

File 120119

June 9, 2025

Steve Assaff
Charis Development Ltd.
204-186 Hurontario Street, Suite 204
Collingwood, Ontario L9Y 4T5
sassaff@carisdevelopments.ca

Re: The Gateway Centre, 7564 Poplar Sideroad, Town of Collingwood
Preliminary Feature Based Water Budget

Dear Steve:

As per the NVCA's comments during the November 6, 2024, virtual meeting, and further clarification in the email on January 10, 2025, it is understood NVCA will provide draft plan approval for the subject development based on a satisfactory preliminary feature-based water balance report.

We have prepared a preliminary feature-based water budget using LiDAR topographic survey and groundwater data collected from the monitoring wells and piezometers installed on-site with monitoring data to date. A summary of the assessment and results are summarized in this letter.

EXISTING DRAINAGE PATTERNS

The subject development is located at the northeast corner of the Hurontario Street and Poplar Sideroad intersection, and south of the Hamilton Drain. A roadside ditch conveys external flows from east to west on Poplar Sideroad and north on Hurontario Street to the Hamilton Drain. Runoff from the rear yard of residential lots fronting the west side of Hughes Street drain overland as sheet flow towards the subject development.

The extents of the mapped wetland were included in the Terms of Reference prepared by NVCA dated April 10, 2024 and is attached for reference. The wetland delineation includes an area of approximately 0.197 ha on-site, in the northeast corner of the subject property, and 0.094 ha off-site, on adjacent private lands. A Pre-Development Water Balance Drainage Plan (Figure 1) is attached for reference.

Runoff Drainage

The subject development is generally flat with approximately 0.7% slope from south to north. Runoff from the site generally drains overland as sheet flow towards the Hamilton Drain. However, there is a localized

low point on-site in the location of the on-site portion of wetland, where runoff from a portion of the subject development and the external rear yards collects.

Surface water draining to the wetland was delineated for the on-site and off-site portions as follows:

- The off-site portion of wetland receives runoff from Catchment A1, which continues to drain towards the on-site portion of the wetland; and
- The on-site portion of the wetland receives runoff from Catchment A1 and A2.

Infiltration Drainage

Monitoring well and piezometer readings from December 3, 2024, and March 20, 2025, were recorded, and the groundwater contours were plotted on Figure 1 attached for reference. The readings from March 20, 2025, were considered to capture the spring freshet.

After reviewing the groundwater levels measured at the south end of the subject development (MW122, MW115) together with the ground surface elevations at the monitoring wells and the elevations of the roadside ditches along Poplar Sideroad and Hurontario Street, it was determined the groundwater flow split is at the south property limit of the subject development and the groundwater gradient across the subject development flows from south to north towards the Hamilton Drain, consistent with the surface drainage patterns.

The groundwater gradient across to the wetland was mapped for the on-site and off-site portions as follows:

- Catchment A2 infiltration flows across the on-site portion of the wetland, which continues towards the off-site portion of the wetland; and
- Catchment A1 and A2 infiltration drains across the off-site portion of the wetland towards the Hamilton Drain.

PROPOSED DRAINAGE PATTERNS

The proposed development will be built in phases; however, the ultimate buildout has been considered for this assessment. Under proposed conditions the majority of runoff from the development will be captured and treated on-site, and discharge directly to the Hamilton Drain. The proposed development will be built-out to approximately 77% impervious. A Post-Development Water Balance Drainage Plan (Figure 2) is attached for reference.

WATER BALANCE ASSESSMENT

The feature-based water budget has been completed for the off-site portion of the wetland using the Thornthwaite method to determine water surplus after evapotranspiration and attached for reference.



Based on the Collingwood Climate Normal Data for 2002 to 2021 (Environment Canada), the annual surplus available for infiltration or runoff is 529.7 mm.

Runoff Volume

The runoff volume from the annual surplus can be estimated based on the imperviousness and infiltration factors from Table 3.1 of the SWM Planning & Design Manual (Ministry of the Environment, 2003). Specific infiltration factors are provided for topography, soils, and landcover. Catchment A1 has an infiltration factor of 0.690 and an imperviousness of 18.8% under existing conditions.

Since no physical changes will be made to Catchment A1, the infiltration factor and the imperviousness will remain the same under proposed conditions.

The annual runoff volume contributing to the off-site portion of the wetland under existing conditions is 286 m³. The annual runoff volume contributing to the off-site portion of the wetland under proposed conditions is 286 m³. Therefore, there will be no change in runoff volume contributing to the off-site portion of the wetland.

Infiltration Volume

The infiltration volume from the annual surplus can be estimated based on the imperviousness and infiltration factors from Table 3.1 of the SWM Planning & Design Manual (Ministry of the Environment, 2003). Specific infiltration factors are provided for topography, soils, and landcover. Catchment A1+A2 has an infiltration factor of 0.690 and an imperviousness of 18.9% under existing conditions.

Under proposed conditions, Catchment A2 will be developed, which will result in an increase in imperviousness to 59.8%.

The annual infiltration volume contributing to the off-site portion of the wetland under existing conditions is 2,778 m³. The annual infiltration volume contributing to the off-site portion of the wetland under proposed conditions is 1,560 m³. Therefore, there will be an infiltration volume deficit of 1,217 m³ to the off-site portion of the wetland.

PRELIMINARY MITIGATION PLAN

A soakaway pit is proposed in the northeast corner of the development to address the infiltration deficit anticipated for the off-site portion of the wetland. Factoring in the potential capture loss due to evapotranspiration, the target annual average rainfall capture was determined to be 1,522 m³.

It is proposed to direct runoff from the adjacent 1-storey building into the soakaway pit (2,880 m² rooftop area). Runoff from rooftops is considered clean from a water quality perspective and will not require pre-treatment before infiltration. The equivalent target precipitation depth is 9.2 mm, which will require a soakaway pit storage volume of 26.6 m³. A 35 m long by 4.5 m wide by 0.6 m deep soakaway pit will



provide 28.4 m³ of infiltration storage. The length of the soakaway pit will mimic the existing groundwater gradient conditions and cover the length of the off-site portion of the wetland.

The soakaway pit will have a maximum retention time of 48 hours, considering a conservative infiltration rate of 25 mm/hr. Infiltration testing can be completed in the location of the proposed soakaway pit to refine the feature at detailed design.

With this design in place, the system is projected to capture 1,575 m³ of annual volume before evapotranspiration, exceeding the required annual average. Detailed calculations of the preliminary soakaway pit sizing are attached as reference.

CLOSING

This letter summarizes the results of a preliminary feature-based water balance assessment and demonstrates a preliminary mitigation plan can be implemented to ensure no significant interference with the hydrology of the off-site portion of the wetland will occur due to the proposed development.

The preliminary mitigation plan proposes a soakaway pit feature which can be optimized at detailed design.

We trust this letter provides sufficient information to provide draft plan approval for the subject development.

Yours truly,

Tatham Engineering Limited



Nick Roque, B.Eng.
Engineering Candidate
NR:ARO:ha



Alysse Overholt, P.Eng.
Engineer



Attachments



NATURAL FEATURES

 WetlandUpdates2024_MF

ORTHO IMAGERY

Simcoe 2023

BASEMAPS

ESRI Basemap

OpenStreetMap

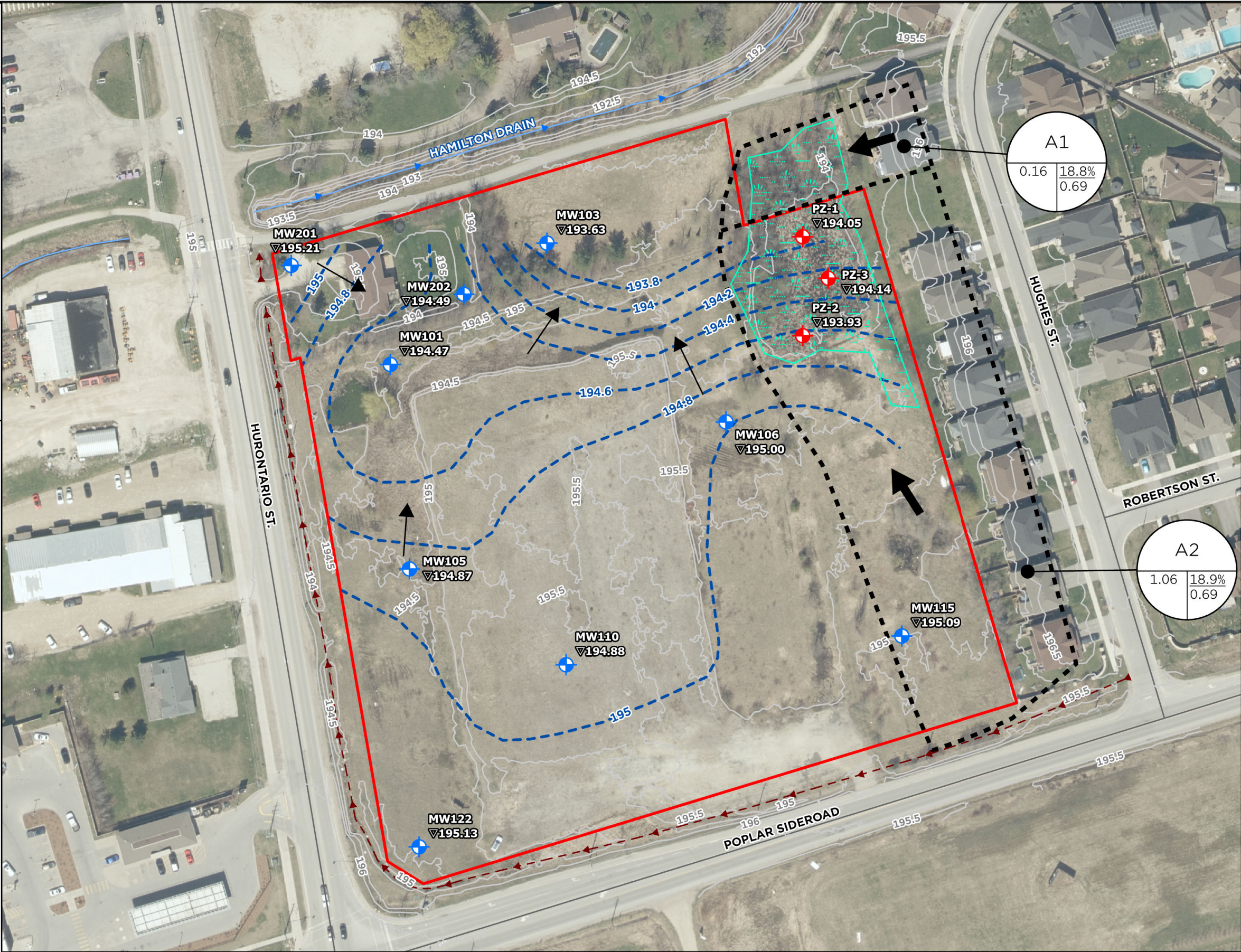


NOTES:
1. COORDINATE SYSTEM: NAD 1983 UTM
ZONE 17N
2. CONTAINS INFORMATION LICENSED
UNDER THE OPEN GOVERNMENT LICENSE -
ONTARIO.

LEGEND

- SITE
- MONITORING WELL LOCATIONS
- PIEZOMETER LOCATIONS
- ROAD
- WATERCOURSE
- NVCA MAPPED WETLAND BOUNDARY
- CATCHMENT BOUNDARY
- SURFACE FLOW DIRECTION
- SURFACE CONTOURS
- GROUNDWATER CONTOUR
- DITCH
- GROUNDWATER FLOW DIRECTION
- GROUNDWATER ELEVATION (MEASURED MARCH 20, 2025)

ID	
AREA (ha)	% IMPERVIOUS INFILTRATION FACTOR



**HURONTARIO STREET AND
POPLAR SIDEROAD DEVELOPMENT
PRE-DEVELOPMENT WATER BALANCE
DRAINAGE PLAN**

DWG. No.
FIG-1

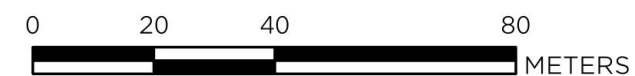
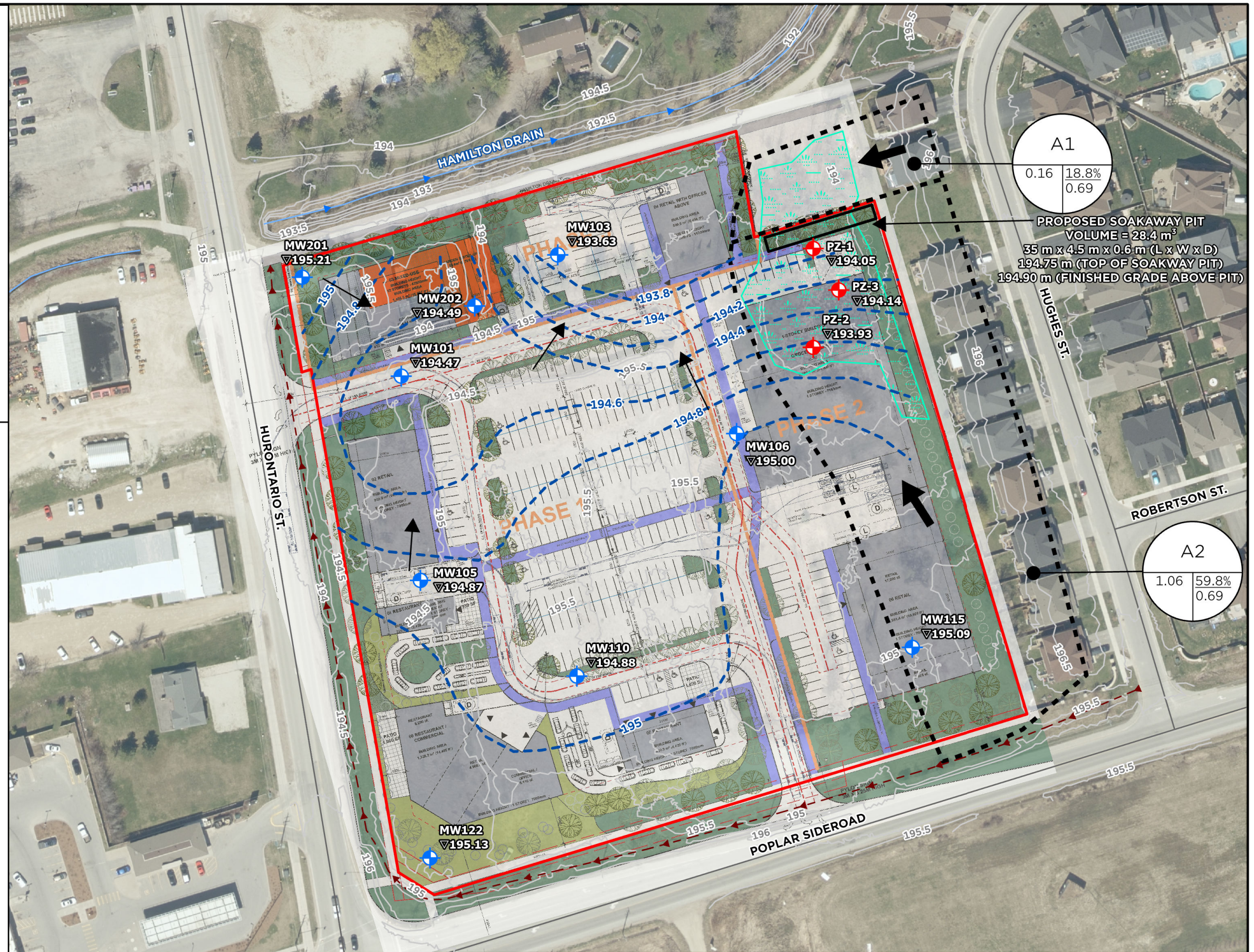
SCALE: 1:1,250 | DRAWN: AO | DATE: JUN. 2025 | JOB NO. 120119

NOTES:
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LEGEND

- SITE
- MONITORING WELL LOCATIONS
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- ROAD
- WATERCOURSE
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- GROUNDWATER ELEVATION (MEASURED MARCH 20, 2025)

ID	
AREA (ha)	% IMPERVIOUS INFILTRATION FACTOR



TATHAM
ENGINEERING

**HURONTARIO STREET AND
POPLAR SIDEROAD DEVELOPMENT
POST-DEVELOPMENT WATER BALANCE
DRAINAGE PLAN**

SCALE: 1:1,250

DRAWN: AO

DATE: JUN. 2025

DWG. No.

FIG-2

JOB NO. 120119

Project Details

Hurontario & Poplar	120119
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Prepared By

Nick Roque	March 24, 2025
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Water Budget Details

Methodology	Thornthwaite Method
Climate Data & Source	Collingwood Climate Normal Data for 2002 to 2021 (Environment Canada)
Thornthwaite Coefficient	1.056

Month	Temp (°C)	Precip (mm)	Heat Index	PET (mm)	Daylight Factor	Days	Average Day Length	Adjusted PET (mm)	AET (mm)	Surplus (mm)	Deficit (mm)
Jan.	-6.3	100	0.0	0.0	0.77	31	9.290	0.0	0.0	100.0	0.0
Feb.	-5.4	68.4	0.0	0.0	0.87	28	10.464	0.0	0.0	68.4	0.0
Mar.	-1.5	64	0.0	0.0	1.00	31	11.941	0.0	0.0	64.0	0.0
Apr.	5.5	65.3	1.2	25.7	1.12	30	13.483	28.9	28.9	36.4	0.0
May	11.5	82.7	3.5	56.0	1.23	31	14.800	71.4	71.4	11.3	0.0
Jun.	16.7	79.1	6.2	83.0	1.29	30	15.477	107.1	79.1	0.0	28.0
Jul.	19.8	72.1	8.0	99.4	1.26	31	15.144	129.6	72.1	0.0	57.5
Aug.	19.2	78.2	7.7	96.2	1.17	31	13.989	115.9	78.2	0.0	37.7
Sep.	15.5	95.9	5.5	76.7	1.04	30	12.513	80.0	80.0	15.9	0.0
Oct.	9.1	87.3	2.5	43.7	0.92	31	10.983	41.4	41.4	45.9	0.0
Nov.	3.1	99.6	0.5	14.0	0.80	30	9.625	11.3	11.3	88.3	0.0
Dec.	-2.7	99.4	0.0	0.0	0.74	31	8.909	0.0	0.0	99.4	0.0
Total	-	992	35.1	494.8	-	365	-	585.4	462.3	529.7	123.1

Additional Notes

PET = Potential Evapotranspiration; AET = Actual Evapotranspiration

Equations

$$PET = 16 \left(\frac{L}{12} \right) \left(\frac{N}{30} \right) \left(\frac{10T_d}{I} \right)^\alpha \text{ Where}$$

PET is the estimated potential evapotranspiration (mm/month)

T_d is the average daily temperature (degrees Celsius; if this is negative, use 0) of the month being calculated

N is the number of days in the month being calculated

L is the average day length (hours) of the month being calculated

$$\alpha = (6.75 \times 10^{-7})I^3 - (7.71 \times 10^{-5})I^2 + (1.792 \times 10^{-2})I + 0.49239$$

$$I = \sum_{i=1}^{12} \left(\frac{T_{mi}}{5} \right)^{1.514} \text{ is a heat index which depends on the 12 monthly mean temperatures } T_{mi} [^{\circ}\text{F}]$$

Water Budget

Surface Water Drainage

Pre and Post Development Comparison

Project Details

Hurontario & Poplar	120119
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Prepared By

Nick Roque	3/24/2025
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Pre-Development Catchment Details

Area (ha)	A1	0.16
Pervious Area (ha)		0.13
Impervious Area (ha)		0.03

Post Development Catchment Details

Area (ha)	A1	0.16
Pervious Area (ha)		0.13
Impervious Area (ha)		0.03

Infiltration Factor

Infiltration Factor	Pre-Development		Post Development	
	Pervious	Impervious	Pervious	Impervious
Topography	0.190	0.0	0.190	0.0
Soil	0.400	0.0	0.400	0.0
Land Cover	0.100	0.0	0.100	0.0
Infiltration Factor	0.690	0.0	0.690	0.0

Water Budget

Water Budget	Pervious	Impervious	Total	Pervious	Impervious	Total
Water Surplus (m ³)	528	122	651	528	122	651
Runoff (m ³)	164	122	286	164	122	286
Reduction in Runoff Volume (m ³)						0

Additional Notes
Infiltration Factors

<u>Topography</u>	Flat Land, average slope < 0.6 m/km	0.3
	Rolling Land, average slope 2.8 m to 3.8 m/km	0.2
	Hilly Land, average slope 28 m to 47 m/km	0.1
<u>Soils</u>	Tight impervious clay	0.1
	Medium combinations of clay and loam	0.2
	Open Sandy loam	0.4
<u>Cover</u>	Cultivated Land	0.1
	Woodland	0.2

(Stormwater Planning and Design Manual. MOE, 2003.)

Water Budget Groundwater Drainage

Pre and Post Development Comparison

Project Details

Hurontario & Poplar	120119
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Prepared By

Nick Roque	3/24/2025
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Pre-Development Catchment Details

Area (ha)	A1+A2	1.22
Pervious Area (ha)		0.99
Impervious Area (ha)		0.23

Post Development Catchment Details

Area (ha)	A1+A2	1.22
Pervious Area (ha)		0.56
Impervious Area (ha)		0.66

Infiltration Factor

Infiltration Factor	Pre-Development		Post Development	
	Pervious	Impervious	Pervious	Impervious
Topography	0.190	0.0	0.190	0.0
Soil	0.400	0.0	0.400	0.0
Land Cover	0.100	0.0	0.100	0.0
Infiltration Factor	0.690	0.0	0.690	0.0

Water Budget

Water Budget	Pervious	Impervious	Total	Pervious	Impervious	Total
Water Surplus (m ³)	4,026	935	4,960	2,261	2,699	4,960
Infiltration (m ³)	2,778	0	2,778	1,560	0	1,560
Reduction in Infiltration Volume (m ³)						1,217

Additional Notes

Infiltration Factors

<u>Topography</u>	Flat Land, average slope < 0.6 m/km	0.3
	Rolling Land, average slope 2.8 m to 3.8 m/km	0.2
	Hilly Land, average slope 28 m to 47 m/km	0.1
<u>Soils</u>	Tight impervious clay	0.1
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	Open Sandy loam	0.4
<u>Cover</u>	Cultivated Land	0.1
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(Stormwater Planning and Design Manual. MOE, 2003.)

Water Budget

Mitigation Measures

Preliminary LID Sizing

Project Details

Hurontario & Poplar	120119
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Prepared By

Nick Roque	Jun-25
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Preliminary LID Sizing Details

Catchment Area (ha)	1.22
Catchment Impervious Area (ha)	0.66
LID Impervious Drainage Area (ha)	0.29
Remaining Infiltration Deficit (m ³)	1,217
Evapotranspiration from Impervious Area	20%
Required Infiltration Depth from LID Drainage Area (mm/year)	528.3
Required Annual Average Captured (m ³)	1,522
Design Precipitation Depth (mm)	9.2
Total LID Volume Required (m ³)	26.6

Additional Notes

Water Budget

Mitigation Measures

LID Design

Project Details

Hurontario & Poplar	120119
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Prepared By

Nick Roque	LID
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LID System Design Details

LID Measure	Soakaway Pit
LID Impervious Drainage Area (ha)	0.29
Number of LIDs	1
Void Ratio	0.40
Footprint of LID (m ²)	158
Depth of LID (m)	0.60
Storage Volume Required (m ³)	26.6
Volume Required / LID (m ³)	26.6
Volume Provided / LID (m ³)	28.4
Volume Provided (m ³)	28.4
Design Precipitation Depth (mm)	9.8
Annual Volume Captured (mm)	547.0
Annual Volume Captured excluding Evapotranspiration (m ³)	1,575
Annual Volume Captured after Evapotranspiration (m ³)	1,260

Additional Notes

Water Budget

Summary

Project Details

Hurontario & Poplar	120119
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Prepared By

Nick Roque	Mar-25
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Summary

Existing Infiltration (m ³)	2,778
Proposed Infiltration (m ³) - No Mitigation	1,560
Infiltration Deficit Prior to Mitigation (m ³)	1,217
Proposed Infiltration Measures	
☐ Increase Topsoil Depth	
☒ Infiltration LID	
☐ Impervious Area Routed Over Pervious Area	
Mitigation - Increase Topsoil Reduction in Pervious Runoff (m ³)	0
Mitigation Measure - Implementing LID (m ³)	1,260
Mitigation Measure - Impervious Area Routed over Pervious Area (m ³)	0
Proposed Infiltration (m ³)	2,821
Infiltration Surplus after Mitigation (m ³)	43

Additional Notes

Soakaway Pit Design Worksheet

Project Details

Hurontario & Poplar	120119
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Municipality

Collingwood

Prepared By

ARO	June 2025
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Checked By

RS	June 2025
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Equations, Table 4.12 and factors as per Sections 4.5 & 4.9.3 of the SWM Planning & Design Manual 2003

Storage Volume Required

Drainage Area (m ²)	A	2880
Depth over Roof Top (mm)		9.2
Storage Volume Required (m³)	V	26.5
Soakaway Pit Length (m)	L	35.00
Soakaway Pit Width (m)	W	4.50
Soakaway Pit Depth (m)	D	0.60
Soakaway Pit Volume Provided (m³)	V	28.4

References / Notes

Phase 2 Roof

Includes area of roof

Refer to Section 4.5

Volume = L x W x D x n x f

Storage Volume is SUFFICIENT

Soakaway Pit Bottom Area

Infiltration rate of native soil (mm/h)	P	25
Porosity of clear stone	n	0.4
Drawdown/Retention Time (hours)	T	48
Minimum Bottom Area Required (m²)	A	55.20
Actual Bottom Area Provided (m²)	A	157.50

Sandy Loam (assumption)

Typically 0.4 for 50 mm clear stone

24-48 hrs (24hrs as per Design Manual)

Refer to Equation 4.3

Bottom Area is SUFFICIENT

Soakaway Pit Depth

Maximum Depth of Pit (m)	D_{max}	1.20
Actual Depth of Pit (m)	D	0.60

Refer to Equation 4.2

Pit Depth is SUFFICIENT

Soakaway Pit Separation to Groundwater

Seasonal High Groundwater Elevation (m)	194.00
Minimum Separation (m)	0.15
Underside of Soakaway Pit (m)	194.15
Top of Soakaway Pit (m)	194.75
Depth of Topsoil (mm)	150
Finished Grade Above Pit (m)	194.90

SHGWE + Minimum Separation

Underside of Soakaway Pit + Depth

Confirm with municipality

Top of Pit + Depth of Topsoil

Soakaway Pit Rating Curve

Infiltration Area (m ²)	A	204.9
Longevity Factor	f	0.75
Flow Rate (L/s)	Q	0.43

Refer to Equation 4.17

Longevity Factor for Conveyance Media

Soil Percolation Rate (mm/hr)	< 25	> 25 but <100	> 100
Longevity Factor (f)	0.5	0.75	1

Refer to Table 4.12