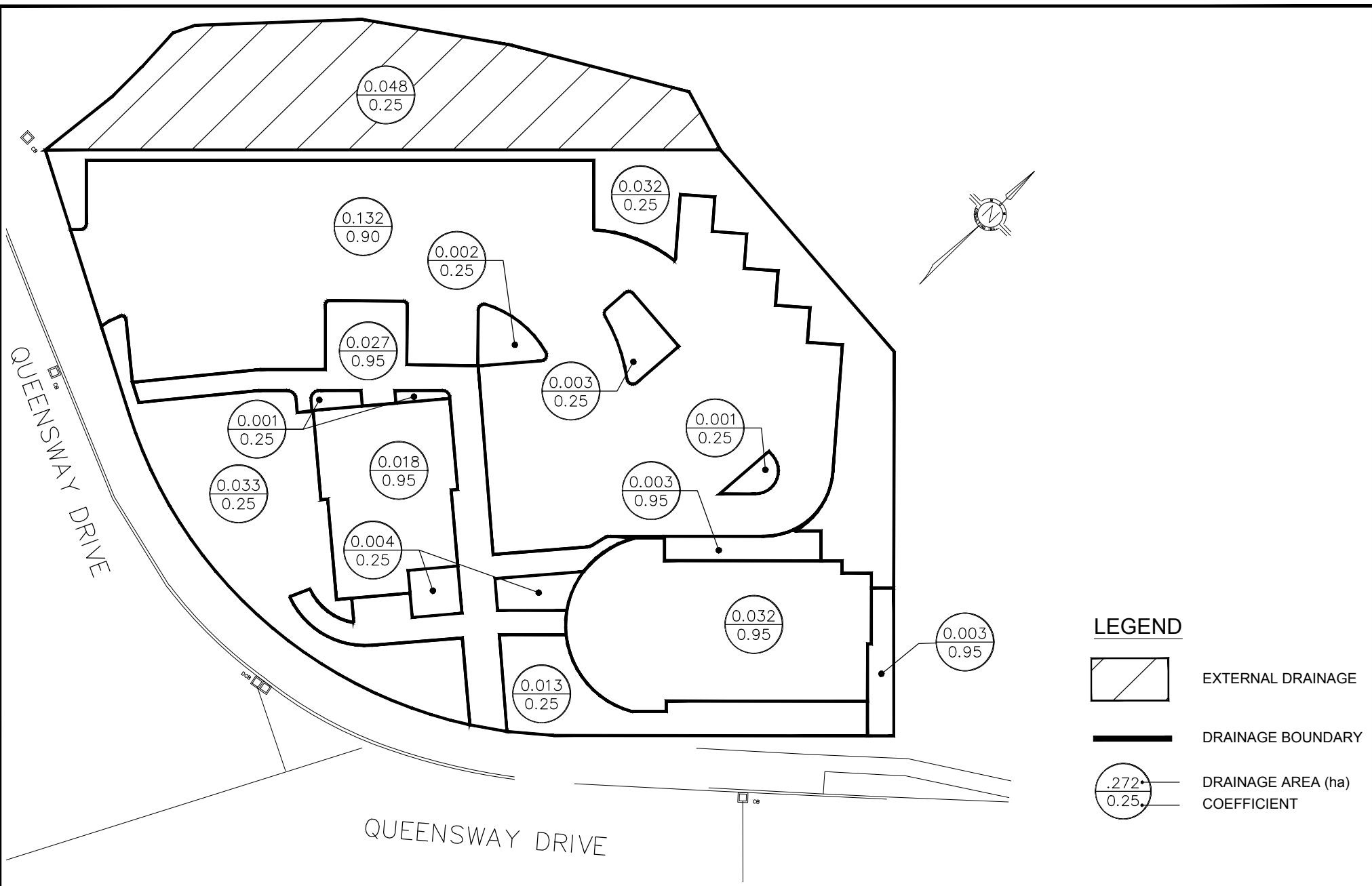


PROPOSED SITE DEVELOPMENT
 2477 QUEENSWAY DRIVE, BURLINGTON ONTARIO
EXISTING DRAINAGE AREAS

MGM
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 Consulting Engineering & Project Management
 400 Bronte Street South Tel: (905)567-8678
 Suite 201 Fax: (905)875-1339
 Milton, Ontario Email: mgm@mgm.on.ca
 L9T 0H7 www.mgm.on.ca

FIGURE 1

MAY 26, 2016
 NTS
 2016-23-FIG1-2



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FIGURE 2

DEC.14, 2017
 NTS
 2016-23-FIG1-2

APPENDIX A
STORMWATER MANAGEMENT CALCULATIONS

Appendix A
Detailed Stormwater Management Calculations

1.0 DRAINAGE CHARACTERISTICS

1.1 Existing Drainage Areas: (see Figure No. 1)

| <u>Attenuated Areas</u> | "c" | Area (ha) |
|-------------------------|------------|--------------|
| Asphalt | 0.90 | 0.022 |
| Roof | 0.95 | 0.020 |
| Gravel | 0.60 | 0.027 |
| Grass/Landscaping | 0.25 | 0.223 |
| Concrete | 0.95 | 0.012 |
| Weighted Avg. | "C" | 0.44 |
| Site Area | | 0.304 |
| External Area | 0.25 | 0.048 |
| Total Area | | 0.352 |

1.2 Proposed Drainage Areas (see Figure No. 2)

| <u>Attenuated Areas:</u> | "c" | Area (ha) |
|--------------------------|------------|--------------|
| Asphalt | 0.90 | 0.132 |
| Roof | 0.95 | 0.050 |
| Grass/Landscaping | 0.25 | 0.089 |
| Concrete | 0.95 | 0.033 |
| Weighted Avg. | "C" | 0.76 |
| Site Area | | 0.304 |
| External Area | 0.25 | 0.048 |
| Total Area | | 0.352 |

2.0 Allowable Post Development Flows

2.1 Allowable Post Development Flow Rate

Peak 100 year storm flows for the redevelopment are to be controlled to the existing 5 year peak rate.

Based on Tc = 10 minutes

$$\text{Intensity 'I' = } \frac{A}{(t+b)^c}$$

For 5 year storm,

A = 697.4

b = 5

c = 0.764

Therefore I = 88.1 mm/hr

For 100 year storm,

A = 1114.2

b = 5

c = 0.761

Therefore I = 141.9 mm/hr

Flow "Q" - CIA/360, where c = 0.44

Therefore Q allow = 0.0380 m³/sec

Appendix A
Detailed Stormwater Management Calculations

3.0 Orifice Control Calculations:

A 120mm orifice plate is proposed at the outlet of Manhole No. 2 that will control peak flows during the 2 to 100 year storm events to the two year predevelopment flow rate.

3.1 - 5 Year Post Development Flow:

| | |
|--------------------------------------|---------------|
| Invert at controlled outlet = | 101.95 m |
| Ponding Elev. during 1:5 yr. storm = | 103.15 m |
| Centreline Orifice Elevation = | 102.01 m |
| Maximum Head on Orifice (H) | 1.14 m |

| | | | | | |
|------------|-----------------------------|------------|-----------------------|------------|------|
| H = | 1.14 m | A = | 0.0113 m ² | g = | 9.81 |
| Q = | 0.03316 m ³ /sec | D = | 120 mm. | C = | 0.62 |

Based on the above, a 120 mm orifice plate will provide a controlled flow during the 5 year storm event = 33.2 l/sec.

3.2 - 100 Year Post Development Flow:

| | |
|--|---------------|
| Invert at controlled outlet = | 101.95 m |
| Ponding Elev. during 1:100 yr. storm = | 103.46 m |
| Centreline Orifice Elevation = | 102.01 m |
| Maximum Head on Orifice (H) | 1.45 m |

| | | | | | |
|------------|-----------------------------|------------|-----------------------|------------|------|
| H = | 1.45 m | A = | 0.0113 m ² | g = | 9.81 |
| Q = | 0.03740 m ³ /sec | D = | 120 mm. | C = | 0.62 |

Based on the above, a 120 mm orifice plate will provide a controlled flow during the 100 year storm event = 37.4 l/sec.

4.0 On-Site Storage Required

4.1 - 5 Year Storage Calculation

| Rainfall Duration min. | s | 5 Year Rainfall Intensity (I) mm/h | Attenuated Flow from External Areas m ³ /sec | Attenuated Flow From Site m ³ /sec | Controlled Flow From Site* m ³ /sec | Aprox. Detention Volumes m ³ |
|------------------------------|------------|---|--|--|---|--|
| 10 | 600 | 88.1 | 0.0029 | 0.0538 | 0.0332 | 14.2 |
| 15 | 900 | 70.7 | 0.0024 | 0.0432 | 0.0332 | 11.1 |
| 20 | 1200 | 59.6 | 0.0020 | 0.0364 | 0.0332 | 6.3 |
| 25 | 1500 | 51.9 | 0.0017 | 0.0317 | 0.0332 | 0.4 |
| 30 | 1800 | 46.1 | 0.0015 | 0.0282 | 0.0332 | -6.2 |

Based on the above, the required 5 year site storage = **14.2 m³**

**Appendix A
Detailed Stormwater Management Calculations**

4.2 - 100 Year Storage Calculation

| Rainfall Duration min. | s | 100 Year Rainfall Intensity (I) mm/h | Attenuated Flow from External Areas m ³ /sec | Attenuated Flow From Site m ³ /sec | Controlled Flow From Site* m ³ /sec | Aprox. Detention Volumes m ³ |
|---------------------------|------------|---|--|--|---|--|
| 10 | 600 | 141.9 | 0.0047 | 0.0867 | 0.0374 | 32.4 |
| 15 | 900 | 114.0 | 0.0038 | 0.0696 | 0.0374 | 32.4 |
| 20 | 1200 | 96.2 | 0.0032 | 0.0588 | 0.0374 | 29.5 |
| 25 | 1500 | 83.7 | 0.0028 | 0.0511 | 0.0374 | 24.8 |
| 30 | 1800 | 74.5 | 0.0025 | 0.0455 | 0.0374 | 19.0 |

Based on the above, the required 100 year site storage = **32.4 m³**

5.0 On-site Storage Provided

5.1 Storm Sewer Storage

The detention volume available within the storm sewer pipes is as follows:

| From | To | Size | Length | Volume (m ³) |
|---------|---------|------|--------|--------------------------|
| MH2 | STC 300 | 600 | 5.0 | 1.4 |
| STC 300 | CBMH3 | 525 | 13.6 | 2.9 |
| CBMH3 | MH4 | 525 | 16.7 | 3.6 |
| MH4 | CBMH5 | 525 | 20.4 | 4.4 |
| CBMH5 | CB6 | 300 | 26.0 | 1.8 |

Total Underground Storage = **14.2**

5.2 Surface Storage

The detention volume available within the ponding areas at an assumed elev of **103.46** m. is as follows:

| Structure | Grate Elev. | Ponding | Area | Depth | Volume (m ³) |
|-------------------------------------|-------------|---------|------|-------|--------------------------|
| CBMH5 | 103.16 | 103.46 | 460 | 0.30 | 46.0 |
| CB6 | 103.30 | 103.46 | 35 | 0.16 | 1.9 |
| Max Aboveground Storage (100 year)= | | | | | 46.0 |
| Max Storage Underground & Surface = | | | | | 60.2 |

APPENDIX B
TREATMENT UNIT MODELLING

Brief Stormceptor Sizing Report - 2477 Queensway Drive

| Project Information & Location | | | |
|--------------------------------|---------------------|----------------------------|----------|
| Project Name | 2477 Queensway | Project Number | 2016-023 |
| City | Burlington | State/ Province | Ontario |
| Country | Canada | Date | 6/1/2016 |
| Designer Information | | EOR Information (optional) | |
| Name | Blair Nock | Name | |
| Company | MGM Consulting Inc. | Company | |
| Phone # | 905-567-8678 | Phone # | |
| Email | bnock@mgm.on.ca | Email | |

Stormwater Treatment Recommendation

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

| | |
|--------------------------------------|----------------------|
| Site Name | 2477 Queensway Drive |
| Target TSS Removal (%) | 80 |
| TSS Removal (%) Provided | 85 |
| Recommended Stormceptor Model | STC 300 |

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

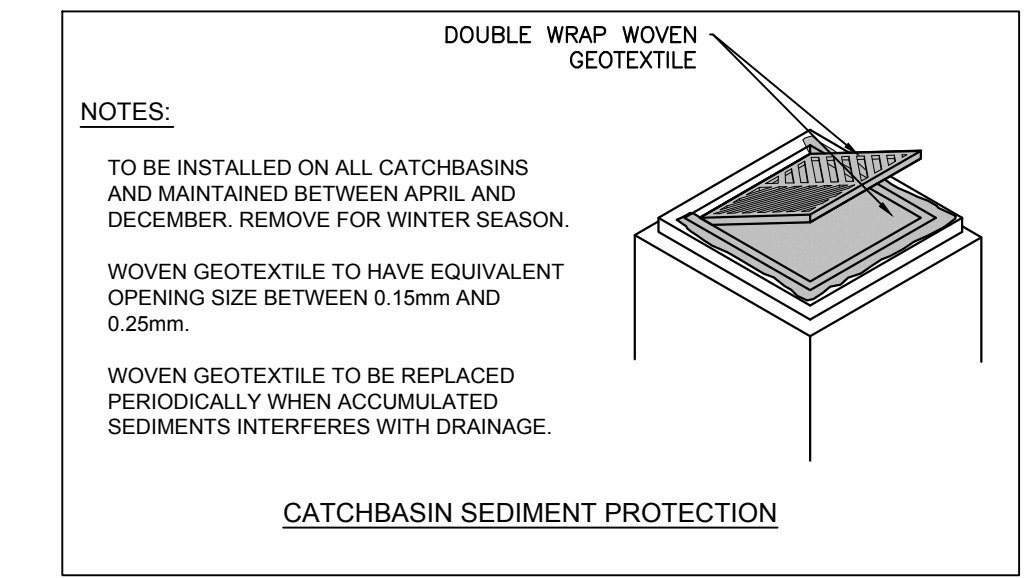
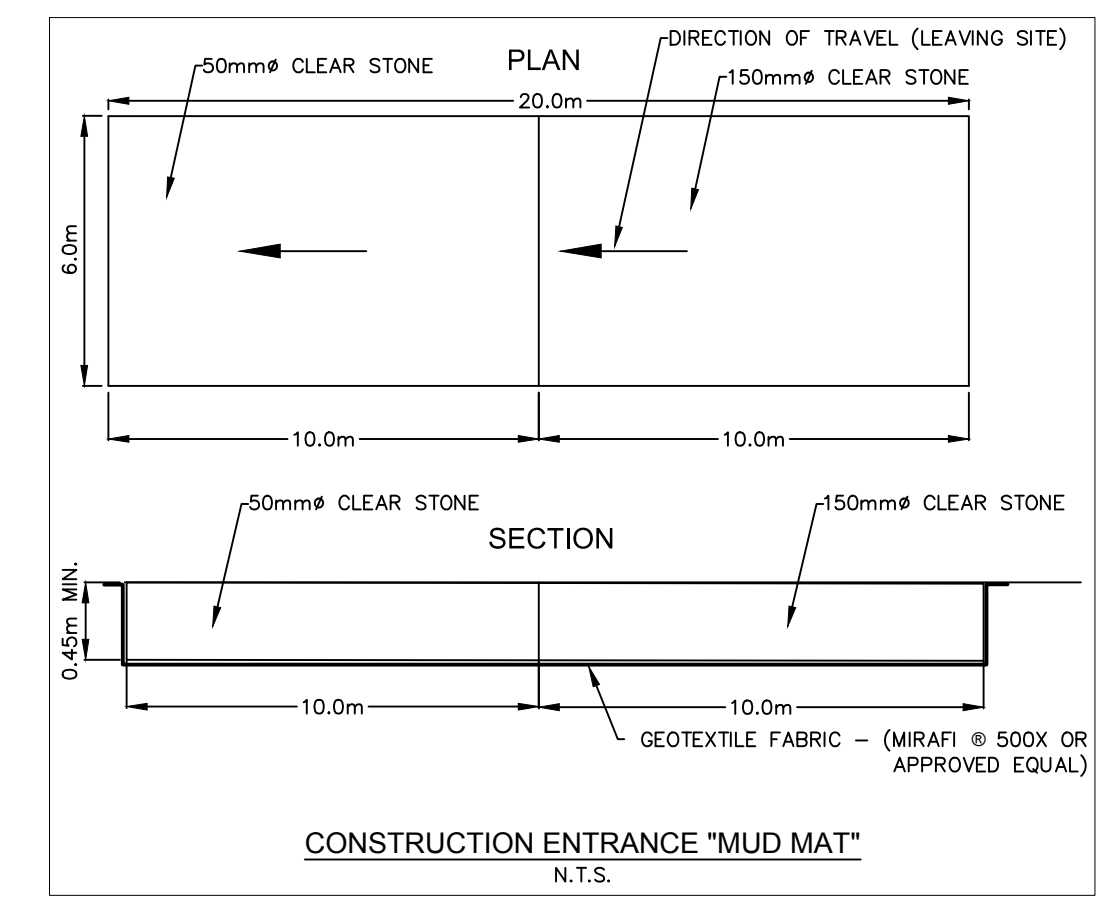
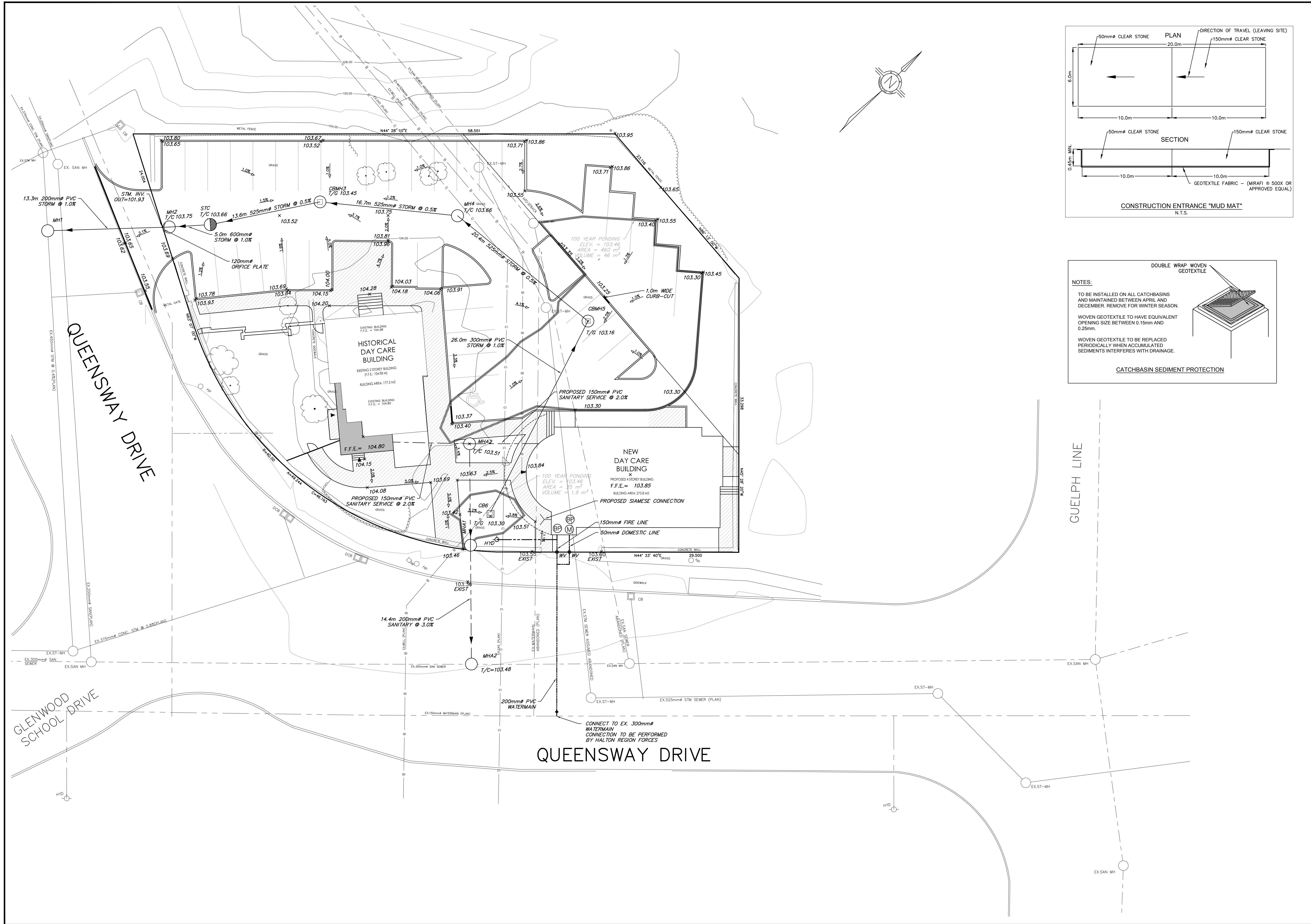
| Stormceptor Sizing Summary | |
|----------------------------|------------------------|
| Stormceptor Model | % TSS Removal Provided |
| STC 300 | 85 |
| STC 750 | 91 |
| STC 1000 | 92 |
| STC 1500 | 92 |
| STC 2000 | 94 |
| STC 3000 | 94 |
| STC 4000 | 96 |
| STC 5000 | 96 |
| STC 6000 | 97 |
| STC 9000 | 98 |
| STC 10000 | 98 |
| STC 14000 | 98 |
| Stormceptor MAX | Custom |

| Sizing Details | | | |
|------------------|-----------------|--------------------------------|-----------------|
| Drainage Area | | Water Quality Objective | |
| Total Area (ha) | 0.30 | TSS Removal (%) | 80.0 |
| Imperviousness % | 73.0 | Runoff Volume Capture (%) | |
| Rainfall | | Oil Spill Capture Volume (L) | |
| Station Name | TORONTO CENTRAL | Peak Conveyed Flow Rate (L/s) | |
| State/Province | Ontario | Water Quality Flow Rate (L/s) | |
| Station ID # | 0100 | Up Stream Storage | |
| Years of Records | 18 | Storage (ha-m) | Discharge (cms) |
| Latitude | 45°30'N | 0.000 | 0.000 |
| Longitude | 90°30'W | Up Stream Flow Diversion | |
| | | Max. Flow to Stormceptor (cms) | |

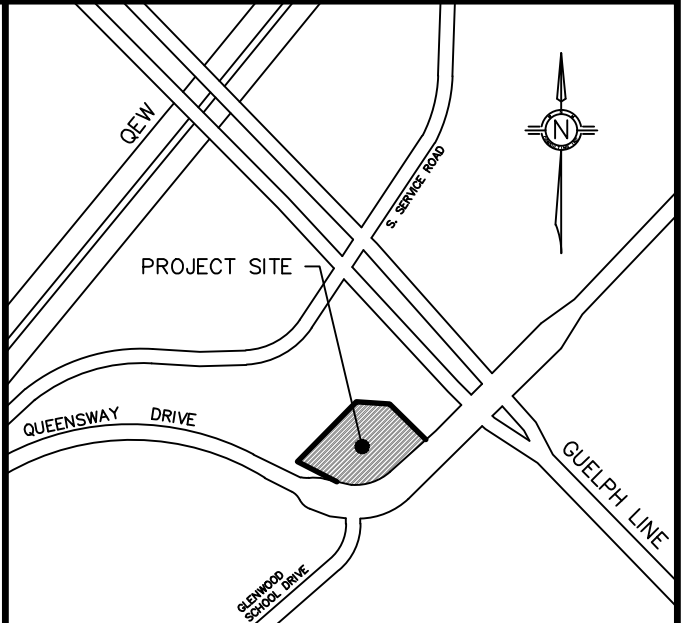
| Particle Size Distribution (PSD) The selected PSD defines TSS removal CLOCA | | |
|---|----------------|------------------|
| Particle Diameter (microns) | Distribution % | Specific Gravity |
| 1.0 | 4.5 | 2.65 |
| 1.5 | 1.3 | 2.65 |
| 3.0 | 1.3 | 2.65 |
| 6.5 | 1.3 | 2.65 |
| 9.0 | 0.0 | 2.65 |
| 12.0 | 1.9 | 2.65 |
| 22.0 | 1.3 | 2.65 |
| 36.0 | 2.6 | 2.65 |
| 50.0 | 3.9 | 2.65 |
| 75.0 | 3.9 | 2.65 |
| 100.0 | 3.9 | 2.65 |
| 125.0 | 5.2 | 2.65 |
| 150.0 | 11.7 | 2.65 |
| 212.0 | 6.5 | 2.65 |
| 250.0 | 6.5 | 2.65 |
| 300.0 | 17.5 | 2.65 |
| 425.0 | 23.4 | 2.65 |
| 850.0 | 3.3 | 2.65 |

| Notes |
|--|
| <ul style="list-style-type: none"> Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance. |

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



NOTES:
 TO BE INSTALLED ON ALL CATCHBASINS AND MAINTAINED BETWEEN APRIL AND DECEMBER. REMOVE FOR WINTER SEASON.
 WOVEN GEOTEXTILE TO HAVE EQUIVALENT OPENING SIZE BETWEEN 0.15mm AND 0.25mm.
 WOVEN GEOTEXTILE TO BE REPLACED PERIODICALLY WHEN ACCUMULATED SEDIMENTS INTERFERES WITH DRAINAGE.



| No. | DATE | DRAWING ISSUE DESCRIPTION |
|-----|------------|---------------------------|
| 1 | JUNE 10/16 | FIRST SUBMISSION TO CITY |
| 2 | MAY 10/17 | SECOND SUBMISSION TO CITY |
| 3 | DEC.14/17 | THIRD SUBMISSION TO CITY |

| LEGEND | |
|--------|--|
| | EXISTING FIRE HYDRANT |
| | EXISTING ELEVATION |
| | PROPOSED ELEVATION |
| | PROPOSED SLOPE |
| | PROPOSED OIL GRIT SEPARATOR |
| | PROPOSED CATCH BASIN |
| | PROPOSED CB MANHOLE |
| | PROPOSED STORM MANHOLE |
| | PROPOSED STORM SEWER |
| | PROPOSED WATERMAIN |
| | PROPOSED WATER VALVE |
| | PROPOSED CATCH BASIN SEDIMENT PROTECTION |
| | PROPOSED MAJOR OVERLAND FLOW |

BENCHMARK:
 ELEVATIONS ARE GEODETIC, DERIVED BY DIFFERENTIAL GPS OBSERVATIONS, AND ARE REFERRED TO THE CANNET REFERENCE STATION, HAVING AN ELEVATION OF 200.044m. UTM-17 NORTH CANADA NAD 83 CSRS

ALL DISTANCES & ELEVATIONS SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.



CONSULTANTS:

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CLIENT:

Riepma CONSULTANTS INC.

PROJECT:
 SITE DEVELOPMENT
 2477 QUEENSWAY DRIVE,
 BURLINGTON ONTARIO

DRAWING:
 PRELIMINARY GRADING & SERVICING PLAN

| | | |
|---------------------|--------------------------|--------------------|
| DRAWN BY: BN | CHECKED BY: JB | JOB CAPTAIN: MS |
| SCALE: 1:200 | PROJECT NO.: 2016-023 | DATE: MAY 2016 |
| CURRENT ISSUE: 3 | CURRENT REV: 2 | SHEET NO.: CV-2 |