Functional Servicing and Stormwater Management Design Report – 81 Royal Road

City of Guelph, Ontario

Submitted to:
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Submitted by:
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December 13, 2024
Project No. 2406127

Patricia Wiebe, P.Eng.
Project Engineer

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Certification

PREPARED BY:
GEI Consultants Canada Ltd.

Patricia Wiebe, P.Eng.
Project Engineer

1. Introduction

This report documents the servicing design and the design of the stormwater management system for the proposed development at 81 Royal Road in the City of Guelph.

The Owner is required to have a Professional Engineer design a stormwater management system and have the said Engineer supervise and certify that the stormwater management system was installed in accordance with the approvals given under Section 41 of the Planning Act.

Van Harten completed the detailed site survey in May 29th, 2023. BJC Architects and Associates Inc. provided site layout (received December 12, 2024). The existing and proposed site details are shown on the Site Servicing and Grading Plans.

1.1. Site Information

The 1.83-hectare site is located at 81 Royal Road, in the City of Guelph. The site is bounded by existing industrial development to the north and east, Royal Road to the south and Woodlawn Road W to the west.

At this time, the intent of the Owner is to construct 30,000 sq. ft (2,787 m^2), industrial building along with associated parking, driving, and landscaped areas on the currently vacant area.

Under existing conditions, runoff generated from the site is mostly conveyed via a swale on the adjacent property to the north to a catchbasin, ultimately discharging to the storm sewer on Woodlawn Road W. Following the development, stormwater runoff generated by the site will be attenuated on-site prior to discharging to the existing storm sewer on Woodlawn Road W.

1.2. Site Grading

As illustrated on the topographic survey completed for the proposed development, the site generally slopes towards the swale on the adjacent property in a southwest to northeast direction. The lowest elevation on the site of 341.00 (approximately) is in the northeast limits of the site boundary. The highest elevation on the site of 344.50 (approximately) is along the southeast limits of the site.

The grade and elevations of the site, along with the internal driving aisles, are controlled by the elevation of the Woodlawn Road W and Royal Road rights-of-way. The site will be graded to match the existing elevations along the property limits.

2. Site Services

2.1. Water Supply

Water supply is proposed to be provided via the extension of a 200mm diameter watermain from the existing 300mm diameter watermain on Royal Road.

There is one (1) existing nearby municipal fire hydrant on Royal Road alongside the proposed development.

Table 2-1. Anticipated Water Demands from Site

	Anticipated Water Demand
Proposed Average Water Demand	2.2 L/s
Proposed Peak Flow Rate (peaking factor of 4)	8.8 L/s

2.2. Sanitary Service

Sanitary service for the site will be provided by a 200mm diameter sanitary sewer extended southwest to the existing 300mm diameter sanitary sewer on Royal Road. The capacity of the existing 300mm diameter sanitary sewer on Royal Road is 0.081 m^3/s (approximately), based on a grade of 0.64%.

The following tables summarize the flows discharging from the site to the municipal sanitary sewer. The sanitary sewer design sheet is found in Appendix A.

Table 2-2. Anticipated Sanitary Design Flows to Royal Road

	Anticipated Sanitary Design Flow
Proposed Average Sanitary Sewer Flow	0.0022 m^3/s
Peak Sanitary Sewer Flow	0.0088 m^3/s
Extraneous Flow (0.25 L/s/ha)	0.0005 m^3/s
Total Sanitary Flow	0.0093 m^3/s
Existing 300mm Diameter Sanitary Sewer Capacity	0.0810 m^3/s

The peak sanitary sewer flow from the proposed development represents approximately 11.5% of the existing sanitary sewer capacity. Therefore, in our opinion the existing 300mm sanitary sewer on Royal Road has sufficient capacity to convey the anticipated design flows from the proposed development.

2.3. Storm Service

Storm services for the site will be provided via a 300mm diameter storm sewer discharging to the existing 600mm diameter storm sewer on Woodlawn Road West. Stormwater flows will be attenuated within the proposed underground stormwater management tank prior to discharge from the site.

Storm sewer design sheets are found in Appendix A.

3. Stormwater Management Design

The stormwater management design has been separated into the existing and approved site and the proposed development.

The City of Guelph Chicago Storm parameters used to model the design rainfall events for the site are summarized in the following Table 3-1. These parameters are consistent with the City of Guelph Stormwater Management Master Plan IDF Curves (dated August 2023). The Chicago Rainfall Distribution parameters and the total depth of rainfall for the analysis are as follows:

Table 3-1. City of Guelph – Chicago Storm Parameters

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	563.699	750.423	855.183	972.202	1054.539	1122.601
B	1.5	1.5	1.5	1.5	1.5	1.5
C	0.766	0.769	0.764	0.752	0.746	0.738
r	0.400	0.400	0.400	0.400	0.400	0.400
Duration (min.)	240	240	240	240	240	240
Total Depth (mm)	33.713	44.147	51.710	62.786	70.383	78.288

The Horton infiltration method was used in the MIDUSS model. The following parameters summarized in Table 3-2 were used according to the City of Guelph Standards:

Table 3-2. City of Guelph – MIDUSS Horton Parameters

	Impervious Areas	Pervious Areas
Maximum Infiltration (mm/hr)	0.0	75.0
Minimum Infiltration (mm/hr)	0.0	12.5
Lag Constant (hr)	0.0	0.25
Depression Storage (mm)	1.5	5.0

The hydrologic model MIDUSS was used to create runoff hydrographs and to route the flows through the storage structures.

3.1. Stormwater Management Criteria

Based on the City of Guelph Development Engineering Manual, the stormwater management criteria for the proposed development are as follows:

1. Maintain predevelopment recharge rate, volume and hydroperiods at post-development conditions
2. Provide a minimum of 5mm of volume control
3. Thermal preventive and mitigation measures for cool water habitat per Figure 4.1.
4. Enhanced level of water quality treatment
5. Control peak flow post to pre for all design events (2-100 year)
6. Control 90th percentile event or extended detention of the 4 hour, 25mm Chicago distribution rainfall event for 24 hours.

3.2. Existing Conditions

For analysis purposes, the site was modelled as one (1) drainage catchment under existing conditions. The existing condition drainage catchments are shown on Figure No. 1 and described below. The existing condition MIDUSS computer modeling is attached in Appendix C.

Catchment 100 (2.03-hectares, 0% Impervious) represents the site. Runoff generated from Catchment 100 is captured and conveyed by a swale on the adjacent property to the east, ultimately discharging to the existing catchbasin south of Woodlawn Road right-of-way.

In summary, the existing condition flow rates are as follows:

Table 3-3. Existing Condition Flow Rates

	2-Year	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Catchment 100 (uncontrolled)	0.030 m^3/s	0.121 m^3/s	0.226 m^3/s	0.338 m^3/s	0.414 m^3/s	0.480 m^3/s
Total	**0.030 m^3/s**	**0.121 m^3/s**	**0.226 m^3/s**	**0.338 m^3/s**	**0.414 m^3/s**	**0.480 m^3/s**

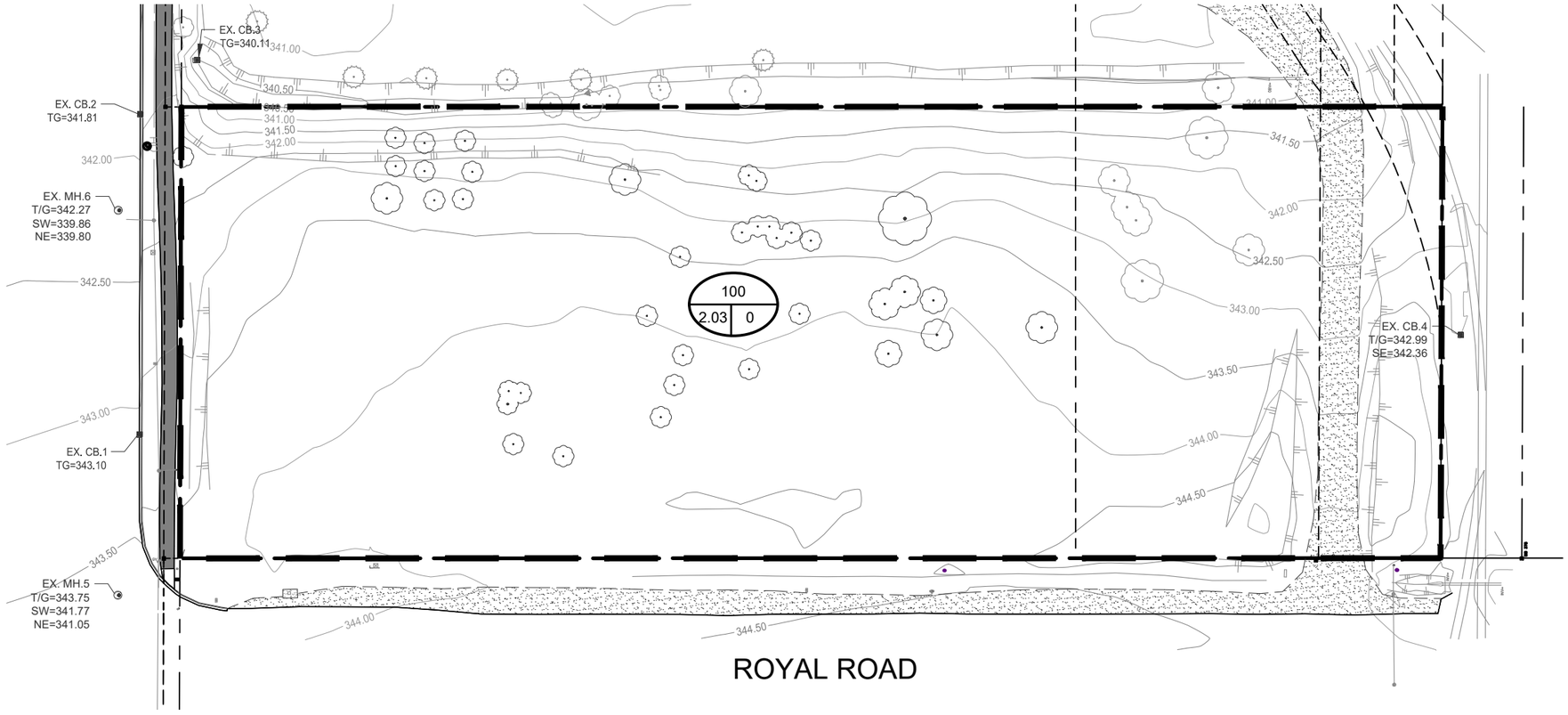
3.3. Allowable Release Rates

The post-development flows are to be attenuated to existing condition flow rates during all design storm events. Therefore, the allowable release rate under post-development conditions are as follows:

Table 3-4. Allowable Release Rates

	2-Year	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Total Flows from Site to Storm Sewer on Woodlawn Road W	0.030 m^3/s	0.121 m^3/s	0.226 m^3/s	0.338 m^3/s	0.414 m^3/s	0.480 m^3/s

81 ROYAL ROAD
CITY OF GUELPH



LEGEND

- EX. STORM SEWER
- DRAINAGE AREA BOUNDARY
- 100 — CATCHMENT NUMBER
- 1.82 | 0 — % IMPERVIOUS
- CATCHMENT AREA IN HECTARES

15 0 10 20 40
1:1000 (m)

EXISTING CONDITIONS DRAINAGE AREA

Figure No. 1

GEI Consultants

2406127
AUGUST 2024
Scale: 1:1000 | NAD 1983 UTM Zone 17N

3.4. Post-Development Condition Drainage Areas

For post-development analysis purposes, the proposed development was modelled as five (5) drainage catchments. The post-development drainage catchments are shown on Figure No. 2 and described below. The post-development MIDUSS computer modeling is attached in Appendix C.

Catchment 200 (0.28-hectares, 100% Impervious) represents the rooftop of the proposed building. The rooftop of the proposed building is flat and will be used to store and attenuate stormwater runoff. Runoff from Catchment 200 will be attenuated through the use of eight (8) roof drains with one (1) notch per drain and the average depth of water stored on the rooftop will not exceed the design criteria of 150 mm based on OBC. Please note that six (6) notches represent a fully open roof drain. Details of the roof drains have been appended. Runoff generated from Catchment 200 is directed to the proposed on-site storm sewers, and ultimately the storm sewers in the Woodlawn Road right-of-way.

Catchment 201 (0.75-hectares, 100% Impervious) represents the asphalt and landscape areas of the proposed development. Runoff generated from Catchment 201 will be captured by storm sewers and conveyed to the proposed underground stormwater management tank, discharging to the proposed on-site storm sewers, ultimately discharging to the storm sewers in the Woodlawn Road right-of-way.

Discharge from the underground stormwater management tank (22.4 m L x 12.8 m W x 1.32 m H tank using an EZStorm system) will be attenuated via a 90 mm diameter orifice plate prior to discharge to the existing storm sewer on Woodlawn Road W. The stormwater management tank will be constructed using an EZStorm system in order to maximize the storage volume and minimize the footprint of the tank. The stormwater management tank will provide a total of approximately 363.3 m^3 of storage. Stormwater runoff exceeding the capacity of the stormwater management tank will discharge overland, ultimately discharging to the Woodlawn Road W right-of-way.

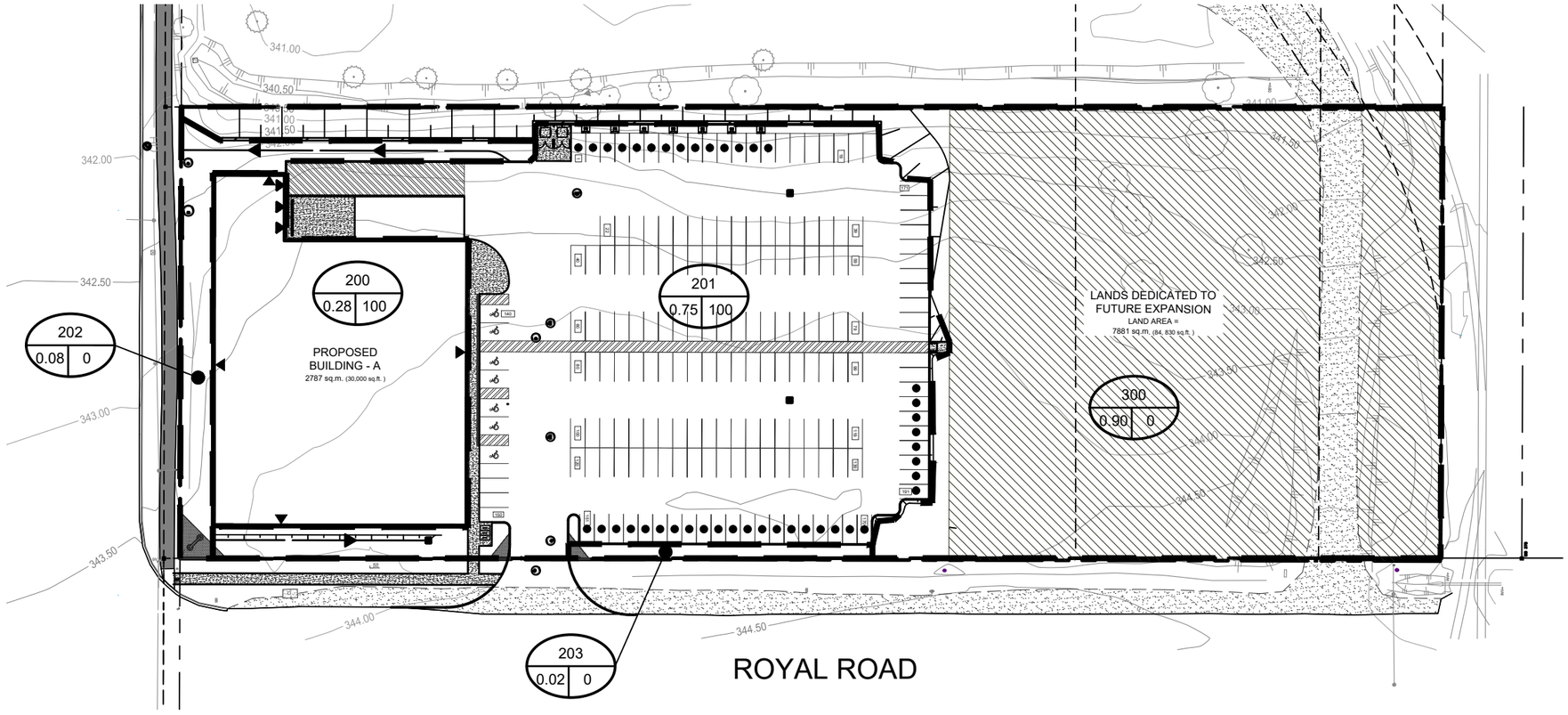
Catchment 202 (0.08-hectares, 0% Impervious) represents a small portion of the proposed development along the northwest limits of the site. Runoff generated from Catchment 202 sheetflows overland, uncontrolled, ultimately discharging to the Woodlawn Road West right-of-way.

Catchment 203 (0.02-hectares, 0% Impervious) represents the landscaped area around the south limits of the proposed development. Runoff generated from Catchment 203 will sheetflow overland, discharging uncontrolled to the existing Royal Road right-of-way.

Catchment 300 (0.90-hectares, 0% Impervious) represents a portion of the site for future development along the east limits of the site. Runoff generated from Catchment 300 sheetflows overland north and east, uncontrolled, ultimately discharging to the catchbasin on the adjoining property and the storm sewers in the Woodlawn Road right-of-way.

Quality Control for Catchments 200 and 201 will be provided by a treatment train of the pre-treatment row in the proposed underground EZStorm storage tank and further quality control for Catchments 200 and 201 will be provided by the proposed oil/grit separator unit (SDD3). We recognize that the City of Guelph Development Engineering Manual restricts the TSS removal from OGS Units to 50%. As such the TSS removal for the portion of the site being developed has been calculated as follows:

81 ROYAL ROAD
CITY OF GUELPH



LEGEND

- PROP. STORM SEWER
- DRAINAGE AREA BOUNDARY
- 201 / 0.110 | 80 — CATCHMENT NUMBER; % IMPERVIOUS
- CATCHMENT AREA IN HECTARES

15 0 10 20 40
1:1000 (m)

POST DEVELOPMENT DRAINAGE AREA

Figure No. 2

GEI Consultants

2406127
AUGUST 2024
Scale: 1:1000 | NAD 1983 UTM Zone 17N

Table 3-5. Quality Control Calculation

Catchment	Area	Imp.	TSS Generated Annually	TSS Removal (%)	Annual TSS Removal
200	0.28 ha	100%	0 (rooftops considered clean runoff)	--	--
201	0.75 ha	100%	3.60 m^3	85% (70% from pretreatment row, then 50% from oil and grit separator)	3.06 m^3
202	0.08 ha	0%	0 (landscaped areas considered clean runoff)	--	--
203	0.02 ha	0%	0 (landscaped areas considered clean runoff)	--	--
300	0.90 ha	0%	0 (landscaped areas considered clean runoff)	--	--
Total	**2.03 ha**	**52%**	**3.60 m^3**		**3.06 m^3**

Therefore, the criteria of 80% TSS removal for the proposed development has been met. Details of the storage tank and the oil and grit separator are included in Appendix C.

3.5. Routing

The hydrologic model MIDUSS was used to create the 2-100-year design storm runoff hydrographs and to route the hydrographs. A copy of the modelling results of the post-development analysis is appended.

The results of the routing analysis are as follows:

Table 3-6. Catchment 200 Rooftop Stage/Storage/Discharge Capacities

	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	**Storage Volume m^3**	**Storage Elevation m**	**Peak Flow m^3/s**	**Storage Volume m^3**	**Storage Elevation m**
Rooftop	0.000	0.0	0.000	---	---	---
2-Year	---	---	---	0.004	61.2	0.022
5-Year	---	---	---	0.006	80.8	0.029
10-Year	---	---	---	0.007	94.5	0.034
25-Year	---	---	---	0.008	114.0	0.041
50-Year	---	---	---	0.009	127.2	0.046
100-Year	---	---	---	0.010	140.8	0.051
Overflow	0.021	297.0	0.100	---	---	---

Table 3-7. Catchment 201 Underground Storage Stage/Storage/Discharge Capacities

	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	**Storage Volume m^3**	**Storage Elevation m**	**Peak Flow m^3/s**	**Storage Volume m^3**	**Storage Elevation m**
Orifice Invert	0.000	0.0	340.420	---	---	---
2-Year	---	---	---	0.013	172.0	341.045
5-Year	---	---	---	0.016	234.7	341.273
10-Year	---	---	---	0.017	279.7	341.436
25-Year	---	---	---	0.019	345.6	341.675
Top of Storm Tank	0.020	363.3	341.740	---	---	---
CB T/G Overflow	0.029	366.7	343.210			
Weir	0.030	368.9	343.300	---	---	---
50-Year	---	---	---	0.032	368.9	343.301
100-Year	---	---	---	0.075	369.3	343.314
Overflow	0.506	372.7	343.450	---	---	---

The rooftop and underground storage attenuates the 2-year design storm event flows by approximately 4 hours. Extended detention of 24 hours is not feasible on this site given that infiltration is not a feasible option.

A summary of the post-development peak flow from the site for all design storm events are provided in the Table below.

Table 3-8. Summary of Post-Development Peak Flow Rates

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Catchment 200 and 201 (controlled)	0.013 m^3/s	0.016 m^3/s	0.017 m^3/s	0.019 m^3/s	0.032 m^3/s	0.075 m^3/s
Catchment 202 (uncontrolled)	0.004 m^3/s	0.010 m^3/s	0.016 m^3/s	0.024 m^3/s	0.030 m^3/s	0.035 m^3/s
Catchment 203 (uncontrolled)	0.001 m^3/s	0.003 m^3/s	0.005 m^3/s	0.007 m^3/s	0.009 m^3/s	0.010 m^3/s
Catchment 300 (uncontrolled)	0.013 m^3/s	0.051 m^3/s	0.090 m^3/s	0.148 m^3/s	0.182 m^3/s	0.211 m^3/s
Total	**0.026 m^3/s**	**0.067 m^3/s**	**0.108 m^3/s**	**0.170 m^3/s**	**0.207 m^3/s**	**0.239 m^3/s**

Table 3-9. Comparison of Allowable Release Rates and Post-Development Flow Rates

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Allowable Release Rate	0.030 m^3/s	0.121 m^3/s	0.226 m^3/s	0.338 m^3/s	0.414 m^3/s	0.480 m^3/s
Post-Development Flow Rate	0.026 m^3/s	0.067 m^3/s	0.108 m^3/s	0.170 m^3/s	0.207 m^3/s	0.239 m^3/s

Therefore, the post-development peak flow rates are attenuated to allowable release rates during all design storm events.

4. Water Balance

The precipitation and temperature values were taken from the City of Guelph Stormwater Management Master Plan (dated December 2022). The average annual precipitation is estimated to be 844.3 mm.

Therefore, based on the annual infiltration rates, the existing annual average recharge occurring within the 2.03-hectare catchment area is estimated to be 1,880.9 m^3. Under post-development conditions, the annual average groundwater recharge is estimated to be 1,442.7 m^3.

Under existing conditions, the annual average runoff from the area is estimated to be 4,388.7 m^3. As a result of the proposed development the impervious area (rooftop and paved surfaces) of the site increases, the annual potential evapotranspiration for impervious surfaces decreases and the runoff from the site increases. The runoff from the site under post-development conditions is estimated to be 8,576.1m^3 per year.

In summary, the estimated recharge and runoff volume for the site are as follows:

Table 4-1. Summary of Recharge and Runoff Volumes

	Existing Condition	**Post-Development Condition**	**Percent Change**
Total Estimated Recharge	1,880.9 m^3	1,442.7 m^3	-23%
Total Estimated Runoff	4,388.7 m^3	8,576.1 m^3	+95%

As noted above, the reduction in infiltration under post-development conditions is approximately 438.2m^3 annually. Per the Ontario Sourcewater Information Atlas, the area of this site is in an Issue Contributing Area and not in a Significant Groundwater Recharge Area, and as such, the reduction in annual infiltration is not considered a significant change. Based on nearby sites, we anticipate the site will have tight existing subsurface soils and a shallow local groundwater table. As such, infiltration has not been included in the proposed design and the site cannot meet the 5mm volume control or maintain pre-development recharge rates. This assumption will be updated with the completion of the Geotechnical Investigation of the site. The water budget is summarized in Appendix C.

5. Thermal Preventative Measures

This site contributes to a storm sewer on the Woodlawn Road right-of-way. Figure 4.1 of the Guelph Stormwater Management Master Plan shows this storm sewer contributes to a watercourse with unknown temperature requirements. The proposed development uses underground stormwater attenuation for minor design storm events and therefore minimizes temperature increases.

6. Erosion and Sediment Control Plan

A silt fence is to be installed along the perimeter of the site. The silt fence serves to minimize the opportunity for sediment to leave the site. The on-site catch basins are to have silt sacs placed under the grate until all on-site construction has been completed.

Upon completion of the grading, any area not subject to active construction within 30 days will be topsoiled and hydroseeded as per OPSS. PROV 804.

Inspection and maintenance of all silt fencing will start after installation is complete. The silt fence will be inspected on a weekly basis during active construction or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the silt fence found to need repair.

Once construction and landscaping has been substantially completed, the silt fence will be removed, any accumulated sediment will be removed, and the landscaping will be completed.

7. Maintenance Plan

To ensure that the stormwater management system continues to function as designed and constructed, we recommend that the following inspections and maintenance activities be completed on an annual basis:

1. Is there any indication of a spill (i.e. frothy water, oily sheen on the water)? If yes, investigate, inform the appropriate agencies and complete the necessary clean-up and restoration.
2. Inspect all orifice plates, and flow control devices. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).
3. Inspect all catch basins, and manholes. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).
4. Inspect all swales and overflow locations. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves. etc.).
5. Inspect and maintain stormwater tank and oil and grit separator in line with manufacturer recommendations.

Please note that any structures identified during the annual inspection to be worn, missing or damaged are to be repaired or replaced within 48 hours.

8. Conclusions

In summary,

1. It is proposed that the site will be accessed by Royal Road and Woodlawn Road W, and that the grading of the development is controlled by these access routes.
2. Water supply for the proposed development will be provided via the extension of a 200mm diameter watermain from the existing 300mm diameter watermain on Royal Road.
3. Sanitary service for the development will be provided via one (1) connection to the 300mm diameter sanitary sewer on Royal Road.
4. Storm service for the development will be provided via one (1) storm sewer connection to the existing 600mm diameter storm sewer on Woodlawn Road W.
5. The post-development condition flow rates for the proposed development will be attenuated to allowable release rates during all design storm events.
6. Quality Control for Catchment 200 and 201 will be provided by the proposed pretreatment row in the underground EZStorm storage tank and further quality control will be provided by the proposed oil and grit separator (SDD3) for Catchments 200 and 201. Therefore, enhanced quality control is provided for the proposed development.
7. The reduction in infiltration under post-development conditions is approximately 438.2 m^3 annually. Per the Ontario Sourcewater Information Atlas, the area of this site is in an Issue Contributing Area and not in a Significant Groundwater Recharge Area, and as such, the reduction in annual infiltration is not considered a significant change. Based on nearby sites, we anticipate the existing subsurface soils to be tight and have a shallow local groundwater table. Infiltration has therefore not been included in the proposed design and the site cannot meet the 5mm volume control or maintain pre-development recharge rates. This assumption will be updated with the completion of the Geotechnical Investigation.
8. The proposed development uses underground stormwater attenuation for minor design storm events and therefore minimizes temperature increases to generated runoff.
9. The Owner/Architect/Agent is to provide the Mechanical and Structural Engineers with copies of the Site Servicing and Stormwater Management Report and the Site Grading and Servicing Plan and the Notes and Details for their use in the design of the rooftop stormwater management measures.
10. A qualified Structural Engineer must review and verify that the roof of the proposed Operations and Maintenance building and proposed building addition have the structural capacity to carry the loading of the stored rainfall and all other loading in accordance with OBC 2017.
11. To ensure that the average depth of water storage on the rooftop does not exceed the average design depth criteria of 100mm, with a maximum storage depth of 150mm at the roof drains, we recommend that a qualified Mechanical Engineer review and verify the requirement for overflow structures to be included in the design.
12. Prior to construction, a silt fence will be installed along the property boundary in all locations where runoff will discharge from the site to adjacent lands. This will minimize the transport of sediment off-site during the construction period.

Appendix A Sewer Design Sheets

PROJECT: 81 Royal Road
City of Guelph
DATE: December 13, 2024
DESIGNED BY: P.W.
CHECKED BY: S.P.

SANITARY SEWER DESIGN

City of Guelph

Note: Flow rate based on est. fixture units as per OBC
Peaking Factor = 4
n = 0.013

Q(i) = Cum. Area (ha) * Infiltration Rate / 1000
Infiltration Rate: 0.25 L/s/ha

Peaking Factor : F = 1 + (14/(4+P^0.5 P = Population/1000

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5
D = Diameter (mm)
S = Slope (%
n = 0.013 (PVC & Concrete), 01016 (Vitrified Clay)

Minimum Full Velocity = 0.80 m/s

From	To	RESIDENTIAL AREA AND POPULATION						Commercial		Industrial		Institutional		C+I+I	Infiltration	Total Flow	Pipe					
		Area	Pop.	Cumulative		Peak Factor	Peak Flow	Area	Cum. Area	Area	Cum. Area	Area	Cum. Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
		(ha)		Area (ha)	Pop.		(m^3/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
BLDG	MH.B							0.28	0.28					0.0088	0.000070	0.0089	12.70	200	2.00	0.0464	1.477	1.152
MH.B	MH.A							1.75	2.03					0.0088	0.000508	0.0093	43.80	200	0.50	0.0232	0.738	0.694
MH.A	EX.MH.B							0.00	2.03					0.0088	0.000508	0.0093	75.70	300	0.64	0.0774	1.095	0.745

PROJECT: 81 Royal Road
City of Guelph
DATE: December 13, 2024

DESIGNED BY: P.W.

STORM SEWER DESIGN

5-Year Design Storm
City of Guelph

Chicago Storm Parameters
Intensity = A / (t + B) ^ C
5-Year
A = 750.423
B = 1.5
C = 0.769

From	To	Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	TC (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer						
									Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
Trench Drain	Tank	0.03	0.90	0.03	0.03	10.00	114.72	0.009	38	300	0.013	1.70	0.126	1.78	0.36
CB.9	MH.6	0.05	0.20	0.01	0.01	10.00	114.72	0.003	23	300	0.013	0.50	0.068	0.97	0.40
MH.6	CBMH.5	0.00	0.90	0.00	0.01	10.40	111.77	0.003	19.5	300	0.013	0.50	0.068	0.97	0.34
CBMH.5	CBMH.4	0.14	0.90	0.13	0.14	10.73	109.40	0.041	21.4	375	0.013	0.50	0.124	1.12	0.32
BLDG	CBMH.4	0.28	0.90	0.25	0.03	10.00	114.72	0.010	15.4	300	0.013	2.00	0.137	1.93	0.13
CB.7	CBMH.4	0.26	0.90	0.23	0.23	10.00	114.72	0.075	47.3	300	0.013	1.20	0.106	1.50	0.53
CBMH.4	Tank	0.07	0.90	0.06	0.46	10.73	109.40	0.141	8.9	450	0.013	0.50	0.202	1.27	0.12
CB.8	CBMH.3	0.10	0.90	0.09	0.09	10.00	114.72	0.029	40.1	300	0.013	1.93	0.134	1.90	0.35
CBMH.3	Tank	0.11	0.90	0.10	0.19	10.85	108.60	0.057	2.6	300	0.013	1.00	0.097	1.37	0.03
Tank	MH11	0.00	0.90	0.00	0.10	10.88	108.39	0.030	57.8	300	0.013	0.50	0.068	0.97	1.00
MH11	OGS	0.00	0.90	0.00	0.10	11.88	102.13	0.028	9.0	300	0.013	0.50	0.068	0.97	0.16
OGS	EX.MH.6	0.00	0.90	0.00	0.10	12.03	101.23	0.028	12.5	300	0.013	0.50	0.068	0.97	0.22

The Cumulative A x C at BLDG to CBMH.4 has been reduced to represent the 100-year flow rate attenuated from rooftop controls (0.010 m^3/s).
The Cumulative A x C at Tank to MH.11 has been reduced to represent the 100-year flow rate attenuated from storm tank and orifice through the storm sewer (0.030 m^3/s)

Appendix B Stormwater Management Analysis

C.1. Existing Conditions Modelling

C.2. Post-Development Conditions Modelling

C.3. Oil and Grit Separator and Stormwater Tank Details

C.4. Water Balance Analysis

C.1. Existing Conditions Modelling

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"     1500.000   Max. Hydrograph"
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"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"      563.699   Coefficient A"
"        1.500   Constant B"
"        0.766   Exponent C"
"        0.400   Fraction R"
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"             Maximum intensity           129.248    mm/hr"
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"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"        0.000   % Impervious"
"        2.030   Total Area"
"       85.000   Flow length"
"        4.000   Overland Slope"
"        2.030   Pervious Area"
"       85.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
```

```
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.030     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.030      0.000      2.030      hectare"
"             Time of concentration  29.161     3.038      29.161     minutes"
"             Time to Centroid       121.897    118.112    121.897    minutes"
"             Rainfall depth         33.713     33.713     33.713     mm"
"             Rainfall volume        684.37     0.00       684.37     c.m"
"             Rainfall losses        31.150     1.935      31.150     mm"
"             Runoff depth           2.562      31.777     2.562      mm"
"             Runoff volume          52.02      0.00       52.02      c.m"
"             Runoff coefficient     0.076      0.000      0.076      "
"             Maximum flow           0.030      0.000      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.030     0.030     0.000     0.000"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    2.030    hectare"
"             Total Impervious area                   0.000    hectare"
"             Total % impervious                      0.000"
" 19          EXIT"
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"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"      750.423   Coefficient A"
"        1.500   Constant B"
"        0.769   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           171.091    mm/hr"
"             Total depth                  44.147    mm"
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"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"        0.000   % Impervious"
"        2.030   Total Area"
"       85.000   Flow length"
"        4.000   Overland Slope"
"        2.030   Pervious Area"
"       85.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
```

```
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.121     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.030      0.000      2.030      hectare"
"             Time of concentration  19.091     2.715      19.091     minutes"
"             Time to Centroid       116.903    116.631    116.903    minutes"
"             Rainfall depth         44.147     44.147     44.147     mm"
"             Rainfall volume        896.19     0.00       896.19     c.m"
"             Rainfall losses        35.988     1.940      35.988     mm"
"             Runoff depth           8.159      42.207     8.160      mm"
"             Runoff volume          165.64     0.00       165.64     c.m"
"             Runoff coefficient     0.185      0.000      0.185      "
"             Maximum flow           0.121      0.000      0.121      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.121     0.121     0.000     0.000"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    2.030    hectare"
"             Total Impervious area                   0.000    hectare"
"             Total % impervious                      0.000"
" 19          EXIT"
```

```
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"      855.183   Coefficient A"
"        1.500   Constant B"
"        0.764   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
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"             Maximum intensity           196.822    mm/hr"
"             Total depth                  51.710    mm"
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" 33          CATCHMENT 100"
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"          100   Catchment 100"
"        0.000   % Impervious"
"        2.030   Total Area"
"       85.000   Flow length"
"        4.000   Overland Slope"
"        2.030   Pervious Area"
"       85.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.226     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.030      0.000      2.030      hectare"
"             Time of concentration  16.384     2.567      16.384     minutes"
"             Time to Centroid       115.994    116.117    115.994    minutes"
"             Rainfall depth         51.710     51.710     51.710     mm"
"             Rainfall volume        1049.70    0.00       1049.70    c.m"
"             Rainfall losses        39.164     2.012      39.164     mm"
"             Runoff depth           12.545     49.697     12.545     mm"
"             Runoff volume          254.67     0.00       254.67     c.m"
"             Runoff coefficient     0.243      0.000      0.243      "
"             Maximum flow           0.226      0.000      0.226      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.226     0.226     0.000     0.000"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                       2.030    hectare"
"             Total Impervious area                      0.000    hectare"
"             Total % impervious                         0.000"
" 19          EXIT"
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"            1   Chicago storm"
"      972.202   Coefficient A"
"        1.500   Constant B"
"        0.752   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           228.875    mm/hr"
"             Total depth                  62.786    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"        0.000   % Impervious"
"        2.030   Total Area"
"       85.000   Flow length"
"        4.000   Overland Slope"
"        2.030   Pervious Area"
"       85.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.338     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.030      0.000      2.030      hectare"
"             Time of concentration  14.247     2.417      14.247     minutes"
"             Time to Centroid       116.241    115.809    116.241    minutes"
"             Rainfall depth         62.786     62.786     62.786     mm"
"             Rainfall volume        1274.55    0.00       1274.56    c.m"
"             Rainfall losses        43.432     2.202      43.432     mm"
"             Runoff depth           19.354     60.584     19.354     mm"
"             Runoff volume          392.88     0.00       392.88     c.m"
"             Runoff coefficient     0.308      0.000      0.308      "
"             Maximum flow           0.338      0.000      0.338      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.338     0.338     0.000     0.000"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
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"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1054.539   Coefficient A"
"        1.500   Constant B"
"        0.746   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           251.085    mm/hr"
"             Total depth                  70.383    mm"
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" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"        0.000   % Impervious"
"        2.030   Total Area"
"       85.000   Flow length"
"        4.000   Overland Slope"
"        2.030   Pervious Area"
"       85.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.414     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.030      0.000      2.030      hectare"
"             Time of concentration  13.245     2.329      13.245     minutes"
"             Time to Centroid       116.774    115.601    116.774    minutes"
"             Rainfall depth         70.383     70.383     70.383     mm"
"             Rainfall volume        1428.77    0.00       1428.77    c.m"
"             Rainfall losses        46.156     2.395      46.156     mm"
"             Runoff depth           24.226     67.987     24.226     mm"
"             Runoff volume          491.80     0.00       491.80     c.m"
"             Runoff coefficient     0.344      0.000      0.344      "
"             Maximum flow           0.414      0.000      0.414      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.414     0.414     0.000     0.000"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

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"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1122.601   Coefficient A"
"        1.500   Constant B"
"        0.738   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           271.357    mm/hr"
"             Total depth                  78.288    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"        0.000   % Impervious"
"        2.030   Total Area"
"       85.000   Flow length"
"        4.000   Overland Slope"
"        2.030   Pervious Area"
"       85.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.480     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.030      0.000      2.030      hectare"
"             Time of concentration  12.617     2.258      12.617     minutes"
"             Time to Centroid       117.994    115.464    117.994    minutes"
"             Rainfall depth         78.288     78.288     78.288     mm"
"             Rainfall volume        1589.24    0.00       1589.24    c.m"
"             Rainfall losses        48.574     2.483      48.574     mm"
"             Runoff depth           29.714     75.804     29.714     mm"
"             Runoff volume          603.19     0.00       603.19     c.m"
"             Runoff coefficient     0.380      0.000      0.380      "
"             Maximum flow           0.480      0.000      0.480      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.480     0.480     0.000     0.000"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

C.2. Post-Development Conditions Modelling

81 Royal Road
City of Guelph
Our File: 2406127
November 29, 2024

Catchment 200: Proposed Rooftop Storage

Design Discharge Rate =	1.50	l/min/mm/weir	2.50E-05	m^3/s/mm/weir
Max. Average Storage Depth =	100	mm		
Design Discharge =	150.0	l/min/weir	0.0025	m^3/s/weir
No. of Drains =	8			
No. Weirs/Drain =	1			
Allowable Release Rate =	1200.0	l/min	0.020	m^3/s
Rooftop Area =	2,787	m^2	(flat rooftop area that is available for storage)	

Therefore: 464.5 sq m/Roof Drain or 5000 sq ft/Roof Drain as per OBC

STAGE-STORAGE-DISCHARGE TABLE

Stage (m)	Incremental Storage (m^3)	Discharge (m^3/s)
0.000	0.00	0.000
0.025	69.68	0.005
0.050	139.35	0.010
0.075	209.03	0.015
0.100	278.70	0.020

81 Royal Road
City of Guelph
Our File: 2406127
November 29, 2024

Catchment 201: Underground Stormwater Tank (EZStorm System)

ELEV (m)	INC. DEPTH (m)	TANK SURFACE AREA (m^2)	PONDING SURFACE AREA (m^2)	INCR. VOL (m^3)	ACCUM STORAGE VOL (m^3)	
340.42	0.00	286.72	0.00	0.00	0.00	Bottom of Storm Tank
340.72	0.30	286.72	0.00	82.58	82.58	
341.02	0.60	286.72	0.00	82.58	165.15	
341.32	0.90	286.72	0.00	82.58	247.73	
341.62	1.20	286.72	0.00	82.58	330.30	
341.74	1.32	286.72	0.00	33.03	363.33	Top of Storm Tank
342.04	1.62	0.00	2.26	0.68	364.01	
342.34	1.92	0.00	2.26	0.68	364.69	
342.64	2.22	0.00	2.26	0.68	365.37	
343.21	2.79	0.00	2.26	1.29	366.65	CB T/G
343.30	2.88	0.00	25.00	2.25	368.90	Weir
343.45	3.03	0.00	25.00	3.75	372.65	Overflow

Tank Parameters

L=	22.4	m
W=	12.8	m
H=	1320	mm

ORIFICE

invert=	340.420	
Q =	0.031	m^3/s
Cd =	0.63	
H =	2.98	m
2g =	19.62	
A =	0.006	m^2
D =	0.090	m
D/2 =	0.045	m

OVERFLOW WEIR

Q =	0.475	cu m/s
d1 =	0.240	m
h =	0.090	m
H =	0.150	m
2g =	19.620	
L =	5.000	m

Stage/Storage/Discharge Table

ELEV (m)	STAGE (m)	STORAGE (m^3)	ORIFICE DISCHARGE (m^3/s)	OVERFLOW WEIR (m^3/s)	TOTAL DISCHARGE (m^3/s)	
340.42	0.00	0.00	0.000	0.000	0.000	Bottom of Storm Tank
340.72	0.30	82.58	0.009	0.000	0.009	
341.02	0.60	165.15	0.013	0.000	0.013	
341.32	0.90	247.73	0.016	0.000	0.016	
341.62	1.20	330.30	0.019	0.000	0.019	
341.74	1.32	363.33	0.020	0.000	0.020	Top of Storm Tank
342.04	1.62	364.01	0.022	0.000	0.022	
342.34	1.92	364.69	0.024	0.000	0.024	
342.64	2.22	365.37	0.026	0.000	0.026	
343.21	2.79	366.65	0.029	0.000	0.029	CB T/G
343.30	2.88	368.90	0.030	0.000	0.030	Weir
343.45	3.03	372.65	0.031	0.475	0.506	Overflow

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                B:\Working\ROHNBRAD\"
"                2406127 - 422111 352 Woodlawn Rd Build\Design Phase\Design
Data\Modelling Files\Updated_Dec2024"
"                Output filename:                                   Post_2yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                12/13/2024 at 8:07:25 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      563.699   Coefficient A"
"        1.500   Constant B"
"        0.766   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           129.248    mm/hr"
"             Total depth                  33.713    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"      100.000   % Impervious"
"        0.280   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.280   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.084     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.280      0.280      hectare"
"             Time of concentration  12.240     1.275      1.275      minutes"
"             Time to Centroid       109.467    114.982    114.982    minutes"
"             Rainfall depth         33.713     33.713     33.713     mm"
"             Rainfall volume        0.00       94.40      94.40      c.m"
"             Rainfall losses        31.156     2.230      2.230      mm"
"             Runoff depth           2.557      31.482     31.482     mm"
"             Runoff volume          0.00       88.15      88.15      c.m"
"             Runoff coefficient     0.000      0.934      0.934      "
"             Maximum flow           0.000      0.084      0.084      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.084     0.084     0.000     0.000"
" 54          POND DESIGN"
"        0.084   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"         88.2   Hydrograph volume    c.m"
"           5.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.100   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02500   0.00500    69.680"
"                 0.05000   0.01000   139.350"
"                 0.07500   0.01500   209.030"
"                  0.1000   0.02000   278.700"
"             Peak outflow                  0.004    c.m/sec"
"             Maximum level                 0.022    metre"
"             Maximum storage              61.149    c.m"
"             Centroidal lag                5.728   hours"
"                  0.084     0.084     0.004     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.084     0.004     0.004     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Catchment 201"
"      100.000   % Impervious"
"        0.750   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.750   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.218     0.004     0.004     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.750      0.750      hectare"
"             Time of concentration  15.069     1.570      1.570      minutes"
"             Time to Centroid       111.645    115.522    115.522    minutes"
"             Rainfall depth         33.713     33.713     33.713     mm"
"             Rainfall volume        0.00       252.84     252.84     c.m"
"             Rainfall losses        31.149     2.016      2.016      mm"
"             Runoff depth           2.564      31.696     31.696     mm"
"             Runoff volume          0.00       237.72     237.72     c.m"
"             Runoff coefficient     0.000      0.940      0.940      "
"             Maximum flow           0.000      0.218      0.218      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.218     0.220     0.004     0.000"
" 54          POND DESIGN"
"        0.220   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        325.6   Hydrograph volume    c.m"
"          12.   Number of stages"
"      340.420   Minimum water level    metre"
"      343.450   Maximum water level    metre"
"      340.420   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                340.420     0.000     0.000"
"                340.720   0.00900    82.580"
"                341.020   0.01300   165.150"
"                341.320   0.01600   247.730"
"                341.620   0.01900   330.300"
"                341.740   0.02000   363.330"
"                342.040   0.02200   364.010"
"                342.340   0.02400   364.690"
"                342.640   0.02600   365.370"
"                343.210   0.02900   366.650"
"                343.300   0.03000   368.900"
```

```
"               343.450    0.5060   372.650"
"             Peak outflow                  0.013    c.m/sec"
"             Maximum level               341.045    metre"
"             Maximum storage             172.033    c.m"
"             Centroidal lag                5.959   hours"
"                  0.218     0.220     0.013     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.218     0.013     0.013     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Catchment 202"
"        0.000   % Impervious"
"        0.080   Total Area"
"        5.500   Flow length"
"        8.000   Overland Slope"
"        0.080   Pervious Area"
"        5.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        5.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                  0.004     0.013     0.013     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  4.582      0.477      4.582      minutes"
"             Time to Centroid       103.908    0.000      103.908    minutes"
"             Rainfall depth         33.713     33.713     33.713     mm"
"             Rainfall volume        26.97      0.00       26.97      c.m"
"             Rainfall losses        31.167     33.713     31.167     mm"
"             Runoff depth           2.545      0.000      2.545      mm"
"             Runoff volume          2.04       0.00       2.04       c.m"
"             Runoff coefficient     0.076      0.000      0.076      "
"             Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.004     0.015     0.013     0.000"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   Catchment 203"
"        0.000   % Impervious"
"        0.020   Total Area"
"        2.500   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"        2.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.001     0.015     0.013     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  2.855      0.297      2.855      minutes"
"             Time to Centroid       102.414    113.909    102.414    minutes"
"             Rainfall depth         33.713     33.713     33.713     mm"
"             Rainfall volume        6.74       0.00       6.74       c.m"
"             Rainfall losses        31.196     5.140      31.196     mm"
"             Runoff depth           2.517      28.572     2.517      mm"
"             Runoff volume          0.50       0.00       0.50       c.m"
"             Runoff coefficient     0.075      0.000      0.075      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.016     0.013     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.900   Total Area"
"       85.000   Flow length"
"        3.500   Overland Slope"
"        0.900   Pervious Area"
"       85.000   Pervious length"
```

```
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.013     0.016     0.013     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.900      0.000      0.900      hectare"
"             Time of concentration  30.353     3.162      30.353     minutes"
"             Time to Centroid       122.819    118.348    122.819    minutes"
"             Rainfall depth         33.713     33.713     33.713     mm"
"             Rainfall volume        303.41     0.00       303.41     c.m"
"             Rainfall losses        31.146     1.988      31.146     mm"
"             Runoff depth           2.566      31.725     2.566      mm"
"             Runoff volume          23.10      0.00       23.10      c.m"
"             Runoff coefficient     0.076      0.000      0.076      "
"             Maximum flow           0.013      0.000      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.013     0.026     0.013     0.000"
" 38          START/RE-START TOTALS 300"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     1.030    hectare"
"             Total % impervious                       50.739"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                              B:\Working\ROHNBRAD\"
"                2406127 - 422111 352 Woodlawn Rd Build\Design Phase\Design
Data\Modelling Files\Updated_Dec2024"
"                Output filename:                                  Post_5yr.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:                12/13/2024 at 8:08:50 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      750.423   Coefficient A"
"        1.500   Constant B"
"        0.769   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           171.091    mm/hr"
"             Total depth                  44.147    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"      100.000   % Impervious"
"        0.280   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.280   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.112     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.280      0.280      hectare"
"             Time of concentration  8.013      1.140      1.140      minutes"
"             Time to Centroid       107.999    113.945    113.945    minutes"
"             Rainfall depth         44.147     44.147     44.147     mm"
"             Rainfall volume        0.00       123.61     123.61     c.m"
"             Rainfall losses        35.958     2.671      2.671      mm"
"             Runoff depth           8.189      41.476     41.476     mm"
"             Runoff volume          0.00       116.13     116.13     c.m"
"             Runoff coefficient     0.000      0.939      0.939      "
"             Maximum flow           0.000      0.112      0.112      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.112     0.112     0.000     0.000"
" 54          POND DESIGN"
"        0.112   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        116.1   Hydrograph volume    c.m"
"           5.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.100   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02500   0.00500    69.680"
"                 0.05000   0.01000   139.350"
"                 0.07500   0.01500   209.030"
"                  0.1000   0.02000   278.700"
"             Peak outflow                  0.006    c.m/sec"
"             Maximum level                 0.029    metre"
"             Maximum storage              80.779    c.m"
"             Centroidal lag                5.711   hours"
"                  0.112     0.112     0.006     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.112     0.006     0.006     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Catchment 201"
"      100.000   % Impervious"
"        0.750   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.750   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.293     0.006     0.006     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.750      0.750      hectare"
"             Time of concentration  9.865      1.403      1.403      minutes"
"             Time to Centroid       109.094    114.257    114.257    minutes"
"             Rainfall depth         44.147     44.147     44.147     mm"
"             Rainfall volume        0.00       331.10     331.10     c.m"
"             Rainfall losses        36.087     2.318      2.318      mm"
"             Runoff depth           8.060      41.829     41.829     mm"
"             Runoff volume          0.00       313.72     313.72     c.m"
"             Runoff coefficient     0.000      0.947      0.947      "
"             Maximum flow           0.000      0.293      0.293      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.293     0.296     0.006     0.000"
" 54          POND DESIGN"
"        0.296   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        429.6   Hydrograph volume    c.m"
"          12.   Number of stages"
"      340.420   Minimum water level    metre"
"      343.450   Maximum water level    metre"
"      340.420   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                340.420     0.000     0.000"
"                340.720   0.00900    82.580"
"                341.020   0.01300   165.150"
"                341.320   0.01600   247.730"
"                341.620   0.01900   330.300"
"                341.740   0.02000   363.330"
"                342.040   0.02200   364.010"
"                342.340   0.02400   364.690"
"                342.640   0.02600   365.370"
"                343.210   0.02900   366.650"
"                343.300   0.03000   368.900"
```

```
"               343.450    0.5060   372.650"
"             Peak outflow                  0.016    c.m/sec"
"             Maximum level               341.273    metre"
"             Maximum storage             234.713    c.m"
"             Centroidal lag                6.301   hours"
"                  0.293     0.296     0.016     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.293     0.016     0.016     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Catchment 202"
"        0.000   % Impervious"
"        0.080   Total Area"
"        5.500   Flow length"
"        8.000   Overland Slope"
"        0.080   Pervious Area"
"        5.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        5.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                  0.010     0.016     0.016     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  3.000      0.427      3.000      minutes"
"             Time to Centroid       103.324    0.000      103.324    minutes"
"             Rainfall depth         44.147     44.147     44.147     mm"
"             Rainfall volume        35.32      0.00       35.32      c.m"
"             Rainfall losses        36.150     44.147     36.150     mm"
"             Runoff depth           7.998      0.000      7.998      mm"
"             Runoff volume          6.40       0.00       6.40       c.m"
"             Runoff coefficient     0.181      0.000      0.181      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.010     0.023     0.016     0.000"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   Catchment 203"
"        0.000   % Impervious"
"        0.020   Total Area"
"        2.500   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"        2.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.003     0.023     0.016     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  1.869      0.266      1.869      minutes"
"             Time to Centroid       102.535    112.720    102.535    minutes"
"             Rainfall depth         44.147     44.147     44.147     mm"
"             Rainfall volume        8.83       0.00       8.83       c.m"
"             Rainfall losses        35.968     6.539      35.968     mm"
"             Runoff depth           8.179      37.608     8.179      mm"
"             Runoff volume          1.64       0.00       1.64       c.m"
"             Runoff coefficient     0.185      0.000      0.185      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.003     0.025     0.016     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.900   Total Area"
"       85.000   Flow length"
"        3.500   Overland Slope"
"        0.900   Pervious Area"
"       85.000   Pervious length"
```

```
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.051     0.025     0.016     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.900      0.000      0.900      hectare"
"             Time of concentration  19.871     2.826      19.871     minutes"
"             Time to Centroid       117.612    116.855    117.612    minutes"
"             Rainfall depth         44.147     44.147     44.147     mm"
"             Rainfall volume        397.32     0.00       397.32     c.m"
"             Rainfall losses        35.965     1.987      35.965     mm"
"             Runoff depth           8.182      42.161     8.182      mm"
"             Runoff volume          73.64      0.00       73.64      c.m"
"             Runoff coefficient     0.185      0.000      0.185      "
"             Maximum flow           0.051      0.000      0.051      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.051     0.067     0.016     0.000"
" 38          START/RE-START TOTALS 300"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     1.030    hectare"
"             Total % impervious                       50.739"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                              B:\Working\ROHNBRAD\"
"                2406127 - 422111 352 Woodlawn Rd Build\Design Phase\Design
Data\Modelling Files\Updated_Dec2024"
"                Output filename:                                  Post_10yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                12/13/2024 at 8:09:47 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      855.183   Coefficient A"
"        1.500   Constant B"
"        0.764   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           196.822    mm/hr"
"             Total depth                  51.710    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"      100.000   % Impervious"
"        0.280   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.280   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.130     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.280      0.280      hectare"
"             Time of concentration  6.877      1.078      1.078      minutes"
"             Time to Centroid       107.499    113.595    113.595    minutes"
"             Rainfall depth         51.710     51.710     51.710     mm"
"             Rainfall volume        0.00       144.79     144.79     c.m"
"             Rainfall losses        39.396     3.038      3.038      mm"
"             Runoff depth           12.313     48.671     48.671     mm"
"             Runoff volume          0.00       136.28     136.28     c.m"
"             Runoff coefficient     0.000      0.941      0.941      "
"             Maximum flow           0.000      0.130      0.130      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.130     0.130     0.000     0.000"
" 54          POND DESIGN"
"        0.130   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        136.3   Hydrograph volume    c.m"
"           5.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.100   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02500   0.00500    69.680"
"                 0.05000   0.01000   139.350"
"                 0.07500   0.01500   209.030"
"                  0.1000   0.02000   278.700"
"             Peak outflow                  0.007    c.m/sec"
"             Maximum level                 0.034    metre"
"             Maximum storage              94.494    c.m"
"             Centroidal lag                5.705   hours"
"                  0.130     0.130     0.007     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.130     0.007     0.007     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Catchment 201"
"      100.000   % Impervious"
"        0.750   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.750   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.340     0.007     0.007     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.750      0.750      hectare"
"             Time of concentration  8.466      1.327      1.327      minutes"
"             Time to Centroid       108.900    113.872    113.872    minutes"
"             Rainfall depth         51.710     51.710     51.710     mm"
"             Rainfall volume        0.00       387.82     387.82     c.m"
"             Rainfall losses        39.099     2.557      2.557      mm"
"             Runoff depth           12.611     49.152     49.152     mm"
"             Runoff volume          0.00       368.64     368.64     c.m"
"             Runoff coefficient     0.000      0.951      0.951      "
"             Maximum flow           0.000      0.340      0.340      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.340     0.343     0.007     0.000"
" 54          POND DESIGN"
"        0.343   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        504.6   Hydrograph volume    c.m"
"          12.   Number of stages"
"      340.420   Minimum water level    metre"
"      343.450   Maximum water level    metre"
"      340.420   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                340.420     0.000     0.000"
"                340.720   0.00900    82.580"
"                341.020   0.01300   165.150"
"                341.320   0.01600   247.730"
"                341.620   0.01900   330.300"
"                341.740   0.02000   363.330"
"                342.040   0.02200   364.010"
"                342.340   0.02400   364.690"
"                342.640   0.02600   365.370"
"                343.210   0.02900   366.650"
"                343.300   0.03000   368.900"
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"               343.450    0.5060   372.650"
"             Peak outflow                  0.017    c.m/sec"
"             Maximum level               341.436    metre"
"             Maximum storage             279.649    c.m"
"             Centroidal lag                6.525   hours"
"                  0.340     0.343     0.017     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.340     0.017     0.017     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Catchment 202"
"        0.000   % Impervious"
"        0.080   Total Area"
"        5.500   Flow length"
"        8.000   Overland Slope"
"        0.080   Pervious Area"
"        5.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        5.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                  0.016     0.017     0.017     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  2.574      0.403      2.574      minutes"
"             Time to Centroid       103.534    112.962    103.534    minutes"
"             Rainfall depth         51.710     51.710     51.710     mm"
"             Rainfall volume        41.37      0.00       41.37      c.m"
"             Rainfall losses        39.190     6.087      39.190     mm"
"             Runoff depth           12.519     45.623     12.519     mm"
"             Runoff volume          10.02      0.00       10.02      c.m"
"             Runoff coefficient     0.242      0.000      0.242      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.016     0.029     0.017     0.000"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   Catchment 203"
"        0.000   % Impervious"
"        0.020   Total Area"
"        2.500   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"        2.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.005     0.029     0.017     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  1.604      0.251      1.604      minutes"
"             Time to Centroid       102.636    112.304    102.636    minutes"
"             Rainfall depth         51.710     51.710     51.710     mm"
"             Rainfall volume        10.34      0.00       10.34      c.m"
"             Rainfall losses        39.304     7.577      39.304     mm"
"             Runoff depth           12.405     44.132     12.405     mm"
"             Runoff volume          2.48       0.00       2.48       c.m"
"             Runoff coefficient     0.240      0.000      0.240      "
"             Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.005     0.032     0.017     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.900   Total Area"
"       85.000   Flow length"
"        3.500   Overland Slope"
"        0.900   Pervious Area"
"       85.000   Pervious length"
```

```
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.090     0.032     0.017     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.900      0.000      0.900      hectare"
"             Time of concentration  17.054     2.672      17.054     minutes"
"             Time to Centroid       116.553    116.307    116.553    minutes"
"             Rainfall depth         51.710     51.710     51.710     mm"
"             Rainfall volume        465.39     0.00       465.39     c.m"
"             Rainfall losses        39.111     2.012      39.111     mm"
"             Runoff depth           12.599     49.698     12.599     mm"
"             Runoff volume          113.39     0.00       113.39     c.m"
"             Runoff coefficient     0.244      0.000      0.244      "
"             Maximum flow           0.090      0.000      0.090      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.090     0.108     0.017     0.000"
" 38          START/RE-START TOTALS 300"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     1.030    hectare"
"             Total % impervious                       50.739"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                B:\Working\ROHNBRAD\"
"                2406127 - 422111 352 Woodlawn Rd Build\Design Phase\Design
Data\Modelling Files\Updated_Dec2024"
"                Output filename:                                  Post_25yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 12/13/2024 at 8:10:49 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      972.202   Coefficient A"
"        1.500   Constant B"
"        0.752   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           228.875    mm/hr"
"             Total depth                  62.786    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"      100.000   % Impervious"
"        0.280   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.280   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.152     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.280      0.280      hectare"
"             Time of concentration  5.980      1.014      1.014      minutes"
"             Time to Centroid       108.072    113.354    113.354    minutes"
"             Rainfall depth         62.786     62.786     62.786     mm"
"             Rainfall volume        0.00       175.80     175.80     c.m"
"             Rainfall losses        43.578     3.604      3.605      mm"
"             Runoff depth           19.208     59.182     59.181     mm"
"             Runoff volume          0.00       165.71     165.71     c.m"
"             Runoff coefficient     0.000      0.943      0.943      "
"             Maximum flow           0.000      0.152      0.152      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.152     0.152     0.000     0.000"
" 54          POND DESIGN"
"        0.152   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        165.7   Hydrograph volume    c.m"
"           5.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.100   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02500   0.00500    69.680"
"                 0.05000   0.01000   139.350"
"                 0.07500   0.01500   209.030"
"                  0.1000   0.02000   278.700"
"             Peak outflow                  0.008    c.m/sec"
"             Maximum level                 0.041    metre"
"             Maximum storage             113.954    c.m"
"             Centroidal lag                5.701   hours"
"                  0.152     0.152     0.008     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.152     0.008     0.008     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Catchment 201"
"      100.000   % Impervious"
"        0.750   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.750   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.399     0.008     0.008     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.750      0.750      hectare"
"             Time of concentration  7.362      1.249      1.249      minutes"
"             Time to Centroid       109.562    113.739    113.739    minutes"
"             Rainfall depth         62.786     62.786     62.786     mm"
"             Rainfall volume        0.00       470.89     470.89     c.m"
"             Rainfall losses        43.605     2.883      2.883      mm"
"             Runoff depth           19.181     59.903     59.903     mm"
"             Runoff volume          0.00       449.27     449.27     c.m"
"             Runoff coefficient     0.000      0.954      0.954      "
"             Maximum flow           0.000      0.399      0.399      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.399     0.403     0.008     0.000"
" 54          POND DESIGN"
"        0.403   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        614.6   Hydrograph volume    c.m"
"          12.   Number of stages"
"      340.420   Minimum water level    metre"
"      343.450   Maximum water level    metre"
"      340.420   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                340.420     0.000     0.000"
"                340.720   0.00900    82.580"
"                341.020   0.01300   165.150"
"                341.320   0.01600   247.730"
"                341.620   0.01900   330.300"
"                341.740   0.02000   363.330"
"                342.040   0.02200   364.010"
"                342.340   0.02400   364.690"
"                342.640   0.02600   365.370"
"                343.210   0.02900   366.650"
"                343.300   0.03000   368.900"
```

```
"               343.450    0.5060   372.650"
"             Peak outflow                  0.019    c.m/sec"
"             Maximum level               341.675    metre"
"             Maximum storage             345.554    c.m"
"             Centroidal lag                6.819   hours"
"                  0.399     0.403     0.019     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.399     0.019     0.019     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Catchment 202"
"        0.000   % Impervious"
"        0.080   Total Area"
"        5.500   Flow length"
"        8.000   Overland Slope"
"        0.080   Pervious Area"
"        5.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        5.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                  0.024     0.019     0.019     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  2.239      0.380      2.239      minutes"
"             Time to Centroid       104.247    112.783    104.247    minutes"
"             Rainfall depth         62.786     62.786     62.786     mm"
"             Rainfall volume        50.23      0.00       50.23      c.m"
"             Rainfall losses        43.484     7.294      43.484     mm"
"             Runoff depth           19.302     55.492     19.302     mm"
"             Runoff volume          15.44      0.00       15.44      c.m"
"             Runoff coefficient     0.307      0.000      0.307      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.024     0.037     0.019     0.000"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   Catchment 203"
"        0.000   % Impervious"
"        0.020   Total Area"
"        2.500   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"        2.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.007     0.037     0.019     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  1.395      0.237      1.395      minutes"
"             Time to Centroid       103.398    112.037    103.398    minutes"
"             Rainfall depth         62.786     62.786     62.786     mm"
"             Rainfall volume        12.56      0.00       12.56      c.m"
"             Rainfall losses        43.872     9.189      43.872     mm"
"             Runoff depth           18.914     53.597     18.914     mm"
"             Runoff volume          3.78       0.00       3.78       c.m"
"             Runoff coefficient     0.301      0.000      0.301      "
"             Maximum flow           0.007      0.000      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.007     0.044     0.019     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.900   Total Area"
"       85.000   Flow length"
"        3.500   Overland Slope"
"        0.900   Pervious Area"
"       85.000   Pervious length"
```

```
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.148     0.044     0.019     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.900      0.000      0.900      hectare"
"             Time of concentration  14.829     2.516      14.829     minutes"
"             Time to Centroid       116.832    115.974    116.832    minutes"
"             Rainfall depth         62.786     62.786     62.786     mm"
"             Rainfall volume        565.07     0.00       565.07     c.m"
"             Rainfall losses        43.426     2.155      43.426     mm"
"             Runoff depth           19.360     60.631     19.360     mm"
"             Runoff volume          174.24     0.00       174.24     c.m"
"             Runoff coefficient     0.308      0.000      0.308      "
"             Maximum flow           0.148      0.000      0.148      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.148     0.170     0.019     0.000"
" 38          START/RE-START TOTALS 300"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     1.030    hectare"
"             Total % impervious                       50.739"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                B:\Working\ROHNBRAD\"
"                2406127 - 422111 352 Woodlawn Rd Build\Design Phase\Design
Data\Modelling Files\Updated_Dec2024"
"                Output filename:                                  Post_50yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 12/13/2024 at 8:13:10 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1054.539   Coefficient A"
"        1.500   Constant B"
"        0.746   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           251.085    mm/hr"
"             Total depth                  70.383    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"      100.000   % Impervious"
"        0.280   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.280   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.167     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.280      0.280      hectare"
"             Time of concentration  5.559      0.978      0.978      minutes"
"             Time to Centroid       108.752    113.191    113.191    minutes"
"             Rainfall depth         70.383     70.383     70.383     mm"
"             Rainfall volume        0.00       197.07     197.07     c.m"
"             Rainfall losses        46.029     4.038      4.038      mm"
"             Runoff depth           24.354     66.345     66.345     mm"
"             Runoff volume          0.00       185.76     185.76     c.m"
"             Runoff coefficient     0.000      0.943      0.943      "
"             Maximum flow           0.000      0.167      0.167      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.167     0.167     0.000     0.000"
" 54          POND DESIGN"
"        0.167   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        185.8   Hydrograph volume    c.m"
"           5.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.100   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02500   0.00500    69.680"
"                 0.05000   0.01000   139.350"
"                 0.07500   0.01500   209.030"
"                  0.1000   0.02000   278.700"
"             Peak outflow                  0.009    c.m/sec"
"             Maximum level                 0.046    metre"
"             Maximum storage             127.240    c.m"
"             Centroidal lag                5.698   hours"
"                  0.167     0.167     0.009     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.167     0.009     0.009     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Catchment 201"
"      100.000   % Impervious"
"        0.750   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.750   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.440     0.009     0.009     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.750      0.750      hectare"
"             Time of concentration  6.844      1.204      1.204      minutes"
"             Time to Centroid       110.091    113.625    113.625    minutes"
"             Rainfall depth         70.383     70.383     70.383     mm"
"             Rainfall volume        0.00       527.87     527.87     c.m"
"             Rainfall losses        46.539     3.161      3.161      mm"
"             Runoff depth           23.844     67.222     67.222     mm"
"             Runoff volume          0.00       504.17     504.17     c.m"
"             Runoff coefficient     0.000      0.955      0.955      "
"             Maximum flow           0.000      0.440      0.440      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.440     0.445     0.009     0.000"
" 54          POND DESIGN"
"        0.445   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        689.5   Hydrograph volume    c.m"
"          12.   Number of stages"
"      340.420   Minimum water level    metre"
"      343.450   Maximum water level    metre"
"      340.420   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                340.420     0.000     0.000"
"                340.720   0.00900    82.580"
"                341.020   0.01300   165.150"
"                341.320   0.01600   247.730"
"                341.620   0.01900   330.300"
"                341.740   0.02000   363.330"
"                342.040   0.02200   364.010"
"                342.340   0.02400   364.690"
"                342.640   0.02600   365.370"
"                343.210   0.02900   366.650"
"                343.300   0.03000   368.900"
```

```
"               343.450    0.5060   372.650"
"             Peak outflow                  0.032    c.m/sec"
"             Maximum level               343.301    metre"
"             Maximum storage             368.919    c.m"
"             Centroidal lag                6.740   hours"
"                  0.440     0.445     0.032     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                   0.440     0.032     0.032     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Catchment 202"
"        0.000   % Impervious"
"        0.080   Total Area"
"        5.500   Flow length"
"        8.000   Overland Slope"
"        0.080   Pervious Area"
"        5.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        5.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                   0.030     0.032     0.032     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  2.081      0.366      2.081      minutes"
"             Time to Centroid       104.934    112.663    104.934    minutes"
"             Rainfall depth         70.383     70.383     70.383     mm"
"             Rainfall volume        56.31      0.00       56.31      c.m"
"             Rainfall losses        46.075     8.189      46.074     mm"
"             Runoff depth           24.308     62.194     24.308     mm"
"             Runoff volume          19.45      0.00       19.45      c.m"
"             Runoff coefficient     0.345      0.000      0.345      "
"             Maximum flow           0.030      0.000      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.030     0.043     0.032     0.000"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   Catchment 203"
"        0.000   % Impervious"
"        0.020   Total Area"
"        2.500   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"        2.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.009     0.043     0.032     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  1.297      0.228      1.297      minutes"
"             Time to Centroid       104.067    111.866    104.067    minutes"
"             Rainfall depth         70.383     70.383     70.383     mm"
"             Rainfall volume        14.08      0.00       14.08      c.m"
"             Rainfall losses        46.714     10.321     46.714     mm"
"             Runoff depth           23.668     60.062     23.669     mm"
"             Runoff volume          4.73       0.00       4.73       c.m"
"             Runoff coefficient     0.336      0.000      0.336      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.052     0.032     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.900   Total Area"
"       85.000   Flow length"
"        3.500   Overland Slope"
"        0.900   Pervious Area"
"       85.000   Pervious length"
```

```
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.182     0.052     0.032     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.900      0.000      0.900      hectare"
"             Time of concentration  13.786     2.424      13.786     minutes"
"             Time to Centroid       117.394    115.770    117.394    minutes"
"             Rainfall depth         70.383     70.383     70.383     mm"
"             Rainfall volume        633.44     0.00       633.44     c.m"
"             Rainfall losses        46.042     2.296      46.042     mm"
"             Runoff depth           24.341     68.087     24.341     mm"
"             Runoff volume          219.07     0.00       219.07     c.m"
"             Runoff coefficient     0.346      0.000      0.346      "
"             Maximum flow           0.182      0.000      0.182      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.182     0.207     0.032     0.000"
" 38          START/RE-START TOTALS 300"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     1.030    hectare"
"             Total % impervious                       50.739"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                B:\Working\ROHNBRAD\"
"                2406127 - 422111 352 Woodlawn Rd Build\Design Phase\Design
Data\Modelling Files\Updated_Dec2024"
"                Output filename:                                  Post_100yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                 12/13/2024 at 8:14:00 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1122.601   Coefficient A"
"        1.500   Constant B"
"        0.738   Exponent C"
"        0.400   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           271.357    mm/hr"
"             Total depth                  78.288    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"      100.000   % Impervious"
"        0.280   Total Area"
"       10.000   Flow length"
"        1.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        1.000   Pervious slope"
"        0.280   Impervious Area"
"       10.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.181     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.280      0.280      hectare"
"             Time of concentration  5.296      0.948      0.948      minutes"
"             Time to Centroid       109.575    113.099    113.099    minutes"
"             Rainfall depth         78.288     78.288     78.288     mm"
"             Rainfall volume        0.00       219.20     219.21     c.m"
"             Rainfall losses        48.444     4.469      4.469      mm"
"             Runoff depth           29.844     73.818     73.818     mm"
"             Runoff volume          0.00       206.69     206.69     c.m"
"             Runoff coefficient     0.000      0.943      0.943      "
"             Maximum flow           0.000      0.181      0.181      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.181     0.181     0.000     0.000"
" 54          POND DESIGN"
"        0.181   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        206.7   Hydrograph volume    c.m"
"           5.   Number of stages"
"        0.000   Minimum water level    metre"
"        0.100   Maximum water level    metre"
"        0.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  0.000     0.000     0.000"
"                 0.02500   0.00500    69.680"
"                 0.05000   0.01000   139.350"
"                 0.07500   0.01500   209.030"
"                  0.1000   0.02000   278.700"
"             Peak outflow                  0.010    c.m/sec"
"             Maximum level                 0.051    metre"
"             Maximum storage             140.815    c.m"
"             Centroidal lag                5.696   hours"
"                  0.181     0.181     0.010     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.181     0.010     0.010     0.000"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          201   Catchment 201"
"      100.000   % Impervious"
"        0.750   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.750   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.478     0.010     0.010     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.000      0.750      0.750      hectare"
"             Time of concentration  6.520      1.167      1.167      minutes"
"             Time to Centroid       110.981    113.592    113.592    minutes"
"             Rainfall depth         78.288     78.288     78.288     mm"
"             Rainfall volume        0.00       587.16     587.16     c.m"
"             Rainfall losses        48.955     3.477      3.477      mm"
"             Runoff depth           29.332     74.810     74.810     mm"
"             Runoff volume          0.00       561.08     561.08     c.m"
"             Runoff coefficient     0.000      0.956      0.956      "
"             Maximum flow           0.000      0.478      0.478      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.478     0.483     0.010     0.000"
" 54          POND DESIGN"
"        0.483   Current peak flow    c.m/sec"
"        0.045   Target outflow    c.m/sec"
"        767.2   Hydrograph volume    c.m"
"          12.   Number of stages"
"      340.420   Minimum water level    metre"
"      343.450   Maximum water level    metre"
"      340.420   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                340.420     0.000     0.000"
"                340.720   0.00900    82.580"
"                341.020   0.01300   165.150"
"                341.320   0.01600   247.730"
"                341.620   0.01900   330.300"
"                341.740   0.02000   363.330"
"                342.040   0.02200   364.010"
"                342.340   0.02400   364.690"
"                342.640   0.02600   365.370"
"                343.210   0.02900   366.650"
"                343.300   0.03000   368.900"
```

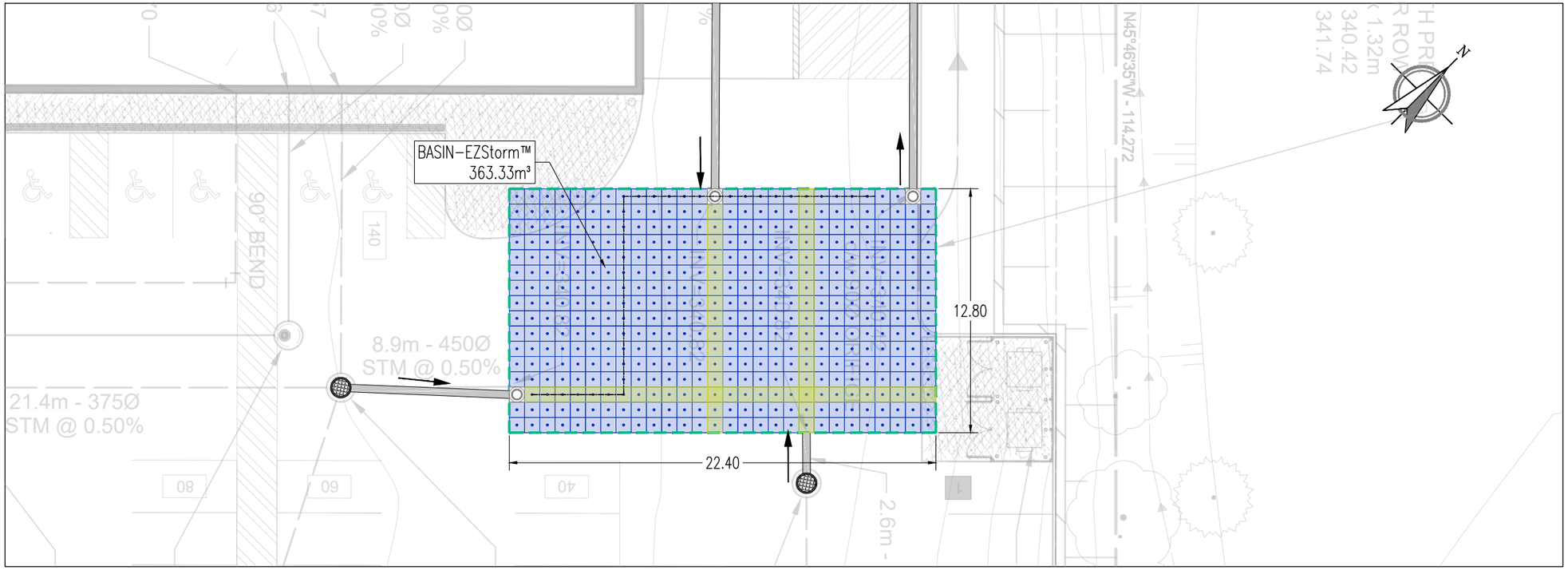
```
"               343.450    0.5060   372.650"
"             Peak outflow                  0.075    c.m/sec"
"             Maximum level               343.314    metre"
"             Maximum storage             369.257    c.m"
"             Centroidal lag                6.424   hours"
"                  0.478     0.483     0.075     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.478     0.075     0.075     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          202   Catchment 202"
"        0.000   % Impervious"
"        0.080   Total Area"
"        5.500   Flow length"
"        8.000   Overland Slope"
"        0.080   Pervious Area"
"        5.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        5.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                  0.035     0.075     0.075     0.000 c.m/sec"
"             Catchment 202          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  1.983      0.355      1.983      minutes"
"             Time to Centroid       105.591    112.631    105.591    minutes"
"             Rainfall depth         78.288     78.288     78.288     mm"
"             Rainfall volume        62.63      0.00       62.63      c.m"
"             Rainfall losses        48.628     9.144      48.628     mm"
"             Runoff depth           29.660     69.143     29.660     mm"
"             Runoff volume          23.73      0.00       23.73      c.m"
"             Runoff coefficient     0.379      0.000      0.379      "
"             Maximum flow           0.035      0.000      0.035      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.035     0.079     0.075     0.000"
" 33          CATCHMENT 203"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          203   Catchment 203"
"        0.000   % Impervious"
"        0.020   Total Area"
"        2.500   Flow length"
"        8.000   Overland Slope"
"        0.020   Pervious Area"
"        2.500   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"        2.500   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.010     0.079     0.075     0.000 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.000      0.020      hectare"
"             Time of concentration  1.235      0.221      1.235      minutes"
"             Time to Centroid       104.712    111.796    104.712    minutes"
"             Rainfall depth         78.288     78.288     78.288     mm"
"             Rainfall volume        15.66      0.00       15.66      c.m"
"             Rainfall losses        49.376     11.510     49.376     mm"
"             Runoff depth           28.912     66.777     28.912     mm"
"             Runoff volume          5.78       0.00       5.78       c.m"
"             Runoff coefficient     0.369      0.000      0.369      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.080     0.075     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.900   Total Area"
"       85.000   Flow length"
"        3.500   Overland Slope"
"        0.900   Pervious Area"
"       85.000   Pervious length"
```

```
"        3.500   Pervious slope"
"        0.000   Impervious Area"
"       85.000   Impervious length"
"        3.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.001   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.211     0.080     0.075     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.900      0.000      0.900      hectare"
"             Time of concentration  13.133     2.350      13.133     minutes"
"             Time to Centroid       118.576    115.652    118.576    minutes"
"             Rainfall depth         78.288     78.288     78.288     mm"
"             Rainfall volume        704.59     0.00       704.59     c.m"
"             Rainfall losses        48.654     2.510      48.654     mm"
"             Runoff depth           29.634     75.778     29.634     mm"
"             Runoff volume          266.70     0.00       266.70     c.m"
"             Runoff coefficient     0.379      0.000      0.379      "
"             Maximum flow           0.211      0.000      0.211      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.211     0.239     0.075     0.000"
" 38          START/RE-START TOTALS 300"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.030    hectare"
"             Total Impervious area                     1.030    hectare"
"             Total % impervious                       50.739"
" 19          EXIT"
```

C.3. Oil and Grit Separator and Stormwater Tank Details

81 ROYAL ROAD GUELPH MANUFACTURING, ON



1/01 IMPLANTATION
SCALE 1:250

INDEX PAGE

CONTACTS			
SITE CONTACT	PARTH PUSHKARNA	647 278-7339	ppushkarna@brunet.cc
SALES REPRESENTATIVE	PARTH PUSHKARNA	647 278-7339	ppushkarna@brunet.cc
TECNICAL SUPPORT	NEXTSTORM	450 322-6260	info@nextstorm.ca

NOTE :

- These drawings may contain components, including but not limited to manholes, catch basins, storm pipes, fittings, manifolds, castings or other necessary appurtenances that may not be supplied by Nextstorm.
- It is the responsibility of the contractor to confirm all the material required is provided before installation.
- This drawing was prepared to support the project engineer of record for the proposed system. It is the ultimate responsibility of the project engineer of record to ensure that the EZSTORM™ System's design is in full compliance with all applicable laws and regulations. It is the contractor of record's responsibility to ensure that the Nextstorm products are designed in accordance with Nexstorm's minimum requirements. Nextstorm does not approve plans, sizings or systems designs.
- All measurements are in meters unless otherwise indicated.

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A	ISSUED FOR APPROVAL	16/08/2024	S.M.

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COVER

BASIN-EZSTORM™-363.33M³

PROJECT NAME:
81 ROYAL ROAD GUELPH MANUFACTURING, ON

PROJECT N°:	DATE:
240815-06	16/08/2024
DRAWN BY: S.M.	CHECKED BY: S.K.
SCALE: SCALE	SHEET N°: 6/6

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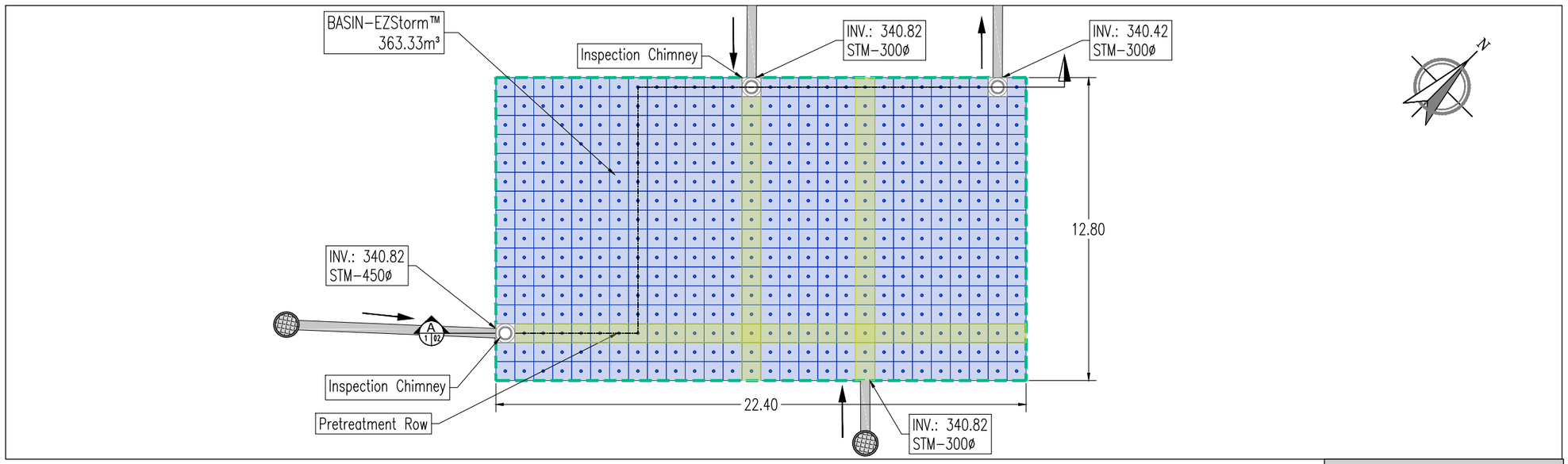
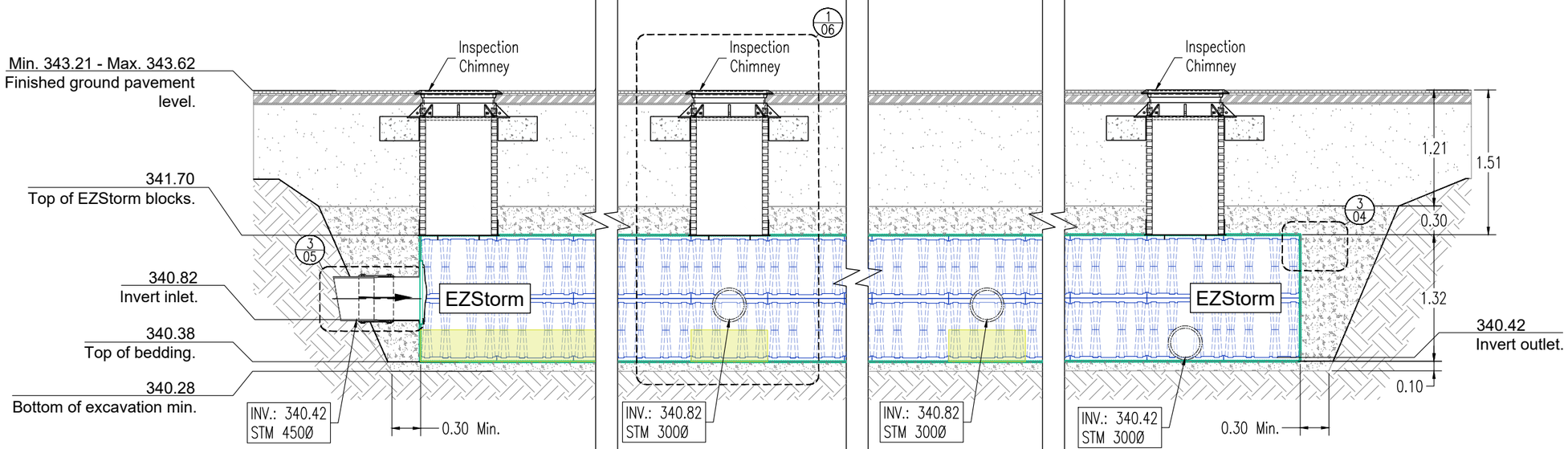
Salaberry-de-Valleyfield J6S 1C2, Québec



1 / 02 — 2 LAYER PLAN VIEW

SCALE 1:200

EZSTORM™ SYSTEM	
Total volume storage capacity	363.33m³
EZSTORM™ Storage Volume	363.33m³
Clean Stone Storage Volume	000.0m³
System Area	286.72m²
Number of blocks length	28
Number of blocks widht	16
System's height	1.32m



2 / 02 — SECTION A-A

SCALE 1:50

LEGEND

- Inspection Chimney
- Catch basin
- Connection–acces concrete manhole
- Manhole
- A. Geotextile EZ–226.
- B. Geomembrane EZ–LLDPE–30
- Drain PEHD 150ø (By others)
- Clean Stone with maximum grain size of 20mm at 40% void ratio or MG–20 or MG–112 compacted sand at 90%PM
- A / B — Thickness of this layer may vary according to project requirements
- C — Paving bed

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PLAN ET SECTION DU BASIN

BASIN-EZSTORM™-363.33M³

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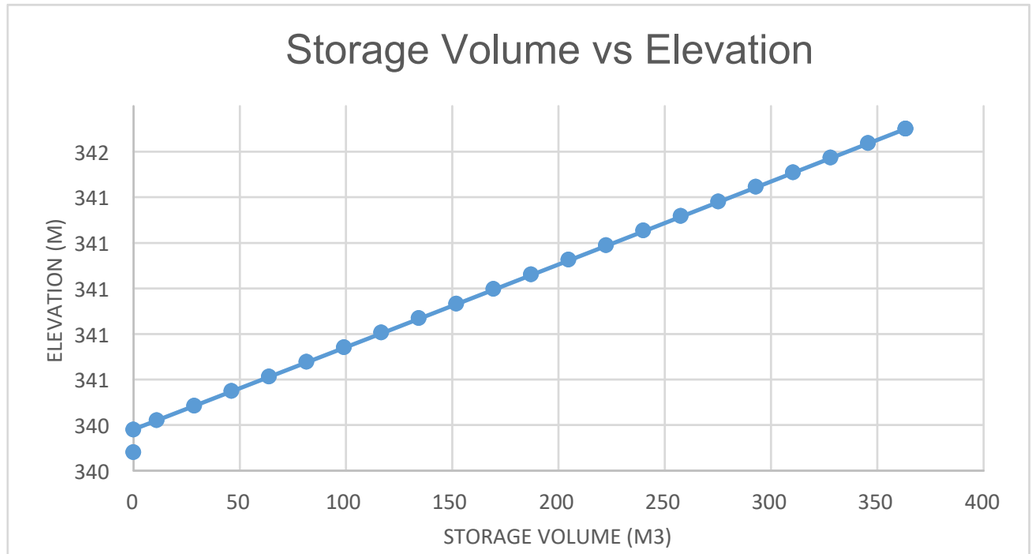
SYSTEM CHARACTERISTICS			
Model	EZSTORM™ system B1		
	Number of blocks (unit)	Dimensions / blocks (m)	Dimensions EZStorm (m)
Height	2,0	0,66	1,32
Length	28	0,80	22,40
Width	16	0,80	12,80

EZSTORM area (m2)	286,7
EZSTORM + Clear stone area (m2)	0,0
Total storage volume (m3)	363,3
Invert (m)	340,42
Min finished ground level (m)	343,21

EZSTORM volume (m3)	363,3	Clear stone volume (m3)	0,0
Void in EZSTORM (%)	96%	Void in Clear stone (%)	40%

System height (m)	Storage volume (m3)	Elevation (m)	Notes
1,32	363,33	341,700	Top EZSTORM
1,26	345,72	341,636	
1,19	328,10	341,572	
1,13	310,48	341,508	
1,06	292,87	341,444	
1,00	275,25	341,380	
0,94	257,64	341,316	
0,87	240,02	341,252	
0,81	222,40	341,188	
0,74	204,79	341,124	
0,68	187,17	341,060	
0,62	169,55	340,996	
0,55	151,94	340,932	
0,49	134,32	340,868	
0,42	116,71	340,804	
0,36	99,09	340,740	
0,30	81,47	340,676	
0,23	63,86	340,612	
0,17	46,24	340,548	
0,10	28,63	340,484	
0,04	11,01	340,420	Invert
0,00	0,00	340,380	Bottom EZSTORM



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VOLUME CALCULATION

BASIN-EZSTORM™-363.33M³

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81 ROYAL ROAD GUELPH MANUFACTURING, ON

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240815-06	16/08/2024
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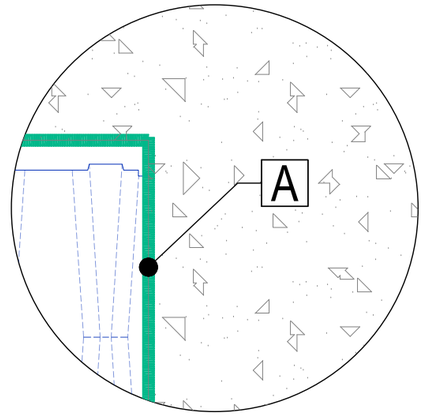
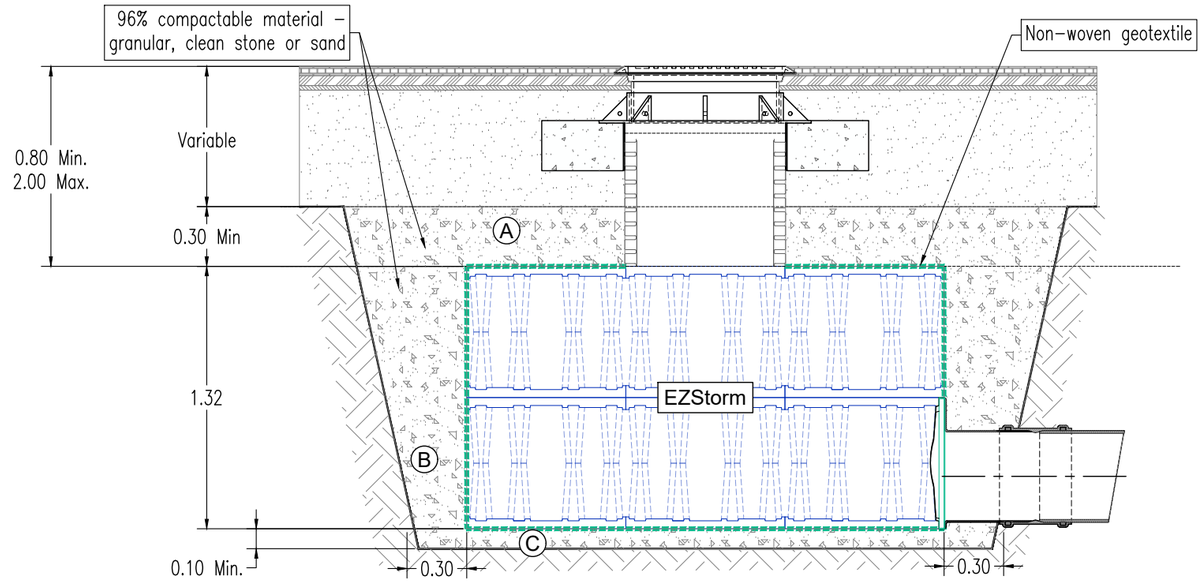
Acceptable backfill materials for this project

Live Load: CL-625 (CSA-S6: 19)

	Layer location	Backfill material	Density requirements
(A)	Top embakment: Embakment located directly above the EZSTORM™ chambers abd below the road structure.	Backfill with a 20 mm Max. granular material compacted at a rate > 95 % S.P.D. (3/4 (20mm) granular material, clean stone or sand)	Without driving over the structure, place a first layer of 450mm thick on top then compact to 90% M.P. using light equipment not exceeding 5.000 kg and always driving in the same direction. Then add layers up to 300 mm thick using the same equipment and always in the same direction. Normal traffic is only permitted once the final backfill height has been reached.
(B)	Lateral backfill: Located between the lateral faces of the EZSTORM™s and the limits of the excavated volume.	Frost-resistant granular earthwork material with a maximum grain diameter of 20 mm per 300 mm layer and compacted at a rate > 96% M.P.	Spread the backfill material with a hydraulic shovel or loader, then compact it with a compactor or vibratory plate to 90% M.P. in successive layers up to 300 mm thick, over the full width.
(C)	Laying bed: located under the EZSTORM™ blocks, between the foundation floor and the base of the blocks.	Subgrade granular material 100 mm Min. 3/4 (20mm) granular material, clean stone or sand to 96% M.P.	Compact to 90% M.P. using a vibrating plate or roller compactor. Place the system on a flat, solid, horizontal and stable surface.



3/03 DETAIL
SCALE NOT AT SCALE



1/03 TYPICAL SECTION
SCALE 1:30

LEGEND

- Inspection Chimney
- Catch basin
- Connection-acces concrete manhole
- Manhole
- A. Geotextile EZ-226.
- B. Geomembrane EZ-LLDPE-30
- Drain PEHD 150Ø (By others)
- Clean Stone with maximum grain size of 20mm at 40% void ratio or MG-20 or MG-112 compacted sand at 90%PM
- A / B: Thickness of this layer may vary according to project requirements
- C: Paving bed

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STANDARD BACKFILL REQUIREMENTS

BASIN-EZSTORM™-363.33M³

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PROJECT N°:	DATE:
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List of materials

CODE DE L'ARTICLE	DESCRIPTION	B1
EZ-SHD	EZStorm - half block 2 units/block (units)	1792
FL-EZSHD	EZSTORM Sidewall grid (units)	176
FL-EZSHD 1/2	EZSTORM Sidewall grid for half block (units)	0
PR-EZSHD	EZSTORM Cover plate	0
CONNECTEUR EZS-1	EZSTROM Single layer-connector (units)	0
CONNECTEUR EZS-2	EZSTROM Multi layer-connector (units)	1000
R-P	EZSTORM Pre-treatment row (0.8m / unit)	120
EZSTORM adapters		
FC-200mm-PVC	EZSTORM Adapter 200 mm PVC (unités)	0
FC-250mm-PVC	EZSTORM Adapter 250 mm PVC (unités)	0
FC-300mm-PVC	EZSTORM Adapter 300 mm PVC (unités)	3
FC-375mm-PVC	EZSTORM Adapter 375 mm PVC (unités)	0
FC-450mm-PVC	EZSTORM Adapter 450 mm PVC (unités)	1
FC-450mm-TBA	EZSTORM Adapter 450 mm PCP (unités)	0
FC-525mm-PVC	EZSTORM Adapter 525 mm PVC (unités)	0
FC-600mm-PEHD	EZSTORM Adapter 600 mm HDPE (unités)	0
Inspection Chimney		
EZSTORM-ACCES	EZSTORM half-elements with opening (units)	6
PP-EZSTORM	EZSTORM half-elements with positioning plate (units)	3
PP-EZSTORM 1/2	EZSTORM Cover plate with positioning plate (units)	0
REHAUSSE-PEHD-600	EZSTORM Extension Pipe - Chimney (units) - Ø 600mm - 1.5 m /unit	3
Dalle-répartition	EZSTORM Support concrete ring (units)	3
OPSD401.01ST	Cast iron frame and cover (unit)	3
OPSD401.01ST	Catch bassin Frame and grates (unités)	0
Rectangulare concrete inspection manhole 1200mm x 1200mm		
R1212	EZSTORM regtangular inspection concrete manhole	0
EZ-225	EZSTORM Protection geotextile (226g/m2) - Rolls of 6 m x 100 m	2
EZ-450	EZSTORM Protection geotextile (450g/m2) -Rolls of 6 m x 100 m	0
EZ-LLDPE30	LLDPE 30 mils liner (m2)	0
Clear Stone (by others)		
	Quantity of 20 mm (3/4') clear stone required (m3) (by others)	0

LEGEND

- **ACCESSORIES not included in all projects**
- **Drawings for guidance only. For more details please refer to the DETAILES project plans**

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B	ISSUED FOR APPROVAL	02/12/2024	S.M.
A	ISSUED FOR APPROVAL	16/08/2024	S.M.

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NOT FOR PRODUCTION

LIST OF MATERIALS

BASIN-EZSTORM™-363.33M³

PROJECT NAME:
81 ROYAL ROAD GUELPH MANUFACTURING, ON

PROJECT N°:	DATE:
240815-06	16/08/2024
DRAWN BY: S.M.	CHECKED BY: S.K.
SCALE: SCALE	SHEET N°: 6/6

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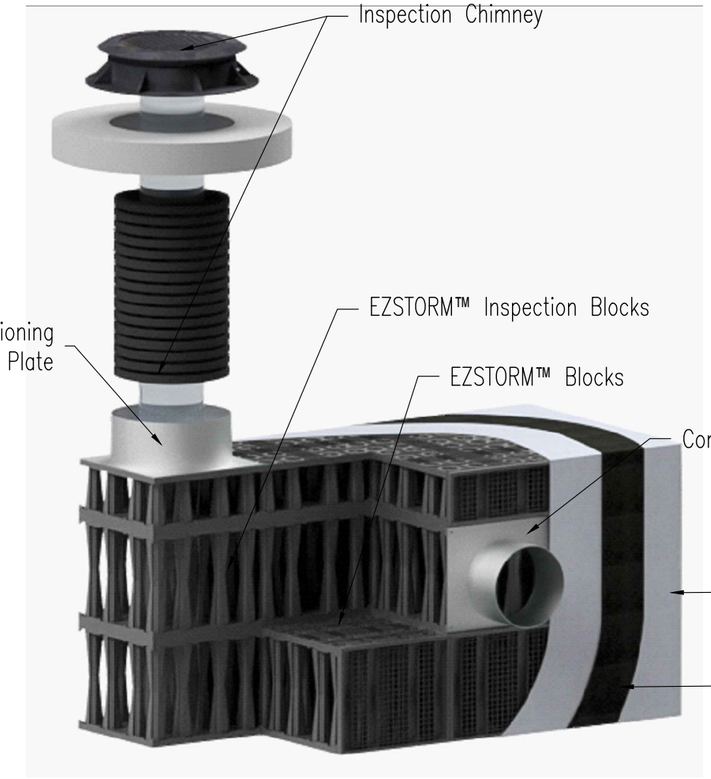
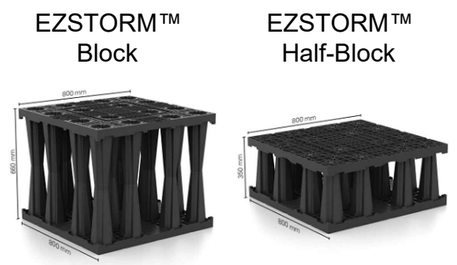
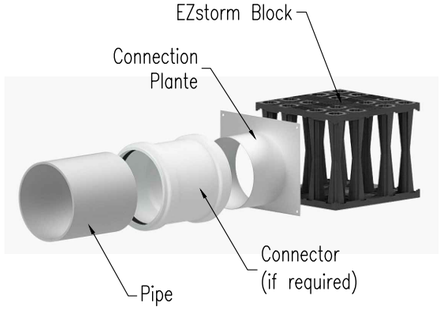


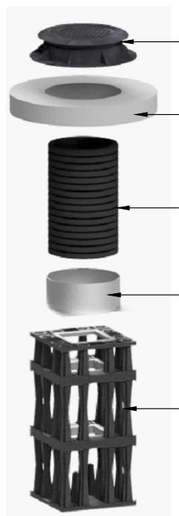
1. EZSTORM™ Components and Accessories (According on each project)



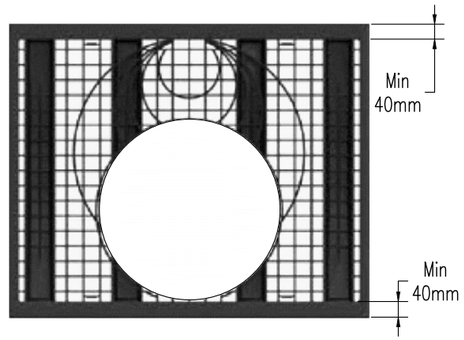
2. EZSTORM™ Block Standard Dimensions



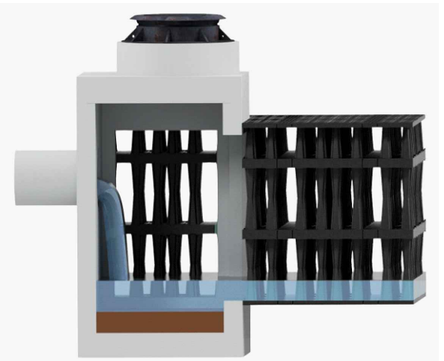
3.Connection Accessories Configuration



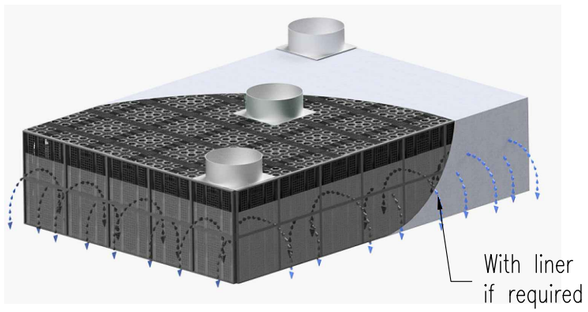
4. EZSTORM™ Block and Inspection Chimney



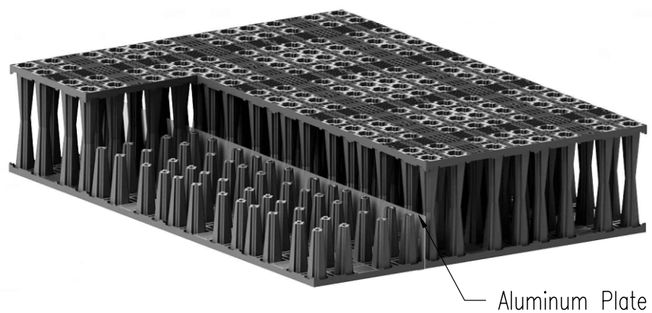
5. sidewall Grid with Connection Opening



6. Concrete Manhole for Access and Connection (if required)



7. Infiltration Basin Typical 3D Section View



8. Pretreatment Row (if required)

LEGEND

- **ACCESSORIES not included in all projects**
- **Drawings for guidance only. For more details please refer to the DETAILES project plans**

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ACCESSORIES

BASIN-EZSTORM™-363.33M³

PROJECT NAME:
81 ROYAL ROAD GUELPH MANUFACTURING, ON

PROJECT N°:	DATE:
240815-06	16/08/2024
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81 Royal Rd

DRAWING INDEX

CONTACT INFORMATION

SITE CONTACT	Parth Pushkarna	647-278-7339	ppushkarna@brunet.cc
ENGINEER / TECHNICAL SPECIALIST	Andres Velez	819-696-7171	asanchez@nextstorm.ca
SALES REP:	Parth Pushkarna	647-278-7339	ppushkarna@brunet.cc

GENERAL NOTES

1. MANHOLES AND APPURTENANCES TO FOLLOW DIVISION 700 OF OPSD OR APPLICABLE LOCAL STANDARDS.
2. COORDINATE WITH MANUFACTURER'S REPRESENTATIVE/DISTRIBUTOR FOR PRE-CONSTRUCTION MEETING AND SITE INSPECTION DURING INSTALLATION.
3. ENGINEERING DRAWINGS SUPERSEDE ALL PROVIDED DOCUMENTATION. REFER TO SITE ENGINEERS FOR ADDITIONAL INSTRUCTIONS.
4. COORDINATE SDD3 INSTALLATION ACTIVITIES WITH OTHER SITE ACTIVITIES
5. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE
6. THE SUB-GRADE AND SIDE BACKFILL TO BE COMPACTED TO 95% SPD OR AS DIRECTED BY THE QUALIFIED ENGINEER.
7. CONFIRM GEOTECHNICAL SOIL EVALUATION BY A QUALIFIED ENGINEER TO DETERMINE SUITABILITY OF STRUCTURAL INSTALLATION
8. CONFIRM FOR BURIED UNDERGROUND UTILITIES INCLUDING GAS, ELECTRICAL, PIPELINES OR CONDUITS
9. WHEN INSTALLED IN CONFORMANCE TO THE INSTALLATION GUIDELINES, SDD3 CAN HANDLE STANDARD CL-625 TRUCK LOADING. FOR NON-STANDARD LOADS CONTACT MANUFACTURER'S REPRESENTATIVE/DISTRIBUTOR
10. PROTECT THE INSTALLATION AGAINST DAMAGE WITH CONSTRUCTION TAPE, FENCING OR OTHER MEANS TILL THE CONSTRUCTION IS COMPLETE.
11. ENSURE THAT CONSTRUCTION FOLLOWS APPLICABLE FEDERAL, PROVINCIAL, LOCAL, MUNICIPAL AND LOCAL LAWS, ORDNANCES, REGULATIONS AND SAFETY REQUIREMENTS.

NOTES FOR BIDDING AND INSTALLATIONS

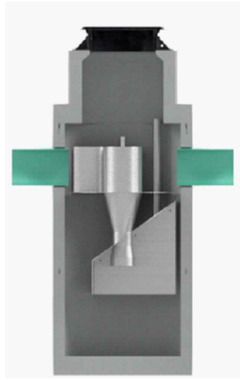
1. CONTRACTORS ARE EXPECTED TO COMPREHEND AND USE THE MOST CURRENT INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING A SYSTEM INSTALLATION. FOR THE MOST CURRENT INSTRUCTIONS, CONTACT NEXTSTORM AT LEAST TWO WEEKS PRIOR TO SYSTEM INSTALLATION TO ARRANGE FOR A PRE-CONSTRUCTION MEETING.
2. USE SDD3 INSTALLATION INSTRUCTIONS AS A GUIDELINE ONLY FOR MINIMUM/MAXIMUM REQUIREMENTS. ACTUAL DESIGN MAY VARY. REFER TO APPROVED CONSTRUCTION DRAWINGS FOR JOB-SPECIFIC DETAILS. ENGINEERING DRAWINGS SUPERSEDE ALL PROVIDED DOCUMENTATION.
3. ANY DISCREPANCIES WITH THE SYSTEM SUB-GRADE SOIL'S BEARING CAPACITY MUST BE REPORTED TO THE GEOTECHNICAL ENGINEER.
4. EROSION AND SEDIMENT-CONTROL MEASURES MUST MEET LOCAL CODES AND THE DESIGN ENGINEER'S SPECIFICATIONS THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS.

CHECK - REQUIRED MATERIALS AND EQUIPMENT

- ALL SDD3 COMPONENTS AND ACCESSORIES AS SPECIFIED IN THE ENGINEER'S PLANS INCLUDING FRAME AND COVER, LADDER AND RISER .
- RECIPROCATING SAW OR ROUTER
- TRANSIT OR LASER LEVEL MEASURING DEVICE
- COMPACTION EQUIPMENT
- ACCEPTABLE FILL MATERIAL AS SHOWN IN INSTALLATION INSTRUCTIONS.

NOTE: THESE SHOP DRAWINGS MAY CONTAIN COMPONENTS INCLUDING BUT NOT LIMITED TO MANHOLES, CATCH BASINS, STORM PIPES AND FITTINGS, MANIFOLDS, CASTINGS AND OTHER NECESSARY APPURTENANCES THAT MAY NOT BE SUPPLIED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND/OR SUPPLIER TO CONFIRM THE MATERIALS PROVIDED.

THIS DRAWING WAS PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. IT IS THE ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE SDD3 SYSTEM'S DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. DOES NOT APPROVE PLANS, SIZING, OR SYSTEM DESIGNS.



N°.	RÉVISION	DATE	PAR
A	ISSUED FOR APPROVAL	02/12/2024	M.C.

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COVER PAGE

SDD3-1800

PROJECT: 81 Royal Rd

PROJECT N°:	DATE:
240815-06	02/12/2024
DRAWN BY: M.C.	CHECKED BY: M.S.
SCALE: SCALE	SHEET N°: 1/4

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SDD3 SIZING REPORT

2024-11-29

PROJECT INFORMATION	
Project Name	81 Royal Rd
Location	Guelph
Province	Ontario
Unit ID	MH 9 OGS
Project Number	240815-06

SITE INFORMATION	
Site Area (hectares)	1.08
Runoff Coefficient	1

SIZING CRITERA	
Rainfall Station	WATERLOO WELLINGTON AP
Target TSS removal (%)	80
Particle Size Distribution	ETV (20-1000µm)
Peak or Regulated Flow (L/s)	

STORMWATER TREATEMENT RECOMMENDATION

RESULTS SUMMARY		
Model	**TSS (%)**	**Volume(%)**
SDD3-900	71	99
SDD3-1200	75	100
SDD3-1500	79	100
SDD3-1600	79	100
SDD3-1800	81	100
SDD3-2400	85	100
SDD3-3000	87	100
SDD3-3200	87	100
SDD3-3600	88	100
SDD3-4000	88	100

Recommended Model	SDD3 1800

Annual TSS removal efficiency (%)1	Manhole Diameter (mm)	Maximum Pipe Diameter (mm)	Oil Storage Capacity (m3)	Sediment Storage Capacity (m3)	Height from invert to SDD floor (m)	Treatment area (m2)	Max treatement flow (lps)
81	1830	900	0.98	3.66	2.36	2.63	114

DETAILED SDD3 SIZING REPORT

Rainfall Intensity (mm / hr)	Total Rainfall (%)	Cumulative rainfall volume (%)	Flow Rate (Lps)	Surface Loading Rate (L/s/m2)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1.0	20.00	20.0	1	0.4	88.9	17.8	18
1.5	7.90	27.9	2	0.6	88.9	7.0	25
2.0	7.90	35.8	2	0.8	87.8	6.9	32
2.5	5.60	41.4	3	1.0	86.4	4.8	37
3.0	5.60	47.0	3	1.2	85.0	4.8	41
3.5	4.35	51.4	4	1.4	83.9	3.6	45
4.0	4.35	55.7	4	1.6	83.0	3.6	49
4.5	3.80	59.5	5	1.8	82.1	3.1	52
5.0	3.80	63.3	5	2.1	81.2	3.1	55
5.5	3.20	66.5	6	2.3	80.4	2.6	57
6.0	3.20	69.7	6	2.5	79.5	2.5	60
6.5	2.05	71.8	7	2.7	78.6	1.6	62
7.0	2.05	73.8	8	2.9	77.7	1.6	63
7.5	1.40	75.2	8	3.1	76.8	1.1	64
8.0	1.40	76.6	9	3.3	76.0	1.1	65
8.5	1.35	78.0	9	3.5	75.1	1.0	66
9.0	1.35	79.3	10	3.7	74.3	1.0	67
9.5	1.20	80.5	10	3.9	73.5	0.9	68
10.0	1.20	81.7	11	4.1	72.6	0.9	69
10.5	1.35	83.1	11	4.3	71.8	1.0	70
11.0	1.35	84.4	12	4.5	71.0	1.0	71
11.5	1.10	85.5	12	4.7	70.2	0.8	72
12.0	1.10	86.6	13	4.9	69.3	0.8	72
12.5	0.90	87.5	14	5.1	68.5	0.6	73
13.0	0.90	88.4	14	5.3	67.7	0.6	74
13.5	0.50	88.9	15	5.5	66.9	0.3	74
14.0	0.50	89.4	15	5.7	66.0	0.3	74
14.5	0.85	90.3	16	6.0	65.2	0.6	75
15.0	0.85	91.1	16	6.2	64.4	0.5	75
15.5	0.60	91.7	17	6.4	63.6	0.4	76
16.0	0.60	92.3	17	6.6	62.7	0.4	76
16.5	0.55	92.9	18	6.8	62.5	0.3	77
17.0	0.55	93.4	18	7.0	62.7	0.3	77
17.5	0.30	93.7	19	7.2	62.9	0.2	77
18.0	0.30	94.0	19	7.4	63.1	0.2	77
18.5	0.15	94.2	20	7.6	63.3	0.1	77
19.0	0.15	94.3	21	7.8	63.5	0.1	78
19.5	0.35	94.7	21	8.0	63.7	0.2	78
20.0	0.35	95.0	22	8.2	63.9	0.2	78
20.5	0.35	95.4	22	8.4	64.1	0.2	78
21.0	0.35	95.7	23	8.6	64.4	0.2	78
21.5	0.15	95.9	23	8.8	64.6	0.1	78
22.0	0.15	96.0	24	9.0	64.8	0.1	79
22.5	0.45	96.5	24	9.2	65.0	0.3	79
23.0	0.45	96.9	25	9.4	65.2	0.3	79
23.5	0.25	97.2	25	9.6	65.4	0.2	79
24.0	0.25	97.4	26	9.9	65.6	0.2	80
24.5	0.10	97.5	26	10.1	65.8	0.1	80
25.0	0.10	97.6	27	10.3	65.8	0.1	80
27.5	0.45	98.1	30	11.3	65.8	0.3	80
30.0	0.45	98.5	32	12.3	65.8	0.3	80
32.5	0.45	99.0	35	13.3	65.8	0.3	81
35.0	0.45	99.4	38	14.4	65.9	0.3	81
37.5	0.15	99.6	41	15.4	65.9	0.1	81
40.0	0.15	99.7	43	16.4	65.9	0.1	81
42.5	0.15	99.9	46	17.5	65.5	0.1	81
45.0	0.15	100.0	49	18.5	64.9	0.1	81
47.5	0.00	100.0	51	19.5	64.3	0.0	81
50.0	0.00	100.0	54	20.5	63.7	0.0	81
Total cumulative rainfall (%)		100			**Net Annual TSS removal (%)**		81

1 Performance efficiency based on ETV (20 1000µm) particle size distribution

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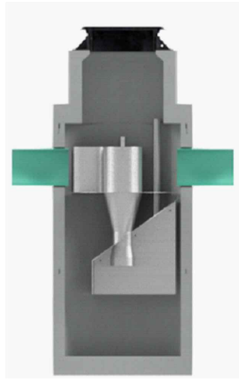

N°.	RÉVISION	DATE	PAR
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SIZING REPORT

SDD3-1800

PROJECT: 81 Royal Rd

PROJECT N°: 240815-06 | DATE: 02/12/2024

DRAWN BY: M.C. | CHECKED BY: M.S.

SCALE: SCALE | SHEET N°: 2/4

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MH.11
G=342.48
V=340.07
E=340.13

342.00

339.90

MH.6
2.27
9.86
9.80

MH-11

EX. MH-6

PVC 300Ø
Invert Inlet: 340.020

90°

HP

PVC 300Ø
Invert Outlet: 339.960

SDD3-1800

9.0m - 300
STM @ 0.5

OGS – S

A	ISSUED FOR APPROVAL	02/12/2024	M.C.
N°.	RÉVISION	DATE	PAR

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IMPLANTATION

SDD3-1800

PROJECT: 81 Royal Rd

PROJECT N°: 240815-06	DATE: 02/12/2024
DRAWN BY: M.C.	CHECKED BY: M.S.
SCALE: 1:100	SHEET N°: 3/4

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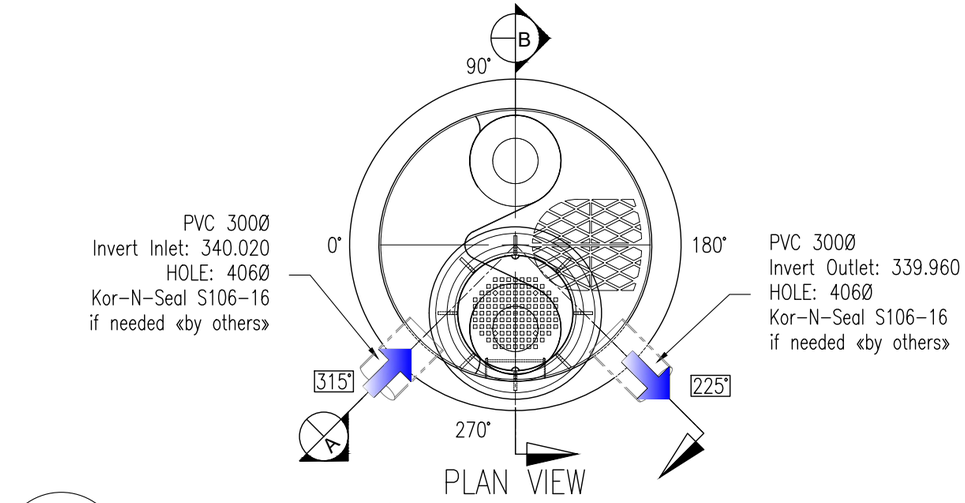
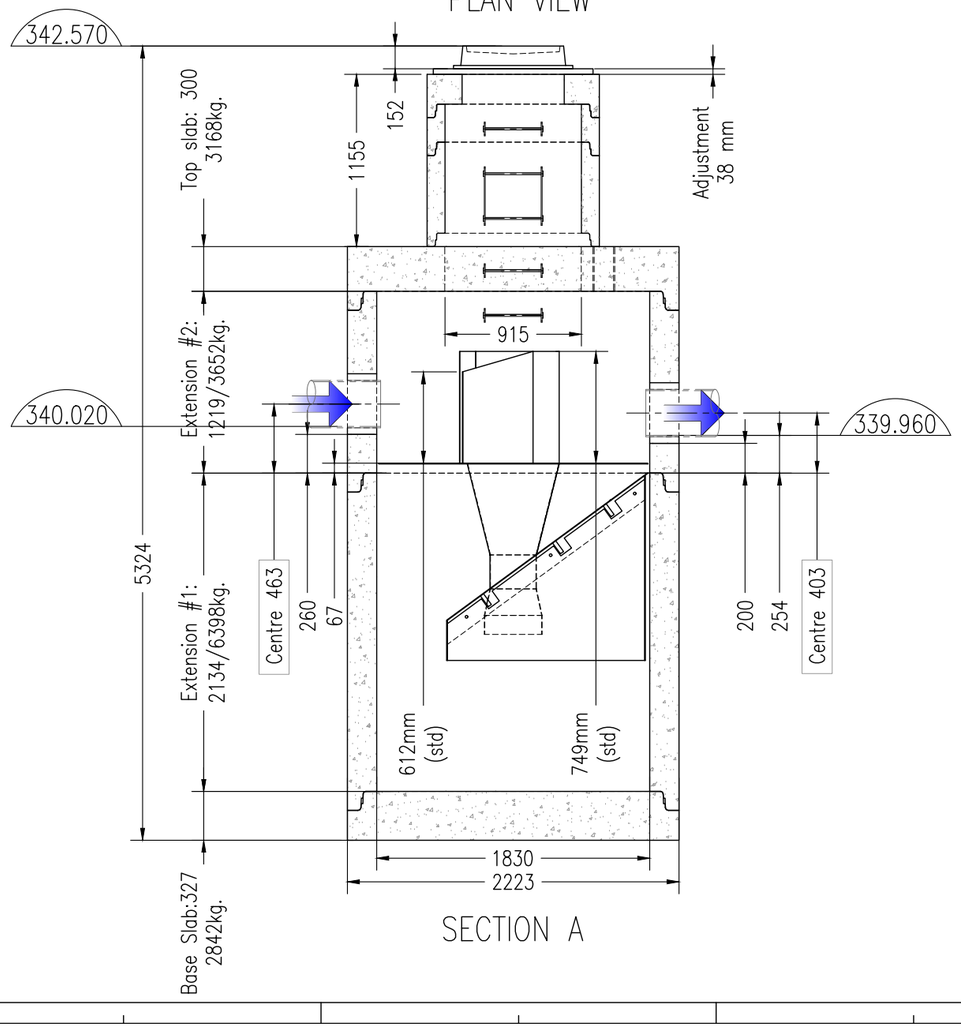


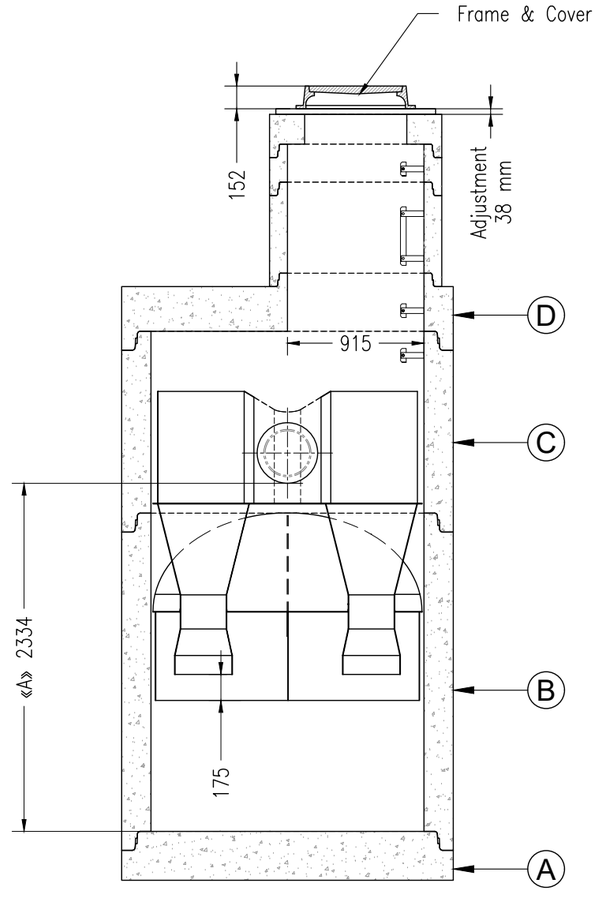
PVC 300Ø
Invert Inlet: 340.020
HOLE: 406Ø
Kor-N-Seal S106-16
if needed «by others»

PVC 300Ø
Invert Outlet: 339.960
HOLE: 406Ø
Kor-N-Seal S106-16
if needed «by others»

PLAN VIEW



SECTION A



SECTION B

BILL OF MATERIALS

✓	QTY	PIECE	DESCRIPTION	MATERIAL	WEIGHT (Kg)
	1	A	Base 1800Ø	Concrete	2842
	1	B	Extension #1	Concrete	6398
	1	C	Extension #2	Concrete	3652
	1	D	Top slab 1800Ø	Concrete	3168
	1	–	Top slab–ON 200mm	Concrete	547
	Var.		Chimney elements	Concrete	
	1		Frame and cover 30–1/2"Ø	Iron	
	Var.		Gasket		

NOTES:
- PRECAST CONCRETE COMPONENTS SHALL BE ACCORDING TO CSA A257.4
- ALL REINFORCING STEEL HAS 30mm MIN. COVER
- LADDER RUNGS
- ALL DIMENSIONS ARE NOMINAL.
- ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

FLOW AND POLLUTANTS
- 100% TSS VOLUME STORAGE 2.659m³
- EFFECT ON PIEZOMETRIC LINE: NIL
- IN–LINE

MEASUREMENT MAINTENANCE
- TOTAL HEIGHT (A): 2.334 m

Model MB – Standard

N°.	RÉVISION	DATE	PAR
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NOT FOR PRODUCTION

OIL GRIT SEPARATOR

SDD3-1800

PROJECT: 81 Royal Rd

PROJECT N°: 240815-06 | DATE: 02/12/2024

DRAWN BY: M.C. | CHECKED BY: M.S.

SCALE: 1:40 | SHEET N°: 4/4

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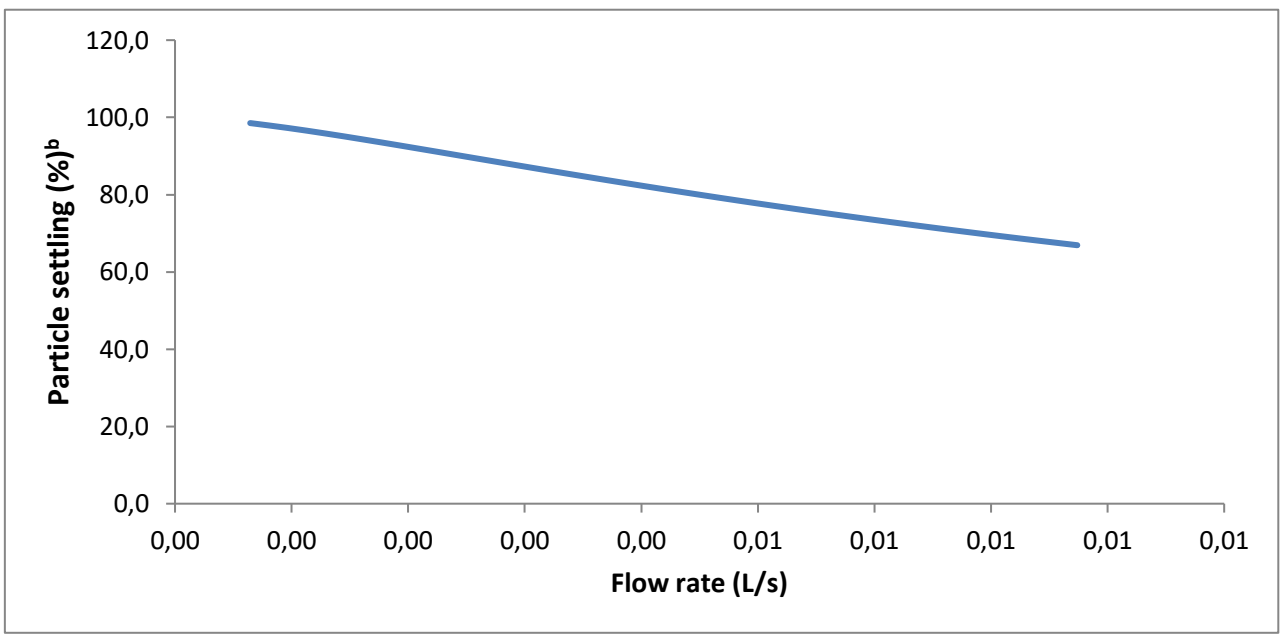
EZStorm Treatment Row
Performance Report

PROJECT INFORMATION

Project Name:	81 ROYAL ROAD GUELPH MANUFACTURING
Location:	GUELPH, ON
Comments:	

Treatment Row

Length	48,0	m
Width	0,8	m
Total Area (m2)	38,4	m2
Max. Volume (m)	11,5	m3
TSS annual removal (%)[a]	78	%



Estimation of Treatment Train Performance

Treatment Train Component	Sediment Removal
SDD3 TSS Removal	80 %
Treatment Row trapping capacity	78 %
Weighted Treatment Train Performance	96 %

Notes:

[a] Sediment trapping and detention could differ depending on detention time Treatment Row configuration.
Weighed annual sediment removal based on the distribution and intensity of local rainfall for 90% of rainfall volume.

[b] Theoretical sediment trapping capacity estimated and based on the sedimentation area and shape of the treatment row, particle settling velocity and flow rate.
Vertical settling velocity in accordance with Stokes' law for particles over 20um .
No treatment is provided over the Treatment Row maximum volume (by-pass)
Performance shown in figure 1 do not take in account turbulence, scour or resuspension.

C.4. Water Balance Analysis

81 Royal Road
City of Guelph
Hydrologic Components Determination

The following is a summary of calculations using Table 3.1 in the Stormwater Management Planning and Design Manual (MOE, 2003) for the identification of the hydrologic breakdown

Table 3.1 identifies the approximate relationship between soil types, ground cover, and hydrologic components.

The table utilizes a base precipitation of 940mm. The ratios have been retained for a base of 844mm of precipitation to match the Guelph average annual precipitation (Table 4.1, City of Guelph Stormwater Management Master Plan, dated December 2022).

Values Calculated using Table 3.1

Soil Type	Urban Lawn - Silt Loam				
Soil Group	Water Holding Capacity (mm)	Precipitation (mm)	Evapotranspiration (mm)	Runoff (mm)	Infiltration* (mm)
C	125	844	536	217	91

* Infiltration factor has been determined using the following values from Table 3.1

Topography	0.2	Flat Land
Soils	0.2	Medium combinations of clay and loam
Cover	0.1	Cultivated Land
Total Infiltration Factor:	0.5	

81 Royal Road
City of Guelph
Existing Conditions Site Water Balance

EXISTING CONDITION

Contributing Catchments: 100
Soil Type: Silt Loam
Vegetation: Shallow Rooted
Contributing Area = 2.03 ha
Root Zone Depth =0.62m
Percent Impervious = 0.0%
Soil Moisture Retention Capacity (mm) 125
Runoff Factor = 0.70
Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET	Actual Evapotrans-piration (mm)	Pervious ET - Actual ET	Moisture Deficit (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Recharge Volume (m^3)	Runoff Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	57.7	57.7		249.5	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	4.0	2.8	24	57
Feb	-6.5	0.0	0.0	24.6	0.0	50.9	50.9		300.4	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	2.2	1.5	13	31
Mar	-1.7	0.0	0.0	30.6	0.0	61.8	61.8		362.2	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.8	7	16
Apr	5.6	1.2	0.9	33.6	30.2	73.4	43.2		125.0	0.0	30.2	30.2	0.0	0.0	43.2	21.6	23.7	45.3	31.7	276	644
May	12.0	3.8	1.9	37.8	71.8	75.0	3.2		125.0	0.0	71.8	71.8	0.0	0.0	3.2	12.4	106.7	119.1	83.4	725	1,693
Jun	17.1	6.4	2.8	38.4	107.5	75.2	-32.3	-32.3	96.0	-29.0	104.2	104.2	0.0	3.3	0.0	6.2	53.4	59.6	41.7	363	846
Jul	19.6	7.9	3.3	38.7	127.7	80.4	-47.3	-79.6	65.0	-31.0	111.4	111.4	0.0	16.3	0.0	3.1	26.7	29.8	20.8	181	423
Aug	18.7	7.4	3.1	36.0	109.8	80.5	-29.3	-108.9	51.0	-14.0	94.5	94.5	0.0	15.3	0.0	1.5	13.3	14.9	10.4	91	212
Sep	14.6	5.1	2.4	31.2	74.9	75.4	0.5		51.5	0.5	74.9	74.9	0.0	0.0	0.0	0.8	6.7	7.4	5.2	45	106
Oct	8.5	2.2	1.4	28.5	39.9	71.0	31.1		82.6	31.1	39.9	39.9	0.0	0.0	0.0	0.4	4.2	4.6	3.2	28	65
Nov	2.5	0.4	0.4	24.3	9.7	76.2	66.5		125.0	42.4	9.7	9.7	0.0	0.0	24.1	12.2	2.5	14.7	10.3	90	210
Dec	-3.7	0.0	0.0	23.1	0.0	66.8	66.8		191.8	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	6.1	4.3	37	87
Total		**34.3**				**844.3**	**272.7**				**536.7**	**536.7**	**0.0**	**34.9**	**70.4**	**71.6**	**237.2**	**308.8**	**216.2**	**1880.9**	**4388.7**

Notes: Precipitation and Temperature data from City of Guelph Stormwater Management Master Plan (dated December 2022)
Monthly water balance strategy as outlined in the document *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance (Thornthwaite and Mather, 1957)*
Monthy Heat Index (I) from Table 2 of *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance*
Correction Factors from Table 6 of *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance*
Evaporation Factor for Impervious Surfaces = Average Annual Evapotranspiration for Impervious Surfaces (183mm/year) / Average Annual Evapotranspiration for Pervious Surfaces (536.7mm/year) = 0.34
Runoff Factor = [(Impervious Percentage of Site x Average Annual Runoff for Impervious Surfaces) + (Pervious Silt Till Percentage of Site x Average Annual Runoff for Pervious Silt Till Surfaces)] / Total Annual Recharge & Runoff

81 Royal Road
City of Guelph
Post-Development Site Monthly Water Balance

POST-DEVELOPMENT CONDITIONS

Contributing Catchments: 200 - 202, 300

Contributing Area = 2.03 ha

Percent Impervious = 52.0%

Soil Type: Silt Loam
Vegetation: Shallow Rooted
Root Zone Depth =0.62m
Soil Moisture Retention Capacity 125

Runoff Factor = 0.86

Evapotranspiration Factor for Impervious Surfaces = 0.34

Month	Daily Average Temperature (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET	Actual Evapotrans-piration (mm)	Pervious ET - Actual ET	Moisture Deficit (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Recharge Volume (m^3)	Runoff Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	57.7	57.7		249.5	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	6.1	5.3	18	107
Feb	-6.5	0.0	0.0	24.6	0.0	50.9	50.9		300.4	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0	5.1	4.4	15	89
Mar	-1.7	0.0	0.0	30.6	0.0	61.8	61.8		362.2	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	3.0	2.6	9	52
Apr	5.6	1.2	0.9	33.6	30.2	73.4	43.2		125.0	0.0	30.2	19.9	10.4	10.4	53.5	26.8	23.7	50.5	43.2	148	877
May	12.0	3.8	1.9	37.8	71.8	75.0	3.2		125.0	0.0	71.8	47.2	24.6	24.6	27.8	27.3	106.7	134.0	114.7	392	2,329
Jun	17.1	6.4	2.8	38.4	107.5	75.2	-32.3	-32.3	96.0	-29.0	104.2	68.5	35.7	39.0	35.7	31.5	53.4	84.9	72.6	248	1,475
Jul	19.6	7.9	3.3	38.7	127.7	80.4	-47.3	-79.6	65.0	-31.0	111.4	73.2	38.2	54.5	38.2	34.8	26.7	61.5	52.7	180	1,069
Aug	18.7	7.4	3.1	36.0	109.8	80.5	-29.3	-108.9	51.0	-14.0	94.5	62.1	32.4	47.7	32.4	33.6	13.3	47.0	40.2	137	816
Sep	14.6	5.1	2.4	31.2	74.9	75.4	0.5		51.5	0.5	74.9	49.2	25.7	25.7	25.7	29.6	6.7	36.3	31.1	106	631
Oct	8.5	2.2	1.4	28.5	39.9	71.0	31.1		82.6	31.1	39.9	26.2	13.7	13.7	13.7	21.7	4.2	25.9	22.1	76	449
Nov	2.5	0.4	0.4	24.3	9.7	76.2	66.5		125.0	42.4	9.7	6.4	3.3	3.3	27.4	24.5	2.5	27.0	23.1	79	470
Dec	-3.7	0.0	0.0	23.1	0.0	66.8	66.8		191.8	0.0	0.0	0.0	0.0	0.0	0.0	12.3	0.0	12.3	10.5	36	213
Total		**34.3**				**844.3**	**272.7**				**536.7**	**352.8**	**183.9**	**218.8**	**254.3**	**256.3**	**237.2**	**493.5**	**422.5**	**1,442.7**	**8,576.1**

Notes: Precipitation and Temperature data from City of Guelph Stormwater Management Master Plan (dated December 2022)
Monthly water balance strategy as outlined in the document *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance (Thornthwaite and Mather, 1957)*
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Runoff Factor = [(Impervious Percentage of Site x Average Annual Runoff for Impervious Surfaces) + (Pervious Silt Till Percentage of Site x Average Annual Runoff for Pervious Silt Till Surfaces)] / Total Annual Recharge & Runoff