May 25, 2023 Reference No. 11154619.100

Pat Scanga, P.Eng., FEC
Acting Manager, Engineering & Construction Services
City of Toronto - Toronto & East York District
55 John Street Metro Hall, 20th Floor
Toronto ON M5V 3C6

Dear Mr. Scanga:

Re: Site Servicing Assessment & Stormwater Management Implementation Report
Proposed Mixed-Use Residential Development
1365 and 1375 Yonge Street
M4T 2P7 and M4T 1Y4
Yonge and Rosehill Inc

1. Purpose

GHD has been retained by 'Yonge and Rosehill Inc' (herein referred to as the "Owner") to provide professional engineering services for the preparation of a 'Site Servicing Assessment & Stormwater Management Implementation Report' for a mixed-use residential development to be located on the lands to be known hereafter as 1365 and 1375 Yonge Street, situated at the northeast corner of Yonge Street and Rosehill Avenue (herein referred to as the "Site"). The previous application was for an assisted living senior facility – the change in proposed development is due to a change in site ownership.

This report has been prepared in support of the 'Site Plan Control' and the 'Zoning Bylaw Amendment' applications being submitted for the site. Included in the following, is a description of the existing infrastructure in the vicinity of the subject lands, and recommendations for the provision of sanitary sewage services, stormwater management, and water distribution / fire protection in accordance with the City of Toronto's Design Criteria for Sewers and Watermains (January 2021).

Our report concludes that the proposed development can be serviced utilizing the existing surrounding infrastructure. This can be achieved without any adverse impact to the municipal services of the surrounding areas.

The report identifies design details which are to be included in the detailed drawings for both the site services, architectural, and mechanical designs.

2. Background

The proposed development is located on the east side of Yonge Street, between Rosehill Avenue and Pleasant Boulevard in the City of Toronto. The site is bounded by a public laneway to the east, Yonge Street to the west, Rosehill Avenue to the south, and another building to the north. Currently, vehicular access to the site is provided off the public laneway on the east side with pedestrian access available from Yonge Street, Rosehill Avenue, and the public laneway. A key plan indicating the site location has been provided as Figure 1 on the following page.

The site was previously occupied by two different buildings (1365 and 1375 Yonge Street), which have been demolished. 1365 Yonge Street was a two-storey building with finished basement in the eastern quarter of the building footprint. 1375 Yonge Street was a three-storey building with finished basement in the eastern quarter of the building footprint. The total site area is 2,176 m^2. A portion of the laneway to the east of the site and the southwest corner of the site, totalling 70.7m^2, will be conveyed to the City for lane / boulevard widening purposes. The conveyed areas have been excluded from all design calculations for the purpose of this report. As such, the net site area considered for the site is 2,105.5 m^2.

The proposed development will consist of a 50-storey mixed-use residential building with ground floor retail totaling 384.8 m^2 of retail GFA; and 45,534.9 m^2 of residential GFA consisting of six-hundred and fifty-five (655) residential units. The proposed building will also include five (5) levels of below ground parking. Vehicular underground garage access to the site is provided from the adjoining public laneway.

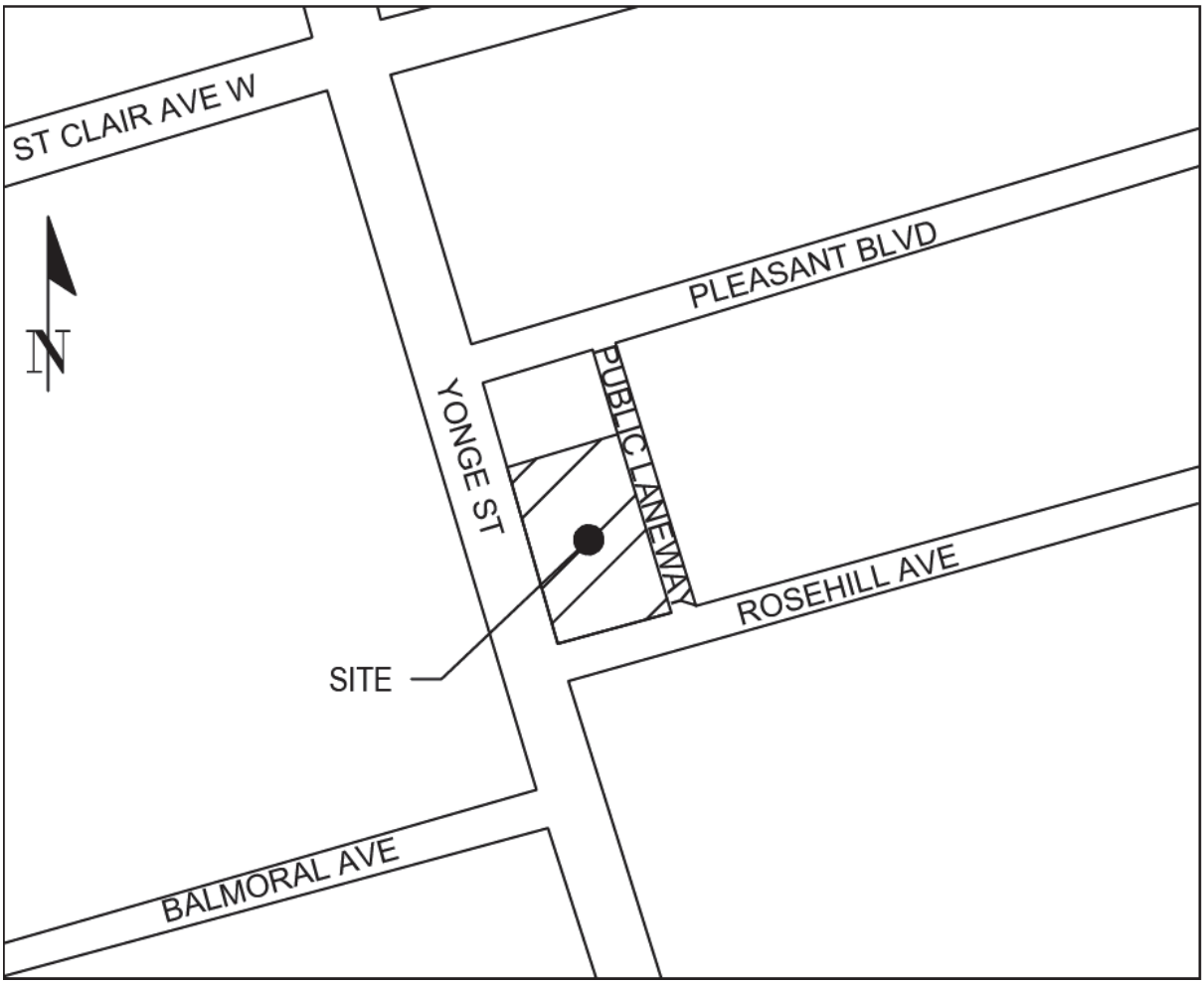


Figure 1: Site Location

3. Sanitary Drainage

3.1 Existing Sanitary Drainage

Sanitary drainage within the vicinity of the proposed development consists of an existing 900x1350mm egg-shaped brick combined storm/sanitary sewer on Yonge Street, an 1125mm circular brick combined sanitary/storm sewer on Yonge Street, a 375mm diameter combined sanitary/storm sewer in the south boulevard of Rosehill Avenue, and an additional 375mm abandoned combined storm/sanitary sewer on Rosehill Avenue. All of these combined sewers discharge into a single larger trunk line on Yonge Street, south of Birch Avenue. Sanitary flows ultimately discharge to the Ashbridges Bay WWTP via the Lower Level Interceptor (LLI) within Front Street.

The size and location of the existing sanitary sewers in the vicinity of the site have been determined from information provided by the City of Toronto including the Digital Map Owners Group of Toronto, as-constructed plan/profile drawings, and Toronto Mono Viewer (TMV).

Under the supervision of GHD, the existing sanitary and storm drainage patterns of the site have been investigated by Global Sewers and Road Maintenance. The discharge locations of sanitary and storm flows from the site in existing conditions have been verified through a dye test investigation. Global has concluded that both storm and sanitary flows from the site currently discharge to combined sewers on Yonge Street and on Rosehill Avenue. Discharge from the 1375 Yonge Street building outlets to the 1350 x 900mm elliptical combined sewer on Yonge Street and 1365 Yonge Street building outlets to the 375mm diameter combined sewer on Rosehill Avenue.

Based on the field observations, the existing storm and sanitary drainage discharges to the same combined sewer overflow. Observations from the dye testing can be found in **Appendix 'A'**.

Yonge Street Combined Sewers

Based on the pre-development land use (commercial retail and office space within the existing 1375 Yonge Street building) we have estimated the peak pre-development domestic sanitary flows to be 0.19 l/s, which is directed to the existing 900x1350mm egg-shaped brick combined sewer on Yonge Street. Our calculations are based on:

Our calculations are based on:

- A commercial GFA of 1,028 m^2 (first floor),
- A total office GFA of 1,028 m^2 (second floor),
- A commercial population rate of 3.3 persons per 100m^2 of GFA,
- An office population rate of 1.1 persons per 100m^2 of GFA, and
- A generation rate of 250 L/s/day for industrial, commercial and institutional land uses.

Furthermore, the storm runoff from the existing building is directed towards the combined sewer on Yonge Street. Since the combined sewers were originally designed to accommodate both sanitary and storm flows, we have estimated that under the existing conditions, the combined sewer system is receiving at minimum 22.7 l/s of storm flows (based on a 2-year rainfall event at the pre-development runoff coefficient of 0.90) from the subject site during minor storm events.

Therefore, in the existing conditions, the combined sewer on Yonge Street receives a minimum total flow of 23.3 l/s.

Stormwater calculations are included in **Appendix 'B'**. Sanitary calculations are in **Appendix 'A'.**

Rosehill Avenue Combined Sewers

Based on the pre-development land use (commercial retail and office space within the existing 1365 Yonge Street building) we have estimated the peak pre-development sanitary flows to be 0.19 l/s, which is directed to the existing 375mm diameter combined sewer on Rosehill Avenue.

- A commercial GFA of 1,077 m^2 (first floor);
- A total office GFA of 1,077 m^2 (second floor);
- A commercial population rate of 3.3 persons per 100m^2 of GFA;
- An office population rate of 1.1 persons per 100m^2 of GFA; and,
- An average generation rate of 250 L/s/day for industrial, commercial and institutional land uses.

Furthermore, the storm runoff from the existing building is directed towards the combined sewer on Rosehill Avenue. Since the combined sewers were originally designed to accommodate both sanitary and storm flows, we have estimated that under the existing conditions, the combined sewer system is receiving at minimum 23.7 l/s of storm flows (based on a 2-year rainfall event at the pre-development runoff coefficient of 0.90) from the subject site during minor storm events.

Therefore, in the existing conditions, the combined sewer on Rosehill Avenue receives a minimum total flow of 24.3 l/s.

Stormwater calculations are included in **Appendix 'B'**. Sanitary calculations are in **Appendix 'A'.**

The total combined minimum flow from the existing buildings to the existing combined sewer system at Yonge and Birch is therefore 47.6 L/s. A summary table has been provided below for each property.

Table 1: Existing Conditions Sanitary Flow Rates

	1365 Yonge Street	1375 Yonge Street
Existing sewer discharge point	Rosehill Avenue 375mm combined sewer	Yonge Street 900x1350mm combined sewer
Sanitary flows to discharge receiving sewer	0.59 L/s	0.57 L/s
Storm flows to discharge receiving sewer	23.7 L/s	22.7 L/s
Total flows to discharge receiving sewer	24.3 L/s	23.3 L/s
Total flows to discharge combined sewer system	**47.6 L/s**	

3.2 Proposed Sanitary Drainage

Contributing sanitary flows from the proposed development were calculated based on the following City of Toronto design criteria:

- A commercial GFA of 384.8 m^2;
- A residential generation rate of 450 litres/person/day;
- A commercial / retail sanitary generation rate of 180,000 L/floor ha/day;
- A residential population density of 1.4 persons/unit (bachelor, 1-bedroom and 1-bedroom+den)
- A residential population density of 2.1 persons/unit (2-bedroom and 2-bedroom+den)
- A residential population density of 3.1 person/unit (3-bedroom)
- A Harmon's peaking factor of 3.7 (Based on Harmon's Equation); and,
- A peak groundwater discharge rate of 0.19 l/s for the backup failsafe groundwater system (see Section 6.2 of this report)

Given the above noted criteria, the Development, with an equivalent population of 1,236 persons, will generate a peak wastewater flow of 24.3 l/s based on the City of Toronto's design criteria. Our calculations are presented in **Appendix 'A'**.

The development will be serviced via a single service connection to the existing 375mm diameter combined sewer located on Rosehill Avenue. The proposed sanitary service will be a 19.8m - 250mm diameter pipe installed at 2.0% grade. Details of the proposed sanitary service connections are shown on our 'Site Servicing & Grading Plan (Drawing SS-1)'. Sanitary service sizing calculations are presented in **Appendix 'A'.**

As per OBC, internal plumbing design to ensure backwater valves are installed to protect fixtures which are below the elevation of the sanitary manhole cover. Backwater valves are to be designed as per OBC Section 7.4.6.4.

MOE Procedure F-5-5

Given that storm flows from the site will be discharged to the dedicated storm sewer system on Rosehill Avenue in the post development condition, conveyance capacity will be created within the City's combined sewer network to even when the increase of domestic sanitary flows from the proposed development site are considered. This is a net benefit to the City.

Flows to the combined sewer overflow would be reduced by 23.3 l/s (47.6 L/s minus 24.3 L/s) in comparison to the pre-development flows. This satisfies the requirements in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Procedure F-5-5, Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Systems.

MOE Procedure F-5-5 is the governing requirement in this situation. Therefore, no off-site improvements or upgrades to the existing combined / sanitary infrastructure will be required to accommodate the subject development.

4. Stormwater Management

Stormwater Management Criteria

Based on the City of Toronto's Wet Weather Flow Management Guidelines, the applicable stormwater management criteria for this 2,105 m^2 development site is as follows:

Water Quantity

- The 100-year post-development storm flows from the site are to be controlled to the allowable release rate that is based on the lesser of the 2-year pre-development flow, 2-year storm flow based on a composite runoff coefficient of 0.50, or the capacity of the receiving storm sewer.

Water Balance

- On-site runoff retention from a 5mm, 24-hour storm event.

Water Quality

- 80% removal of TSS on an average annual loading basis.

Erosion & Sediment Control During Construction

- Temporary erosion and sediment control is to be implemented on-site during construction.

Discharge Criteria to Municipal Infrastructure

- Discharge the minor flow to the 2-year design storm event using the Rational Method / IDF Curves, or at the capacity of the sewer whichever is less.

4.1 Pre-Development Conditions

The topography of the site indicates that the site generally slopes from northwest to southeast, with overland flow being directed to Rosehill Avenue right-of-way. The topography indicates that there is no overland flow from external areas that is directed onto the site.

There is an existing dedicated 300mm diameter storm sewer within the adjoining Rosehill Avenue that discharges westerly to an existing 1350mm diameter storm sewer in Yonge Street via a 300mm diameter vertical drop. The 1350mm diameter Yonge Street storm sewer travels southerly on Yonge Street, and eventually discharges to an existing 3750mm storm trunk sewer that flows westerly on Macpherson Avenue.

In existing conditions, storm discharge from the site does not discharge to the existing storm sewer system. Storm flows discharge to the existing combined sewer system, split into two (2) drainage areas:

- Rosehill catchment – storm flows collected from 1365 Yonge Street property within this drainage area discharges to the 375mm diameter combined sewer on Rosehill Avenue.
- Yonge catchment – storm flows collected from 1375 Yonge Street property within this drainage area discharges to the 900mm x 1350mm egg-shaped combined brick sewer on Yonge Street

The size and location of the existing storm and combined sewers in the vicinity of the subject site have been determined from information provided by the City of Toronto including drainage area maps, as-constructed plan/profile drawings, and Toronto Mono Viewer (TMV).

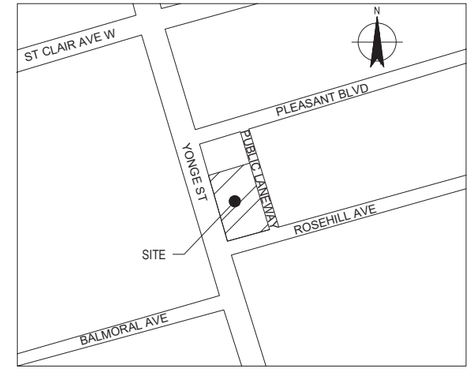
Water Quantity

The pre-development runoff rates for the site were calculated based on controlled roof areas totaling 2,105 m^2.

The 2-year, 5-year and 100-year pre-development release rates were calculated to be 46 l/s, 69 l/s and 132 l/s respectively, and a 2-year storm flow of 26 l/s at a runoff coefficient of 0.50.

NOTES:

1. EXISTING ROOF DRAINAGE ARE CAPTURED AND CONVEYED INTERNALLY AND DISCHARGED TO EX COMBINED SEWER ON ROSEHILL AVENUE AND YONGE STREET.
2. LEGAL & TOPOGRAPHIC SURVEY PREPARED BY LLOYD & PURCELL Ltd., DATED APRIL 3 2018.
3. SITE PLAN INFORMATION PROVIDED BY TURNER FLEISCHER ARCHITECTS INC., DATED MAY 19 2023.



KEY PLAN

PUBLIC LANEWAY
FUTURE ROAD WIDENING

YONGE CATCHMENT

1028M2
0.90

ROSEHILL CATCHMENT

1077M2
0.90

ROSEHILL AVENUE

YONGE STREET

EXISTING COMBINED SANITARY AND STORM SERVICE TO EXISTING 1350X900 ELLIPTICAL COMBINED SEWER ON YONGE STREET.

EXISTING COMBINED SANITARY AND STORM CONNECTION TO EXISTING 375Ø COMBINED SEWER ON ROSEHILL AVENUE.

LAND CONVEYANCE TO CITY

LEGEND

25 M2 — DRAINAGE AREA (m²)

0.50 — DRAINAGE COEFFICEINT

- ROOF / AMENITY
- GREEN ROOF/GRASS
- PROPERTY LINE
- HARD SURFACE
- EMERGENCY OVERLAND DRAINAGE FLOW

BENCHMARK

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE REFERRED TO THE CITY OF TORONTO BENCHMARK N° 12219741472, HAVING A PUBLISHED ELEVATION OF 140.121 METERS.

YONGE AND ROSEHILL INC.
1365-1375 YONGE STREET

PRE-DEVELOPMENT STORM DRAINAGE PLAN

GHD
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date	MAY 2023.	rev no.	D

FIGURE 2

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Given the above, the allowable release flow rate for the subject site was calculated to be 25.8 l/s, with flows discharging to the storm sewer on Rosehill Avenue, and discharges to the Yonge Street sub-trunk storm sewer just downstream. Our calculations are presented in **Appendix 'B'**.

Water Quality

There was no water quality control measure incorporated on the subject lands under pre-development conditions. As such, all runoff from the site was discharged untreated to the adjacent municipal sewers.

4.2 Post-Development Conditions

Quantity Control

Based on the proposed site plan, the post-development runoff rate was calculated for the 100-year rainfall event. Our calculations were based on the following:

- Controlled roof areas of 1157 m^2
- Green Roof Area of 530 m^2
- Paved / impervious areas totaling 418 m^2

Given the above, the 100-year post-development flows were determined to be 115.2 l/s. The required quantity control calculations was completed using the Rational method and are presented in **Appendix 'B'.**

Since the 100-year post-development flow rate of 115.2 l/s exceeds the adjusted allowable release rate of 25.8 l/s, there will be a requirement for quantity controls and on-site storage is required to attenuate peak flow.

A 105mm diameter orifice plate was selected to attenuate the post-development flows from the development to 25.5 l/s. A corresponding stormwater storage volume of 53.8 m^3 will be required to control post-development storm flows below the allowable release rate of 25.8 l/s. The orifice plate calculations account for the surcharged sewer HGL under 100-year conditions and are presented in **Appendix 'B'.**

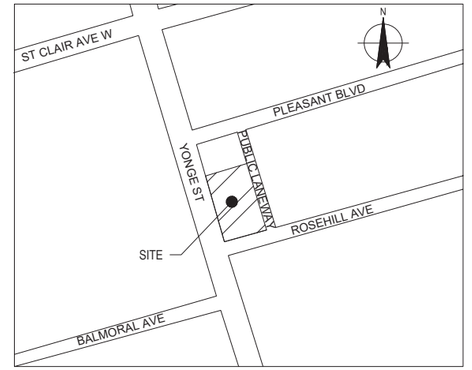
The aforementioned storage volume requirement of 54.5 m^3 will be met through the implementation of a storage cistern, with a footprint of 48.5 m^2, to be located within the underground parking structure for the proposed building.

The controlled 100-year post-development flows of 25.5 l/s achieved through the implementation of the proposed 105mm diameter orifice plate will be discharged via a new storm service connection to the adjacent existing municipal 300mm diameter storm sewer on Rosehill Avenue. The proposed storm service will be a 12.7m - 150mm diameter pipe installed at 3.0% grade. Details of the proposed storm connection are shown on our 'Site Servicing & Grading Plan (Drawing SS-1)'.

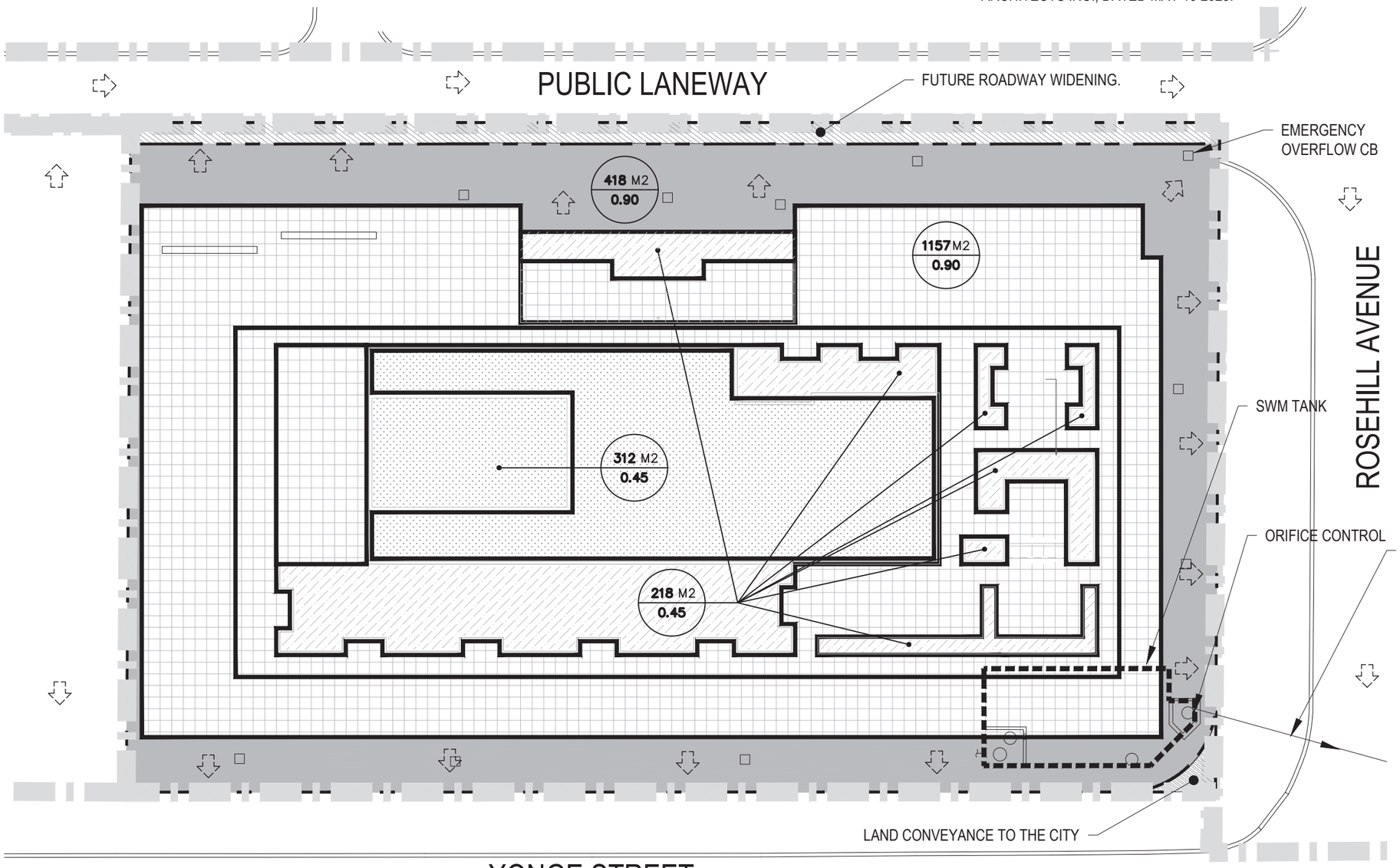
Post development, all flows up to the 100-year storm are controlled through on-site grading and area drains. There are no uncontrolled flows up to the 100-year storm condition. Storms in excess of the 100-year flows are designed to sheet flow onto the neighboring ROW's as shown in Figure 3 on the following page.

NOTES:

1. SITE DRAINAGE TO BE CAPTURED AND CONVEYED TO INTERNAL STORM STORAGE TANK AND DISCHARGED TO EX 300Ø STORM SEWER ON YONGE STREET.
2. LEGAL & TOPOGRAPHIC SURVEY PREPARED BY LLOYD & PURCELL Ltd., DATED APRIL 3 2018.
3. SITE PLAN INFORMATION PROVIDED BY TURNER FLEISCHER ARCHITECTS INC., DATED MAY 19 2023.



KEY PLAN



LEGEND

25 M2 / 0.50 — DRAINAGE AREA (m²) / DRAINAGE COEFFICEINT

- ROAD WIDENING
- HARD SURFACE
- ROOF / AMENITY
- EMERGENCY OVERLAND DRAINAGE FLOW
- GREEN ROOF (EXTENSIVE)
- GREEN ROOF (INTENSIVE)
- PROPERTY LINE

YONGE AND ROSEHILL INC.
1365-1375 YONGE STREET

POST-DEVELOPMENT STORM DRAINAGE PLAN

GHD

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FIGURE 3

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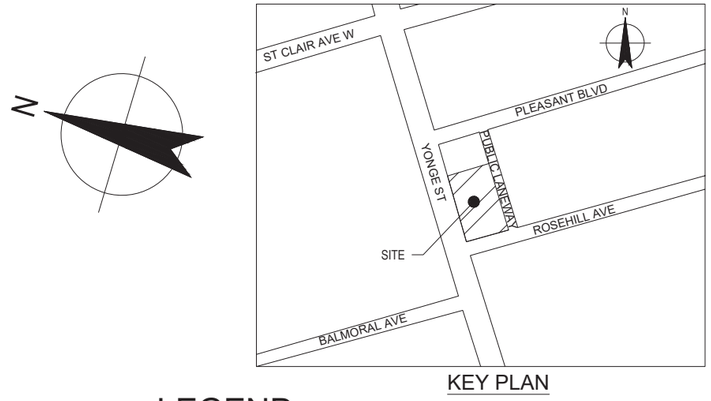
NOTES:

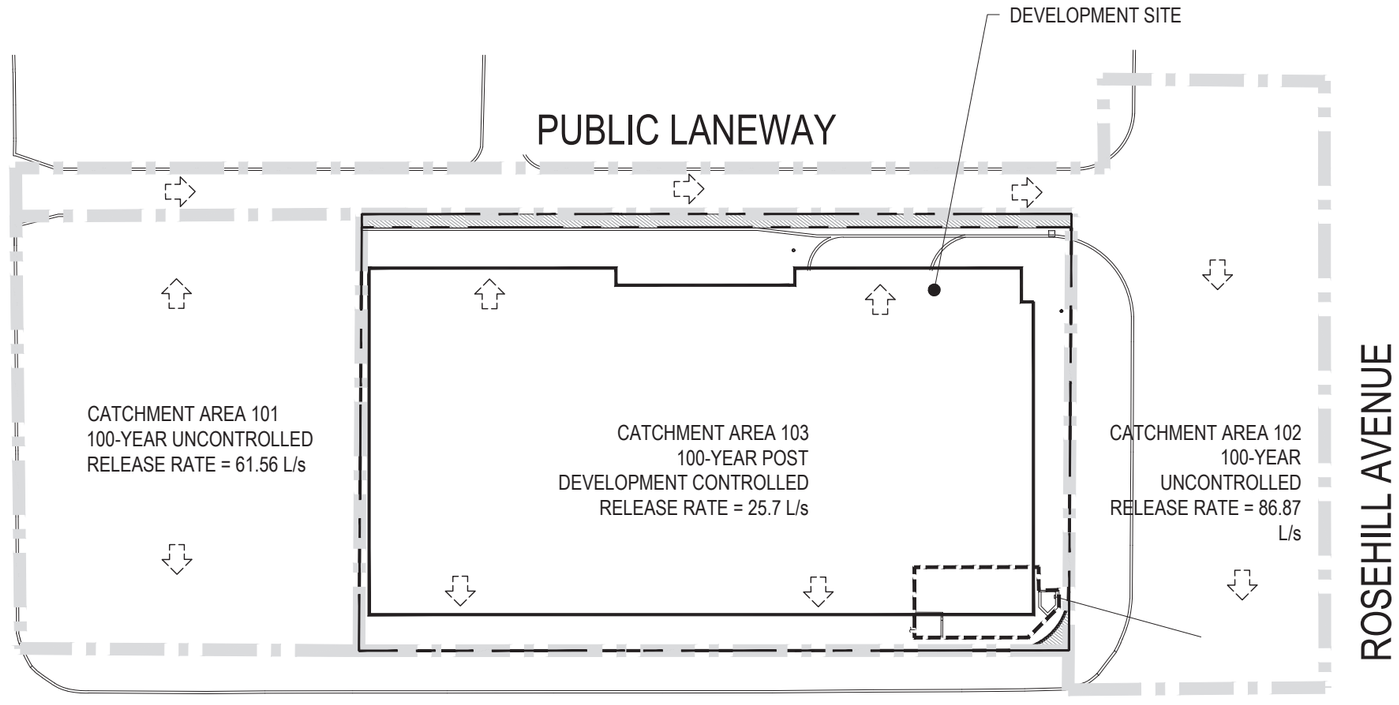
1. SITE DRAINAGE TO BE CAPTURED AND CONVEYED TO INTERNAL STORM STORAGE TANK AND DISCHARGED TO EX 300Ø STORM SEWER ON YONGE STREET.
2. LEGAL & TOPOGRAPHIC SURVEY PREPARED BY LLOYD & PURCELL Ltd., DATED APRIL 3 2018.
3. SITE PLAN INFORMATION PROVIDED BY TURNER FLEISCHER ARCHITECTS INC., DATED MAY 19 2023.



KEY PLAN

LEGEND

- PROPERTY LINE
- CATCHMENT AREA BOUNDARY
- EMERGENCY OVERLAND DRAINAGE FLOW



YONGE AND ROSEHILL INC.
1365-1375 YONGE STREET

STORM DRAINAGE AREAS POST CONDITION

GHD

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FIGURE 4

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4.2.1 HGL Model of Storm Sewer System

PCSWMM model was completed to determine the flow characteristics of the storm sewers on Rosehill Avenue in existing and in proposed conditions. Note that the PCSWMM model was developed for the purpose to determine the hydraulic grade line information within the storm sewer only, for quantity confrol requirement, please refer to the rational method in Section 4.2 above.

The single-event PCSWMM models used 4h Chicago storm distributions and the City of Toronto IDF data to estimate existing and proposed conditions for precipitation events ranging from the 2 to the 100 year storm. The PCSWMM program was also used to evaluate HGL elevations and hydraulic regimes in the stormwater management system under existing and proposed conditions from the external lands upstream and adjacent to the site. Inputs and outputs from the PCSWMM model can be found in **Appendix 'B'.**

The analysis was taken up to the 1350mm diameter storm trunk on Yonge Street which is installed at a depth of 7.8m below ground surface. Given the size and depth of this pipe, it is assumed that this sewer has the capacity to intake incoming flows with no negative impacts on the existing infrastructure. No existing HGL issues have been observed at this time that would indicate that the 1350mm diameter sewer is operating under surcharge. As a conservative measure, all scenarios assumed that the 1350mm diameter trunk sewer is operating under full flow conditions to the obvert of the pipe.

Existing System

Under existing conditions, we have assumed that storm flows collected from the building north of the site (Catchment 101 – refer to Figure 4 in **Appendix 'B'**) discharge to the storm sewer system within the public laneway. This assumption was taken to present the 'worst-case' scenario. Should the storm flows from the building to the north discharge to Yonge Street, the actual conditions would be better than the results presented in this report.

Flows captured by the catchbasins on the laneway, and at the intersection of the laneway and Rosehill Avenue (Catchment 102), are directed to the 300mm diameter storm sewer on Rosehill Avenue. Flows from the subject site have been confirmed to discharge to the existing combined sewers, and as such do not contribute to the existing storm sewer system on Rosehill Avenue or Yonge St.

The PCSWMM model estimates peak runoff rates by applying the rain volume of the Chicago Storm over the drainage area and subtracting infiltration losses based on catchment-specific soil characteristics; the resulting peak flow hydrograph is calculated from the remaining runoff using unit hydrograph methodology. The existing conditions flow rates are presented in Table 2.

Table 2: Existing Conditions Flow Rates

CATCH.	DESCRIPTION	AREA (ha)	IMP (%)	FLOW RATES IN L/s BY RETURN YEAR	
				2 yr	100 yr
101	Building	0.90	95	22.30	61.56
102	Laneway/Roadway	1.27	95	31.47	86.87

The hydraulic modelling features of PCSWMM were used to evaluate the hydraulic performance (HGL) of the storm sewer system under the hydrological conditions. The HGL was calculated by PCSWMM using continuity, energy and momentum equations assuming normal flow boundary conditions downstream.

The PCSWMM hydraulic models show that during the 2 year storm the system operates under an open channel hydraulic regime for all parts of the system except for EXMH2, which shows a slight surcharge. As the volume and peak intensities of the simulated storm events increase, the hydraulic regime changes to surcharged conditions. Surcharging conditions can be seen within the system from EXMH2 to EXCBMH during the 100-year storm event. The results of the hydraulic models are presented in Table 3 below and illustrated in **Appendix B.**

Table 3: Existing HGL Elevations

US MH	DS MH	MAX HGL ELEVATION [DS Flow Rates (L/s)]		Surface Elevation (MASL)
		2 yr	100 yr	
CBMH	EXMH3	139.09 [53.7]	140.00 [148.1]	141.27
EXMH3	EXMH2	138.97 [53.6]	139.79 [148.1]	142.16
EXMH2	EXMH1	138.97 [75.6]	139.53 [170.12]	142.38

Proposed System

Under the proposed conditions, the model assumes that the proposed development (Catchment 103) will be discharging to the storm sewer system at a fixed release rate of 25.7 l/s. The proposed pervious and impervious areas were considered, resulting in an overall site imperviousness of 75%. The proposed conditions flow rates are presented in Table 4.

Table 4: Proposed Conditions Flow Rates

CATCH.	DESCRIPTION	AREA (ha)	IMP (%)	FLOW RATES IN L/s BY RETURN YEAR	
				2 yr	100 yr
101	Building	0.10	95	24.13	66.61
102	Laneway/Roadway	0.12	95	28.96	79.92
103	Proposed Development	0.21	72	40.96	122.55

As per existing conditions, the PCSWMM hydraulic models show that during progressively more infrequent events, the storm system operates under surcharge conditions. However, the change in surcharge between existing and proposed conditions is minimal. The results of the hydraulic models are presented in Table 5 below and illustrated in **Appendix B**.

Table 5: Proposed HGL Elevations

US MH	DS MH	MAX HGL ELEVATION (MASL) [DS Flow Rates (L/s)]		Surface Elevation (MASL)	Difference in 100 yr Surcharge Between Existing and Proposed HGL (m)
		2 yr	100 yr		
CBMH	EXMH3	138.85 [53.0]	140.10 [146.52]	141.27	+0.10
EXMH3	EXMH2	138.83 [51.6]	139.89 [146.52]	142.16	+0.10
EXMH2	EXMH1	138.77 [88.2]	139.64 [188.68]	142.38	+0.09

The hydraulic grade lines of the surcharged flow are well below the road elevations, with the HGL of the most critical surcharge point being (141.27m-140.10m)1.17m below the surface in the 100-year storm scenario. There are no known service connections to the existing storm sewer at the surcharge points. As such, the existing storm system is deemed to have the capacity to convey the proposed flows up to the 100-year storm scenario before overland emergency relief is required.

Proposed Service Connection

Due to the flat slope of the 300mm diameter storm leg (between EXMH2 and EXMH1) on Rosehill Avenue in which the proposed storm service from the site discharges to, an additional model was generated in PCSWMM to determine the conditions of the storm connection, storm tank inside the building, and the receiving storm sewer leg during a 2 and 100 year storm.

The results of the hydraulic models are presented in Table 6 below and illustrated in **Appendix B**.

Table 6: Proposed Service Connection Conditions

Storm Event	Orifice Flow Rate (L/s)	HGL ELEVATION AT CONNECTION	Surcharge at Connection (m)	Water Level @ Ctrl MH (m)
2 Yr	23.8	138.98	0.00	139.54
100 Yr	24.3	140.98	0.46	139.75

The PCSWMM hydraulic models indicate that during a 2-year storm event, the service connection operates under an open channel hydraulic regime. In storm events greater than the 2-year storm, the system begins to operate under head due to the surcharged condition in the Rosehill storm system within the pipe between MH1 and MH2. Using the PCSWMM model, an orifice plate size of 105mm diameter was selected to meet the maximum allowable release rate of 25.8 l/s. The water level in the control MH has been accounted for in the orifice design.

To ensure that the surcharge conditions of the outside system do not affect the storage capacity of the storm cistern on the property, the storage tank has been oversized to provide 82.9 m^3 of storage above the invert of the outlet and 61.2 m3 of storage above the 100-year HGL, significantly more than the required storage volume. The PCSWMM program indicates that the 100-year water level will be at 140.98m, 0.41m below the proposed overflow outlet elevation of 141.39m at the south-east corner of the site. Should a storm event greater than the 100-year storm occurs, the overflow point will act as a relief to convey flows overland to the Rosehill Avenue right-of-way.

It should be noted that the difference in 100-year HGL level in the tank based on the rational method (140.87m) and the PCSWMM model (140.98m) is because the PCSWMM model utilizes more conservative estimates in its parameters.

4.2.2 Water Balance

The objective of the water balance target is to preserve pre-development hydrology through the combination of various SWM practices. According to the WWFMMP guidelines the subject area must be able to retain on-site all the runoff from a small design rainfall event.

A 5mm 24-hour storm event was used for the small design rainfall event. This runoff must be retained through infiltration, evapotranspiration or rainwater reuse. Based on a SWM captured drainage area of 2,105m^2 (which excludes uncontrolled areas) a 5mm 24-hour storm is equivalent to 10.5 m^3 of total site storage (2,105m^2 x 0.005m).

Without any specific on-site retention measures, the proposed development would achieve the following levels of water balance as seen in Table 7.

Table 7: Achieved Water Balance

Site Description	Fraction of Site Area*	Initial Abstraction (mm)	Overall Initial Abstraction (mm)
Controlled Roof Areas	0.55 (1157 m^2)	1.0	0.55
Green Roof Areas (Extensive)	0.15 (312 m^2)	5.0	0.74
Green Roof Areas (Intensive)	0.10 (218 m^2)	7.0	0.72
Paved / Impervious Areas	0.20 (418 m^2)	1.0	0.20
TOTAL	1.00 (2,105 m^2)	**-**	**2.21**

*Discrepancies between areas and fractions are due to rounding.

Based on Table 7, the site will achieve 2.21mm in initial abstraction given the proposed development conditions. This corresponds to a shortfall of 2.79mm (5mm – 2.21mm) in initial abstraction or a water balance volume requirement of **5.9 m^3** (2,105m^2 x 2.79 mm).

Information from the consultant team indicates that irrigation can re-use up to **4.3 m3** of stormwater within 72 hours (see **Appendix 'B'**). Rainwater will be collected and harvested via a sump incorporated in the storage tank below the invert of the orifice, capable of holding 8.0 m^3, and pumped out of the tank for the necessary irrigation uses. This will be detailed on the mechanical engineering drawings for the building.

Although the site does not meet the 5 mm initial abstraction requirement, best efforts have been made, including maximizing green roof areas and maximizing irrigation usage. The site does not have clearance for an infiltration solution and garbage washdown is not accepted by the city.

4.2.3 Water Quality

There are a number of Stormwater Management Practices (SWMPs) available to meet the various aspects of water quality control. However, site characteristics and the nature of the development will determine the applicability and possible usage of many of the different SWMPs.

The stormwater management approach endorsed by the Ministry of the Environment (MOE) is to preserve the natural hydrologic cycle. As discussed in the March 2003 MOE manual, the establishment of water quality criteria in the absence of a subwatershed study will have a certain degree of subjectivity. The level of protection is selected such that the existing aquatic habitat is maintained or enhanced. The levels of protection identified in the manual are given as Basic, Normal, and Enhanced, where a watercourse requiring Basic protection has less stringent control requirements than one requiring Normal protection. However, the strategy acknowledges that individual development plans cannot explicitly address cumulative effects.

Stormwater management measures are to be assessed in the following order:

1. stormwater lot level controls,
2. stormwater conveyance controls, and
3. end-of-pipe stormwater management facilities.

Lot level controls would include such measures as: rainwater leaders discharging to infiltration areas; rainwater leaders discharging to a subsurface soakaway pit; reducing grassed site grading to a minimum of 0.5%; separate foundation drains and routing of storm runoff along grassed swales.

Conveyance controls would include perforated storm sewers, pervious catchbasins, and grassed swales. The selection of conveyance control is very much dependent on municipal requirements.

It must be an acceptable form of servicing for a municipality and the municipality must be willing to implement and maintain these controls.

End-of-pipe facilities receive water from the conveyance system and discharges the water to the receiving system. The March 2003 MOE Stormwater Management Planning and Design (SWMPD) Manual includes nine categories of end-of-pipe facilities as follows: wet ponds, wetlands, dry ponds, infiltration basins, infiltration trenches, filter strips, buffer strips, sand filters, and oil/grit separators.

Physical factors such as topography, soil stratification, depth to bedrock, depth to water table and drainage areas are factors to be assessed in determining SWMP type. The manual indicates that the selection and design of an end-of-pipe system in the absence of a subwatershed plan is driven by receiving water concerns. The selection of the appropriate water quality measure is based on four factors, namely:

- Conformity with development plan
- Cost
- Technical effectiveness
- Physical suitability

As defined by the March 2003 SWMPD Manual and as required by the City of Toronto's Wet Weather Flow Management Master Plan (WWFMMP) Guidelines, an 'Enhanced' level of water quality control must be achieved for the subject site.

The potential SWMP alternatives have been evaluated with respect to their applicability for this development and implemented in a manner to achieve the best total suspended solids (TSS) removal possible. Table 8 below summarizes the proposed measures that in combination will provide an overall TSS removal of 80.00% for the post-development site.

Table 8: Proposed Approach for Water Quality Treatment

Site Description	Fraction of Site Area**	TSS Removal (%) ***	Overall TSS Removal (%)
Controlled Roof Areas	0.55 (1157 m^2)	80	44
Green Roof Areas	0.25 (530 m^2)	80	20
Paved / Impervious Areas	0.00 (0 m^2)	0	0
MFS Treated Pavement Area	0.20 (418 m^2)	80	16
TOTAL	1.00 (2,105 m^2)	-	**80**

*Discrepancies between areas and fractions are due to rounding **80% applied to landscaped areas, which are reinforced by runoff reduction. ***Uncontrolled areas excluded from calculations

Based on the above, the subject development site will achieve a level of 80% TSS removal. The Media Filtration System (MFS) unit is proposed upstream of the storage tank to allow for cleansing of the rainwater collected from paved / driveway areas before entering the storage tank. The MFS connection to the storm tank will be coordinated with the design team including the mechanical and architectural consultants. The unit can be located upstream of the storage component of the tank and has been sized to only treat flows captured by stormwater inlets located in the impervious / driveway areas. The preliminary sizing calculations and specifications for the selected MFS unit are included in **Appendix 'B'.**

4.2.4 Erosion and Sediment Control

Erosion and sediment control will be provided on-site during construction, including the provision of a silt fence around the site perimeter, silt sacks on the external catchbasins adjacent to the site and a mud mat at the access point of the site to control mud tracking by construction traffic. Regular maintenance of the above measures provided herein should be provided during construction.

4.2.5 Site Grading & Stormwater Capture

Site grading is to be designed such that runoff from rainfall events beyond the 100-year rainfall event will be directed overland away from the proposed building to the existing adjacent road allowances.

Due to the requirement for stormwater storage, the internal storm sewer system within the proposed building will operate in a surcharged condition during major rainfall events. As such, all internal inlet structures (area drains, catchbasins, etc.) which cannot be drained by gravity to the proposed service connection, and sunken or depressed areas without overland relief are to be collected in a sump and pumped either to the surface or to the internal storm sewer system.

The design of all internal piping within the proposed underground structure must provide adequate capacity for full capture and conveyance of all flows generated by storms up to and including the 100-year rainfall event. All design and associated calculations for the internal storm system, including the design of the internal inlet structures, piping and mechanical appurtenances is to be completed by the Mechanical Engineer.

Table 9: Water Quantity Summary Table

Description	Quantity
Calculated allowable release rate for total site	25.8 l/s
Actual release rate for total site in 100-year event	25.5 l/s
Required storage	53.8 m^3
Provided storage above discharge invert	82.9 m^3
Provided storage above 100-year sewer HGL	61.2 m^3
Flow attenuation method	105mm Orifice Plate
Water Balance Required	5.9 m^3
Water Balance Provided	4.3 m^3

5. Water Distribution

Water supply in the vicinity of the subject lands consists of an existing 150 mm diameter watermain located on Rosehill Avenue, and a 150 mm diameter watermain and a 300mm diameter watermain located on Yonge Street.

Domestic Demand

The domestic demand for the site is based on an equivalent population of 1236 persons. Given a consumption rate of 191 litres/capita/day for high-rise condominium buildings, the domestic demand for the site is as follows;

Average Day = 191 liters /capita/day x 1236 persons = 163.90 litres/min.

Maximum Day = 1.3 x Average Day = 213.1 litres/min.

Peak Hour = 2.5 x Average Day = 409.8 litres/min.

Fire Demand

Based on the provided site plan, it is assumed that the building will have protected openings (as defined by the Fire Underwriters Survey) and a sprinkler system. It is also assumed that the building will be constructed of fire resistive material. Given the above, the estimated fire flow required is given by the following formula (as based on the Fire Underwriters Survey):

F = 220 * C * A^0.5, where 'F' is the calculated fire flow required, based on the floor area and building material resistance to fire.

For a building with fire resistive construction (< 3 hours), C = 0.6.

For fire resistive buildings with adequately protected vertical openings, 'A' is taken as the area of the largest floor plus 25% of each of the immediately adjoining floors (excluding the basement). For this

building the fifth floor had the largest area, with the fourth and sixth adjoining floors being used in the calculation.

As such, A = 2,011 m^2

Therefore F = 6,000 litres/min.

The proposed development has an occupancy hazard surcharge of 'limited combustible' since it is a residential apartment. As a result the fire flow can be reduced by 15%, thus F = 5,100 liters/min.

As the development will be equipped with an automatic sprinkler system, the fire flow may be further reduced by 30% (equalling 1,530 litres/min).

F = 3,570 litres/min.

Finally, the fire flow will be increased by 75% due to exposure to structures within 45 meters of the proposed building (equalling 3,830 litres/min).

Thus, F = 7,000 litres/min.

Our calculations are included in **Appendix 'C'** at the back of this report.

Total Demand

The total demand is the greater of the Maximum Day Domestic plus the Fire Flow or the Peak Hour demand. Thus, the total demand for the subject development is 7,213 liters per minute (120.2 liters per second or 1,906 U.S. gallons per minutes).

To confirm the adequacy of the existing municipal water distribution system to meet domestic water supply and fire flow requirements for the proposed development, flow and pressure have been undertaken for the 150mm diameter watermain system on Yonge Street and Rosehill Avenue adjacent to the subject site, by Corix Water Services Inc. The test was conducted on May 8th, 2018 at 10:00AM and resulted in a static pressure of 56 pounds per square inch, a residual pressure of 47 pounds per square inch at a flow rate of 1,894 U.S. gallons per minute.

Based on the above information we have calculated the available flow at the desired residual pressure of 20 pounds per square inch, as per the guidelines provided by the 'National Fire Protection Association (NFPA), to be 4,010 U.S. gallons per minute (15,180 liters per minute or 253 liters per second) which is far above the required capacity for the site. As such, the existing 150mm diameter watermain on Yonge Street and Rosehill Avenue can adequately service the development, providing the total max day plus fire demand of 7,213 liters per minute (120.2 liters per second or 1,906 U.S. gallons per minutes).

We would recommend that the site be serviced primarily off the existing 150mm diameter watermain on Rosehill Avenue with a 150mm diameter fire service and a 100mm domestic water service, and a second emergency 150mm fire service off the existing 150mm diameter watermain on Yonge Street. Details of the proposed water service connections are shown on our 'Site Servicing & Grading Plan (Drawing SS-1)'.

6. Groundwater Discharge

The proposed development includes an underground parking facility. Since the lowest finished floor elevation of the underground facility is below the groundwater table, measures to deal with groundwater are anticipated.

These measures are described below.

6.1 Short Term Groundwater Discharge

The temporary groundwater discharge strategy for the site plan is intended to discharge to the combined sewer system. The discharge will be addressed by way of an application to Toronto Water.

As per the hydrogeological report prepared by GEMS, dated April 2023, the temporary dewatering quantity with safety factor included for the development is calculated to be 145,000 L/day (1.7 L/s). Flows will not need to be treated to meet the City's standards for discharge to the combined sewer system, as the groundwater quality meets the City's requirements. Discharge will be pumped to the existing 1350x900mm egg-shaped combined sewer on Yonge Street and the existing 375mm diameter combined sewer on Rosehill Avenue via a layflat discharge hose from the site. The rate will be set to equal, or less than, the existing discharge to the combined sewers (47.6 l/s) since the domestic sanitary flows and collected storm flows from the site will not be present at that time. As such, the pump rate of each discharge point will be set for no more than 23.8 l/s, with a total site discharge of no more than 47.6 l/s.

6.2 Long Term Groundwater

The permanent groundwater strategy is to utilize a subfloor drainage system to prevent build-up of hydrostatic forces along the foundation wall and to prevent seepage into the foundation. As per the hydrogeological report prepared by GEMS, dated April 2023, the estimated maximum volume quantified to be discharged as part of the drainage system with safety factor applied is 10,712.4 L/day (equivalent to 10.7 m^3/day), and the quality of discharge will meet the sanitary/combined sewer By-law limits. The discharge system will be designed to discharge to the 375mm combined sewer on Rosehill Avenue at a peak rate of 0.19 l/s (equivalent to 16 m^3/day) via the proposed sanitary connection.

It should be noted that the Site Plan Control application for the site predates the Foundation Drainage Policy and Guidelines (January 2022) and can therefore discharge groundwater under the long term scenario.

7. Conclusion

Based on the above, we are satisfied that the proposed development can be serviced utilizing the existing surrounding infrastructure. This can be achieved without any adverse impact to the municipal services of the surrounding areas.

The key findings are summarized as follows:

- A 250mm diameter sanitary connection will be provided to the 375mm combined sewer on Rosehill Avenue. The proposed sanitary discharge is 24.3 l/s.
- A 150mm diameter storm connection will be provided to the 300mm diameter storm sewer on Rosehill Avenue. Flows are controlled via a 105mm diameter orifice plate to control the 100-year post-

development flows to a release rate of 25.5 l/s. A storm cistern in the underground parking level will provide 82.9 m³ of quantity storage with a gravity outlet, and 61.2 m3 of quantity storage above the 100-year control MH HGL.

- The shortfall of approximately 2.79mm in initial abstraction results in a water balance volume of approximately 5.9 m³ of storage, which will be detained in the rainwater harvesting sump of the storm cistern. Irrigation will reuse 4.33 m^3 over 72 hours.
- Although the site does not meet the 5 mm initial abstraction requirement, best efforts have been made, including maximizing green roof areas and maximizing irrigation usage. The site does not have clearance for an infiltration solution and garbage washdown is not accepted by the city.
- A MFS unit is proposed to meet the 80% TSS removal target, and will allow the site to reach 80.00% TSS removal.
- Site grading will be such that runoff from rainfall event beyond the 100-year rainfall event will be directed away from the building to the existing road allowances via overland flow.
- A proposed 150mm diameter fire connection will be provided from the existing 150mm diameter watermain located on Yonge Street, and a proposed 150mm diameter domestic + fire combined connection will be provided from the existing 150mm diameter watermain on Rosehill Avenue.
- Groundwater will discharge to the combined sewers on Yonge Street and Rosehill Avenue during construction.
- The development will utilize a subfloor drainage system to prevent seepage into the foundation. This system will discharge a peak flow of 0.19 l/s to the combined sewer system via the proposed sanitary connection. As the Site Plan Control Application predates the foundation drainage policy by the City of Toronto (2021), long-term discharge is acceptable.

Please do not hesitate to contact our office should you have any questions or concerns regarding this assessment.

Sincerely,

GHD

Nelson Wong, P.Eng
Senior Project Manager
905 752 4310

Mark Wong
Designer
905 752 4373

NW/en

Appendices

Appendix A
Dye Test Investigation Report
Sanitary Sewer Calculations

Site Review #1 – Sewer Investigation

Project Name:	Sunrise Senior Living Residences	Project No.:	11156419
Date of Report:	April 18, 2018	Contractor:	Global Road and Sewer Maintenance Ltd.
Location:	City of Toronto	Owner:	Sunrise Homes
Report Completed By:	Andrew Karakatsanis		

1. Works Completed	
Wednesday, April 18, 2018 – Partly Cloudy, 6°C	
Time Onsite: 8:30 a.m. – 5:30 p.m.	
Purpose of Visit: To determine where all sanitary and storm services of the buildings drain	
Deficiencies Noted: N/A	
Equipment/Labour: 1 Foreman (Julio), 2 Labourers	
8:30 a.m.	- Spoke with foreman on the phone about schedule, crew to arrive shortly
9:00 a.m.	- Crew arrives on site. Unloads all necessary equipment. ie. push camera and accessories.
9:30 a.m.	- Access roof and attempt to feed the push camera down roof spouts. - Camera can't fit through the elbows in the roof down spouts (multiple down spouts were tested).
11:00 a.m.	- Accessed the basement of 1365 Yonge Street. - Pushed the camera through the cleanout for sanitary service. Camera was found in the combined sewer manhole on the South side of Rosehill Avenue. (See the attached drawing and the pictures below)
12:00 p.m.	- The contractor poured a gallon of pink dyed water down multiple roof drains on 1365 Yonge St. - Pink dyed water was observed in both the sanitary service cleanout and the combined sewer manhole on Rosehill.
1:00 p.m.	- Accessed the basement of 1375 Yonge Street. - Moved existing restaurant appliances around to find the sanitary cleanout.
1:30 p.m.	- Pushed the camera through the cleanout for sanitary service. Sanitary service line shows the connection to a brick sewer. The contractor attempted to find the camera head with a sonar reading device but ultimately could not locate it. By the distance measured from the sanitary cleanout it was concluded that the connection is made to the 1350mm Egg Shaped brick combined sewer in the middle of Yonge Street.
4:30 p.m.	- The contractor poured a gallon of pink dyed water down the roof drain for 1375 Yonge St. - Pink dyed water was observed in the sanitary service cleanout.
5:30 p.m.	- The contractor left the site.

Figure 1: View looking down into the combined sewer MH on Rosehill Ave. The camera is seen exiting the 1365 Yonge St. sanitary service connection

Figure 2: Inside view of the egg-shaped combined sewer, taken from the camera that entered in the 1375 Yonge St. sanitary service clean out

Pleasant Blvd

Pleasant Blvd

Yonge St

Rosehill Ave

Yonge St

Balmoral Ave

SUBJECT SITE

TAMBLYN LANE

PLEASANT BOULEVARD

STREET

YONGE STREET

ROSEHILL AVENUE

BALMORAL AVENUE

LANE

LANE (CLOSED)

SAN C/O

SAN C/O

SAN + STM SERVICE CONN. FOR 1375 YONGE ST. CONCLUDED TO CONNECT TO 1350mm EGG SHAPED BRICK SEWER.

1365 YONGE ST. SAN + STM SERVICE CONN. TO 375mm COMB.

C/O = CLEAN OUT

Global Road and Sewer Maintenance Ltd.

69 Maplecrete Road Concord, Ontario L4K 1A5
Tel: (905) 738-6704 Fax: (905) 738-1303
Web: www.globalsewer.com Email: infoglobalsewer.com

April 25, 2018

GHD
140 Allstate Parkway
Markham, Ontario, L3R 5Y8
Attention: Tom Cobitz

Re: Dye Tests at 1365 and 1375 Yonge Street, Toronto

Dear Mr. Cobitz,

This communication provides confirmation that dye tests were performed by our company on April 18, 2018 at 1365 Yonge Street, Toronto and 1375 Yonge Street, Toronto and was witnessed by a representative from GHD.

Our crew who executed the tests reported the following:

- **1365 Yonge Street** – Pink dye was poured into the roof leader and was observed in the sanitary cleanout in the basement, as well as in the combined sewer manhole on the south side of Rosehill Avenue.
- **1375 Yonge Street** -- Pink dye was poured into the roof leader and was observed in the sanitary cleanout in the basement. Based on the measurement provided by the push camera, we conclude that the sanitary service connects into the 1350mm egg-shaped brick sewer in the center of Yonge Street.

This confirmation is provided based on your request. Should you have any questions or comments feel free to contact us.

Yours truly,

Julio Serrano
President
Global Road and Sewer Maintenance Ltd.

Project Name: 1365-1375 Yonge Street
Project Number: 11156419
Date Created: April 5, 2018
Date Printed: May 25, 2023

Sanitary Sewer Calculations - Equivalent Populations and Wastewater Flows (Existing vs. Proposed)

	Bach / 1-Bed / 1-Bed+Den Units	2-Bed / 2-Bed+Den Units	3-Bed Units	Total Unit Count	Comm. / Retail GFA (m^2)	Office GFA (m^2)	Residential Population	Existing ICI Population	Residential Generation Rate (L/day)	Commercial/ Retail Office Generation Rate (L/day)	I/I Flows or Groundwater Discharge (L/s)	Generation Peak Rate (L/s)	2-yr Storm Discharge (L/s)	Total Discharge (L/s)
Proposed Development	293	296	66	655	385	0	1,236	-	2,058,606	25,641	0.2	**24.1**	0.0	**24.3**
Existing Development	0	0	0	0	2,168	2,168	0	95	0	100,162	0.1	**1.16**	46.4	**47.6**

Residential Generation Rate	450	L/person/day
Proposed Commercial / Retail / Office Gen Rate	180000	L/floor ha/day
Bach / 1-Bed / 1-Bed+Den Population Density =	1.4	persons/unit
2-Bed / 2-Bed+Den Population Density =	2.1	persons/unit
3-Bed / 3-Bed+Den Population Density =	3.1	persons/unit
Existing Office Population Density Rate =	3.3	persons/100 m2
Existing Retail Population Density Rate =	1.1	persons/100 m2
Existing ICI population generation =	250.0	L/person/day
Site Area =	0.22	hectares
Inflow & Infiltration (proposed) =	0.26	L/s/ha
Inflow & Infiltration (existing) =	0.26	L/s/ha
Peaking factor =	3.7	Proposed (Based on Harmon's Equation)
Peaking factor =	4.2	Existing (Based on Harmon's Equation)

SANITARY SERVICE ANALYSIS

DEPARTMENT OF PUBLIC WORKS

SANITARY SEWER DESIGN

A = area ha
q = 450 l/person/day (Residential)
q = 180000 l/floor ha/day (Commercial / retail)
P = Equivalent Population
M = 1+ (14)/(4+sqrt(P/10^3))

Pflow (in l/s) = M q P / 86400 = population flow

Q TOTAL (in l/s) = P flow + I

Designed by MW Checked by NW

Design Sheet N° _____
Assess. Sheet N° _____

Date August 15, 2022

STREET	MANHOLE FROM	MANHOLE TO	LENGTH (m)	A SITE ha	A SITE p	POPULATION P	M	P FLOW l/s	A Comm ha	I Gross l/s	Q Commercial l/s	Q Residential	Q TOTAL l/s	S %	D (mm)	TYPE OF PIPE	Q FULL (L/s)	Velocity Full (m/s)	SEWER CAP. (%)	Comments
FLOWS FROM DEVELOPMENT																				
	CTRL MH	SEWER	19.8	0.22	1236	1236	3.70	23.8	0.0	0.2	0.3	23.8	24.3	2.0	250	PVC	84.1	1.71	28.9%	

Project: 1365-1375 YONGE ST STORAGE SIZING
Project No: 11156419
Created: Apr-18
Printed: 5/9/2023 16:40

Stormwater Management Calculations

Rational Method

Proposed Institutional Redevelopment
City of Toronto - Toronto & East York District

Rational Method Flow Calculator

	Tc (mins.)	A Area (ha)	I Intensity (mm/hr)	R Run-off Co-efficient
	10	0.204	250.32	0.71

Q=R*A*I*N — **0.100 cms**
N=2.778 for l/s, 1/360 for cms — **100.34 l/s**

Input Tc, A and R

	Formulas below: V	
2-yr:	21.8/(t/60)^0.78	88.19
5-yr:	32/(t/60)^0.79	131.79
10-yr:	38.7/(t/60)^0.80	162.27
25-yr:	45.2/(t/60)^0.80	189.52
50-yr:	53.5/(t/60)^0.80	224.32
100-yr:	59.7/(t/60)^0.80	250.32

City of Toronto

IDF Curve - Input Table

Return	A	C
2	21.8	-0.78
5	32	-0.79
10	38.7	-0.8
25	45.2	-0.8
50	53.5	-0.8
100	59.7	-0.8

Project:	1365-1375 YONGE ST	STORAGE SIZING	
Project No:	11156419	0	
Created:	43191		
Printed:	5/9/2023 16:40		

Stormwater Management Calculations

Pre Development Flows - 1365 YONGE ST

Proposed Institutional Redevelopment

City of Toronto - Toronto & East York District

SITE AREA **1077** m^2 **THIS SUB CATCHMENT'S ALLOTMENT** 100%

Contributing Areas

	Area (m^2)	
Controlled Roof:	0	m^2
Uncontrolled Roof:	1077	m^2
Total Roof Area:	1077	m^2
Pavement / Impervious		m^2
Landscaped / Pervious:		m^2
TOTAL SITE AREA	1077	m^2
TOTAL AREA (Excluding Controlled Roof)	1077	m^2

	Area (m^2)	Area*RC	Percent
Controlled Roof	0		0%
Uncontrolled Roof	1077	969	100%
Pavement / Impervious	0	0	0%
Landscaped / Pervious	0	0	0%
TOTAL AREA (Excluding Controlled Roof Area)	**1077**	**0.90**	

Runoff Coefficients	
Rooftops	0.90
Pavement/Concrete	0.90
Landscape	0.25

2 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min
2 year intensity	88.19	mm/hr

Uncontrolled Roof Runoff:	23.7 l/s
Pavement / Impervious Runoff:	0.0 l/s
Landscaped / Pervious Runoff:	0.0 l/s
RELEASE RATE:	23.7 l/s
THIS SUB CATCHMENT'S RELEASE RATE: 100%	**23.7 l/s**

Project: 1365-1375 YONGE ST
Project No: 11156419
Created: 43191
Printed: 5/9/2023 16:40

Stormwater Management Calculations

Pre Development Flows - 1375 YONGE ST

Proposed Institutional Redevelopment
City of Toronto - Toronto & East York District

SITE AREA 1028 m^2 **THIS SUB CATCHMENT'S ALLOTMENT** 100%

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Contributing Areas

	Area (m^2)	
Controlled Roof:	0	m^2
Uncontrolled Roof:	1028	m^2
Total Roof Area:	1028	m^2
Pavement / Impervious		m^2
Landscaped / Pervious:		m^2
TOTAL SITE AREA	1028	m^2
TOTAL AREA (Excluding Controlled Roof)	1028	m^2

	Area (m^2)	Area*RC	Percent
Controlled Roof	0		0%
Uncontrolled Roof	1028	925	100%
Pavement / Impervious	0	0	0%
Landscaped / Pervious	0	0	0%
TOTAL AREA (Excluding Controlled Roof Area)	**1028**	**0.90**	

Runoff Coefficients	
Rooftops	0.90
Pavement/Concrete	0.90
Landscape	0.25

2 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min
2 year intensity	88.19	mm/hr

Uncontrolled Roof Runoff:	22.7 l/s
Pavement / Impervious Runoff:	0.0 l/s
Landscaped / Pervious Runoff:	0.0 l/s
RELEASE RATE:	22.7 l/s
THIS SUB CATCHMENT'S RELEASE RATE: 100%	**22.7 l/s**

Appendix B
Stormwater Management Calculations
PCSWMM Model
Irrigation Water Requirement Calculations
MFS Calculations and Details

Project: 1365-1375 YONGE ST STORAGE SIZING
Project No: 11156419
Created: Apr-18
Printed: 5/9/2023 16:36

Stormwater Management Calculations

Rational Method

1365-1375 Yonge Street
City of Toronto - Toronto & East York District

Rational Method Flow Calculator	Tc (mins.)	**A** Area (ha)	**I** Intensity (mm/hr)	**R** Run-off Co-efficient
	10	**0.211**	250.32	**0.79**

Q=R*A*I*N **0.115 cms**
N=2.778 for l/s, 1/360 for cms **115.17 l/s**

Input Tc, A and R

	Formulas below: V	
2-yr:	21.8/(t/60)^0.78	88.19
5-yr:	32/(t/60)^0.79	131.79
10-yr:	38.7/(t/60)^0.80	162.27
25-yr:	45.2/(t/60)^0.80	189.52
50-yr:	53.5/(t/60)^0.80	224.32
100-yr:	59.7/(t/60)^0.80	250.32

City of Toronto

IDF Curve - Input Table		
Return	**A**	**C**
2	21.8	-0.78
5	32	-0.79
10	38.7	-0.8
25	45.2	-0.8
50	53.5	-0.8
100	59.7	-0.8

Project:	1365-1375 YONGE ST	STORAGE SIZING	
Project No:	11156419	0	
Created:	43191		
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Stormwater Management Calculations

Pre Development Flows

1365-1375 Yonge Street
City of Toronto - Toronto & East York District

SITE AREA 2105 m^2 **THIS SUB CATCHMENT'S ALLOTMENT** 100%

Contributing Areas

	Area (m^2)	
Controlled Roof:	0	m^2
Uncontrolled Roof:	2105	m^2
Total Roof Area:	2105	m^2
Pavement / Impervious		m^2
Landscaped / Pervious:		m^2
TOTAL SITE AREA	2105	m^2
TOTAL AREA (Excluding Controlled Roof)	2105	m^2

	Area (m^2)	Area*RC	Percent
Controlled Roof	0		0%
Uncontrolled Roof	2105	1895	100%
Pavement / Impervious	0	0	0%
Landscaped / Pervious	0	0	0%
TOTAL AREA (Excluding Controlled Roof Area)	**2105**	**0.90**	

Runoff Coefficients	
Rooftops	0.90
Pavement/Concrete	0.90
Landscape	0.25

2 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min	
2 year intensity	88.19	mm/hr	
Uncontrolled Roof Runoff:			46.4 l/s
Pavement / Impervious Runoff:			0.0 l/s
Landscaped / Pervious Runoff:			0.0 l/s
RELEASE RATE:			46 l/s
THIS SUB CATCHMENT'S RELEASE RATE: 100%			**46 l/s**

5 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min	
5 year intensity	131.79	mm/hr	
Uncontrolled Roof Runoff:			69.4 l/s
Pavement / Impervious Runoff:			0.0 l/s
Landscaped / Pervious Runoff:			0.0 l/s
RELEASE RATE:			69 l/s
THIS SUB CATCHMENT'S RELEASE RATE: 100%			**69 l/s**

100 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min	
100 year intensity	250.32	mm/hr	
Uncontrolled Roof Runoff:			131.7 l/s
Pavement / Impervious Runoff:			0.0 l/s
Landscaped / Pervious Runoff:			0.0 l/s
RELEASE RATE:			132 l/s
THIS SUB CATCHMENT'S RELEASE RATE: 100%			**132 l/s**

2 Year Rainfall Event @Runoff Coefficient of 0.5

Runoff Coefficient	0.5		RELEASE RATE: 25.8 l/s
2 year intensity	88.19	mm/hr	**ALLOWABLE RELEASE RATE: 100% 25.8 l/s**

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Stormwater Management Calculations

Post Development Flows

1365-1375 Yonge Street
City of Toronto - Toronto & East York District

SITE AREA **2105 m^2**

Contributing Areas

	Area (m^2)		
Green Roof:	530 m^2	312	Extensive Green Roof
Controlled Roof:	1157 m^2	217.52	Intensive Green Roof
Total Roof Area:	1687 m^2	529.52	Total Green Roof
Paved / Impervious	418 m^2		
Permeable Pavers:	0 m^2		
Landscaped / Pervious:	0 m^2		
TOTAL SITE AREA	2105 m^2		

	Area (m^2)	Area*RC	Percent
Controlled Roof	1157	1042	55%
Green Roof	530	238	25%
Paved / Impervious	418	376	20%
Permeable Pavers	0	0	0%
Landscaped / Pervious	0	0	0%
TOTAL AREA	**2105**	**0.79**	**Composite Runoff Coefficient**
(Excluding Controlled Roof Area)			

Runoff Coefficients	
Non-Green Rooftop	0.90
Green Rooftop	0.45
Pavement	0.90
Pavers	0.25
Landscaped	0.25

100 Year Post Development Flow @Runoff Coefficient of 0.79

Time of Concentration	10 min
100 year intensity	250.32 mm/hr

Green Roof Runoff:	16.6 l/s
Controlled Roof Runoff:	72.4 l/s
Contributing Roof Runoff:	89.0 l/s
Paved/Impervious Runoff:	26.2 l/s
Permeable Pavers Runoff:	0.0 l/s
Landscaped / Pervious Runoff:	0.0 l/s
RELEASE RATE:	**115.2 l/s**

Project: 1365-1375 YONGE ST
Project No: 11156419
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STORAGE SIZING

Stormwater Management Calculations

Maximum Required Storage & Release Rate

1365-1375 Yonge Street
City of Toronto - Toronto & East York District

DESIGN 100 YEAR POST TO 2 YEAR @ 0.5
CONTROL 100 YEAR POST TO 2 YEAR PRE

SITE AREA 2105 m^2

Release rate from 105mm orifice plate

MAXIMUM ALLOWABLE RELEASE RATE **25.8 l/s**
less Uncontrolled Flow Rate 0.0 l/s
ALLOWABLE ORIFICE RELEASE RATE **25.8 l/s**
ACTUAL RELEASE RATE **25.5 l/s**
COMPOSITE RUNOFF COEFFICIENT **0.79**
TIME OF CONCENTRATION **10 minutes**

100 YEAR STORM I = 59.7/(t/60)^0.80

TIME	RAINFALL INTENSITY	CONTROLLED ROOF RUNOFF	ROOF, IMPERVIOUS & PERVIOUS	TOTAL RUNOFF	VOLUME in	VOLUME out	STORAGE VOLUME
minutes	mm/hr	l/s	l/s	l/s	m^3	m^3	m^3
5	435.8	0.0	200.5	200.5	60	8	53
10	250.3	0.0	115.2	115.2	69	15	54
15	181.0	0.0	83.3	83.3	75	23	52
20	143.8	0.0	66.1	66.1	79	31	49
25	120.3	0.0	55.3	55.3	83	38	45
30	103.9	0.0	47.8	47.8	86	46	40
35	91.9	0.0	42.3	42.3	89	54	35
40	82.6	0.0	38.0	38.0	91	61	30
45	75.1	0.0	34.6	34.6	93	69	24
50	69.1	0.0	31.8	31.8	95	77	19
55	64.0	0.0	29.4	29.4	97	84	13
60	59.7	0.0	27.5	27.5	99	92	7
65	56.0	0.0	25.8	25.8	100	99	1
70	52.8	0.0	24.3	24.3	102	107	0
75	49.9	0.0	23.0	23.0	103	115	0
80	47.4	0.0	21.8	21.8	105	122	0
85	45.2	0.0	20.8	20.8	106	130	0
90	43.2	0.0	19.9	19.9	107	138	0
95	41.3	0.0	19.0	19.0	108	145	0
100	39.7	0.0	18.3	18.3	110	153	0
105	38.2	0.0	17.6	17.6	111	161	0
110	36.8	0.0	16.9	16.9	112	168	0

REQUIRED STORAGE (m^3): 53.8

Project:	1365-1375 YONGE ST	STORAGE SIZING
Project No:	11156419	
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Stormwater Management Calculations

Initial Abstraction & TSS Removal

1365-1375 Yonge Street
City of Toronto - Toronto & East York District

			Area (m^2)	Percent
Site Area	**2105 m^2**	Controlled Roof area:	1157 m^2	55%
		Green Roof Area:	530 m^2	25%
		Paved / Impervious Area:	418 m^2	20%
		Permeable Pavers Area:	0 m^2	0%
		Landscaped / Pervious Area:	0 m^2	0%
		MFS Treated Pavement Area	418 m^2	
		TOTAL SITE AREA	**2105 m^2**	

Initial Abstraction

Site Description	Fraction of Site Area	Initial Abs. (mm)	Initial Abs (mm)
Controlled Roof area:	0.55	1	0.55
Green Roof Area (Extensive):	0.15	5	0.74
Green Roof Area (Intensive):	0.10	7	0.72
Paved / Impervious Area:	0.20	1	0.20
Permeable Pavers Area:	0.00	5	0.00
Landscaped / Pervious Area:	0.00	5	0.00
TOTAL:	**1.0**		**2.21**

Required Rainwater Harvesting (RWH) Vol. **5.9 m^3**

TSS Removal

Site Description	Fraction of Site Area	TSS Removal (%)	Overall TSS Rem. (%)
Controlled Roof area:	0.55	80	44
Green Roof Area:	0.25	80	20
Paved / Impervious Area:	0.20	0	0
Permeable Pavers Area:	0.00	0	0
Landscaped / Pervious Area:	0.00	80	0
MFS Treated Pavement Area	0.20	80	16
TOTAL:	**1.0**		**80**

FLOW THROUGH ORIFICE CALCULATIONS

PROJECT: 1365-1375 Yonge St
PROJECT No.: 11156419
CREATED: Mar 19, 2018
PRINTED: May 9, 2023

Stormwater Management Calculations

City of Toronto

ORIFICE CALCULATION

$Q_o = C_d * A_o * (2 * g * H_o)^{0.5}$

C_d = 0.62

INVERT OF ORIFICE	139.30 m	WIDTH	0.000 m
ELEVATION INCREMENT	0.10 m	DIAMETER/HEIGHT	0.105 m
Top of Storage	141.01 m		
Tank HGL under 100-year condition	140.78 m		
Sewer HGL under 100-year condition	139.71 m		

ELEVATION (m)	EFFECTIVE HEAD (m)	ORIFICE FLOW (L/s)	DIAMETER (m)	X-SECT AREA (m^2)	Ho (m)
139.30	-0.41	0.0	0.000	0.0000	0.00
139.41	-0.30	0.0	0.105	0.0087	0.00
139.51	-0.20	0.0	0.105	0.0087	0.00
139.61	-0.10	0.0	0.105	0.0087	0.00
139.71	0.00	0.0	0.105	0.0087	0.00
139.81	0.10	5.3	0.105	0.0087	0.05
139.91	0.20	9.1	0.105	0.0087	0.15
140.01	0.30	11.8	0.105	0.0087	0.25
140.11	0.40	14.0	0.105	0.0087	0.35
140.21	0.50	15.9	0.105	0.0087	0.45
140.31	0.60	17.6	0.105	0.0087	0.55
140.41	0.70	19.1	0.105	0.0087	0.65
140.51	0.80	20.6	0.105	0.0087	0.75
140.61	0.90	21.9	0.105	0.0087	0.85
140.71	1.00	23.1	0.105	0.0087	0.95
140.81	1.10	24.3	0.105	0.0087	1.05
140.91	1.20	25.5	0.105	0.0087	1.15
141.01	1.30	26.6	0.105	0.0087	1.25
141.11	1.40	27.6	0.105	0.0087	1.35
141.21	1.50	28.6	0.105	0.0087	1.45
141.31	1.60	29.6	0.105	0.0087	1.55
141.41	1.70	30.5	0.105	0.0087	1.65
141.51	1.80	31.4	0.105	0.0087	1.75
141.61	1.90	32.3	0.105	0.0087	1.85
141.71	2.00	33.2	0.105	0.0087	1.95
141.81	2.10	34.0	0.105	0.0087	2.05
141.91	2.20	34.8	0.105	0.0087	2.15
142.01	2.30	35.6	0.105	0.0087	2.25
142.11	2.40	36.4	0.105	0.0087	2.35
142.21	2.50	37.2	0.105	0.0087	2.45
142.31	2.60	38.0	0.105	0.0087	2.55
142.41	2.70	38.7	0.105	0.0087	2.65
142.51	2.80	39.4	0.105	0.0087	2.75

```
[TITLE]

[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           09/30/2015
START_TIME           00:00:00
REPORT_START_DATE    09/30/2015
REPORT_START_TIME    00:00:00
END_DATE             09/30/2015
END_TIME             05:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:00:01
DRY_STEP             00:00:01
ROUTING_STEP         0.5

INERTIAL_DAMPING     NONE
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           100
HEAD_TOLERANCE       0.00015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;                Rain      Time     Snow     Data
;;Name            Type      Intrvl   Catch    Source
;;--------------- --------- -------- -------- ----------
100YR_Chicago_4hr INTENSITY 0:10     1.0      TIMESERIES 100YR_Chicago_4hr
10YR_Chicago_4hr  INTENSITY 0:10     1.0      TIMESERIES 10YR_Chicago_4hr
25YR_Chicago_4hr  INTENSITY 0:10     1.0      TIMESERIES 25YR_Chicago_4hr
2YR_Chicago_4hr   INTENSITY 0:10     1.0      TIMESERIES 2YR_Chicago_4hr
50YR_Chicago_4hr  INTENSITY 0:10     1.0      TIMESERIES 50YR_Chicago_4hr
5YR_Chicago_4hr   INTENSITY 0:10     1.0      TIMESERIES 5YR_Chicago_4hr

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.
Curb     Snow
```

```
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope
Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -----
--- -------- --------
S1               100YR_Chicago_4hr CBMH            0.2172   95       36.6     2
0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
S1               0.013      0.25       0.05       0.01       70         OUTLET

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
S1               80         0.5        7

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
CBMH             138.85     2.1        0          0          0
EXMH1            134.9      7.77       0          0          0
EXMH2            138.59     3.79       0          0.15       0
EXMH3            138.83     2.77       0          0          0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- --------
EXMH             134.9      FIXED      136.25           NO

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet
Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset
Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ----------
---------- ---------- ----------
C1               EXMH3            EXMH2            18.76      0.01       138.83
138.64     0          0
C1_2             EXMH2            EXMH1            17         0.013      138.59
138.59     0          0
C2               EXMH1            EXMH             1          0.013      134.9
134.3      0          0
C3               CBMH             EXMH3            15         0.01       138.85
138.85     0          345
C9_1             EXMH3            EXMH3            22         0.013      138.83
138.83     0          0
C9_2             EXMH2            EXMH2            22         0.013      138.59
138.64     0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---
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C1               CIRCULAR     0.3              0          0          0          1
C1_2             CIRCULAR     0.3              0          0          0          1
C2               CIRCULAR     1.35             0          0          0          1
C3               CIRCULAR     0.3              0          0          0          1
C9_1             CIRCULAR     0.3              0          0          0          1
C9_2             CIRCULAR     0.3              0          0          0          1

[LOSSES]
;;Link            Inlet      Outlet     Average    Flap Gate  SeepageRate
;;--------------- ---------- ---------- ---------- ---------- ----------
C1_2             0.2        0.2        0          NO         0
C2               0.2        0.2        0          NO         0

[INFLOWS]
;;                                          Param    Units    Scale
Baseline Baseline
;;Node            Parameter        Time Series      Type     Factor   Factor   Value
Pattern
;;--------------- ---------------- ---------------- -------- -------- -------- -----
--- --------
EXMH2            FLOW             ""               FLOW     1.0      1        22

[CURVES]
;;Name            Type       X-Value    Y-Value
;;--------------- ---------- ---------- ----------
203_Storage      Storage    0          85
203_Storage                 3          85

204_Storage      Storage    0          50
204_Storage                 3          50

206_Storage      Storage    0          40.8
206_Storage                 3          40.8

207_Storage      Storage    0          45
207_Storage                 3          45

208_Storage      Storage    0          38
208_Storage                 3          38

[TIMESERIES]
;;Name            Date       Time       Value
;;--------------- ---------- ---------- ----------
100YR_Chicago_4hr             0:00       0
100YR_Chicago_4hr             0:10       4.47
100YR_Chicago_4hr             0:20       5.08
100YR_Chicago_4hr             0:30       5.91
100YR_Chicago_4hr             0:40       7.12
100YR_Chicago_4hr             0:50       9.1
100YR_Chicago_4hr             1:00       13.03
100YR_Chicago_4hr             1:10       26.65
100YR_Chicago_4hr             1:20       250.32
100YR_Chicago_4hr             1:30       33.57
100YR_Chicago_4hr             1:40       19.76
100YR_Chicago_4hr             1:50       14.49
100YR_Chicago_4hr             2:00       11.6
100YR_Chicago_4hr             2:10       9.75
100YR_Chicago_4hr             2:20       8.46
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100YR_Chicago_4hr            2:30       7.5
100YR_Chicago_4hr            2:40       6.75
100YR_Chicago_4hr            2:50       6.16
100YR_Chicago_4hr            3:00       5.67
100YR_Chicago_4hr            3:10       5.26
100YR_Chicago_4hr            3:20       4.91
100YR_Chicago_4hr            3:30       4.61
100YR_Chicago_4hr            3:40       4.34
100YR_Chicago_4hr            3:50       4.11
100YR_Chicago_4hr            4:00       3.91

;Chicago design storm, a = 1035, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
10YR_Chicago_4hr             0:00       2.732
10YR_Chicago_4hr             0:10       3.096
10YR_Chicago_4hr             0:20       3.59
10YR_Chicago_4hr             0:30       4.309
10YR_Chicago_4hr             0:40       5.463
10YR_Chicago_4hr             0:50       7.69
10YR_Chicago_4hr             1:00       14.595
10YR_Chicago_4hr             1:10       163.097
10YR_Chicago_4hr             1:20       24.686
10YR_Chicago_4hr             1:30       13.876
10YR_Chicago_4hr             1:40       10.03
10YR_Chicago_4hr             1:50       7.977
10YR_Chicago_4hr             2:00       6.68
10YR_Chicago_4hr             2:10       5.778
10YR_Chicago_4hr             2:20       5.111
10YR_Chicago_4hr             2:30       4.596
10YR_Chicago_4hr             2:40       4.185
10YR_Chicago_4hr             2:50       3.848
10YR_Chicago_4hr             3:00       3.567
10YR_Chicago_4hr             3:10       3.328
10YR_Chicago_4hr             3:20       3.122
10YR_Chicago_4hr             3:30       2.943
10YR_Chicago_4hr             3:40       2.786
10YR_Chicago_4hr             3:50       2.646
10YR_Chicago_4hr             4:00       0

;Chicago design storm, a = 1200, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
25YR_Chicago_4hr             0:00       3.168
25YR_Chicago_4hr             0:10       3.589
25YR_Chicago_4hr             0:20       4.163
25YR_Chicago_4hr             0:30       4.996
25YR_Chicago_4hr             0:40       6.334
25YR_Chicago_4hr             0:50       8.916
25YR_Chicago_4hr             1:00       16.922
25YR_Chicago_4hr             1:10       189.099
25YR_Chicago_4hr             1:20       28.622
25YR_Chicago_4hr             1:30       16.088
25YR_Chicago_4hr             1:40       11.629
25YR_Chicago_4hr             1:50       9.248
25YR_Chicago_4hr             2:00       7.744
25YR_Chicago_4hr             2:10       6.699
25YR_Chicago_4hr             2:20       5.926
25YR_Chicago_4hr             2:30       5.329
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25YR_Chicago_4hr            2:40       4.852
25YR_Chicago_4hr            2:50       4.461
25YR_Chicago_4hr            3:00       4.135
25YR_Chicago_4hr            3:10       3.858
25YR_Chicago_4hr            3:20       3.62
25YR_Chicago_4hr            3:30       3.412
25YR_Chicago_4hr            3:40       3.23
25YR_Chicago_4hr            3:50       3.068
25YR_Chicago_4hr            4:00       0

;Chicago design storm, a = 590, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
2YR_Chicago_4hr             0:00       1.557
2YR_Chicago_4hr             0:10       1.765
2YR_Chicago_4hr             0:20       2.047
2YR_Chicago_4hr             0:30       2.456
2YR_Chicago_4hr             0:40       3.114
2YR_Chicago_4hr             0:50       4.384
2YR_Chicago_4hr             1:00       8.32
2YR_Chicago_4hr             1:10       92.973
2YR_Chicago_4hr             1:20       14.072
2YR_Chicago_4hr             1:30       7.91
2YR_Chicago_4hr             1:40       5.717
2YR_Chicago_4hr             1:50       4.547
2YR_Chicago_4hr             2:00       3.808
2YR_Chicago_4hr             2:10       3.294
2YR_Chicago_4hr             2:20       2.914
2YR_Chicago_4hr             2:30       2.62
2YR_Chicago_4hr             2:40       2.385
2YR_Chicago_4hr             2:50       2.194
2YR_Chicago_4hr             3:00       2.033
2YR_Chicago_4hr             3:10       1.897
2YR_Chicago_4hr             3:20       1.78
2YR_Chicago_4hr             3:30       1.678
2YR_Chicago_4hr             3:40       1.588
2YR_Chicago_4hr             3:50       1.508
2YR_Chicago_4hr             4:00       0

;Chicago design storm, a = 1420, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
50YR_Chicago_4hr            0:00       3.749
50YR_Chicago_4hr            0:10       4.247
50YR_Chicago_4hr            0:20       4.926
50YR_Chicago_4hr            0:30       5.912
50YR_Chicago_4hr            0:40       7.495
50YR_Chicago_4hr            0:50       10.551
50YR_Chicago_4hr            1:00       20.024
50YR_Chicago_4hr            1:10       223.767
50YR_Chicago_4hr            1:20       33.869
50YR_Chicago_4hr            1:30       19.037
50YR_Chicago_4hr            1:40       13.761
50YR_Chicago_4hr            1:50       10.944
50YR_Chicago_4hr            2:00       9.164
50YR_Chicago_4hr            2:10       7.927
50YR_Chicago_4hr            2:20       7.013
50YR_Chicago_4hr            2:30       6.306
50YR_Chicago_4hr            2:40       5.741
```

```
50YR_Chicago_4hr            2:50       5.279
50YR_Chicago_4hr            3:00       4.893
50YR_Chicago_4hr            3:10       4.566
50YR_Chicago_4hr            3:20       4.283
50YR_Chicago_4hr            3:30       4.038
50YR_Chicago_4hr            3:40       3.822
50YR_Chicago_4hr            3:50       3.63
50YR_Chicago_4hr            4:00       0

;Chicago design storm, a = 835, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
5YR_Chicago_4hr             0:00       2.204
5YR_Chicago_4hr             0:10       2.498
5YR_Chicago_4hr             0:20       2.897
5YR_Chicago_4hr             0:30       3.476
5YR_Chicago_4hr             0:40       4.407
5YR_Chicago_4hr             0:50       6.204
5YR_Chicago_4hr             1:00       11.775
5YR_Chicago_4hr             1:10       131.581
5YR_Chicago_4hr             1:20       19.916
5YR_Chicago_4hr             1:30       11.194
5YR_Chicago_4hr             1:40       8.092
5YR_Chicago_4hr             1:50       6.435
5YR_Chicago_4hr             2:00       5.389
5YR_Chicago_4hr             2:10       4.662
5YR_Chicago_4hr             2:20       4.124
5YR_Chicago_4hr             2:30       3.708
5YR_Chicago_4hr             2:40       3.376
5YR_Chicago_4hr             2:50       3.104
5YR_Chicago_4hr             3:00       2.877
5YR_Chicago_4hr             3:10       2.685
5YR_Chicago_4hr             3:20       2.519
5YR_Chicago_4hr             3:30       2.374
5YR_Chicago_4hr             3:40       2.247
5YR_Chicago_4hr             3:50       2.135
5YR_Chicago_4hr             4:00       0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -8838052.8122    5416973.55485    -8837942.9618    5417165.22215
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
CBMH             -8837964.837     5417045.057
EXMH1            -8838025.398     5417019.479
EXMH2            -8838002.679     5417025.512
```

```
EXMH3            -8837977.63      5417032.284
EXMH             -8838017.753     5416992.267

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
C1_2             -8838005.762     5417024.774

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
S1               -8837988.792     5417122.963
S1               -8838036.475     5417108.723
S1               -8838047.819     5417141.304
S1               -8837998.601     5417156.51
S1               -8837994.812     5417155.908
S1               -8837961.245     5417045.956
S1               -8837955.806     5417046.909
S1               -8837947.955     5417019.787
S1               -8838012.504     5417000.359
S1               -8838019.562     5417028.043
S1               -8837966.003     5417043.841
S1               -8837988.792     5417122.963

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

HGL

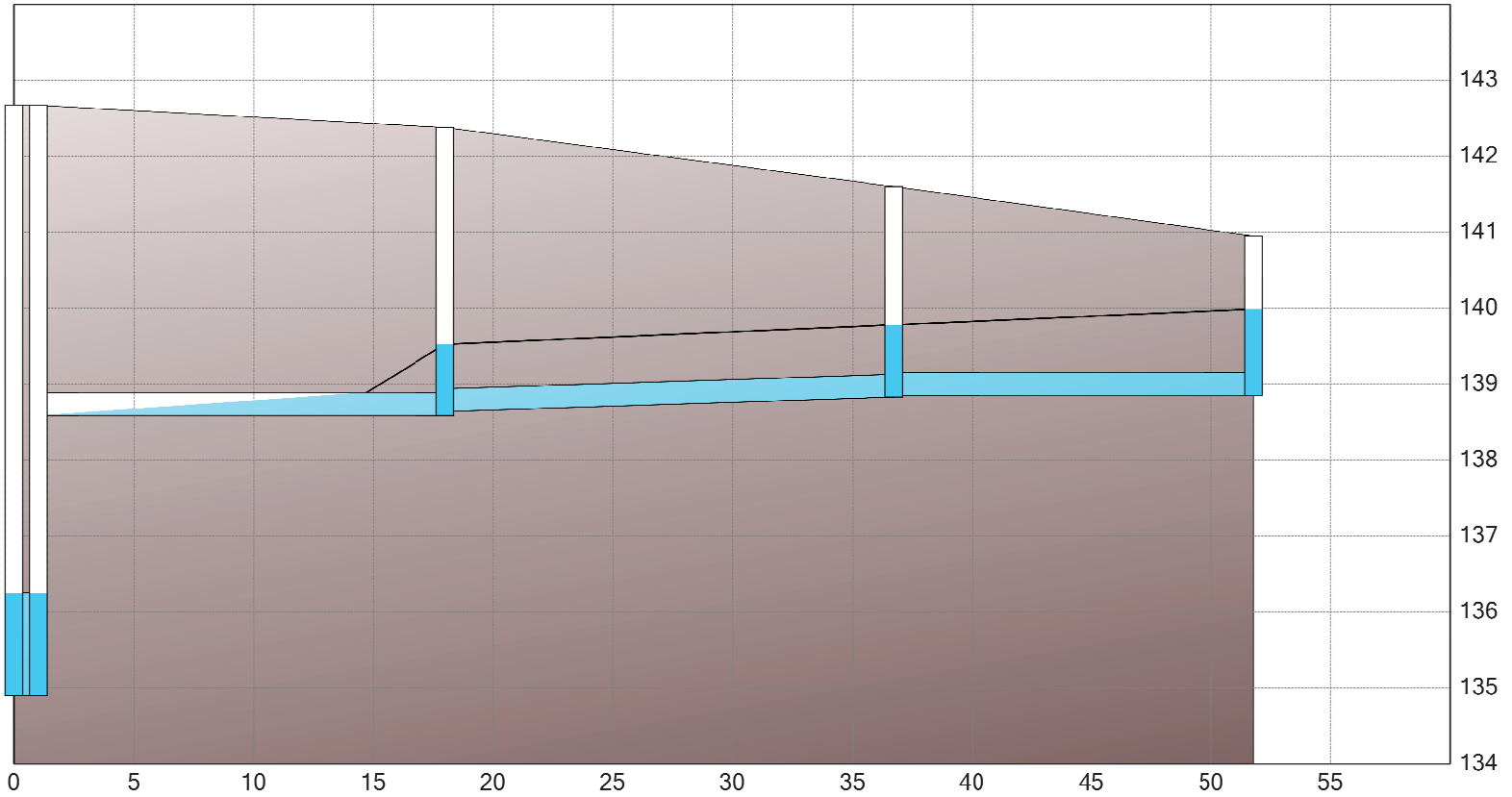
Time: 9/30/2015 1:27:00 AM

Conduit C2
Flow = 168.888 L/s
Velocity = 0.118 m/s

Conduit C1_2
Flow = 168.888 L/s
Velocity = 2.389 m/s

Conduit C1
Flow = 146.89 L/s
Velocity = 2.078 m/s

Conduit C3
Flow = 146.894 L/s
Velocity = 2.078 m/s



Outfall EXMH
CWSEL = 136.25 m
Max. CWSEL = 136.25 m
Rim Elev. = 142.67 m
Invert Elev. = 134.9 m

Junction EXMH1
CWSEL = 136.2503 m
Max. CWSEL = 136.2503 m
Rim Elev. = 142.67 m
Invert Elev. = 134.9 m

Junction EXMH2
CWSEL = 139.5253 m
Max. CWSEL = 139.5253 m
Rim Elev. = 142.38 m
Invert Elev. = 138.59 m

Junction EXMH3
CWSEL = 139.7818 m
Max. CWSEL = 139.7818 m
Rim Elev. = 141.6 m
Invert Elev. = 138.83 m

Junction CBMH
CWSEL = 139.987 m
Max. CWSEL = 139.987 m
Rim Elev. = 140.95 m
Invert Elev. = 138.85 m

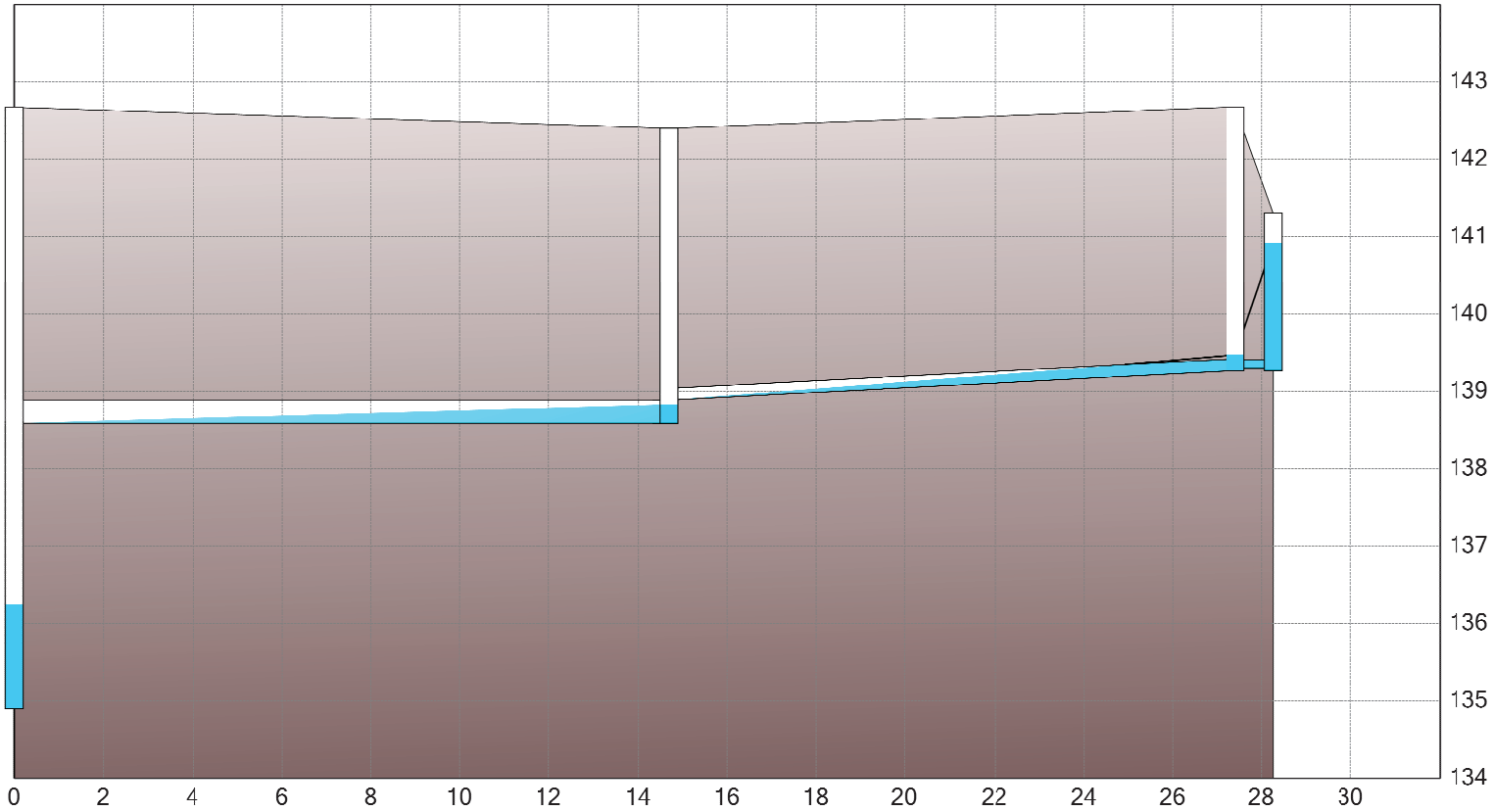
HGL

Time: 9/30/2015 12:02:00 AM

Conduit C1_2
Flow = 41.942 L/s
Velocity = 0.839 m/s

Conduit C1_4
Flow = 28.618 L/s
Velocity = 1.63 m/s

Orifice C1_3
Flow = 28.617 L/s
Velocity = 0 m/s



Junction EXMH1
CWSEL = 136.25 m
Max. CWSEL = 136.25 m
Rim Elev. = 142.67 m
Invert Elev. = 134.9 m

Junction J2
CWSEL = 138.8318 m
Max. CWSEL = 138.8318 m
Rim Elev. = 142.4 m
Invert Elev. = 138.59 m

Junction CTRLMH
CWSEL = 139.4705 m
Max. CWSEL = 139.4705 m
Rim Elev. = 142.675 m
Invert Elev. = 139.262 m

Storage Tank1
CWSEL = 140.918 m
Max. CWSEL = 140.918 m
Rim Elev. = 141.3 m
Invert Elev. = 139.27 m

```
[TITLE]

[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           09/30/2015
START_TIME           00:00:00
REPORT_START_DATE    09/30/2015
REPORT_START_TIME    00:00:00
END_DATE             09/30/2015
END_TIME             05:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:00:01
DRY_STEP             00:00:01
ROUTING_STEP         0.5

INERTIAL_DAMPING     NONE
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           100
HEAD_TOLERANCE       0.00015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;                Rain      Time     Snow     Data
;;Name            Type      Intrvl   Catch    Source
;;--------------- --------- -------- -------- ----------
100YR_Chicago_4hr INTENSITY 0:10     1.0      TIMESERIES 100YR_Chicago_4hr
10YR_Chicago_4hr  INTENSITY 0:10     1.0      TIMESERIES 10YR_Chicago_4hr
25YR_Chicago_4hr  INTENSITY 0:10     1.0      TIMESERIES 25YR_Chicago_4hr
2YR_Chicago_4hr   INTENSITY 0:10     1.0      TIMESERIES 2YR_Chicago_4hr
50YR_Chicago_4hr  INTENSITY 0:10     1.0      TIMESERIES 50YR_Chicago_4hr
5YR_Chicago_4hr   INTENSITY 0:10     1.0      TIMESERIES 5YR_Chicago_4hr
SCS_Type_II_1mm   INTENSITY 0:06     1.0      TIMESERIES SCS_Type_II_1mm

[SUBCATCHMENTS]
```

```
;;                                                  Total    Pcnt.             Pcnt.
Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope
Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -----
--- -------- --------
100              2YR_Chicago_4hr  Tank1            0.2063   75       37       1
0
S1               2YR_Chicago_4hr  CBMH             0.2144   95       36.6     2
0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
100              0.013      0.25       0.01       0.05       72         OUTLET
S1               0.013      0.25       0.05       0.01       70         OUTLET

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
100              79         0.5        7
S1               80         0.5        7

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
CBMH             138.85     2.1        0          0          0
CTRLMH           139.262    3.413      0          0          0
EXMH1            134.9      7.77       0          0          0
EXMH2            138.59     3.79       0          0.15       0
EXMH3            138.83     2.77       0          0          0
J2               138.59     3.81       0          138.89     0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- --------
EXMH             134.9      FIXED      136.25           NO

[STORAGE]
;;               Invert   Max.       Init.      Storage    Curve
Evap.
;;Name           Elev.    Depth      Depth      Curve      Params
Frac.    Infiltration parameters
;;-------------- -------- ---------- ---------- ---------- --------- --------- ----
---- -------- -------- ------------------------
;Tank #2
Tank1            139.27   2.03       1.71       TABULAR    208_Storage
0        0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet
Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset
Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ----------
```

```
C1               EXMH3            EXMH2            18.76      0.01       138.83
138.64     0          0
C1_1             EXMH2            J2               2.29       0.013      138.59
138.59     0          0
C1_2             J2               EXMH1            14.71      0.013      138.59
138.59     0          0
C1_4             CTRLMH           J2               12.7       0.013      139.27
138.89     0          0
C2               EXMH1            EXMH             1          0.013      134.9
134.3      0          0
C3               CBMH             EXMH3            15         0.01       138.85
138.85     0          345
C9_1             EXMH3            EXMH3            22         0.013      138.83
138.83     0          0
C9_2             EXMH2            EXMH2            22         0.013      138.59
138.64     0          0

[ORIFICES]
;;               Inlet            Outlet           Orifice      Crest      Disch.
Flap Open/Close
;;Name           Node             Node             Type         Height     Coeff.
Gate Time
;;-------------- ---------------- ---------------- ------------ ---------- --------
-- ---- ----------
C1_3             Tank1            CTRLMH           SIDE         139.3      0.62
NO       0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---
-------
C1               CIRCULAR     0.3              0          0          0          1
C1_1             CIRCULAR     0.3              0          0          0          1
C1_2             CIRCULAR     0.3              0          0          0          1
C1_4             CIRCULAR     0.15             0          0          0          1
C2               CIRCULAR     1.35             0          0          0          1
C3               CIRCULAR     0.3              0          0          0          1
C9_1             CIRCULAR     0.3              0          0          0          1
C9_2             CIRCULAR     0.3              0          0          0          1
C1_3             CIRCULAR     0.105            0          0          0

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------
C1_1             0.2        0          0          NO         0
C1_2             0          0.2        0          NO         0
C2               0.2        0.2        0          NO         0

[INFLOWS]
;;                                                Param    Units    Scale
Baseline Baseline
;;Node           Parameter        Time Series      Type     Factor   Factor   Value
Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -----
--- --------
EXMH2            FLOW             ""               FLOW     1.0      1        22

[CURVES]
```

```
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
203_Storage      Storage    0          85
203_Storage                 3          85

204_Storage      Storage    0          50
204_Storage                 3          50

206_Storage      Storage    0          40.8
206_Storage                 3          40.8

207_Storage      Storage    0          45
207_Storage                 3          45

208_Storage      Storage    0          56.7
208_Storage                 1.7        56.7

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100YR_Chicago_4hr            0:00       0
100YR_Chicago_4hr            0:10       4.47
100YR_Chicago_4hr            0:20       5.08
100YR_Chicago_4hr            0:30       5.91
100YR_Chicago_4hr            0:40       7.12
100YR_Chicago_4hr            0:50       9.1
100YR_Chicago_4hr            1:00       13.03
100YR_Chicago_4hr            1:10       26.65
100YR_Chicago_4hr            1:20       250.32
100YR_Chicago_4hr            1:30       33.57
100YR_Chicago_4hr            1:40       19.76
100YR_Chicago_4hr            1:50       14.49
100YR_Chicago_4hr            2:00       11.6
100YR_Chicago_4hr            2:10       9.75
100YR_Chicago_4hr            2:20       8.46
100YR_Chicago_4hr            2:30       7.5
100YR_Chicago_4hr            2:40       6.75
100YR_Chicago_4hr            2:50       6.16
100YR_Chicago_4hr            3:00       5.67
100YR_Chicago_4hr            3:10       5.26
100YR_Chicago_4hr            3:20       4.91
100YR_Chicago_4hr            3:30       4.61
100YR_Chicago_4hr            3:40       4.34
100YR_Chicago_4hr            3:50       4.11
100YR_Chicago_4hr            4:00       3.91

;Chicago design storm, a = 1035, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
10YR_Chicago_4hr             0:00       2.732
10YR_Chicago_4hr             0:10       3.096
10YR_Chicago_4hr             0:20       3.59
10YR_Chicago_4hr             0:30       4.309
10YR_Chicago_4hr             0:40       5.463
10YR_Chicago_4hr             0:50       7.69
10YR_Chicago_4hr             1:00       14.595
10YR_Chicago_4hr             1:10       163.097
10YR_Chicago_4hr             1:20       24.686
10YR_Chicago_4hr             1:30       13.876
```

```
10YR_Chicago_4hr            1:40        10.03
10YR_Chicago_4hr            1:50        7.977
10YR_Chicago_4hr            2:00        6.68
10YR_Chicago_4hr            2:10        5.778
10YR_Chicago_4hr            2:20        5.111
10YR_Chicago_4hr            2:30        4.596
10YR_Chicago_4hr            2:40        4.185
10YR_Chicago_4hr            2:50        3.848
10YR_Chicago_4hr            3:00        3.567
10YR_Chicago_4hr            3:10        3.328
10YR_Chicago_4hr            3:20        3.122
10YR_Chicago_4hr            3:30        2.943
10YR_Chicago_4hr            3:40        2.786
10YR_Chicago_4hr            3:50        2.646
10YR_Chicago_4hr            4:00        0

;Chicago design storm, a = 1200, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
25YR_Chicago_4hr            0:00        3.168
25YR_Chicago_4hr            0:10        3.589
25YR_Chicago_4hr            0:20        4.163
25YR_Chicago_4hr            0:30        4.996
25YR_Chicago_4hr            0:40        6.334
25YR_Chicago_4hr            0:50        8.916
25YR_Chicago_4hr            1:00        16.922
25YR_Chicago_4hr            1:10        189.099
25YR_Chicago_4hr            1:20        28.622
25YR_Chicago_4hr            1:30        16.088
25YR_Chicago_4hr            1:40        11.629
25YR_Chicago_4hr            1:50        9.248
25YR_Chicago_4hr            2:00        7.744
25YR_Chicago_4hr            2:10        6.699
25YR_Chicago_4hr            2:20        5.926
25YR_Chicago_4hr            2:30        5.329
25YR_Chicago_4hr            2:40        4.852
25YR_Chicago_4hr            2:50        4.461
25YR_Chicago_4hr            3:00        4.135
25YR_Chicago_4hr            3:10        3.858
25YR_Chicago_4hr            3:20        3.62
25YR_Chicago_4hr            3:30        3.412
25YR_Chicago_4hr            3:40        3.23
25YR_Chicago_4hr            3:50        3.068
25YR_Chicago_4hr            4:00        0

;Chicago design storm, a = 590, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
2YR_Chicago_4hr             0:00        1.557
2YR_Chicago_4hr             0:10        1.765
2YR_Chicago_4hr             0:20        2.047
2YR_Chicago_4hr             0:30        2.456
2YR_Chicago_4hr             0:40        3.114
2YR_Chicago_4hr             0:50        4.384
2YR_Chicago_4hr             1:00        8.32
2YR_Chicago_4hr             1:10        92.973
2YR_Chicago_4hr             1:20        14.072
2YR_Chicago_4hr             1:30        7.91
2YR_Chicago_4hr             1:40        5.717
```

```
2YR_Chicago_4hr             1:50        4.547
2YR_Chicago_4hr             2:00        3.808
2YR_Chicago_4hr             2:10        3.294
2YR_Chicago_4hr             2:20        2.914
2YR_Chicago_4hr             2:30        2.62
2YR_Chicago_4hr             2:40        2.385
2YR_Chicago_4hr             2:50        2.194
2YR_Chicago_4hr             3:00        2.033
2YR_Chicago_4hr             3:10        1.897
2YR_Chicago_4hr             3:20        1.78
2YR_Chicago_4hr             3:30        1.678
2YR_Chicago_4hr             3:40        1.588
2YR_Chicago_4hr             3:50        1.508
2YR_Chicago_4hr             4:00        0

;Chicago design storm, a = 1420, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
50YR_Chicago_4hr            0:00        3.749
50YR_Chicago_4hr            0:10        4.247
50YR_Chicago_4hr            0:20        4.926
50YR_Chicago_4hr            0:30        5.912
50YR_Chicago_4hr            0:40        7.495
50YR_Chicago_4hr            0:50        10.551
50YR_Chicago_4hr            1:00        20.024
50YR_Chicago_4hr            1:10        223.767
50YR_Chicago_4hr            1:20        33.869
50YR_Chicago_4hr            1:30        19.037
50YR_Chicago_4hr            1:40        13.761
50YR_Chicago_4hr            1:50        10.944
50YR_Chicago_4hr            2:00        9.164
50YR_Chicago_4hr            2:10        7.927
50YR_Chicago_4hr            2:20        7.013
50YR_Chicago_4hr            2:30        6.306
50YR_Chicago_4hr            2:40        5.741
50YR_Chicago_4hr            2:50        5.279
50YR_Chicago_4hr            3:00        4.893
50YR_Chicago_4hr            3:10        4.566
50YR_Chicago_4hr            3:20        4.283
50YR_Chicago_4hr            3:30        4.038
50YR_Chicago_4hr            3:40        3.822
50YR_Chicago_4hr            3:50        3.63
50YR_Chicago_4hr            4:00        0

;Chicago design storm, a = 835, b = 0, c = 0.8, Duration = 240 minutes, r = 0.31,
rain units = mm/hr.
5YR_Chicago_4hr             0:00        2.204
5YR_Chicago_4hr             0:10        2.498
5YR_Chicago_4hr             0:20        2.897
5YR_Chicago_4hr             0:30        3.476
5YR_Chicago_4hr             0:40        4.407
5YR_Chicago_4hr             0:50        6.204
5YR_Chicago_4hr             1:00        11.775
5YR_Chicago_4hr             1:10        131.581
5YR_Chicago_4hr             1:20        19.916
5YR_Chicago_4hr             1:30        11.194
5YR_Chicago_4hr             1:40        8.092
5YR_Chicago_4hr             1:50        6.435
```

```
5YR_Chicago_4hr             2:00       5.389
5YR_Chicago_4hr             2:10       4.662
5YR_Chicago_4hr             2:20       4.124
5YR_Chicago_4hr             2:30       3.708
5YR_Chicago_4hr             2:40       3.376
5YR_Chicago_4hr             2:50       3.104
5YR_Chicago_4hr             3:00       2.877
5YR_Chicago_4hr             3:10       2.685
5YR_Chicago_4hr             3:20       2.519
5YR_Chicago_4hr             3:30       2.374
5YR_Chicago_4hr             3:40       2.247
5YR_Chicago_4hr             3:50       2.135
5YR_Chicago_4hr             4:00       0

;SCS_24h_Type_I_1mm design storm, total rainfall = 1 mm, rain units = mm/hr.
SCS_24h_Type_I_1mm            0:00       0.0175
SCS_24h_Type_I_1mm            0:15       0.0175
SCS_24h_Type_I_1mm            0:30       0.0175
SCS_24h_Type_I_1mm            0:45       0.0175
SCS_24h_Type_I_1mm            1:00       0.0175
SCS_24h_Type_I_1mm            1:15       0.0175
SCS_24h_Type_I_1mm            1:30       0.0175
SCS_24h_Type_I_1mm            1:45       0.0175
SCS_24h_Type_I_1mm            2:00       0.0205
SCS_24h_Type_I_1mm            2:15       0.0205
SCS_24h_Type_I_1mm            2:30       0.0205
SCS_24h_Type_I_1mm            2:45       0.0205
SCS_24h_Type_I_1mm            3:00       0.0205
SCS_24h_Type_I_1mm            3:15       0.0205
SCS_24h_Type_I_1mm            3:30       0.0205
SCS_24h_Type_I_1mm            3:45       0.0205
SCS_24h_Type_I_1mm            4:00       0.0245
SCS_24h_Type_I_1mm            4:15       0.0245
SCS_24h_Type_I_1mm            4:30       0.0245
SCS_24h_Type_I_1mm            4:45       0.0245
SCS_24h_Type_I_1mm            5:00       0.0245
SCS_24h_Type_I_1mm            5:15       0.0245
SCS_24h_Type_I_1mm            5:30       0.0245
SCS_24h_Type_I_1mm            5:45       0.0245
SCS_24h_Type_I_1mm            6:00       0.031
SCS_24h_Type_I_1mm            6:15       0.031
SCS_24h_Type_I_1mm            6:30       0.031
SCS_24h_Type_I_1mm            6:45       0.031
SCS_24h_Type_I_1mm            7:00       0.038
SCS_24h_Type_I_1mm            7:15       0.038
SCS_24h_Type_I_1mm            7:30       0.038
SCS_24h_Type_I_1mm            7:45       0.038
SCS_24h_Type_I_1mm            8:00       0.05
SCS_24h_Type_I_1mm            8:15       0.05
SCS_24h_Type_I_1mm            8:30       0.07
SCS_24h_Type_I_1mm            8:45       0.07
SCS_24h_Type_I_1mm            9:00       0.098
SCS_24h_Type_I_1mm            9:15       0.098
SCS_24h_Type_I_1mm            9:30       0.236
SCS_24h_Type_I_1mm            9:45       0.612
SCS_24h_Type_I_1mm            10:00      0.136
SCS_24h_Type_I_1mm            10:15      0.136
```

```
SCS_24h_Type_I_1mm            10:30      0.082
SCS_24h_Type_I_1mm            10:45      0.082
SCS_24h_Type_I_1mm            11:00      0.06
SCS_24h_Type_I_1mm            11:15      0.06
SCS_24h_Type_I_1mm            11:30      0.06
SCS_24h_Type_I_1mm            11:45      0.052
SCS_24h_Type_I_1mm            12:00      0.048
SCS_24h_Type_I_1mm            12:15      0.048
SCS_24h_Type_I_1mm            12:30      0.042
SCS_24h_Type_I_1mm            12:45      0.042
SCS_24h_Type_I_1mm            13:00      0.042
SCS_24h_Type_I_1mm            13:15      0.042
SCS_24h_Type_I_1mm            13:30      0.038
SCS_24h_Type_I_1mm            13:45      0.038
SCS_24h_Type_I_1mm            14:00      0.0315
SCS_24h_Type_I_1mm            14:15      0.0315
SCS_24h_Type_I_1mm            14:30      0.0315
SCS_24h_Type_I_1mm            14:45      0.0315
SCS_24h_Type_I_1mm            15:00      0.0315
SCS_24h_Type_I_1mm            15:15      0.0315
SCS_24h_Type_I_1mm            15:30      0.0315
SCS_24h_Type_I_1mm            15:45      0.0315
SCS_24h_Type_I_1mm            16:00      0.024
SCS_24h_Type_I_1mm            16:15      0.024
SCS_24h_Type_I_1mm            16:30      0.024
SCS_24h_Type_I_1mm            16:45      0.024
SCS_24h_Type_I_1mm            17:00      0.024
SCS_24h_Type_I_1mm            17:15      0.024
SCS_24h_Type_I_1mm            17:30      0.024
SCS_24h_Type_I_1mm            17:45      0.024
SCS_24h_Type_I_1mm            18:00      0.024
SCS_24h_Type_I_1mm            18:15      0.024
SCS_24h_Type_I_1mm            18:30      0.024
SCS_24h_Type_I_1mm            18:45      0.024
SCS_24h_Type_I_1mm            19:00      0.024
SCS_24h_Type_I_1mm            19:15      0.024
SCS_24h_Type_I_1mm            19:30      0.024
SCS_24h_Type_I_1mm            19:45      0.024
SCS_24h_Type_I_1mm            20:00      0.0185
SCS_24h_Type_I_1mm            20:15      0.0185
SCS_24h_Type_I_1mm            20:30      0.0185
SCS_24h_Type_I_1mm            20:45      0.0185
SCS_24h_Type_I_1mm            21:00      0.0185
SCS_24h_Type_I_1mm            21:15      0.0185
SCS_24h_Type_I_1mm            21:30      0.0185
SCS_24h_Type_I_1mm            21:45      0.0185
SCS_24h_Type_I_1mm            22:00      0.0185
SCS_24h_Type_I_1mm            22:15      0.0185
SCS_24h_Type_I_1mm            22:30      0.0185
SCS_24h_Type_I_1mm            22:45      0.0185
SCS_24h_Type_I_1mm            23:00      0.0185
SCS_24h_Type_I_1mm            23:15      0.0185
SCS_24h_Type_I_1mm            23:30      0.0185
SCS_24h_Type_I_1mm            23:45      0.0185
SCS_24h_Type_I_1mm            24:00      0

;SCS_Type_II_1mm design storm, total rainfall = 1 mm, rain interval = 6 minutes,
rain units = mm/hr
```

SCS_Type_II_1mm	0:00	0.0101
SCS_Type_II_1mm	0:06	0.0101
SCS_Type_II_1mm	0:12	0.0103
SCS_Type_II_1mm	0:18	0.0103
SCS_Type_II_1mm	0:24	0.0105
SCS_Type_II_1mm	0:30	0.0105
SCS_Type_II_1mm	0:36	0.0107
SCS_Type_II_1mm	0:42	0.0107
SCS_Type_II_1mm	0:48	0.0109
SCS_Type_II_1mm	0:54	0.0109
SCS_Type_II_1mm	1:00	0.0111
SCS_Type_II_1mm	1:06	0.0111
SCS_Type_II_1mm	1:12	0.0113
SCS_Type_II_1mm	1:18	0.0113
SCS_Type_II_1mm	1:24	0.0115
SCS_Type_II_1mm	1:30	0.0115
SCS_Type_II_1mm	1:36	0.0117
SCS_Type_II_1mm	1:42	0.0117
SCS_Type_II_1mm	1:48	0.0119
SCS_Type_II_1mm	1:54	0.0119
SCS_Type_II_1mm	2:00	0.0121
SCS_Type_II_1mm	2:06	0.0121
SCS_Type_II_1mm	2:12	0.0123
SCS_Type_II_1mm	2:18	0.0123
SCS_Type_II_1mm	2:24	0.0125
SCS_Type_II_1mm	2:30	0.0125
SCS_Type_II_1mm	2:36	0.0127
SCS_Type_II_1mm	2:42	0.0127
SCS_Type_II_1mm	2:48	0.0129
SCS_Type_II_1mm	2:54	0.0129
SCS_Type_II_1mm	3:00	0.0131
SCS_Type_II_1mm	3:06	0.0131
SCS_Type_II_1mm	3:12	0.0133
SCS_Type_II_1mm	3:18	0.0133
SCS_Type_II_1mm	3:24	0.0135
SCS_Type_II_1mm	3:30	0.0135
SCS_Type_II_1mm	3:36	0.0137
SCS_Type_II_1mm	3:42	0.0137
SCS_Type_II_1mm	3:48	0.0139
SCS_Type_II_1mm	3:54	0.0139
SCS_Type_II_1mm	4:00	0.0141
SCS_Type_II_1mm	4:06	0.0143
SCS_Type_II_1mm	4:12	0.0145
SCS_Type_II_1mm	4:18	0.0147
SCS_Type_II_1mm	4:24	0.0149
SCS_Type_II_1mm	4:30	0.0151
SCS_Type_II_1mm	4:36	0.0153
SCS_Type_II_1mm	4:42	0.0155
SCS_Type_II_1mm	4:48	0.0157
SCS_Type_II_1mm	4:54	0.0159
SCS_Type_II_1mm	5:00	0.0161
SCS_Type_II_1mm	5:06	0.0163
SCS_Type_II_1mm	5:12	0.0165
SCS_Type_II_1mm	5:18	0.0167
SCS_Type_II_1mm	5:24	0.0169
SCS_Type_II_1mm	5:30	0.0171
SCS_Type_II_1mm	5:36	0.0173

SCS_Type_II_1mm	5:42	0.0175
SCS_Type_II_1mm	5:48	0.0177
SCS_Type_II_1mm	5:54	0.0179
SCS_Type_II_1mm	6:00	0.0181
SCS_Type_II_1mm	6:06	0.0183
SCS_Type_II_1mm	6:12	0.0185
SCS_Type_II_1mm	6:18	0.0187
SCS_Type_II_1mm	6:24	0.0189
SCS_Type_II_1mm	6:30	0.0191
SCS_Type_II_1mm	6:36	0.0193
SCS_Type_II_1mm	6:42	0.0195
SCS_Type_II_1mm	6:48	0.0197
SCS_Type_II_1mm	6:54	0.0199
SCS_Type_II_1mm	7:00	0.0201
SCS_Type_II_1mm	7:06	0.0203
SCS_Type_II_1mm	7:12	0.0205
SCS_Type_II_1mm	7:18	0.0207
SCS_Type_II_1mm	7:24	0.0209
SCS_Type_II_1mm	7:30	0.0211
SCS_Type_II_1mm	7:36	0.0213
SCS_Type_II_1mm	7:42	0.0215
SCS_Type_II_1mm	7:48	0.0217
SCS_Type_II_1mm	7:54	0.0219
SCS_Type_II_1mm	8:00	0.0225
SCS_Type_II_1mm	8:06	0.0235
SCS_Type_II_1mm	8:12	0.0245
SCS_Type_II_1mm	8:18	0.0255
SCS_Type_II_1mm	8:24	0.0265
SCS_Type_II_1mm	8:30	0.0275
SCS_Type_II_1mm	8:36	0.0285
SCS_Type_II_1mm	8:42	0.0295
SCS_Type_II_1mm	8:48	0.0305
SCS_Type_II_1mm	8:54	0.0315
SCS_Type_II_1mm	9:00	0.032
SCS_Type_II_1mm	9:06	0.032
SCS_Type_II_1mm	9:12	0.032
SCS_Type_II_1mm	9:18	0.032
SCS_Type_II_1mm	9:24	0.032
SCS_Type_II_1mm	9:30	0.0328
SCS_Type_II_1mm	9:36	0.0344
SCS_Type_II_1mm	9:42	0.036
SCS_Type_II_1mm	9:48	0.0376
SCS_Type_II_1mm	9:54	0.0392
SCS_Type_II_1mm	10:00	0.0412
SCS_Type_II_1mm	10:06	0.0436
SCS_Type_II_1mm	10:12	0.046
SCS_Type_II_1mm	10:18	0.0484
SCS_Type_II_1mm	10:24	0.0508
SCS_Type_II_1mm	10:30	0.054
SCS_Type_II_1mm	10:36	0.058
SCS_Type_II_1mm	10:42	0.062
SCS_Type_II_1mm	10:48	0.066
SCS_Type_II_1mm	10:54	0.07
SCS_Type_II_1mm	11:00	0.0768
SCS_Type_II_1mm	11:06	0.0864
SCS_Type_II_1mm	11:12	0.096
SCS_Type_II_1mm	11:18	0.1056

SCS_Type_II_1mm	11:24	0.1152
SCS_Type_II_1mm	11:30	0.2384
SCS_Type_II_1mm	11:36	0.4752
SCS_Type_II_1mm	11:42	0.7643
SCS_Type_II_1mm	11:48	1.3707
SCS_Type_II_1mm	11:54	0.9514
SCS_Type_II_1mm	12:00	0.1896
SCS_Type_II_1mm	12:06	0.1668
SCS_Type_II_1mm	12:12	0.144
SCS_Type_II_1mm	12:18	0.1212
SCS_Type_II_1mm	12:24	0.0984
SCS_Type_II_1mm	12:30	0.0844
SCS_Type_II_1mm	12:36	0.0792
SCS_Type_II_1mm	12:42	0.074
SCS_Type_II_1mm	12:48	0.0688
SCS_Type_II_1mm	12:54	0.0636
SCS_Type_II_1mm	13:00	0.0596
SCS_Type_II_1mm	13:06	0.0568
SCS_Type_II_1mm	13:12	0.054
SCS_Type_II_1mm	13:18	0.0512
SCS_Type_II_1mm	13:24	0.0484
SCS_Type_II_1mm	13:30	0.046
SCS_Type_II_1mm	13:36	0.044
SCS_Type_II_1mm	13:42	0.042
SCS_Type_II_1mm	13:48	0.04
SCS_Type_II_1mm	13:54	0.038
SCS_Type_II_1mm	14:00	0.0367
SCS_Type_II_1mm	14:06	0.0359
SCS_Type_II_1mm	14:12	0.0353
SCS_Type_II_1mm	14:18	0.0345
SCS_Type_II_1mm	14:24	0.0339
SCS_Type_II_1mm	14:30	0.0331
SCS_Type_II_1mm	14:36	0.0325
SCS_Type_II_1mm	14:42	0.0317
SCS_Type_II_1mm	14:48	0.0311
SCS_Type_II_1mm	14:54	0.0303
SCS_Type_II_1mm	15:00	0.0297
SCS_Type_II_1mm	15:06	0.0289
SCS_Type_II_1mm	15:12	0.0283
SCS_Type_II_1mm	15:18	0.0275
SCS_Type_II_1mm	15:24	0.0269
SCS_Type_II_1mm	15:30	0.0261
SCS_Type_II_1mm	15:36	0.0255
SCS_Type_II_1mm	15:42	0.0247
SCS_Type_II_1mm	15:48	0.0241
SCS_Type_II_1mm	15:54	0.0233
SCS_Type_II_1mm	16:00	0.0229
SCS_Type_II_1mm	16:06	0.0226
SCS_Type_II_1mm	16:12	0.0224
SCS_Type_II_1mm	16:18	0.0221
SCS_Type_II_1mm	16:24	0.0219
SCS_Type_II_1mm	16:30	0.0216
SCS_Type_II_1mm	16:36	0.0214
SCS_Type_II_1mm	16:42	0.0211
SCS_Type_II_1mm	16:48	0.0209
SCS_Type_II_1mm	16:54	0.0206
SCS_Type_II_1mm	17:00	0.0204

SCS_Type_II_1mm	17:06	0.0201
SCS_Type_II_1mm	17:12	0.0199
SCS_Type_II_1mm	17:18	0.0196
SCS_Type_II_1mm	17:24	0.0194
SCS_Type_II_1mm	17:30	0.0191
SCS_Type_II_1mm	17:36	0.0189
SCS_Type_II_1mm	17:42	0.0186
SCS_Type_II_1mm	17:48	0.0184
SCS_Type_II_1mm	17:54	0.0181
SCS_Type_II_1mm	18:00	0.0179
SCS_Type_II_1mm	18:06	0.0176
SCS_Type_II_1mm	18:12	0.0174
SCS_Type_II_1mm	18:18	0.0171
SCS_Type_II_1mm	18:24	0.0169
SCS_Type_II_1mm	18:30	0.0166
SCS_Type_II_1mm	18:36	0.0164
SCS_Type_II_1mm	18:42	0.0161
SCS_Type_II_1mm	18:48	0.0159
SCS_Type_II_1mm	18:54	0.0156
SCS_Type_II_1mm	19:00	0.0154
SCS_Type_II_1mm	19:06	0.0151
SCS_Type_II_1mm	19:12	0.0149
SCS_Type_II_1mm	19:18	0.0146
SCS_Type_II_1mm	19:24	0.0144
SCS_Type_II_1mm	19:30	0.0141
SCS_Type_II_1mm	19:36	0.0139
SCS_Type_II_1mm	19:42	0.0136
SCS_Type_II_1mm	19:48	0.0134
SCS_Type_II_1mm	19:54	0.0131
SCS_Type_II_1mm	20:00	0.013
SCS_Type_II_1mm	20:06	0.0129
SCS_Type_II_1mm	20:12	0.0129
SCS_Type_II_1mm	20:18	0.0128
SCS_Type_II_1mm	20:24	0.0128
SCS_Type_II_1mm	20:30	0.0127
SCS_Type_II_1mm	20:36	0.0127
SCS_Type_II_1mm	20:42	0.0126
SCS_Type_II_1mm	20:48	0.0126
SCS_Type_II_1mm	20:54	0.0125
SCS_Type_II_1mm	21:00	0.0125
SCS_Type_II_1mm	21:06	0.0124
SCS_Type_II_1mm	21:12	0.0124
SCS_Type_II_1mm	21:18	0.0123
SCS_Type_II_1mm	21:24	0.0123
SCS_Type_II_1mm	21:30	0.0122
SCS_Type_II_1mm	21:36	0.0122
SCS_Type_II_1mm	21:42	0.0121
SCS_Type_II_1mm	21:48	0.0121
SCS_Type_II_1mm	21:54	0.012
SCS_Type_II_1mm	22:00	0.012
SCS_Type_II_1mm	22:06	0.0119
SCS_Type_II_1mm	22:12	0.0119
SCS_Type_II_1mm	22:18	0.0118
SCS_Type_II_1mm	22:24	0.0118
SCS_Type_II_1mm	22:30	0.0117
SCS_Type_II_1mm	22:36	0.0117
SCS_Type_II_1mm	22:42	0.0116

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SCS_Type_II_1mm             22:48      0.0116
SCS_Type_II_1mm             22:54      0.0115
SCS_Type_II_1mm             23:00      0.0115
SCS_Type_II_1mm             23:06      0.0114
SCS_Type_II_1mm             23:12      0.0114
SCS_Type_II_1mm             23:18      0.0113
SCS_Type_II_1mm             23:24      0.0113
SCS_Type_II_1mm             23:30      0.0112
SCS_Type_II_1mm             23:36      0.0112
SCS_Type_II_1mm             23:42      0.0111
SCS_Type_II_1mm             23:48      0.0111
SCS_Type_II_1mm             23:54      0.011

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       -8838052.8122    5416973.55485    -8837942.9618    5417165.22215
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
CBMH             -8837964.837     5417045.057
CTRLMH           -8838007.32      5417031.895
EXMH1            -8838025.398     5417019.479
EXMH2            -8838002.679     5417025.512
EXMH3            -8837977.63      5417032.284
J2               -8838005.762     5417024.774
EXMH             -8838017.753     5416992.267
Tank1            -8838007.941     5417034.165

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
100              -8838035.56      5417108.145
100              -8837989.639     5417121.894
100              -8837966.667     5417044.216
100              -8838014.083     5417030.026
100              -8838035.56      5417108.145
S1               -8837988.792     5417122.963
S1               -8838036.475     5417108.723
S1               -8838047.819     5417141.304
S1               -8837998.601     5417156.51
S1               -8837994.812     5417155.908
S1               -8837961.245     5417045.956
```

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S1               -8837955.806     5417046.909
S1               -8837947.955     5417019.787
S1               -8837982.763     5417010.988
S1               -8838012.504     5417000.359
S1               -8838019.562     5417028.043
S1               -8837966.003     5417043.841
S1               -8837988.792     5417122.963

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```
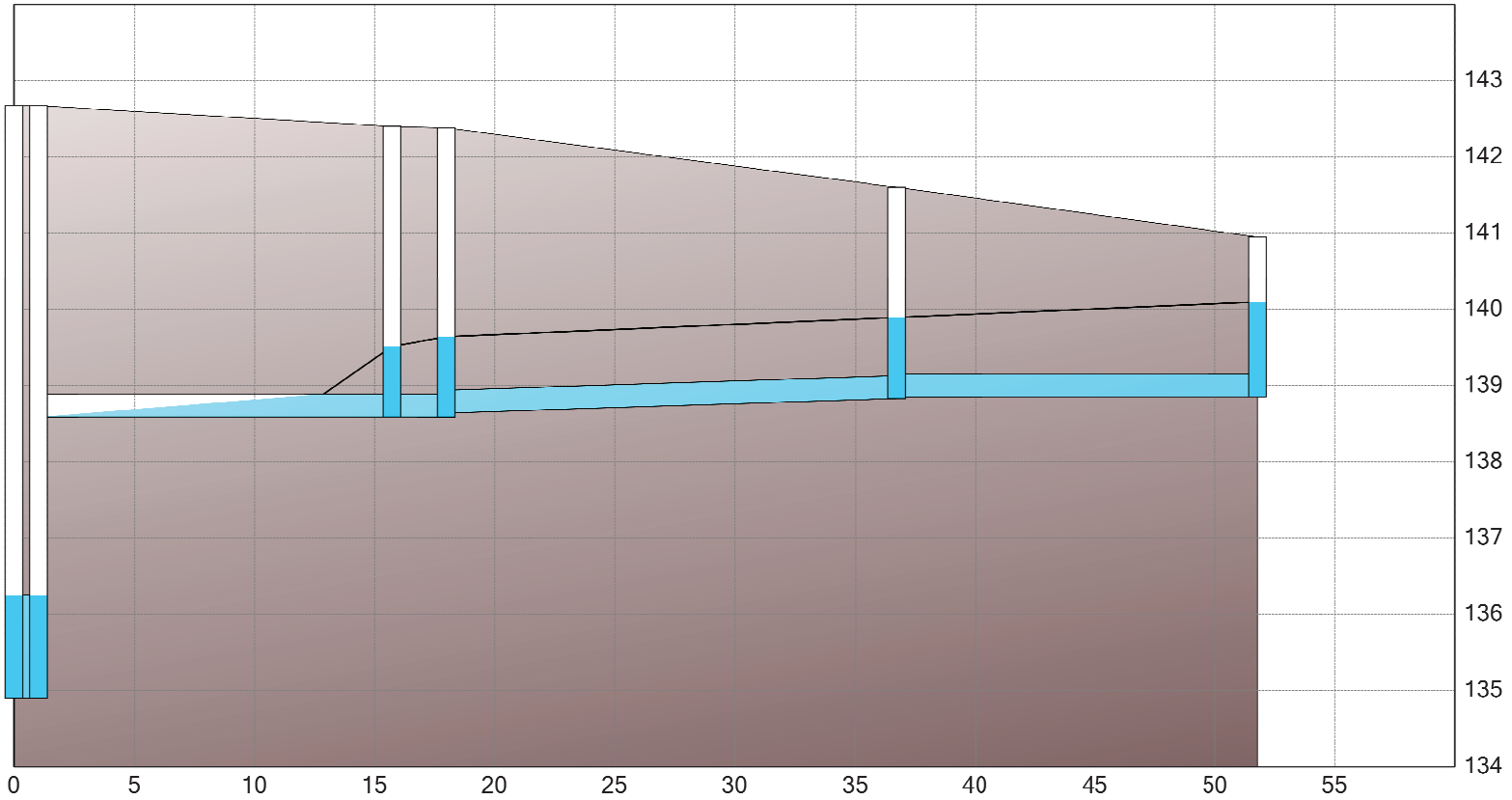

HGL

Time: 9/30/2015 1:29:00 AM

Links:

C2	C1_2	C1_1	C1	C3
Q=187.31 L/s	Q=187.31 L/s	Q=168.218 L/s	Q=146.224 L/s	Q=146.226 L/s
V=0.131 m/s	V=2.65 m/s	V=2.38 m/s	V=2.069 m/s	V=2.069 m/s



Nodes:

EXMH	EXMH1	J2	EXMH2	EXMH3	CBMH
H=136.25 m	H=136.2504 m	H=139.514 m	H=139.6409 m	H=139.8949 m	H=140.098 m
M=136.25 m	M=136.2504 m	M=139.514 m	M=139.6409 m	M=139.8949 m	M=140.098 m
R=142.67 m	R=142.67 m	R=142.4 m	R=142.38 m	R=141.6 m	R=140.95 m
I=134.9 m	I=134.9 m	I=138.59 m	I=138.59 m	I=138.83 m	I=138.85 m

1365 Yonge Street

Irrigation Water Requirement (Rev)

Planting Description	Area (m2)	Species Factor (Ks)	Density Factor (Kd)	Micriclimate Factor (Kmc)	Kl (Kl=KsxKdxKmc)	ETl (mm)/ Day (Etl=ET0xKl)	Water Reqt (m3 per day	Irrig. Eff (%) Drip	Gross Water Reqt (m3) per day
Ground Floor									
Shrub Planting	54.00	0.5	1.1	1.0	0.55	2.5	0.13	90	0.15
Ornamental Trees (4 x 12.6)	50.40	0.5	1.1	1.0	0.55	2.5	0.12	90	0.14
Level 3									
Shrub Planting	24.00	0.5	1.1	1.3	0.715	3.2	0.08	90	0.09
Ornamental Trees (1 x 12.6)	12.60	0.5	1.0	1.4	0.7	3.2	0.04	90	0.04
MPH Level									
Shrub Planting	188.00	0.5	1.1	1.3	0.715	3.2	0.60	90	0.67
Large Deciduous Shade Trees (4 x 28.3	113.20	0.5	1.0	1.4	0.7	3.2	0.36	90	0.40
Ornamental Trees (3 x 12.6)	37.80	0.5	1.0	1.4	0.7	3.2	0.12	90	0.13
Large Growing Shrubs (12 x 1.77)	21.24	0.5	1.0	1.4	0.7	3.2	0.07	90	0.07
Upper MPH Level									
Extensive Green Roof	224.00	0.2	1.1	1.2	0.264	1.2	0.27	90	0.30
Total Water Requirement For July:	**725.24**								**1.99**

ET0 is the evepotranspiration rate for peek period (Month of July in Toronto). This value is 138.2 mm for the month @ 4.5 mm/ day

Seasonal Water Requirement (M3)

Month	Evapotranspiration Factor	Water Req/Day (M3)	Water Req./72 Hours (M3)
May	74%	1.47	4.41
June	90%	1.79	5.37
July	100%	**1.99**	**5.96**
August	80%	1.59	4.77
September	52%	1.03	3.10
October	40%	0.80	2.39
Seasonal Average/ 72 hours:			**4.33**

ECHELON ENVIRONMENTAL

55 Albert Street Suite 200 Markham, ON L3P 2T4
Tel: (905) 948-0000 Fax: (905) 948-0577
E-mail: info@echelonenvironmental.ca

June 8, 2022

Mark Wong
GHD
140 Allstate Parkway, Suite 210
Markham, ON
L3R 5Y8

Re: StormFilter Stormwater Treatment System Design
1365 – 1375 Yonge Street, Toronto, ON

Dear Mark,

This letter is to confirm that the proposed Stormfilter SPFD0806 (or CIP) model for the above referenced project has been designed to comply with the Enhanced Level 1 treatment criteria based on the OGS design parameters provided by GHD on June 8, 2022. More specifically, for a drainage area of 0.0415ha with a runoff coefficient of 0.90. The Stormfilter product has current, non expired NJDEP certification and a copy of this can be obtained from the NJDEP website https://www.nj.gov/dep/stormwater/treatment.html.

Sincerely,

Natalie Wong, P.Eng.
Project Manager
Echelon Environmental

Att. StormFilter Sizing Calculations
StormFilter Cut Sheet Drawing

Determining Number of Cartridges for Flow Based Systems

Date	**08/06/2022**	**Black Cells =**	**Calculation**

Site Information

Project Name	**1365-1375 Yonge Street**		
Project Location	**Toronto, ON**		
OGS ID	**OGS**		
Drainage Area, Ad	**0.10**	ac	(0.0415 ha)
Impervious Area, Ai	**0.10**	ac	
Pervious Area, Ap	**0.00**		
% Impervious	**100%**		
Runoff Coefficient, Rc	**0.90**		
Treatment storm flow rate, Q_{treat}	**0.07**	cfs	(2.1 L/s)
Peak storm flow rate, Q_{peak}	**TBD**	cfs	

Filter System

Filtration brand	**StormFilter**	
Cartridge height	**18**	in
Specific Flow Rate	**2.00**	gpm/ft^2
Flow rate per cartridge	**15.00**	gpm

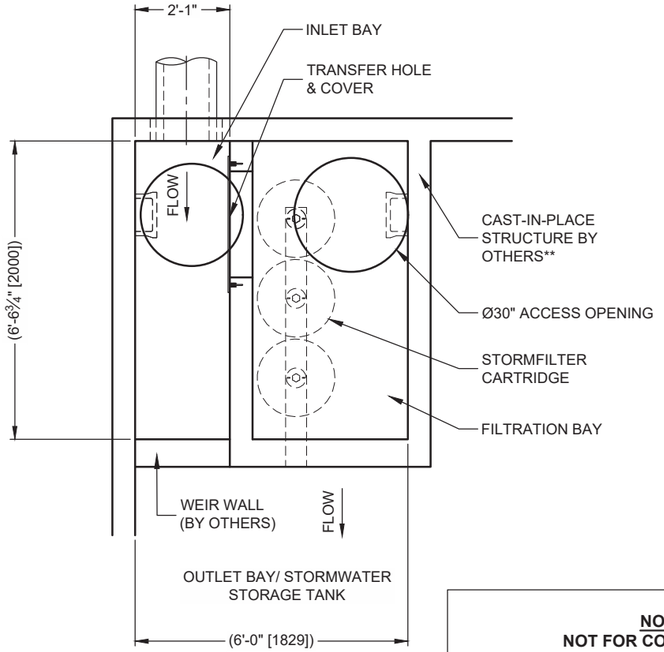
SUMMARY

Number of Cartridges	3
Media Type	Perlite

Event Mean Concentration (EMC)	**150**	mg/L
Annual TSS Removal	**80%**	
Percent Runoff Capture	**90%**	

Recommend SFPD0806 vault or CIP

200 Enterprise Drive
Scarborough, ME 04074
Phone 877-907-8676
Fax 207-885-9825



PLAN

NOTES
NOT FOR CONSTRUCTION

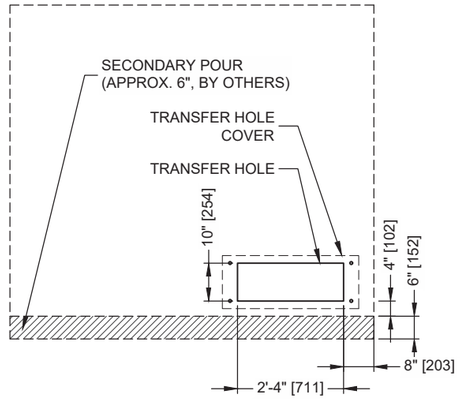
* CRITICAL ELEVATIONS.
** STRUCTURAL DESIGN BY OTHERS.
MINIMUM INTERNAL DIMENSIONS TO REMAIN.
*** INLET & OUTLET PIPE SIZE, LOCATION
AND MATERIAL TO BE CONFIRMED.

STORMFILTER DESIGN TABLE

- THE 8' x 6' 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

SEPARATION WALL DETAIL



ELEVATION VIEW
VIEWED FROM FILTRATION BAY

SITE SPECIFIC DATA REQUIREMENTS

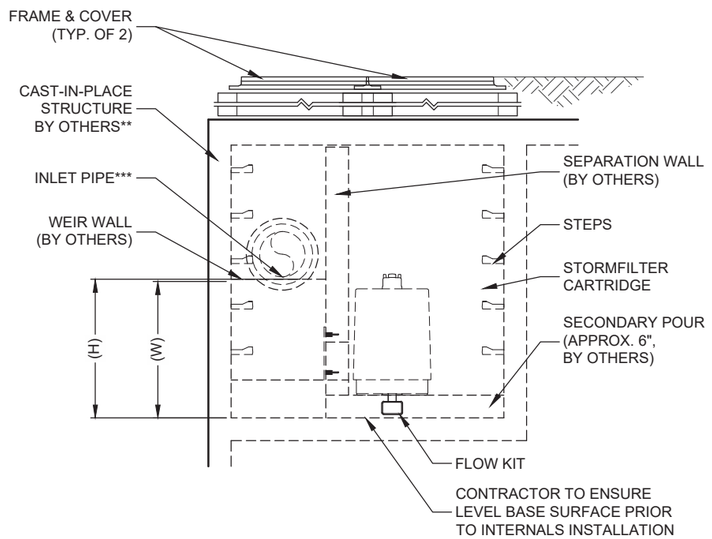
STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (CSF, PERLITE, ZPG)	*

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:



ELEVATION

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. STRUCTURE SHALL MEET AASHTO CL625 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. 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 EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

The Stormwater Management StormFilter®

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

THE STORMWATER MANAGEMENT STORMFILTER PEAK DIVERSION STORMFILTER CAST-IN-PLACE

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 afore-mentioned 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=0.99x3.2x0.25=0.79 cfs=0.79x448.83 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:

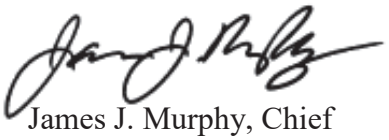
1. *MTFR calculated based on 4.72x10-3 cfs/sf (2.12 gpm/sf) of effective filtration treatment area.*
2. *Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.*

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,



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

CONTECH®
ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

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:

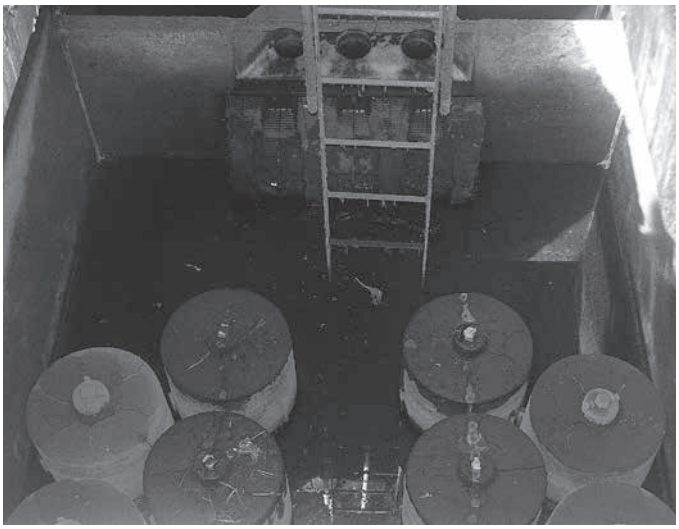
Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

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 weather 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 ≥ 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.

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.

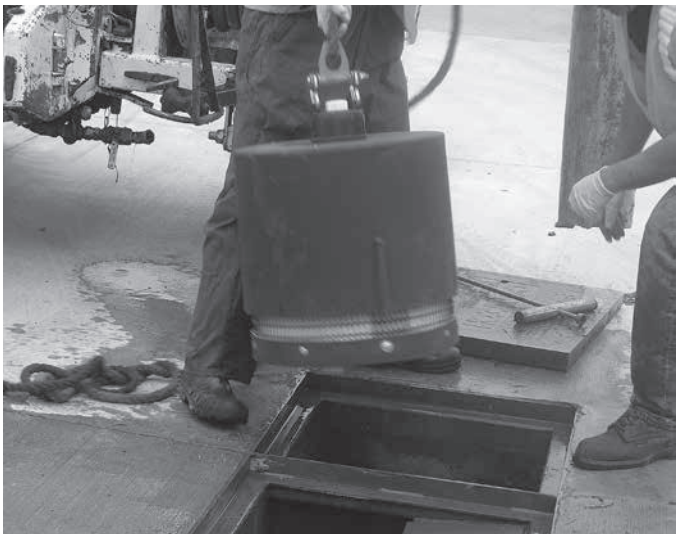
Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste 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.

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.



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:

_____

_____

_____

_____

_____

_____

_____

RECYCLED PAPER

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Project: 1365-1375 YONGE ST STORAGE SIZING
Project No: 11156419
Created: Apr-18
Printed: 2/26/2021 15:43

Stormwater Management Calculations

Rational Method

Proposed Institutional Redevelopment
City of Toronto - Toronto & East York District

Rational Method Flow Calculator

	Tc (mins.)	A Area (ha)	I Intensity (mm/hr)	R Run-off Co-efficient
	10	0.204	250.32	0.71

Q=R*A*I*N — **0.100 cms**
N=2.778 for l/s, 1/360 for cms — **100.34 l/s**

Input Tc, A and R

	Formulas below: V	
2-yr:	21.8/(t/60)^0.78	88.19
5-yr:	32/(t/60)^0.79	131.79
10-yr:	38.7/(t/60)^0.80	162.27
25-yr:	45.2/(t/60)^0.80	189.52
50-yr:	53.5/(t/60)^0.80	224.32
100-yr:	59.7/(t/60)^0.80	250.32

City of Toronto

IDF Curve - Input Table

Return	A	C
2	21.8	-0.78
5	32	-0.79
10	38.7	-0.8
25	45.2	-0.8
50	53.5	-0.8
100	59.7	-0.8

Project:	1365-1375 YONGE ST	STORAGE SIZING	
Project No:	11156419	0	
Created:	43191		
Printed:	2/26/2021 15:43		

Stormwater Management Calculations

Pre Development Flows - ROSEHILL CATCHMENT

1365 Yonge Street
City of Toronto - Toronto & East York District

SITE AREA **1077** m^2 **THIS SUB CATCHMENT'S ALLOTMENT** 100%

Contributing Areas

	Area (m^2)	
Controlled Roof:	0	m^2
Uncontrolled Roof:	1077	m^2
Total Roof Area:	1077	m^2
Pavement / Impervious		m^2
Landscaped / Pervious:		m^2
TOTAL SITE AREA	1077	m^2
TOTAL AREA (Excluding Controlled Roof)	1077	m^2

	Area (m^2)	Area*RC	Percent
Controlled Roof	0		0%
Uncontrolled Roof	1077	969	100%
Pavement / Impervious	0	0	0%
Landscaped / Pervious	0	0	0%
TOTAL AREA (Excluding Controlled Roof Area)	**1077**	**0.90**	

Runoff Coefficients	
Rooftops	0.90
Pavement/Concrete	0.90
Landscape	0.25

2 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min
2 year intensity	88.19	mm/hr

Uncontrolled Roof Runoff:	23.7	l/s
Pavement / Impervious Runoff:	0.0	l/s
Landscaped / Pervious Runoff:	0.0	l/s
RELEASE RATE:	23.7	l/s
THIS SUB CATCHMENT'S RELEASE RATE: ####	**23.7**	**l/s**

Project: 1365-1375 YONGE ST
Project No: 11156419
Created: 43191
Printed: 2/26/2021 15:43

Stormwater Management Calculations

Pre Development Flows - YONGE CATCHMENT

1375 Yonge Street
City of Toronto - Toronto & East York District

SITE AREA **1028** m^2 **THIS SUB CATCHMENT'S ALLOTMENT** 100%

.

Contributing Areas

	Area (m^2)	
Controlled Roof:	0	m^2
Uncontrolled Roof:	1028	m^2
Total Roof Area:	1028	m^2
Pavement / Impervious		m^2
Landscaped / Pervious:		m^2
TOTAL SITE AREA	1028	m^2
TOTAL AREA (Excluding Controlled Roof)	1028	m^2

	Area (m^2)	Area*RC	Percent
Controlled Roof	0		0%
Uncontrolled Roof	1028	925	100%
Pavement / Impervious	0	0	0%
Landscaped / Pervious	0	0	0%
TOTAL AREA (Excluding Controlled Roof Area)	**1028**	**0.90**	

Runoff Coefficients	
Rooftops	0.90
Pavement/Concrete	0.90
Landscape	0.25

2 Year Pre Development Flow @Runoff Coefficient of 0.90

Time of Concentration	10	min
2 year intensity	88.19	mm/hr

Uncontrolled Roof Runoff:	22.7 l/s
Pavement / Impervious Runoff:	0.0 l/s
Landscaped / Pervious Runoff:	0.0 l/s
RELEASE RATE:	22.7 l/s
THIS SUB CATCHMENT'S RELEASE RATE: ####	**22.7 l/s**

Appendix C
Fire Flow Demand Calculations
Hydrant Flow Test
Fire Protection Computations

Fire Flow Calculations

As per Fire Underwriter's Survey Guidelines (1999)

PROJ: 1365-1375 YONGE | **DATE CREATED:** April 9, 2018

JOB#: 11156419 | **DATE PRINTED:** May 25, 2023

C **Coefficient related to type of construction**

	[yes/no]	
• Wood frame		1.5
• Ordinary construction		1
• Non-combustible construction		0.8
• Fire resistive construction (> 3 hrs)	yes	0.6
• Interpolation (Using FUS Tables)		

A **Area of structure considered (m ^{2})** *2,011* <==> 21,645 ft^2

F **Required fire flow (L/min)**

F = 220 C (A)$^{0.5}$ ***6,000 L/min***

Occupancy hazard reduction of surcharge

	[yes/no]	
• Non-combustible		-25%
• Limited combustible	yes	-15%
• Combustible		0%
• Free burning		15%
• Rapid burning		25%

5,100 L/min (1)

Sprinkler Reduction

• Non-combustible - Fire Resistive (3)	yes	30%	***1,530 L/min***	(2)

Exposure surcharge (cumulative (%), 4 sides)

	[yes/no]			
0 - 3 m	Yes	25%	1 side	25%
3.1 - 10 m	Yes	20%	1 side	20%
10.1 - 20 m	Yes	15%	2 side	30%
20.1 - 30 m		10%		
30.1- 45 m		5%		
			Cumulative Total	**75%**

3,830 L/min (3)

REQUIRED FIRE FLOW [(1) - (2) + (3)]		***7,000 L/min***
(2,000 L/min < Fire Flow < 45,000 L/min)	***or***	***116.67 L/s***
	or	***1,849 USGPM***

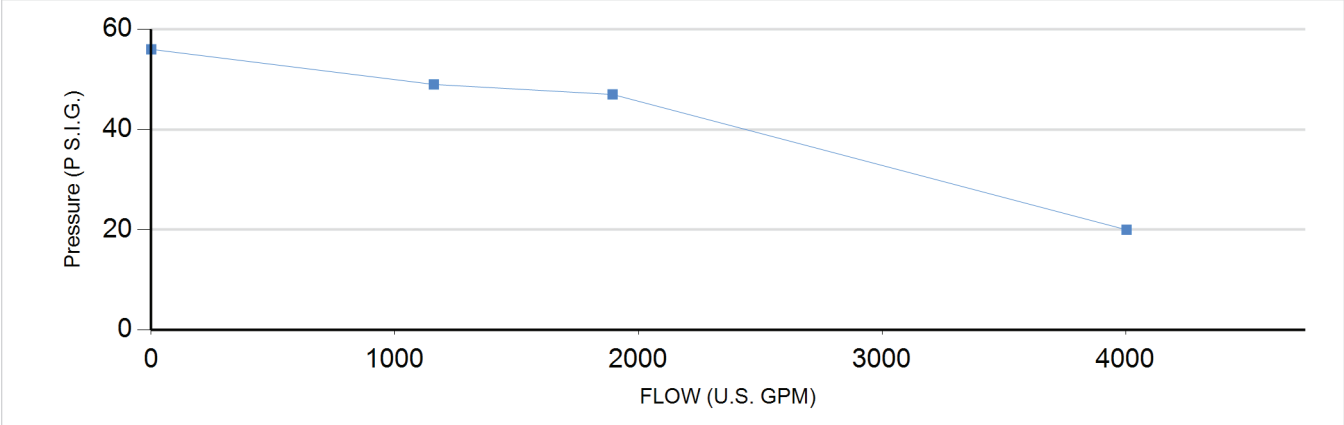
10 Estate Drive, Toronto, Ontario M1H 2Z1
Phone: 416.282.1665 Fax: 416.282.7702
Toll Free: 1.888.349.2493
www.Corix.com

FLOW TEST REPORT

Customer	GHD
Location	1365 Yonge St, Toronto, Ontario Canada
Corix Job Number	2288JOB00183
Order ID	798
Date	May 8, 2018
Time of Test	10:00
Location of test (flow)	1391 Yonge st
Location of test (residual)	1395 Yonge st
Main size	
Static pressure (psi)	56

Test Number: 1

Number of Outlets and Orifice Size	PITOT Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
1 x 1 1/8			
1 x 1 3/4			
1 x 2 1/2	48	1160	49
2 x 2 1/2	32	1894	47
		4004	20



Colour code	Blue
Comments	3 x 2 1/2 = 2560
Crew	

Fire Protection Computations

As per the 'National Fire Protection Association (NFPA)' Guidelines

150mm diameter W/M Yonge Street and Rosehill Avenue - Flow at 20 PSI

PROJ: 1365-1375 Yonge St **DATE CREATED:** July 25, 2018

JOB#: 11154619 **DATE PRINTED:** May 9, 2023

Q_F **Observed Flow**

c Coefficient; 0.90 - 0.95

d Nozzle / Outlet Diameter

p Pitot Pressure

c	0.90		
d	3.5	in.*	
p	32	psi	

$Q_F = 29.83*c*(d^2)*(p^0.5)$ U.S. GPM

Q_F	*1,898*	*U.S. GPM*

Q_R **Available Flow**

h_R Drop in pressure from static pressure to desired residual baseline pressure

h_F Drop in pressure from static pressure to actual residual pressure measured during test

Static Pressure	56	psi
Desired Residual Pressure	20	psi
Measured Residual Pressure	47	psi

$Q_R = (Q_R)*(h_F^0.54)/(h_R^0.54)$ U.S. GPM

Q_R	*4,010*	*U.S. GPM*
or	*15,180*	*L/min*
or	*253*	*L/s*

* Equivalent to 2x2.5in

Appendix D
Site Servicing Report Groundwater Review Form

August 2018

HYDROLOGICAL REVIEW SUMMARY

The form is to be completed by the Professional that prepared the Hydrological Review.
Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

Refer to the Terms of Reference, Hydrological Review:
Link to Terms of Reference Hydrological Review

For City Staff Use Only:	
Name of ECS Case Manager (Please print)	
Date Review Summary provided to to TW, EM&P	

IF ANY OF THE REQUIREMENTS LISTED BELOW HAVE NOT BEEN INLCUDED IN THE HYDROLOGICAL REVIEW, THE REVIEW WILL BE CONSIDERED INCOMPLETE.
THE GREY SHADED BOXES WILL REQUIRE A CONSISTANCY CHECK BY THE ECS CASE MANAGER.

Summary of Key Information:

SITE INFORMATION		**Page # & Section # of Review**	**Review Includes this Information City Staff (Check)**
Site Address	1365-1375 Yonge St, Toronto, Ontario	Cover Page	
Postal Code	M4T 2P7	Cover Page	
Property Owner (on request for comments memo)	Yonge and Rosehill Inc.	Page 3 Section 1	
Proposed description of the project (if applicable) (point towers, number of podiums)	Single, 50 Storey Tower. Mixed Use	Page 3 section 1	
Land Use (ex. commercial, residential, mixed, institutional, industrial)	Commercial Residential	Page 3 Section 2	
Number of below grade levels for the proposed structure	5 underground levels	Page 4 Section 2.2	
HYDROLOGICAL REVIEW INFORMATION			
Date Hydrological Review was prepared:	April 28 2023	Cover Page	
Who Performed the Hydrological Review (Consulting Firm)	GEMS	Cover Page	
Name of Author of Hydrological Review	Kenley Bairos / Laura Maharaj	Page 12 Section 10	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Check the directories on the website for Professional Geoscientists and/or Professional Engineers of Ontario been checked to ensure that the Hydrological Report has been prepared by a qualified person who is a licensed Professional Geoscientist as set out in the Professional Geoscientist Act of Ontario or a Professional Engineer? PEO: Professional Engineers of Ontario APGO: Association of Professional Geoscientists of Ontario		N/A	
Has the Hydrological Review been prepared in accordance with all the following: • Ontario Water Resources Act • Ontario Regulation 387/04 • Toronto Municipal Code Chapter 681-Sewers	Yes		
		Page # & Section # of every occurrence in the Review	**Review Includes this Information City Staff (Check)**

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) **with safety factor included**	145,000 L/day What safety factor was used? 1.5	Page 6 Section 5.4	
Total Volume (L/day) Short Term Discharge of groundwater (construction dewatering) **without safety factor included**	110,718 L/day	Page 6 Section 5.4	
Total Volume (L/day) Long Term drainage of groundwater (from foundation drainage, weeping tiles, sub slab drainage) **with safety factor included** If the development is part of a multiple tower complex, include total volume for each separate tower	10,712 L/day What safety factor was used? 1.5	Page 17 Section 5.5	
List the nearest surface water (river, creek, lake)	Yellow Creek, The Don River	Page 7 Section 4.2	

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
Lowest basement elevation	126.02 masl	Page 14 Section 5.1	
Foundation elevation	125.02 masl	Page 14 Section 5.1	
Ground elevation	142.0 masl	Page 14 Section 5.1	
STUDY AREA MAP		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
Study area map(s) have been included in the report.	**X Yes**	Page 25 Figure 1	N/A
Study area map(s) been prepared according to the Hydrological Review Terms of Reference.	**X Yes**	Page 25 Figure 1	N/A
WATER LEVEL AND WELLS		**Page # & Section # of every occurrence**	**Review Includes this Information (City Staff Initial)**

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
		in the Review	
The groundwater level has been monitored using all wells located on site (within property boundary).	Report presents WLs from 9 wells (MW201, MW202S/D, MW203, MW204S/D, MW301, MW302S/D)	Page 8 Section 4.3	
The static water level measurements have been monitored at all monitoring wells for a minimum of 3 months with samples taken every 2 weeks for a minimum of 6 samples. The intent is for the qualified professional to use professional judgement to estimate the seasonally high groundwater level.	Water levels were taken 6 times from March – August 2021 in wells: MW201, MW202S/D, MW203, MW204S/D	Page 8 Section 4.3	
All water levels in the wells have been measured with respect to masl.	Yes	Page 8 Section 4.3	
A table of geology/soil stratigraphy for the property has been included.	Yes	Page 6 Section 4.1	
GEOLOGY AND PHYSICAL HYDROLOGY		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information (City Staff Initial)**
The review has made reference to the soil materials including thickness, composition and texture, and bedrock environments.	Yes	Page 6 Section 4.1	
Key aquifers and the site's proximity to nearby surface water has been identified.	**X Yes**	Page 6 Section 4.2	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
PUMP TEST/SLUG TEST/DRAWDOWN ANALYSIS		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
A summary of the pumping test data and analysis is included in the review.	Rising head slug tests in three wells were used to determine the hydraulic conductivity characteristics of the site.	Page 9 Section 4.4	
The pump test been carried out for at least 24 hours if possible. If not, has a slug test been conducted?	Rising head slug tests in three wells were used to determine the hydraulic conductivity characteristics of the site.	Page 9 Section 4.4	
Have the monitoring well(s) have been monitored using digital devices? If yes how frequently?	Yes, every 10 seconds for a minimum of 30 minutes or until static levels achieved.	Page 9 Section 4.4	
If a slug or pump test has been conducted has the static groundwater level been monitored at all monitoring well(s) multiple times to measure recovery? -prior to the slug or pumping test(s)? -post slug or pumping test(s)?	**X Yes**	Page 9 Section 4.4	N/A
The above noted slug or pump tests have been included in the report.	**X Yes**	Page 9/10 Section 4.4 & Appendix D	
WATER QUALITY		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
The report includes baseline water quality samples from a laboratory. The water quality must be analyzed for all parameters listed in Tables 1 and 2 of Chapter 681 Sewers of the Toronto Municipal Code (found in Appendix A) and the samples must have to be taken unfiltered within 9 months of the date of submission.	Yes, water quality samples were taken from MW301 and the results are provided in Appendix.	Page 11 Section 4.5 & Appendix E	
The water quality data templates in Appendix A have been completed for each sample taken for both sanitary/combined and storm sewer limits.	For sanitary discharge- See the sanitary/combined sewer parameter limit template - Yes For storm discharge- See the storm sewer parameter limit template - Yes	See Appendix of Hydrological Review	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the sanitary/combined Bylaw limits **If there are any sample parameter Exceedances the groundwater can't be discharged as is.**	There were no exceedances of the Sanitary/combined Bylaw limits	Page 11 Section 4.5	
Qualified professional to list all sample parameters that have violated the Bylaw limits for each sample taken for the storm Bylaw limits. **If there are any sample parameter exceedances the groundwater can't be discharged as is.**	A table of exceedances is provided in the report	Page 11 Section 4.5	
The water quality samples have been analyzed by a Canadian laboratory accredited and licensed by Standards Council of Canada and/or Canadian Association for Laboratory Accreditation.	**X Yes** Analyzed by Bureau Veritas	Appendix E	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
List of Canadian accredited laboratories: Standards Council of Canada			
A chain of custody record for the samples is included with the report.	Yes	Appendix E	
Has the chain of custody reference any filtered sample? If yes, the report has to be amended and re-submitted to include only non-filtered samples.	Samples were not filtered	Appendix E	
List any of the sample parameters that exceed the Bylaw limits with the reporting detection limit (RDL) included.	Exceeded Storm Criteria: Total Suspended Solids (TSS) – Result 25 mg/L RDL 10 Total Manganese (Mn) – Result 58 ug/L RDL 2.0	Page 11 Section 4.5 Appendix E	
A true copy of the Certificate of Analysis report, is included with the report.	Yes	Appendix E	
EVALUATION OF IMPACT		**Page # & Section # of every occurrence in the Review**	**Review Includes this Information City Staff (Check)**
Does the report recommend a back-up system or relief safety valve(s)? Does the associated Geotechnical report recommend a back-up system or relief safety valve(s)?	◯ **Yes** **X No** These are engineering design related components and not a component of a hydrogeology report ◯ **Yes** **X No**		
The taking and discharging of groundwater on site has been analyzed to ensure that no negative	**X Yes**	Page 12 Section 5.0	N/A

August 2018

HYDROLOGICAL REVIEW SUMMARY

SITE INFORMATION		Page # & Section # of Review	Review Includes this Information City Staff (Check)
impacts will occur to: the City sewage works in terms of quality and quantity (including existing infrastructure), the natural environment, and settlement issues.	The hydrogeology report has provided information on the anticipated quantities and quality of groundwater. Short term dewatering of groundwater for excavation is not anticipated.		
Has it been determined that there will be a negative impact to the natural environment, City sewage works, or surrounding properties has the study identified the following: the extent of the negative impact, the detail of the precondition state of all the infrastructure, City sewage works, and natural environment within the effected zone and the proposed remediation and monitoring plan?	◯ **Yes** **If yes, identify impact:** **X No**	Page 15 Section 6	N/A

Summary of Additional Information and Key Items (if applicable):

Appendix A:

SANITARY/COMBINED **Sample Location:**

Inorganics		Sample Result	Sample Result with upper RDL included	
Parameter	mg/L	ug/L	ug/L	ug/L
BOD	300	3	2	300,000
Fluoride	10	ND	0.10	10,000
TKN	100	7.0	1.0	100,000
pH	6.0 - 11.5	7.76		6.0 - 11.5
Phenolics 4AAP	1	ND	0.0010	1,000
TSS	350	**25**	10	350,000
Total Cyanide	2	ND	0.0050	2,000
Metals				
Chromium Hexavalent	2	0.61	0.50	2,000
Mercury	0.01	ND	0.00010 (mg/L)	10
Total Aluminum	50	230	4.9	50,000
Total Antimony	5	ND	0.50	5,000
Total Arsenic	1	ND	1.0	1,000
Total Cadmium	0.7	ND	0.090	700
Total Chromium	4	ND	5.0	4,000
Total Cobalt	5	0.71	0.50	5,000
Total Copper	2	2.5	0.90	2,000
Total Lead	1	1.6	0.50	1,000
Total Manganese	5	58	2.0	5,000
Total Molybdenum	5	ND	0.50	5,000
Total Nickel	2	3.6	1.0	2,000
Total Phosphorus	10	ND	100	10,000
Total Selenium	1	ND	2.0	1,000
Total Silver	5	ND	0.090	5,000
Total Tin	5	ND	1.0	5,000
Total Titanium	5	13	5.0	5,000
Total Zinc	2	ND	5.0	2,000
Petroleum Hydrocarbons				
Animal/Vegetable Oil & Grease	150	ND	0.50	150,000
Mineral/Synthetic Oil & Grease	15	ND	0.50	15,000

August 2018

HYDROLOGICAL REVIEW SUMMARY

Volatile Organics		Sample Result	Sample Result with upper RDL included	
Parameter	mg/L	ug/L	ug/L	ug/L
Benzene	0.01	ND	0.40	10
Chloroform	0.04	0.44	0.40	40
1,2-Dichlorobenzene	0.05	ND	0.80	50
1,4-Dichlorobenzene	0.08	ND	0.80	80
Cis-1,2-Dichloroethylene	4	ND	1.0	4,000
Trans-1,3-Dichloropropylene	0.14	ND	0.80	140
Ethyl Benzene	0.16	ND	0.40	160
Methylene Chloride	2	ND	4.0	2,000
1,1,2,2-Tetrachloroethane	1.4	ND	0.80	1,400
Tetrachloroethylene	1	ND	0.40	1,000
Toluene	0.016	ND	0.40	16
Trichloroethylene	0.4	ND	0.40	400
Total Xylenes	1.4	ND	0.40	1,400
Semi-Volatile **Organics**				
Di-n-butyl Phthalate	0.08	ND	2	80
Bis (2-ethylhexyl) Phthalate	0.012	ND	2	12
3,3'-Dichlorobenzidine	0.002	ND	0.8	2
Pentachlorophenol	0.005	ND	1	5
Total PAHs	0.005	ND	1	5
Misc **Parameters**				
Nonylphenols	0.02	ND	0.001	20
Nonylphenol Ethoxylates	0.2	ND	0.005	200

Sample Collected:
Temperature:

August 2018

HYDROLOGICAL REVIEW SUMMARY

STORM **Sample Location:**

Inorganics		Sample Result	Sample Result with upper RDL included	
Parameter	mg/L	ug/L	ug/L	ug/L
pH	6.0 - 9.5	7.76		
BOD	15	3	2	15,000
Phenolics 4AAP	0.008	ND	0.0010	8
TSS	15	**25**	10	15,000
Total Cyanide	0.02	ND	0.0050	20
Metals				
Total Arsenic	0.02	ND	1.0	20
Total Cadmium	0.008	ND	0.090	8
Total Chromium	0.08	ND	5.0	80
Chromium Hexavalent	0.04	0.61	0.50	40
Total Copper	0.04	2.5	0.90	40
Total Lead	0.12	1.6	0.50	120
Total Manganese	0.05	58	2.0	50
Total Mercury	0.0004	ND	0.00010 (mg/L)	0.4
Total Nickel	0.08	3.6	1.0	80
Total Phosphorus	0.4	ND	100	400
Total Selenium	0.02	ND	2.0	20
Total Silver	0.12	ND	0.090	120
Total Zinc	0.04	ND	5.0	40
Microbiology				
E.coli	200	<10	10	200,000
Volatile Organics				
Parameter	mg/L			ug/L
Benzene	0.002	ND	0.40	2
Chloroform	0.002	0.44	0.40	2
1,2-Dichlorobenzene	0.0056	ND	0.80	6
1,4-Dichlorobenzene	0.0068	ND	0.80	7
Cis-1,2-Dichloroethylene	0.0056	ND	1.0	6
Trans-1,3-Dichloropropylene	0.0056	ND	0.80	6
Ethyl Benzene	0.002	ND	0.40	2
Methylene Chloride	0.0052	ND	4.0	5
1,1,2,2-Tetrachloroethane	0.017	ND	0.80	17
Tetrachloroethylene	0.0044	ND	0.40	4
Toluene	0.002	ND	0.40	2
Trichloroethylene	0.0076	ND	0.40	8
Total Xylenes	0.0044	ND	0.40	4

August 2018

HYDROLOGICAL REVIEW SUMMARY

Semi-Volatile Organics		Sample Result	Sample Result with upper RDL included	
Di-n-butyl Phthalate	0.015	ND	2	5
Bis (2-ethylhexyl) Phthalate	0.0088	ND	2	8.8
3,3'-Dichlorobenzidine	0.0008	ND	0.8	0.8
Pentachlorophenol	0.002	ND	1	2
Total PAHs	0.002	ND	1	2
PCBs	0.0004	ND	0.05	0.4
Misc Parameters				
Nonylphenols	0.001	ND	0.001	1
Nonylphenol Ethoxylates	0.01	ND	0.005	10

Sample Collected: April 18 2023
Temperature: 10C

Consulting Firm that prepared Hydrological Report: Groundwater Environmental Management Services (GEMS)

Qualified Professional who completed the report summary: Laura Maharaj
Print Name

PROFESSIONAL GEOSCIENTIST
April 28, 2023
LAURA A.T. MAHARAJ
PRACTISING MEMBER
2497
ONTARIO

Qualified Professional who completed the report summary: Laura Maharaj
Signature

Date & Stamp

TORONTO

October 2017

SERVICING REPORT GROUNDWATER SUMMARY

The form is to be completed by the Professional that prepared the Servicing Report.
Use of the form by the City of Toronto is not to be construed as verification of engineering/hydrological content.

For City Staff Use Only:	
Name of ECS Case Manager (please print)	
Date Review Summary provided to to TW	

A. SITE INFORMAITON		**Included in SR (reference page number)**	**Report Includes this information City staff (Check)**
Date Servicing Report was prepared: May 25, 2023		1	
Title of Servicing Report: Site Servicing Assessment and Stormwater Management Implementation Report		1	
Name of Consulting Firm that prepared Servicing Report: GHD Ltd		1	
Site Address	1365-1375 Yonge Street Toronto, Ontario	1	
Postal Code	M4T 2P7 and M4T 1Y4	1	
Property Owner (identified on planning request for comments memo)	Yonge and Rosehill Inc.	1	
Proposed description of the project (ex. number of point towers, number of podiums, etc.)	50-storey mixed-use residential building	2	
Land Use (ex. commercial, residential, mixed, industrial, institutional) as defined by the Planning Act	Mixed residential, commercial	2	
Number of below grade levels	5 levels of underground parking	2	

SERVICING REPORT GROUNDWATER SUMMARY

Does the SR include a private water drainage system (PWDS)? **PWDS: Private Water Drainage System:** A subsurface drainage system which may consist of but is not limited to weeping tile(s), foundation drain(s), private water collection sump(s), private water pump or any combination thereof for the disposal of private water on the surface of the ground or to a private sewer connection or drainage system for disposal in a municipal sewer.	If **Yes** continue completing Section B (Information Relating to Groundwater) **ONLY** **If Yes, Number of PWDS?** **1** *(Each of these PWDS may require a separate Toronto Water agreement)* If **No** skip to Sections C (On-site Groundwater Containment) and/or D (Water Tight Requirements) as applicable	☒ YES ◯ NO A back-up fail-safe system is proposed in the event of any leakages in the foundation. Section B is completed to account for this fail-safe system.	
B. INFORMATION RELATING TO GROUNDWATER		**Included in SR (reference page number)**	**Report Includes this information** **City Staff** **(Check)**
A copy of the pump schedule(s) for **ALL** groundwater sump pump(s) for the development site has been included in the FSR **or** A letter written by a Mechanical Consultant (signed and stamped by a Professional Engineer of Ontario) shall be attached to the SR stating the peak flow rate of the groundwater discharge for the development site for all groundwater sump pump(s). This peak flow rate must be based on the pump schedule(s) that have been designed by the Mechanical Consultant. A template of this letter is attached in Schedule A.		To be provided in subsequent submission	

SERVICING REPORT GROUNDWATER SUMMARY

****If there is more than one sump they must ALL be included in the letters along with a combined flow****			
Is it proposed that the groundwater from the development site will be discharged to the sanitary, combined or storm sewer?	◯ Sanitary Sewer ⓧ Combined Sewer ◯ Storm Sewer		
Will the proposed PWDS discharge from the site go to the Western Beaches Tunnel (WBT)? *Reference attached WBT drainage map*	◯ YES ⓧ NO **If Yes, private water discharge fees will apply and site requires a sanitary discharge agreement.**		
What is the street name where the receiving sewer is located?	Rosehill Avenue	19	
What is the diameter of the receiving sewer?	375mm	19	
Is there capacity in the proposed local sewer system? ⓧ YES ◯ NO	Are there any improvements required to the sewer system? If yes, identify them below and refer to the section and page number of the FSR where this information can be found. If a sewer upgrade is required, the owner is required to enter into an Agreement with the City to improve the infrastructure? ◯ YES	5	
Total allowable peak flow rate during a 100 year storm event (L/sec) to storm sewer When groundwater is to be discharged to the storm sewer the total groundwater and stormwater discharge shall not exceed the permissible peak flow rate during a 2 year pre development storm event, as per the City's	0 L/sec of groundwater discharge to storm sewer system	N/A	

SERVICING REPORT GROUNDWATER SUMMARY

Wet Weather Flow Management Guidelines, dated 2006			
Short-Term Groundwater Discharge Provide proposed total flow rate to the sanitary/combined sewer in post-development scenario Total Flow (L/sec) = sanitary flow + peak short-term groundwater flow rate	1.7 L/sec	19	
Long-Tem Groundwater Discharge Provide proposed total flow rate to the sanitary/combined sewer in post-development scenario Total Flow (L/sec) = sanitary flow + peak long-term groundwater flow rate	0.2 L/sec	19	
Does the water quality meet the receiving sewer Bylaw limits? ⓧ YES ◯ NO	If the water quality does not meet the applicable receiving sewer Bylaw limits and the applicant is proposing a treatment system the applicant will need to include a letter stating that a treatment system will be installed and the details of the treatment system will be included in the private water discharge application that will be submitted to TW EM&P.	19	
C. ON-SITE GROUNDWATER CONTAINMENT		**Included in SR (reference page number)**	**Report Includes this information City Staff (Check)**
How is the site proposing to manage the groundwater discharge on site?			

SERVICING REPORT GROUNDWATER SUMMARY

Has the above proposal been approved by:	◯ TW-WIM And ◯ TW-EM&P And ◯ ECS		
If the site is proposing a groundwater infiltration gallery, has it been stated that the groundwater infiltration gallery will not be connected to the municipal sewer? A connection between the infiltration gallery/dry well and the municipal sewer is not permitted Please be advised if an infiltration gallery/dry well on site is not connected to the municipal sewer, the site **must** submit two letters using the templates in Schedule B and Schedule C.	◯ YES ◯ NO		
Confirm that the infiltration gallery can infiltrate 100% of the expected peak groundwater flow year round, ensure that the top of the infiltration trench is below the frost line (1.8m depth), not less than 5 m from the building foundation, bottom of the trench 1m above the seasonally high water table, and located so that the drainage is away from the building.			
D. WATER TIGHT REQUIREMENTS		**Included in SR (reference page number)**	**Report Includes this information City Staff**

October 2017

SERVICING REPORT GROUNDWATER SUMMARY

		(Check)
If the site is proposing a water tight structure: 1. The owner must submit a letter using the template in Schedule D. 2. A Professional Engineer (Structural), licensed to practice in Ontario and qualified in the subject must submit a letter using the template in Schedule E.	N/A	

Provide a copy of the approved SR to Toronto Water Environmental Monitoring & Protection Unit at pwapplication@toronto.ca.

Consulting Firm that prepared Servicing Report: GHD

Professional Engineer who completed the report summary: Nelson Wong, P. Eng
Print Name

Professional Engineer who completed the report summary: _____ 05/25/23
Signature Date & Stamp

March 1, 2021
CA20-156

Daniels High Rise Corporation (Daniels)
130 Queens Quay East, West Tower, 8th Floor
Toronto, Ontario M5A 0P6

Attention: Mr. Dustin Kwinter, Development Coordinator

Re: Groundwater Quality
Zoning By-Law Amendment Application No.: 18 151554 STE 22 OZ
1365-1375 Yonge Street, Toronto, Ontario

Dear Mr. Kwinter:

Further to your request, Terrapex Environmental Ltd. (**Terrapex**) has reviewed the report titled *Updated Hydrogeological Assessment 1365-1375 Yonge Street, Toronto, Ontario* prepared by GHD dated January 21, 2020 for the purpose of comparing the reported groundwater quality results to the City of Toronto Sewer Use By-law Limits for Sanitary and Combined sewers (*Table 1 – Limits for Sanitary and Combined Sewer Discharge* in *Toronto Municipal Code Chapter 681 – Sewers*).

The groundwater sample collected from monitoring well MW108 on 29 March 2018 was analysed by Maxxam Analytics (now BV Laboratories). As shown on Certificate of Analysis B870651 (copy attached), all results meet the Sanitary and Combined Sewer By-law limits. Based upon these results, collected groundwater is suitable for discharge to sanitary and combined sewers.

Closure

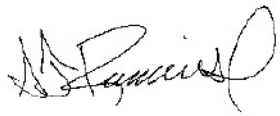
The Review documented herein was conducted in accordance with the terms of reference for this project, agreed upon by Daniels High Rise Corporation and Terrapex Environmental Ltd.

Terrapex Environmental Ltd. has exercised due care, diligence, and judgement in the performance of this review, however, studies of this nature have inherent limitations. Terrapex Environmental Ltd. has not undertaken any intrusive assessment of the site, and our comments, conclusions and recommendations are based solely on the observations and data documented by third parties. Data collected by said third parties at specific locations and under certain conditions may vary at other locations, or with the passage of time.

This report has been prepared for the sole use of Daniels High Rise Corporation and the City of Toronto. Terrapex Environmental Ltd. accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than Daniels High Rise Corporation and the City of Toronto.

We trust this letter meets your current requirements; however, should you have any questions, please do not hesitate to contact the undersigned.

Sincerely,
TERRAPEX ENVIRONMENTAL LTD.



Steven Ruminsky, P.Eng., P.Geo.
Manager, Hydrogeology

Attachment: Laboratory Certificate of Analysis B870651

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 73510898
Your Project #: 11155397
Site Location: PHASE II ESA.
Your C.O.C. #: 654394-01-01

Attention: 11155397-PO-73510898

GHD Limited
651 Colby Dr
Waterloo, ON
N2V 1C2

Report Date: 2018/04/10
Report #: R5071345
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B870651
Received: 2018/03/29, 13:32

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Sewer Use By-Law Semivolatile Organics	1	2018/04/03	2018/04/04	EPA 8270 CAM SOP 00301	EPA 8270 m
Biochemical Oxygen Demand (BOD)	1	2018/04/01	2018/04/06	CAM SOP-00427	SM 23 5210B m
Chromium (VI) in Water	1	N/A	2018/04/02	CAM SOP-00436	EPA 7199 m
Total Cyanide	1	2018/04/03	2018/04/03	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2018/04/02	2018/04/03	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2018/04/03	2018/04/03	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2018/04/04	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2018/03/29	CAM SOP-00552	MOE LSB E3371
Total Nonylphenol in Liquids by HPLC	1	2018/04/03	2018/04/04	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	1	2018/04/03	2018/04/04	CAM SOP-00313	In-house Method
Animal and Vegetable Oil and Grease	1	N/A	2018/04/04	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/04/04	2018/04/04	CAM SOP-00326	EPA1664B m,SM5520A m
Polychlorinated Biphenyl in Water	1	2018/04/02	2018/04/02	CAM SOP-00309	EPA 8082A m
pH	1	N/A	2018/04/03	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/04/03	CAM SOP-00444	OMOE E3179 m
Total Kjeldahl Nitrogen in Water	1	2018/04/03	2018/04/04	CAM SOP-00938	OMOE E3516 m
Total PAHs (1)	1	N/A	2018/04/05	CAM SOP - 00301	EPA 8270 m
Mineral/Synthetic O & G (TPH Heavy Oil) (2)	1	2018/04/04	2018/04/04	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2018/04/03	2018/04/04	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2018/04/03	CAM SOP-00226	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam
A Bureau Veritas Group Company

Your P.O. #: 73510898
Your Project #: 11155397
Site Location: PHASE II ESA.
Your C.O.C. #: 654394-01-01

Attention: 11155397-PO-73510898

GHD Limited
651 Colby Dr
Waterloo, ON
N2V 1C2

Report Date: 2018/04/10
Report #: R5071345
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B870651
Received: 2018/03/29, 13:32

or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Total PAHs include only those PAHs specified in the sewer use by-by-law.
(2) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Tanya Fidlin, Project Manager
Email: tfidlin@maxxam.ca
Phone# (905)817-5700

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

RESULTS OF ANALYSES OF WATER

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918 -SH-001	RDL	QC Batch
Calculated Parameters				
Total Animal/Vegetable Oil and Grease	mg/L	ND	0.50	5462531
Inorganics				
Total BOD	mg/L	ND	2	5465046
Fluoride (F-)	mg/L	ND	0.10	5466025
Total Kjeldahl Nitrogen (TKN)	mg/L	ND (1)	0.20	5467411
pH	pH	7.81		5466048
Phenols-4AAP	mg/L	ND	0.0010	5467485
Total Suspended Solids	mg/L	200	10	5467759
Total Cyanide (CN)	mg/L	ND	0.0050	5467717
Petroleum Hydrocarbons				
Total Oil & Grease	mg/L	ND	0.50	5469336
Total Oil & Grease Mineral/Synthetic	mg/L	ND	0.50	5469358

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected
(1) Due to a high concentration of NOx, the sample required dilution. The detection limit was adjusted accordingly.

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

NONYL PHENOL AND NONYL PHENOL ETHOXYLATE (WATER)

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918-SH-001	RDL	QC Batch
Miscellaneous Parameters				
Nonylphenol Ethoxylate (Total)	mg/L	ND	0.005	5466968
Nonylphenol (Total)	mg/L	ND	0.001	5466963

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918 -SH-001	RDL	QC Batch
Metals				
Chromium (VI)	ug/L	0.87	0.50	5463317
Mercury (Hg)	mg/L	ND	0.0001	5467059
Total Aluminum (Al)	ug/L	2900	5.0	5467646
Total Antimony (Sb)	ug/L	ND	0.50	5467646
Total Arsenic (As)	ug/L	2.2	1.0	5467646
Total Cadmium (Cd)	ug/L	ND	0.10	5467646
Total Chromium (Cr)	ug/L	6.4	5.0	5467646
Total Cobalt (Co)	ug/L	11	0.50	5467646
Total Copper (Cu)	ug/L	16	1.0	5467646
Total Iron (Fe)	ug/L	6700	100	5467646
Total Lead (Pb)	ug/L	6.5	0.50	5467646
Total Manganese (Mn)	ug/L	440	2.0	5467646
Total Molybdenum (Mo)	ug/L	0.55	0.50	5467646
Total Nickel (Ni)	ug/L	13	1.0	5467646
Total Phosphorus (P)	ug/L	210	100	5467646
Total Selenium (Se)	ug/L	ND	2.0	5467646
Total Silver (Ag)	ug/L	ND	0.10	5467646
Total Tin (Sn)	ug/L	ND	1.0	5467646
Total Titanium (Ti)	ug/L	130	5.0	5467646
Total Zinc (Zn)	ug/L	19	5.0	5467646

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918-SH-001	RDL	QC Batch
Semivolatile Organics				
Di-N-butyl phthalate	ug/L	ND	2	5466837
Bis(2-ethylhexyl)phthalate	ug/L	ND	2	5466837
3,3'-Dichlorobenzidine	ug/L	ND	0.8	5466837
Pentachlorophenol	ug/L	ND	1	5466837
Phenanthrene	ug/L	ND	0.2	5466837
Anthracene	ug/L	ND	0.2	5466837
Fluoranthene	ug/L	ND	0.2	5466837
Pyrene	ug/L	ND	0.2	5466837
Benzo(a)anthracene	ug/L	ND	0.2	5466837
Chrysene	ug/L	ND	0.2	5466837
Benzo(b/j)fluoranthene	ug/L	ND	0.2	5466837
Benzo(k)fluoranthene	ug/L	ND	0.2	5466837
Benzo(a)pyrene	ug/L	ND	0.2	5466837
Indeno(1,2,3-cd)pyrene	ug/L	ND	0.2	5466837
Dibenz(a,h)anthracene	ug/L	ND	0.2	5466837
Benzo(g,h,i)perylene	ug/L	ND	0.2	5466837
Dibenzo(a,i)pyrene	ug/L	ND	0.2	5466837
Benzo(e)pyrene	ug/L	ND	0.2	5466837
Perylene	ug/L	ND	0.2	5466837
Dibenzo(a,j) acridine	ug/L	ND	0.4	5466837
7H-Dibenzo(c,g) Carbazole	ug/L	ND	0.4	5466837
1,6-Dinitropyrene	ug/L	ND	0.4	5466837
1,3-Dinitropyrene	ug/L	ND	0.4	5466837
1,8-Dinitropyrene	ug/L	ND	0.4	5466837
Calculated Parameters				
Total PAHs (18 PAHs)	ug/L	ND	1	5462798
Surrogate Recovery (%)				
2,4,6-Tribromophenol	%	54		5466837
2-Fluorobiphenyl	%	58		5466837
D14-Terphenyl (FS)	%	98		5466837
D5-Nitrobenzene	%	81		5466837
D8-Acenaphthylene	%	67		5466837

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

VOLATILE ORGANICS BY GC/MS (WATER)

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918-SH-001	RDL	QC Batch
Volatile Organics				
Benzene	ug/L	ND	1.0	5465270
Chloroform	ug/L	ND	1.0	5465270
1,2-Dichlorobenzene	ug/L	ND	2.0	5465270
1,4-Dichlorobenzene	ug/L	ND	2.0	5465270
cis-1,2-Dichloroethylene	ug/L	ND	1.0	5465270
trans-1,3-Dichloropropene	ug/L	ND	2.0	5465270
Ethylbenzene	ug/L	ND	1.0	5465270
Methylene Chloride(Dichloromethane)	ug/L	ND	5.0	5465270
1,1,2,2-Tetrachloroethane	ug/L	ND	2.0	5465270
Tetrachloroethylene	ug/L	ND	1.0	5465270
Toluene	ug/L	ND	2.0	5465270
Trichloroethylene	ug/L	ND	1.0	5465270
p+m-Xylene	ug/L	ND	1.0	5465270
o-Xylene	ug/L	ND	1.0	5465270
Total Xylenes	ug/L	ND	1.0	5465270
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	96		5465270
D4-1,2-Dichloroethane	%	90		5465270
D8-Toluene	%	99		5465270

RDL = Reportable Detection Limit
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ND = Not detected

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918 -SH-001	RDL	QC Batch
PCBs				
Total PCB	ug/L	ND	0.05	5465712
Surrogate Recovery (%)				
Decachlorobiphenyl	%	112		5465712

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

MICROBIOLOGY (WATER)

Maxxam ID		GIY057		
Sampling Date		2018/03/29 09:00		
COC Number		654394-01-01		
	UNITS	GW-11155397-032918 -SH-001	RDL	QC Batch
Microbiological				
Escherichia coli	CFU/100mL	<10	10	5464069

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

TEST SUMMARY

Maxxam ID: GIY057
Sample ID: GW-11155397-032918-SH-001
Matrix: Water

Collected: 2018/03/29
Shipped:
Received: 2018/03/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	5466837	2018/04/03	2018/04/04	Kathy Horvat
Biochemical Oxygen Demand (BOD)	DO	5465046	2018/04/01	2018/04/06	Frank Zhang
Chromium (VI) in Water	IC	5463317	N/A	2018/04/02	Lang Le
Total Cyanide	SKAL/CN	5467717	2018/04/03	2018/04/03	Xuanhong Qiu
Fluoride	ISE	5466025	2018/04/02	2018/04/03	Surinder Rai
Mercury in Water by CVAA	CV/AA	5467059	2018/04/03	2018/04/03	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5467646	N/A	2018/04/04	Arefa Dabhad
E.coli, (CFU/100mL)	PL	5464069	N/A	2018/03/29	Sirimathie Aluthwala
Total Nonylphenol in Liquids by HPLC	LC/FLU	5466963	2018/04/03	2018/04/04	Tonghui (Jenny) Chen
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	5466968	2018/04/03	2018/04/04	Tonghui (Jenny) Chen
Animal and Vegetable Oil and Grease	BAL	5462531	N/A	2018/04/04	Automated Statchk
Total Oil and Grease	BAL	5469336	2018/04/04	2018/04/04	Mansoor Ahmed
Polychlorinated Biphenyl in Water	GC/ECD	5465712	2018/04/02	2018/04/02	Sarah Huang
pH	AT	5466048	N/A	2018/04/03	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5467485	N/A	2018/04/03	Zahid Soikot
Total Kjeldahl Nitrogen in Water	SKAL	5467411	2018/04/03	2018/04/04	Rajni Tyagi
Total PAHs	CALC	5462798	N/A	2018/04/05	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5469358	2018/04/04	2018/04/04	Mansoor Ahmed
Total Suspended Solids	BAL	5467759	2018/04/03	2018/04/04	Fang Wang
Volatile Organic Compounds in Water	P&T/MS	5465270	N/A	2018/04/03	Gladys Guerrero

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Maxxam Job #: B870651
Report Date: 2018/04/10

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.3°C

Sample GIY057 [GW 11155397 032918 SH 001] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5465270	4-Bromofluorobenzene	2018/04/03	101	70 - 130	102	70 - 130	96	%				
5465270	D4-1,2-Dichloroethane	2018/04/03	85	70 - 130	89	70 - 130	91	%				
5465270	D8-Toluene	2018/04/03	101	70 - 130	100	70 - 130	97	%				
5465712	Decachlorobiphenyl	2018/04/02	136 (2)	60 - 130	102	60 - 130	117	%				
5466837	2,4,6-Tribromophenol	2018/04/03	58	10 - 130	72	10 - 130	71	%				
5466837	2-Fluorobiphenyl	2018/04/03	44	30 - 130	48	30 - 130	65	%				
5466837	D14-Terphenyl (FS)	2018/04/03	94	30 - 130	88	30 - 130	94	%				
5466837	D5-Nitrobenzene	2018/04/03	68	30 - 130	71	30 - 130	93	%				
5466837	D8-Acenaphthylene	2018/04/03	52	30 - 130	58	30 - 130	72	%				
5463317	Chromium (VI)	2018/04/02	102	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L	NC (1)	20		
5465046	Total BOD	2018/04/06					ND,RDL=2	mg/L	NC (1)	30	99	80 - 120
5465270	1,1,2,2-Tetrachloroethane	2018/04/03	90	70 - 130	105	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
5465270	1,2-Dichlorobenzene	2018/04/03	88	70 - 130	98	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
5465270	1,4-Dichlorobenzene	2018/04/03	94	70 - 130	100	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
5465270	Benzene	2018/04/03	100	70 - 130	106	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	Chloroform	2018/04/03	90	70 - 130	99	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	cis-1,2-Dichloroethylene	2018/04/03	98	70 - 130	106	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	Ethylbenzene	2018/04/03	97	70 - 130	102	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	Methylene Chloride(Dichloromethane)	2018/04/03	90	70 - 130	112	70 - 130	ND, RDL=0.50	ug/L	NC (1)	30		
5465270	o-Xylene	2018/04/03	96	70 - 130	104	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	p+m-Xylene	2018/04/03	98	70 - 130	105	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	Tetrachloroethylene	2018/04/03	96	70 - 130	101	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465270	Toluene	2018/04/03	98	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
5465270	Total Xylenes	2018/04/03					ND, RDL=0.10	ug/L	NC (1)	30		
5465270	trans-1,3-Dichloropropene	2018/04/03	90	70 - 130	104	70 - 130	ND, RDL=0.20	ug/L	NC (1)	30		
5465270	Trichloroethylene	2018/04/03	95	70 - 130	101	70 - 130	ND, RDL=0.10	ug/L	NC (1)	30		
5465712	Total PCB	2018/04/02	111	60 - 130	91	60 - 130	ND, RDL=0.05	ug/L	NC (1)	40		
5466025	Fluoride (F-)	2018/04/03	108	80 - 120	101	80 - 120	ND, RDL=0.10	mg/L	14 (1)	20		
5466048	pH	2018/04/03			102	98 - 103			0.29 (1)	N/A		
5466837	1,3-Dinitropyrene	2018/04/04	96	30 - 130	107	30 - 130	ND, RDL=0.4	ug/L	NC (1)	40		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5466837	1,6-Dinitropyrene	2018/04/04	99	30 - 130	109	30 - 130	ND, RDL=0.4	ug/L	NC (1)	40		
5466837	1,8-Dinitropyrene	2018/04/04	104	30 - 130	110	30 - 130	ND, RDL=0.4	ug/L	NC (1)	40		
5466837	3,3'-Dichlorobenzidine	2018/04/04	93	30 - 130	106	30 - 130	ND, RDL=0.8	ug/L	NC (1)	40		
5466837	7H-Dibenzo(c,g) Carbazole	2018/04/04	77	30 - 130	74	30 - 130	ND, RDL=0.4	ug/L	NC (1)	40		
5466837	Anthracene	2018/04/04	69	30 - 130	88	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Benzo(a)anthracene	2018/04/04	104	30 - 130	102	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Benzo(a)pyrene	2018/04/04	78	30 - 130	76	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Benzo(b/j)fluoranthene	2018/04/04	93	30 - 130	88	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Benzo(e)pyrene	2018/04/04	92	30 - 130	88	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Benzo(g,h,i)perylene	2018/04/04	93	30 - 130	89	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Benzo(k)fluoranthene	2018/04/04	85	30 - 130	82	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Bis(2-ethylhexyl)phthalate	2018/04/04	111	30 - 130	109	30 - 130	ND,RDL=2	ug/L	NC (1)	40		
5466837	Chrysene	2018/04/04	105	30 - 130	102	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Dibenz(a,h)anthracene	2018/04/04	97	30 - 130	93	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Dibenzo(a,i)pyrene	2018/04/04	103	30 - 130	99	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Dibenzo(a,j) acridine	2018/04/04	104	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC (1)	40		
5466837	Di-N-butyl phthalate	2018/04/04	102	30 - 130	98	30 - 130	ND,RDL=2	ug/L	NC (1)	40		
5466837	Fluoranthene	2018/04/04	88	30 - 130	87	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Indeno(1,2,3-cd)pyrene	2018/04/04	96	30 - 130	91	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Pentachlorophenol	2018/04/04	43	30 - 130	40	30 - 130	ND,RDL=1	ug/L	NC (1)	40		
5466837	Perylene	2018/04/04	105	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Phenanthrene	2018/04/04	70	30 - 130	90	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466837	Pyrene	2018/04/04	86	30 - 130	84	30 - 130	ND, RDL=0.2	ug/L	NC (1)	40		
5466963	Nonylphenol (Total)	2018/04/04	105	50 - 130	94	50 - 130	ND, RDL=0.001	mg/L	NC (1)	40		
5466968	Nonylphenol Ethoxylate (Total)	2018/04/04	94	50 - 130	88	50 - 130	ND, RDL=0.005	mg/L	NC (1)	40		
5467059	Mercury (Hg)	2018/04/03	94	75 - 125	95	80 - 120	ND, RDL=0.0001	mg/L	NC (1)	20		
5467411	Total Kjeldahl Nitrogen (TKN)	2018/04/03	99	80 - 120	103	80 - 120	ND, RDL=0.10	mg/L	0 (1)	20	102	80 - 120

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Maxxam Job #: B870651
Report Date: 2018/04/10

QUALITY ASSURANCE REPORT(CONT'D)

GHD Limited
Client Project #: 11155397
Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5467485	Phenols-4AAP	2018/04/03	95	80 - 120	97	80 - 120	ND, RDL=0.0010	mg/L	NC (1)	20		
5467646	Total Aluminum (Al)	2018/04/04	107	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L				
5467646	Total Antimony (Sb)	2018/04/04	110	80 - 120	103	80 - 120	ND, RDL=0.50	ug/L				
5467646	Total Arsenic (As)	2018/04/04	103	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L				
5467646	Total Cadmium (Cd)	2018/04/04	105	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L				
5467646	Total Chromium (Cr)	2018/04/04	102	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L				
5467646	Total Cobalt (Co)	2018/04/04	102	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L				
5467646	Total Copper (Cu)	2018/04/04	110	80 - 120	104	80 - 120	ND, RDL=1.0	ug/L				
5467646	Total Iron (Fe)	2018/04/04	102	80 - 120	101	80 - 120	ND, RDL=100	ug/L				
5467646	Total Lead (Pb)	2018/04/04	99	80 - 120	103	80 - 120	ND, RDL=0.50	ug/L				
5467646	Total Manganese (Mn)	2018/04/04	101	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L				
5467646	Total Molybdenum (Mo)	2018/04/04	112	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L				
5467646	Total Nickel (Ni)	2018/04/04	99	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L				
5467646	Total Phosphorus (P)	2018/04/04	NC	80 - 120	108	80 - 120	ND, RDL=100	ug/L	3.2 (1)	20		
5467646	Total Selenium (Se)	2018/04/04	102	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L				
5467646	Total Silver (Ag)	2018/04/04	99	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L				
5467646	Total Tin (Sn)	2018/04/04	106	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L				
5467646	Total Titanium (Ti)	2018/04/04	104	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L				
5467646	Total Zinc (Zn)	2018/04/04	102	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L				
5467717	Total Cyanide (CN)	2018/04/03	85	80 - 120	96	80 - 120	ND, RDL=0.0050	mg/L	NC (1)	20		
5467759	Total Suspended Solids	2018/04/04					ND, RDL=10	mg/L	NC (1)	25	98	85 - 115
5469336	Total Oil & Grease	2018/04/04			99	85 - 115	ND, RDL=0.50	mg/L	4.3 (1)	25		

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QUALITY ASSURANCE REPORT(CONT'D)

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Site Location: PHASE II ESA.
Your P.O. #: 73510898
Sampler Initials: SH

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5469358	Total Oil & Grease Mineral/Synthetic	2018/04/04			96	85 - 115	ND, RDL=0.50	mg/L	1.8 (1)	25		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Duplicate Parent ID

(2) Surrogate recovery was above the upper control limit due to matrix interference. This may represent a high bias in some results. For results that were not detected (ND), this potential bias has no impact.

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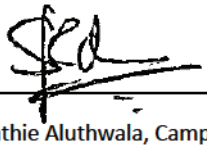
VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Service Specialist



Sirimathie Aluthwala, Campobello Micro

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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MICRO

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#3000 GHD Limited	Company Name:		Quotation #:	B80174	Maxxam Job #:	Bottle Order #:
Attention:	Jennifer Balkwill	Attention:	11155397-PO-73510898	P.O. #:	73510898		654394
Address:	651 Colby Dr Waterloo ON N2V 1C2	Address:		Project:	11155397	COC #:	Project Manager:
Tel:	(519) 884-7780 x3599 Fax: (519) 725-1394 x	Tel:	Fax:	Project Name:	PHASE II ESA.	C#654394-01-01	Tanya Fidlin
Email:	Jennifer.Balkwill@ghd.com, NationalEDDsupport@max	Email:	NationalEDDsupport@maxxam.ca; Jennifer.Balkwill@g	Site #:			
				Sampled By:	SIMON HOWELL		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine; ☐ Table 2 ☐ Ind/Comm ☐ Coarse; ☐ Table 3 ☐ Agri/Other ☐ For RSC; ☐ Table ___

Other Regulations: ☐ CCME ☑ Sanitary Sewer Bylaw; ☐ Reg 558 ☑ Storm Sewer Bylaw; ☐ MISA Municipality TORONTO; ☐ PWQO; ☐ Other

Special Instructions:

Include Criteria on Certificate of Analysis (Y/N)? _____

ANALYSIS REQUESTED (PLEASE BE SPECIFIC):

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: _____ Time Required: _____ ☐
Rush Confirmation Number: _____ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Toronto Sanitary & Storm Sewer Package plus iron	# of Bottles	Comments
1		GW-11155397-032918-SH-001	18/03/29	9:00	GW	No	✓	19	INCLUDED MICROBIOLOGY
2									
3									
4									
5									
6									
7									
8									
9									
10									

29-Mar-18 13:32
Tanya Fidlin
B870651
GK1 ENV-636

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Simon Howell/SIMON HOWELL	18/03/29	13:32	Tanvir Singh/TANVIR SINGH**	2018/03/29	13:32	

Laboratory Use Only: Time Sensitive; Temperature (°C) on Receipt: 7/8/7; Custody Seal Present: Yes ✓ / No; Intact: Yes ✓ / No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics