STORMWATER MANAGEMENT REPORT

Campfire Circle

Bloomfield, ON

August 19, 2026

Belleville
1 – 71 Millennium Pkwy
Belleville, ON
K8N 4Z5
Tel: 613-969-1111
info@jewelleng.ca

Kingston
208 – 4 Cataraqui St
Kingston, ON
K7K 1Z7
Tel: 613-389-7250
kingston@jewellweng.ca

Oakville
214 – 231 Oak Park Blvd
Oakville, ON
L6H 7S8
Tel: 905-257-2880
oakville@jewelleng.ca

Revision Summary

August 19, 2026

Fourth submission for Site Plan approval.

February 3, 2026

Third submission for Site Plan approval.

February 3, 2026

Second submission for Site Plan Application approval.

August 15, 2025

Initial submission for Site Plan Application approval.

Table of Contents

Table of Tables

Table of Figures

List of Appendices

1 Introduction and Background

Jewell Engineering Inc. (Jewell) was retained by Campfire Circle (the Client) to provide the Stormwater Management requirements to support the Site Plan Application approval of the property at 565 Wesley Acres Road in Bloomfield, Ontario, for a proposed Overnight Campground Development. The development includes 33 proposed buildings to provide sleeping accommodations, amenities, and activities for approximately 400 campers and staff. The Site Plan is attached to this report in Appendix A.

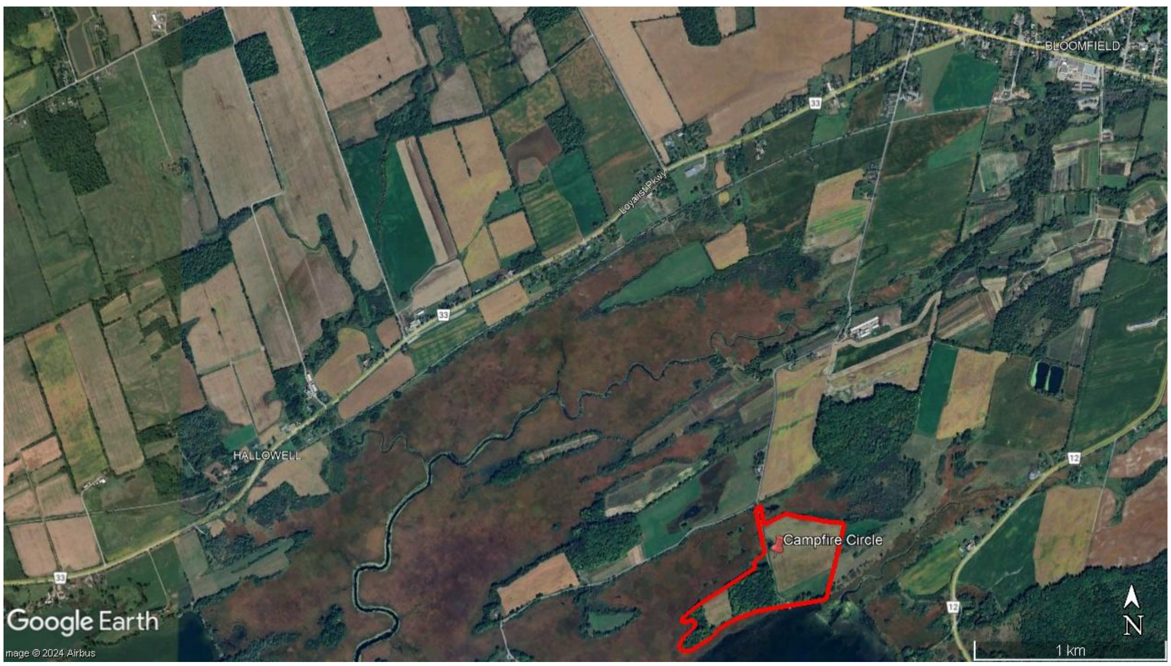


Figure 1-1: Development Site Location (Google, Maxar Tech 2018)

The objective of this Stormwater Management Report is to establish the stormwater management requirements and propose effective solutions.

2 Existing Conditions

The proposed development is situated on a mix of cultivated fields, forest and rural recreational cabins, with frontage on Wesley Acres Road, waterfront access to West Lake along the south property line, and a Provincially Significant Wetland in the northwest/northeast sections of the property.

The topography of the site is defined as rolling hills, due to the significant height difference (10-15m) from the shoreline and wetland to the centre of the site. With a wetland and natural drainage to West Lake, which connects to Lake Ontario, existing drainage conditions can be maintained.

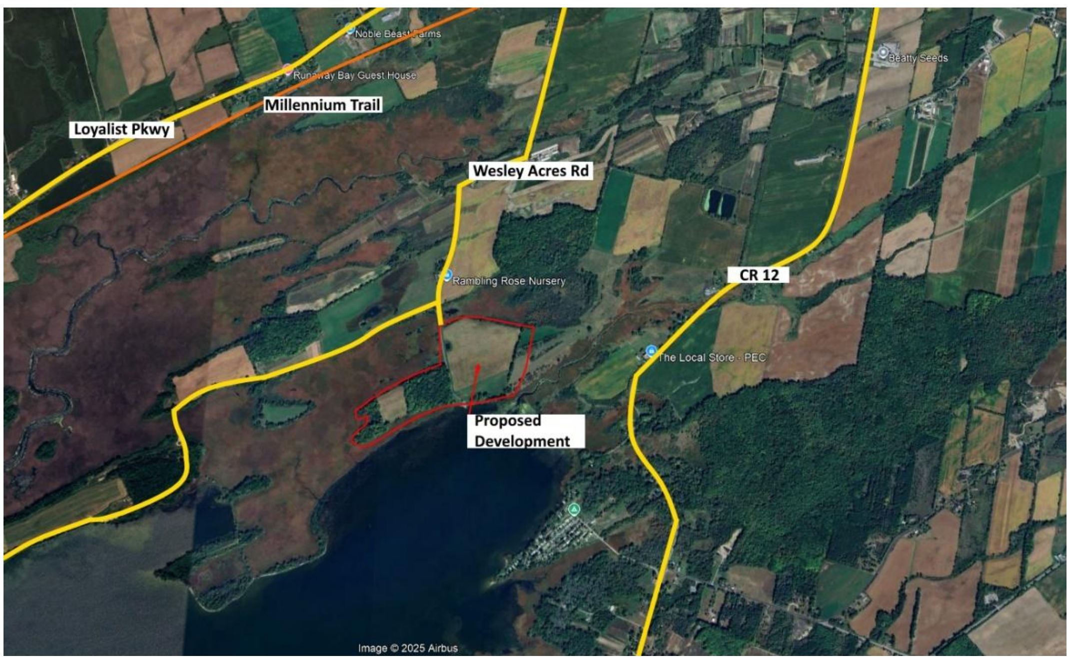


Figure 2-1. Site Location (Google Maps, 2015)

2.1 Soils

According to the Ontario Soil Survey for Prince Edward County, the site is primarily underlain by Pontypool soils, which are sandy loams formed on glacial outwash, with Marsh soils present along the site's edges and in low-lying areas. This classification is supported by the hydrogeological investigation (ASC Environmental, 2024), which identified a surficial profile of clay, sand, and organic deposits overlying limestone bedrock, with peat and muck present in wetland areas.

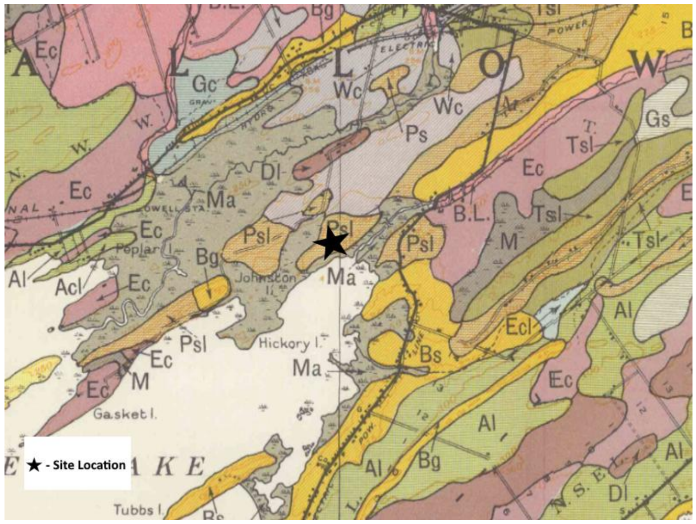


Figure 2-2.Soil Survey of the Site (PEC Soil Survey, Ontario, 1948)

The presence of both soil types suggests that infiltration-based stormwater management may be feasible in central areas dominated by Pontypool soils, while edge zones with Marsh soils will require surface-based solutions and careful erosion control.

The Pontypool and Marsh soils correspond to Hydrologic Soil Groups B and D, respectively.

Figure 2-3 (MTO, 2008) outlines the classifications of Hydrologic Soils Groups.

Hydrologic Soil Group

The hydrologic soil group is used to classify soils into groups of various runoff potential.

The Soil Conservation Service (SCS) classifies bare thoroughly wet soils into four hydrologic soil groups (A, B, C and D). SCS descriptions of the four groups, modified slightly to suit Ontario conditions, are as follows: (Design Chart 1.09)

A: High infiltration and transmission rates when thoroughly wet, eg. deep, well drained to excessively-drained sands and gravels. These soils have a low runoff potential.

B: Moderate infiltration and transmission rates when thoroughly wet, such as moderately deep to deep open textured loam.

C: Slow infiltration and transmission rates when thoroughly wet, eg. fine to moderately fine-textured soils such as silty clay loam.

D: Very slow infiltration and transmission rates when thoroughly wet, eg. clay loams with a high swelling potential. These soils have the highest runoff potential.

In Ontario, soils have been found to lie between the main groups given above, and have therefore been interpolated as AB, BC, CD as appropriate, such as Guelph loam, which is classified as BC.

Figure 2-3.Soils MTO Drainage Management Manual – Description of Hydrologic Soils Groups

2.2 Geotechnical Report

A geotechnical investigation was completed by Groundwork Engineering Limited in November 2023 to determine the subsurface conditions at the site. Six boreholes were drilled to depths ranging from 3.0 to 6.1 metres below ground surface (mbgs). The stratigraphy generally consists of a thin layer of topsoil (0.08 m), underlain by silty sand and sandy silt with varying traces of clay, gravel, and organics. No bedrock was encountered.

Standard Penetration Test (SPT) results indicate soil conditions ranging from loose to very dense, with compact silty sand being the predominant material. Groundwater was encountered at varying depths across the site, with levels observed to rise significantly over time—most notably in the monitoring well, where it increased from a few metres below ground to near the surface within a month—indicating seasonal fluctuation.

Percolation testing was conducted at two locations using the ETC Pask Permeameter. Due to high moisture content, repeatable field measurements were not achievable. Grain size analysis was used to estimate infiltration rates:

- Perc Test Site #1: Estimated percolation rate of 20–50 min/cm (sandy silt with some clay)
- Perc Test Site #2: Estimated percolation rate of >50 min/cm (silt and clay with some sand)

These results suggest moderate to poor infiltration capacity, which may limit the effectiveness of infiltration-based stormwater management practices.

Design considerations should account for low permeability and high seasonal groundwater levels, particularly when siting infiltration features or subsurface infrastructure.

2.3 Drainage Patterns

The existing site drains to three general areas: 1. the wetland to the northwest of the site, 2 the wetland to the northeast of the site, and 3. West Lake. The two wetlands to the north of the site are directly connected to West Lake. Figure 2-4 depicts the three existing catchments exiting to the areas described above. More detailed catchment drawings are included in Appendix B.

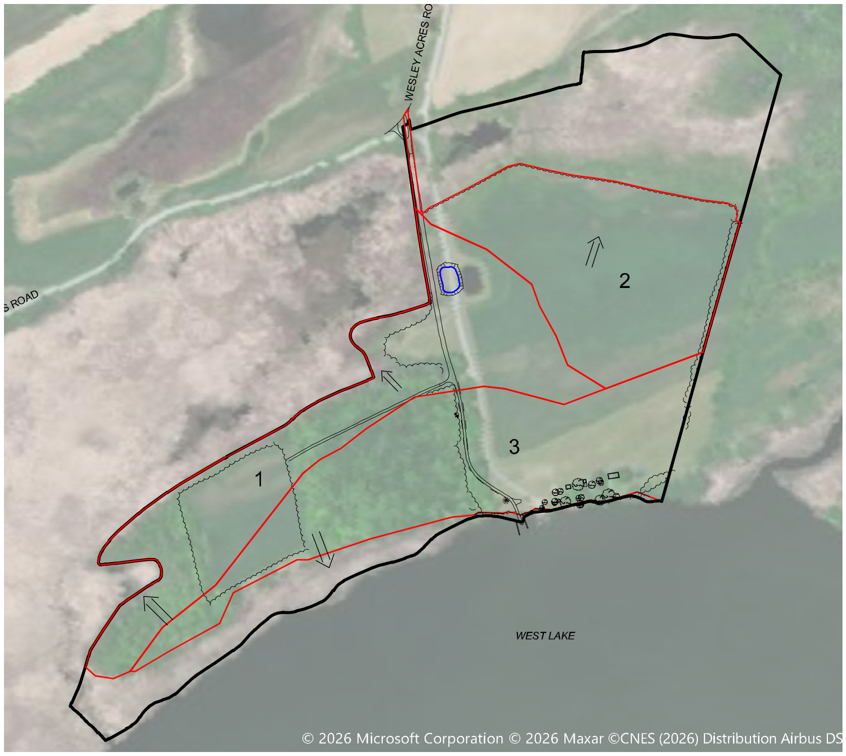


Figure 2-4. Existing Drainage

2.4 Pre-Development Land Use

The integration of land uses practices is crucial for effective stormwater management. Land use determines the amount of rainfall that will infiltrate into the ground versus the runoff that is directed to stormwater systems. The site is currently undeveloped and has a mixture of woodland and cultivated fields. Existing land use is summarized below in Table 2-1.

Table 2-1. Existing Land Use

Land Use	Catchment 1		Catchment 2		Catchment 3		Total	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Wooded	3.9	43%	0.0	0%	4.8	51%	8.7	33%
Field	4.9	53%	7.4	99%	4.4	47%	16.7	64%
Pond	0.1	1%	0.0	0%	0.0	0%	0.1	0%
Gravel	0.2	2%	0.1	1%	0.1	1%	0.4	2%
Asphalt/Concrete	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Buildings	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Total	**9.1**	**35%**	**7.5**	**29%**	**9.3**	**36%**	**25.9**	**100%**

3 SWM Targets

The stormwater management plan focuses on three environmental objectives when considering the treatment and conveyance of stormwater runoff. The objectives are to mitigate flooding, quality, and erosion impacts to the receiving system. These objectives, such protecting water quality, comply with the environmental guideline set out by the Quinte Conservation Stormwater Management Submission Guidelines (May, 2012), and the Ministry of Environment Stormwater Planning and Design Manual (2003).

Based on the guidance above, Jewell proposed a SWM methodology to achieve the following targets:

Quality Control

- Treat stormwater discharge to achieve **Enhanced** quality control objectives (i.e. 80% TSS removal).

Erosion and Sediment Control

- Minimize the potential for erosion of soils
- Mitigate the release of sediment offsite

Quantity Treatment is not required as stormwater will be discharged into wetlands and West Lake directly connecting to Lake Ontario. When discharging to a large body of water, such as Lake Ontario, the volume of runoff produced by the site is insignificant to the lake volume.

4 Proposed Conditions

4.1 Drainage Scheme

In the post-development conditions, the site will continue to drain to West Lake, either directly along the southern boundary, or via the surrounding wetlands along the northern boundary, similar to the pre-development conditions depicted above in Figure 2-4. The post-development scheme is depicted below in Figure 4-1. Pre vs. Post development catchments will vary in size slightly due to minor grade changes in the centre of the site.

Figure 4-1. Post Development Catchments

Low Impact Development (LID) strategies will be incorporated into the site to promote drainage along the natural features of the site. The addition of pervious surfaces, including rain gardens and other natural vegetation, will encourage infiltration and provide treatment of sediment-laden runoff prior to entering the wetlands or West Lake. These are further discussed below.

4.2 Post-Development Land Use

In the post-development condition, there will be significant increase in hardening of the site due to the construction of several buildings and a combination of paved and gravel roads (Table 4-1). The result is that imperviousness is increased from about 2% to 19%.

Table 4-1. Post-Development Land Use

Land Use	Catchment 1		Catchment 2		Catchment 3		Total	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Wooded	3.6	35%	0.0	0%	3.6	43%	7.2	28%
Field	4.3	42%	6.6	91%	3.3	40%	14.2	55%
Pond	0.1	1%	0.0	0%	0.0	0%	0.1	0%
Gravel	0.6	6%	0.1	1%	0.3	4%	1.0	4%
Asphalt/Concrete	1.2	11%	0.2	3%	0.6	7%	1.9	7%
Buildings	0.6	5%	0.4	5%	0.6	7%	1.5	6%
Total	**10.3**	**40%**	**7.2**	**28%**	**8.4**	**32%**	**25.9**	**100%**

5 Stormwater Controls

Quality control of an Enhanced level will be achieved through the use of Low-Impact Development (LID) methods, rather than traditional ponds or mechanical separators. While there is significant hardening of the site, the majority will remain vegetated, including the 30 m wetland setback surrounding most of the perimeter of the property. Hardened areas including buildings and roadways will be spread-out throughout the site, providing ample opportunity to treat runoff in swales, rain gardens, and other vegetation, including the wetland setback which will provide final treatment of runoff from the site.

As stated above, Quantity Control is not required owing to the large receiving body (Lake Ontario via West Lake).

5.1 Quality Treatment

Quality controls will be required to ensure that outflows meet or exceed an Enhanced Level of protection according to the 2003 MOE Stormwater Planning and Design Manual (80% TSS removal). The high groundwater and low infiltration rates of native soils will require a more diffuse approach than traditional infiltration approach. Care will be taken to not concentrate flows but rather maintain several areas of overland flow to reduce concentration and potential for erosion. Flows are not directed to any flowing watercourses, further reducing the potential for erosion.

This development is well-suited for Low Impact Development (LID) strategies, including grassed swales, and vegetated filter strips. Grassed swales will be integrated throughout the site to redirect runoff from impervious surfaces and along property boundaries, enhancing Total Suspended Solids (TSS) removal and minimizing sediment transport into nearby natural water bodies. Vegetated filter strips will be installed adjacent to hardened areas (especially building roofs) and within the shoreline buffer zone to provide additional protection to surrounding waterbodies, particularly for filtering de-icing salts that may otherwise enter West Lake.

The vegetated swales will be designed with appropriate lengths (greater than twenty metres) and gentle slopes (less than 1%) to allow sediment to settle and infiltrate effectively as water flows through. The 2003 MOE Manual indicates that grassed swales are most effective for water quality control when peak flows are less than 0.15 m^3/s, the bottom width is maximized (≥0.75m), longitudinal slope is minimized (≤1 percent), flow depth is low to promote settlement (≤ 0.15m), and when the velocity is less than 0.5 m/s. For small catchment areas such as this, grassed swales can achieve 81% TSS removal (United States Environmental Protection Agency, 1999).

In areas of higher development density, vegetated swales will be utilized. Storm sewers in Catchment 1A will convey runoff to a vegetated swale for initial treatment, followed by discharge into a vegetated basin adjacent to the existing pond. The pond will provide final polishing of the water before discharge into the wetland. Jewell used the 25 mm storm event to determine the required capacity of the swales, ensuring sufficient retention time for sediment to settle before discharge.

Overall, this design approach minimizes sediment transport to natural watercourses and wetlands, while ensuring that all stormwater runoff is managed effectively and sustainably.

5.2 Catchment 1

Catchment 1 drains into the wetland to the northwest of the property. It has been divided into three sub-catchments for the purposes of stormwater quality treatment. Pre and post-development land use and runoff coefficients are depicted below in Table 5-1. Coefficients for each type of land use were taken from the MTO Drainage Management Manual Design Chart 1.07. Wooded and Field land uses were modelled as Rolling Pasture and Woodland in Open Sand Loam soils.

Runoff from sub-catchment 1A will be directed through a vegetated swale and into a sand filter infiltration system. Similar to 1A, 1B will direct flow into the sand filter. Flows from 1C will continue to drain through the existing vegetation and into the wetland.

Table 5-1. Catchment 1 Runoff Coefficients

Land Use	Pre-Development		Post-Development							
			1A		1B		1C		Total	
	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff
Wooded	3.9	0.12	0.0	0.12	0.0	0.12	3.6	0.12	3.6	0.12
Field	4.9	0.15	0.9	0.15	1.6	0.15	1.8	0.15	4.3	0.15
Pond	0.1	0.05	0.0	0.05	0.1	0.05	0.0	0.05	0.1	0.05
Gravel	0.2	0.60	0.2	0.60	0.2	0.60	0.2	0.60	0.6	0.60
Asphalt/Concrete	0.0	0.90	0.7	0.90	0.3	0.90	0.2	0.90	1.2	0.90
Buildings	0.0	0.90	0.2	0.90	0.0	0.90	0.4	0.90	0.6	0.90
Total	**9.1**	**0.15**	**2.0**	**0.53**	**2.2**	**0.28**	**6.1**	**0.21**	**10.3**	**0.29**

5.2.1 Catchment 1A

Sub-catchment 1A includes the central square as well as the main asphalt and granular parking area. It represents the most significant concentration of hardening on the site, with the runoff coefficient increasing from 0.15 to 0.53. Runoff from this area will be directed to vegetated swales along the main access road and between parking aisles. The swales are designed to provide quality treatment through contact with the vegetation, slowing flow and permitting some infiltration. By travelling well over the required 20m, they provide treatment allowing for sediment to settle out and keep the water flowing to the vegetated area adjacent to the existing pond. Water will then be directed to a sand filter constructed in the location of the existing pond. The sand filter will be filled with a pervious liner, sand, and topped with topsoil to ensure water can infiltrate effectively, similar to the MOE 2003 Sand Filter Cross-Section shown in Figure 5-1. Subdrains will convey treated water to the wetland. The gravel service road will act as a berm, permitting overflow in the intense storms after the first flush has been treated in the filter. The parking lot will include grassed swales down the parking lanes to preserve the natural drainage features of the site, and direct the runoff to the sand filter. These swales also contribute to quality treatment.

Figure 4.33: Sand Filter Cross-section

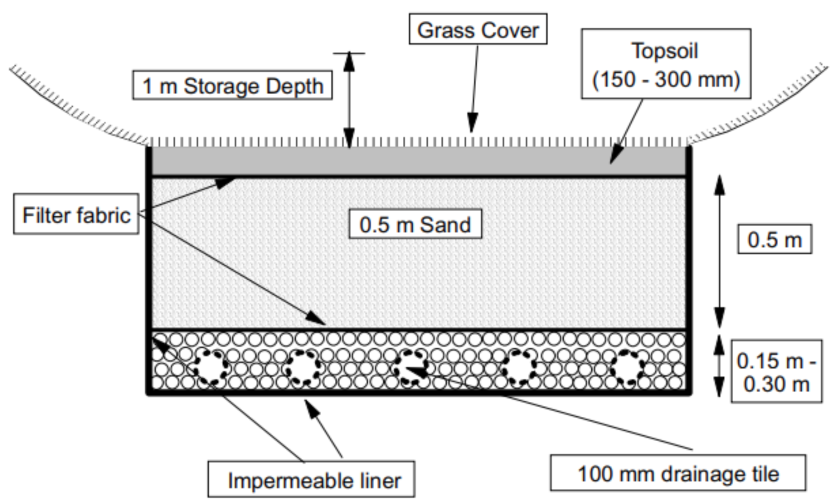


Figure 5-1. Sand Filter (LID, 2010)

Table 5-2. Swale 1A Flow in Quality Event

Catchment Swale	Area, A (ha)	Runoff Coefficient, C	Peak Flow 25 mm, 4 hr Storm (cms)	Channel Length (m)	Channel Width (m)	Slope	Flow Depth (m)	Velocity (m/s)	Meets Require-ments
			≤ 0.15 m³/s	≥ 20 m	≥ 0.75 m	≤ 1%	≤ 0.15m	≤ 0.5 m/s	
1A	2.00	0.53	0.09	58	2.00	0.5%	0.11	0.33	✓

While flows from Catchment 1A are effectively treated in the main swale as shown above in Table 5-2, some runoff from the parking areas enters the swale part way through its length. Flows from Catchments 1A-8 and 1A-9 will not benefit from treatment in the entire length of Swale 1A but are limited to 26 m and 4 m respectively.

5.2.1.1 Catchment 1A-8

Flows from Catchment 1A-8 flow into Swale 1A 26 m upstream from the end of the swale. This is greater than the 20 m minimum to achieve 80% TSS removal. All water from Catchment 1A-8 is sufficiently treated in Swale 1A.

5.2.1.2 Catchment 1A-9

Flows from Catchment 1A-9 flow into Swale 1A 4 m upstream from the end of the swale. This is less than the 20 m minimum recommended length. To compensate for this, the dry swale in Catchment 1A-9 upstream of culvert 1A-2 provides additional treatment. While longitudinal slopes greater than 1% are not preferred, smaller catchments can be effectively treated with steeper swales due to their lower runoff flow rates. More important than slope are water velocity and depth of flow to permit sufficient time and contact with vegetation for suspended solids to be removed. For this swale, velocity is kept below the recommended 0.5 m/s and depth of flow is kept below the recommended 150 mm as shown in the table below. The swale is also underdrained, providing additional treatment via filtration.

Catchment Swale	Area, A (ha)	Runoff Coefficient, C	Peak Flow 25 mm, 4 hr Storm (cms)	Channel Length (m)	Slope	Flow Depth (m)	Velocity (m/s)
			≤ 0.15 m^3/s	≥ 20 m	≤ 1%	≤ 0.15m	≤ 0.5 m/s
9	0.2	0.71	0.014	60	2%	0.09	0.38

5.2.1.3 Catchments 1A-7B and 1A-9B

Flows from Catchments 1A-7B and 1A-9B do not receive a full 20 m of treatment in Swale 1A, however they do receive partial treatment in the swale, and also receive additional treatment flowing through the vegetated filter strip at the outlet of Culvert 1A-3, and in the sand filter. As these flows represent less than 6% of the runoff volume from Catchment 1A, and receive additional treatment in the filter strip and sand filter, no additional treatment is required to achieve 80% TSS removal for Catchment 1A.

5.2.2 Catchment 1B

Similar to 1A, flows from 1B will be directed through vegetated filter strips and into the sand filter. Rather than concentrating flows in swales, water will be allowed to run diffusely through plantings to the pond. Catchment 1C will direct flows through the natural features of the site into surrounding wetland.

5.3 Catchment 2

Catchment 2 drains into the wetland in the northeast part of the property. It is expected to have a low amount of hardening (<10% imperviousness), concentrated at the upland side of the catchment boundary. Vegetation strips adjacent to the athletic centre and camper's cabins will promote infiltration of flows concentrated on the roofs of buildings. As with Catchment 1C, other flows will be kept diffuse and permitted to run through the natural vegetation prior to entering the wetland. The vegetated area adjacent to the treed swamp at the north limit of the Catchment is 30+ m wide with slopes between 0.5% and 2.0%. This will allow ample opportunity for infiltration and settlement of contaminants in the runoff.

Table 5-3. Catchment 2 Runoff Coefficients

Land Use	Pre-Development		Post-Development	
	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff
Wooded	0	0.12	0	0.12
Field	7.43	0.15	6.57	0.15
Pond	0	0.05	0	0.05
Gravel	0.11	0.60	0.09	0.60
Asphalt/Concrete	0	0.90	0.19	0.90
Buildings	0	0.90	0.38	0.90
Total	**7.5**	**0.16**	**7.2**	**0.21**

5.4 Catchment 3

Catchment 3 drains directly into West Lake on the south side of the property. It includes several proposed buildings in proximity to the water's edge. A series of vegetated swales and vegetated filter strips are proposed to intercept and treat water prior to entering the waterbody. A vegetated swale will intercept runoff from the gravel service road in sub-catchment 3A, while filter strips in the riparian zone will be used to treat water downstream of the buildings in the east part of sub-catchment 3B.

Table 5-4. Catchment 3 Runoff Coefficients

Land Use	Pre-Development		Post-Development					
			3A		3B		Total	
	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff
Wooded	4.76	0.12	0.30	0.12	3.31	0.12	3.61	0.12
Field	4.39	0.15	0.85	0.15	2.48	0.15	3.33	0.15
Pond	0	0.05	0	0.05	0	0.05	0	0.05
Gravel	0.11	0.60	0.20	0.60	0.10	0.60	0.30	0.60
Asphalt/Concrete	0	0.90	0.07	0.90	0.50	0.90	0.57	0.90
Buildings	0.02	0.90	0.10	0.90	0.49	0.90	0.59	0.90
Total	**9.3**	**0.14**	**1.5**	**0.29**	**6.9**	**0.25**	**8.4**	**0.26**

Along the southeastern section of the property, a vegetated swale will be implemented to control and direct stormwater runoff down the natural grade of the property to release into West Lake, demonstrated in Catchment 3A. With a similar design to the swale in the centre of the property, enough length will be accounted for to ensure sediment can settle out before entering West Lake. Some vegetated buffers along the shoreline will aid in slowing flows and providing final quality control.

Table 5-5. Swale 3A Flow in Quality Event.

Catchment Swale	Area, A (ha)	Runoff Coefficient, C	Peak Flow 25 mm, 4 hr Storm (cms)	Channel Length (m)	Channel Width (m)	Slope	Flow Depth (m)	Velocity (m/s)	Meets Require-ments
			≤ 0.15 m^3/s	≥ 20 m	≥ 0.75 m	≤ 1%	≤ 0.15m	≤ 0.5 m/s	
3A	1.52	0.29	0.02	77	1.00	0.5%	0.07	0.24	✓

5.5 Site Hydrology

Jewell used the Rational Method to estimate peak flows. The Rational Method equation is shown below. It relies on an estimation of runoff coefficient, flow intensity, and drainage area. Manning's Open Channel Flow was used to determine appropriate sizing of conveyance features based on Peak Flow, hydraulic radius, wetted perimeter, area, and Manning's Roughness Coefficient.

Equation 1: Peak Flow by Rational Method

$$Q = \frac{CiA}{360}$$

Where:

Q = Peak Flow in m^3/s
C = Runoff Coefficient
i = Rainfall Intensity in mm/hr
A = Area in hectares

The intensity of the 25mm event is calculated using the following formula from the 2003 MOE SWM Planning & Design Manual:

Equation 2: Peak Intensity, 25mm Event

$$i = 43C + 5.9$$

Where:

i = Rainfall Intensity in mm/hr
C = Runoff Coefficient

Mannings - Open Channel Flow

Equation 3: Manning's Open Channel Flow

$$V = \frac{R^{2/3} S^{1/2}}{n}$$

Where:

V = Flow Velocity in m/s
R = Hydraulic Radius in m (flow area/wetted perimeter)
S = Channel Slope in m/m
n = Manning's roughness coefficient
C = Runoff Coefficient

5.5.1 Quality Event

The Rational Method was used to determine the Quality Flow provided from each catchment area, to then determine appropriate swale dimensions. All calculations for quality treatment are based on the 25mm event (Table 5-6).

Table 5-6. Flows During Quality Event (25mm Storm)

Catchment	Area (ha)	Runoff Coefficient, C	Rainfall Intensity, i=43C+5.9 (mm/h)	Peak Flow, Q=CiA/360 (m^3/s)	Runoff Volume, V=250CA (m^3)
1A	2.0	0.53	28.8	0.085	266
1B	2.2	0.28	18.1	0.031	153
3A	1.5	0.29	18.2	0.022	109

Depth of flow and velocity in each of the two proposed swales were calculated based on the peak flows shown in Table 5-6. The swale functions most effectively with a low depth of flow (<150 mm), and low velocity (<0.5 m/s). In both cases, the proposed swales meet these targets as shown below in Table 5-7.

Table 5-7. Swale Characteristics - Quality Event

Swale	Peak Flow (m^3/s)	Bottom Width (m)	Side Slopes	Slope	Depth of Flow (mm)	Velocity (m/s)
1A	0.085	2	3:1	0.5%	111	0.3
3A	0.022	1	3:1	0.5%	74	0.2

The existing pond has a surface area of approximately 1,200 m^2. During the quality event flows from 1A and 1B will total approximately 420 m^3. Therefore, water level in the pond is expected to temporarily increase by 350 mm.

5.5.2 Minor Storm Event

For the minor storm event, the 5-year return period storm provided by Environment Canada for Trenton, Ontario was used. For calculating conveyance through the storm sewer system, and on-site culverts the 5-yr storm was used with a minimum duration of 10 minutes. Flow rates were calculated using the Rational Method. The design sheet is provided in Appendix D.

5.5.3 Major Storm Event

For the major storm event, the 100-yr return period storm provided by Environment Canada for Trenton, Ontario was used. For calculating depth and velocity of flow in swales, the 100-yr, 10 minute storm was used, with an intensity of 136.2 mm/h. For calculating total runoff volume, the rational method was used. Runoff coefficients for each land use type were increased by 25% in accordance with the MTO Drainage Management Manual (Table 5-8). Results are shown below in Table 5-9.

Table 5-8. Runoff Coefficients for Major Event.

Land Use	Post-Development					
	1A		1B		3A	
	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff	Area (ha)	Runoff Coeff
Wooded	0.0	0.15	0.0	0.15	0.30	0.15
Field	0.9	0.19	1.6	0.19	0.85	0.19
Pond	0.0	0.06	0.1	0.06	0	0.06
Gravel	0.2	0.75	0.2	0.75	0.20	0.75
Asphalt/Concrete	0.7	0.98	0.3	0.98	0.07	0.98
Buildings	0.2	0.98	0.0	0.98	0.10	0.98
Total	**2.0**	**0.60**	**2.2**	**0.33**	**1.5**	**0.34**

Table 5-9. Flows During Major Event (100-yr Storm)

Catchment	Area (ha)	Runoff Coefficient, C	Rainfall Intensity, 100-yr, 10 min, i (mm/h)	Peak Flow, Q=CiA/360 (m^3/s)
1A	2.0	0.60	136.2	0.454
1B	2.2	0.33	136.2	0.272
3A	1.5	0.34	136.2	0.197

The peak flows from Table 5-9 were used to establish the max depth and velocity of flow in the swales in sub-catchments 1A and 3A. As shown below, the depths are in the order of 250 mm, with velocities less than 1 m/s.

Table 5-10. Swale Characteristics - Major Event.

Swale	Peak Flow (m^3/s)	Bottom Width (m)	Side Slopes	Slope	Depth of Flow (mm)	Velocity (m/s)
1A	0.454	2	3:1	0.5%	248	0.7
3A	0.197	1	3:1	0.5%	213	0.6

Conveyance through culverts was also checked during the Major storm event. All were found to have sufficient freeboard to avoid overtopping of the roadways.

Table 5-11. Culvert Flows During Major Storm Event.

Culvert No.	Catchment No.	Area, A (ha)	Runoff Coefficient, C	Time of Concentration, T_C (min)	Rainfall Intensity, i (mm/h)	Peak Flow, Q = CiA/360 (m^3/s)	Pipe Size (mm)	Pipe Type	Headwater Depth, HW (mm)	Spillover Depth (mm)
1A-1	1A-8	0.16	0.73	10	136.2	0.04	300	HDPE	240	310
1A-2	1A-9	0.20	0.81	10	136.2	0.06	300	HDPE	310	360
1A-3	1A	1.91	0.62	15	106.6	0.35	500	HDPE	690	900
1B-1	1B-1	0.55	0.19	18.5	96.0	0.03	300	HDPE	180	500
1B-2	1B-1 + 1B-2	0.87	0.32	22.9	83.2	0.06	300	HDPE	320	500
2-1	2-1	0.21	0.23	10	136.2	0.02	300	HDPE	<150	450
2-2	2-1 + 2-2	0.62	0.32	15	106.6	0.06	300	HDPE	300	500
2-3	2-3	0.28	0.39	10	136.2	0.04	300	HDPE	230	500

5.6 Climate Resiliency

Climate Change projections typically increase rainfall intensity values by 10% compared to base-year events. The proposed development's conveyance features were checked and found to have sufficient capacity for a 10% increase in flows from those calculated for the 100-year event. Therefore, climate resiliency is provided.

Table 5-12. Swale Characteristics - Major Event +10%.

Swale	Peak Flow (m^3/s)	Bottom Width (m)	Side Slopes	Slope	Depth of Flow (mm)	Velocity (m/s)
1A	0.500	2	3:1	0.5%	261	0.7
3A	0.217	1	3:1	0.5%	223	0.6

Table 5-13. Culvert Flows During Major Storm Event +10%.

Culvert No.	Peak Flow, Q = CiA/360 (m^3/s)	Pipe Size (mm)	Pipe Type	Headwater Depth, HW (mm)	Spillover Depth (mm)
1A-1	0.05	300	HDPE	260	310
1A-2	0.07	300	HDPE	340	360
1A-3	0.39	500	HDPE	750	900
1B-1	0.03	300	HDPE	190	500
1B-2	0.07	300	HDPE	350	500
2-1	0.02	300	HDPE	<150	450
2-2	0.06	300	HDPE	320	500
2-3	0.05	300	HDPE	250	500

6 Low-Impact Development

Low Impact Development is a requirement of the 2020 Provincial Policy Statement. This requires that all developments consider LID strategies to reduce the impact of development on the hydrologic regime.

The Low Impact Development Guidelines (Toronto and Region Conservation Authority, 2010) states that "increases in the quantity, rate, and frequency of runoff can be linked to two root causes:

- the conversion of undeveloped or agricultural land cover to urban uses, and
- the application of storm sewer systems."

The goal of LID site design strategies is to minimize these two sources of hydrologic impacts (Toronto and Region Conservation Authority, 2010, p. 3.3). Large urban areas are negatively impacted by flash flooding associated with extensive hardening. The LID design techniques seek to mitigate flooding and erosion associated with urbanization. While water quality improvements are associated with the recommended techniques, quantity control remains the focus of LID.

The guidelines provide some site design strategies for reducing the hydrologic impact postulating 4 major groupings or "themes":

1) Preserving important hydrologic features and functions;
2) siting and layout of development;
3) reducing impervious area; and
4) using natural drainage systems.

Discussion of the LID design used in the stormwater management design is provided below.

6.1 Theme 1 – Preserving Important Hydrologic Features

This theme focuses on preservation. Site design is adjusted to preserve natural features that benefit hydrology.

- Preserve stream buffers, including along intermittent and ephemeral channels
- Preserve areas of undisturbed soil and vegetation cover
- Avoid development on permeable soils
- Preserve existing trees and, where possible, tree clusters

Important hydrologic features include:

- Highly permeable soils
- Pocket wetlands
- Significant small (headwater) drainage features

- Riparian buffers
- Floodplains
- Undisturbed natural vegetation
- Tree clusters

6.2 Theme 2 – Application of Siting and Layout Techniques

Siting and layout techniques aim to reduce the environmental impacts of the development by fitting the development within the framework of the natural heritage features.

- Fit the design to the terrain
- Use open space or clustered development
- Use innovative street network designs
- Reduce roadway setbacks and lot frontages

There is a Provincially Significant Wetland on this development property. Limited development is to occur throughout the wetland and is to be used as a natural drainage area.

6.3 Theme 3 – Reducing the Impervious Area

Imperviousness can be reduced by minimizing unnecessary surface hardening. Some strategies include:

- Reducing street width
- Reducing building footprints
- Reducing parking footprints
- Considering alternatives to cul-de-sacs
- Eliminating unnecessary sidewalks and driveways

6.4 Theme 4 – Using Natural Drainage Systems

These strategies focus on the use of existing natural drainage systems where available “to take advantage of undisturbed vegetated areas and natural drainage patterns.”

- “Disconnect” impervious areas
- Preserve or create micro-topography
- Extend drainage flow paths

Where possible, flows are encouraged to drain to natural water features (West Lake), wetlands, and pervious grassed surfaces prior to collection in the storm sewers. Pervious grassed surfaces will encourage infiltration into the soils.

7 Maintenance

Regular maintenance is essential to ensure the long-term performance and reliability of stormwater management systems such as sand filters and vegetated swales. Over time, sediment and debris can accumulate, reducing the system's ability to function as designed. Periodic removal of this material, along with occasional replacement of filter media, helps prevent clogging, supports proper drainage, and extends the lifespan of the infrastructure. As part of the detailed design process, comprehensive operation and maintenance manuals will be developed and provided to the property owners. These documents will outline specific responsibilities and procedures to ensure that the infrastructure—remaining privately owned and operated—is maintained in accordance with regulatory and performance standards.

8 Erosion and Sediment Control

Erosion and sediment control is one of the three targets identified in Section 2.3. The following measures are proposed to prevent the negative erosion and sediment impacts of development.

Typical site development requires removal of some vegetated cover. While it is the intention to reduce vegetation removal, exposed soils from the work will be at risk of eroding into the receiving drainage system. Measures will need to be put in place to reduce erosion during construction, and for a period of up to one year after construction is completed. Typical erosion and sediment control measures include:

- Siltation fencing.
- Strawbale check dams.

Controls are to be placed downstream of all active work areas and upstream of protected receivers. Controls should also be placed around stockpiles of topsoil and fill materials.

Typical OPSDs provide good instruction on the correct placement and construction of the controls. The controls provide some protection if they are properly maintained, but they should be considered last-resort measures. The most effective means of control are those which prevent or reduce erosion at the source. This would include diligent stabilization of exposed areas immediately after grading is completed.

The site developer and contractor should actively maintain the new drainage works to remove accumulations of sediment within catch basin sumps.

A silt fence should be located along the upland perimeter of all sensitive features during the construction process, which should be maintained until the lands have stabilized or as directed by the municipality. There would be benefit in maintaining this silt fence for up to 2 growing seasons.

A more detailed Erosion and Sediment Control Plan for construction activities is available under a separate cover.

9 Conclusions

The proposed Overnight Campground Development by Campfire Circle at 565 Wesley Acres Road includes 33 proposed buildings to provide sleeping accommodations, amenities, and activities for approximately 400 campers and staff. Situated between West Lake and two Provincially Significant Wetlands, the site presents both opportunities and responsibilities in managing stormwater effectively.

Given the natural drainage into adjacent wetlands and West Lake, quantity control measures are not required. Instead, the stormwater management plan focuses on quality treatment and erosion control, aligning with the Ministry of Environment's Stormwater Planning and Design Manual (2003), Quinte Conservation's guidelines, and the 2020 Provincial Policy Statement.

Low Impact Development (LID) strategies are central to the design, including the preservation of natural hydrologic features, minimizing impervious surfaces, and using vegetated swales, rain gardens, and sand filters to manage runoff. These features are carefully integrated into the site layout to work with the natural topography and drainage patterns, reducing the impact of development on the surrounding environment.

Prepared by,

Graham Potter, P.Eng.

Jewell Engineering Inc.

10 References

Burger, M. (January, 2024). *Geotechnical Report 565 Wesley Acres Road Bloomfield, Ontario.* Groundwork Engineering Ltd.

Ministry of the Environment. (2003). *Stormwater Management Planning and Design Manual.*

Ontario Ministry of Transportation. (1997). *Drainage Management Manual.*

Richards, N., & Morwick, F. (1948). *Soil Survey of Prince Edward County.* Guelph, Ontario: Experimental Farms Service, Dominion Department of Agriculture and the Ontario Agricultural College.

Toronto and Region Conservation Authority. (2010). *Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0.*

United States Environmental Protection Agency. (1999, September). *Storm Water Technology Fact Sheet Vegetated Swales.* Retrieved from https://nepis.epa.gov/Exe/ZyPDF.cgi/200044A8.PDF?Dockey=200044A8.PDF

APPENDIX A:
SITE PLAN

SITE PLAN - BUILDINGS LAYOUT

1

1 : 1500

BUILDINGS LEGEND

1 - LODGE
2 - MEDICAL CLINIC
3 - SUMMER & STAFF HOUSING
4 - DIRECTOR'S CABIN
5 - FLEX
6 - OFF GRID CABIN
7 - CAMPER #1-9
8 -
9 -
10 -
11 - MUSIC, DRAMA & POOL
12 - ATHLETIC CENTRE
13 - FIRE PUMP
14 - GREENHOUSE
15 - RIDING ARENA
16 - MAINTENANCE
17 - UTILITY
18 - GARAGE
19 - COOKING PROGRAM
20 - STORAGE

LEGEND:

SETBACKS:

- 100-YR FLOOD ELEVATION
- WAVE UPRUSH SETBACK
- EROSION HAZARD LIMIT PER QUINTE CONSERVATION SHORELINE MANAGEMENT PLAN, 2022
- 6m EROSION HAZARD SETBACK
- SHORELINE
- PROPERTY LINE
- SETBACKS AS PER BYLAW & 30m WETLAND SETBACK PER WATERSHED REGULATIONS (O.REG.31/24) POLICY MANUAL SECTION 8.4.5.
- ROOF OVERHANG

COPE GROUP INC.
33 Davies Ave.
Toronto, ON M4M 2A9
T. 416.466.0600
info@copegroup.ca

TED HANDY and ASSOCIATES Inc. ARCHITECT
76 Mary Street,
Barrie, ON, Canada,
L4N 1T1
T. 705.734.3580
thandyarchitect.on.ca

Teeple Architects INC.
5 Camden Street,
Toronto, ON, Canada,
M5V 1V2
T. 416.598.0554
www.teeplearch.com

NO.	DATE:	ISSUED FOR:
1	MAR 01, 2024	Draft ZBA Submission
2	AUG 23, 24	PROGRESS UPDATE
3	AUG 29, 24	DRAFT ZBA RESUBMISSION
4	Oct 1, 24	ZBA COMMENT UPDATE
5	Oct 31, 24	ZBA Resubmission #1
6	Aug 15, 2025	ISSUED FOR SPA
7	Feb 4, 2026	Issued for SPA Resubmission

CLIENT
Campfire Circle
464 Bathurst St.
Toronto, ON
M5T 2S6

CAMPFIRE CIRCLE
HEALING THROUGH HAPPINESS

565 Wesley Acres Rd
Bloomfield, Ontario K0K 1G0

PLAN NORTH

ONTARIO ASSOCIATION OF ARCHITECTS
EDWARD P. HANDY
LICENCE
3854
SEAL

DRAWN BY	CHECKED BY
JM	RK

PROJ NO	SCALE	FORMAT	PLOT DATE
TAI: 23-105	As indicated	ARCH D	09/10/15

CAMPFIRE CIRCLE

BUILDINGS LAYOUT

A014

APPENDIX B:
STORMWATER CATCHMENT DRAWINGS

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH

LICENSED PROFESSIONAL ENGINEER
FEB. 02, 2026
G. G. J. POTTER
100139388
PROVINCE OF ONTARIO

JEWELL ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

THE COUNTY OF PRINCE EDWARD

CATCHMENT PLAN
STORM
PRE-DEVELOPMENT

DRAWN BY: JH
PROJECT NO: 230-5322
DESIGNED BY:
DATE: May 2026
CHECKED BY: GP
SCALE: HORIZONTAL - 1:2000, VERTICAL - N/A
APPROVED BY:
CONTRACT NO:
DRAWING NO: CT-1

05/25/2026

F:\FTP\PROJECT FILES\COPE GROUP INC\CAMPFIRE CIRCLE\DRAWINGS\3 SHEETS\5322 - STORM CATCHMENT PLAN (CT)

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH

LICENSED PROFESSIONAL ENGINEER
FEB. 02, 2026
G. G. J. POTTER
100139388
PROVINCE OF ONTARIO

JEWELL ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

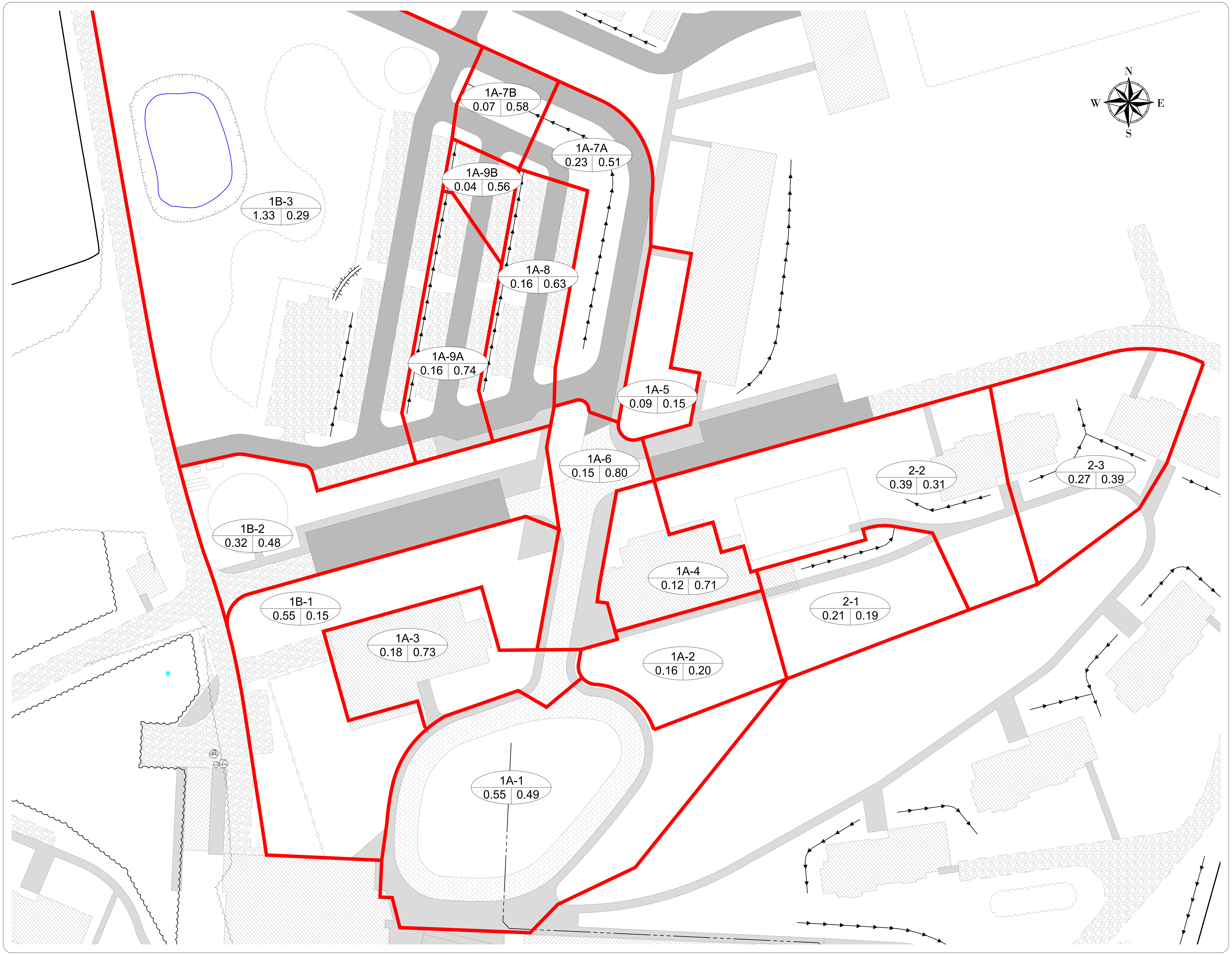
THE COUNTY OF PRINCE EDWARD

CATCHMENT PLAN
STORM
POST-DEVELOPMENT

DRAWN BY: JH	PROJECT NO: 230-5322	
DESIGNED BY:	DATE: May 2026	
CHECKED BY: GP	SCALE: HORIZONTAL - 1:2000 VERTICAL - N/A	
APPROVED BY:	CONTRACT NO:	DRAWING NO: CT-2

05/25/2026

F:\FTP\PROJECT FILES\COPE GROUP INC\CAMPFIRE CIRCLE\DRAWINGS\3 SHEETS\5322 - STORM CATCHMENT PLAN (CT)



GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH
2	06/01/2026	ISSUED FOR SITE PLAN APPROVAL	JH
3	06/18/2026	REVISED SITE PLAN	JH
4	07/06/2026	REVISED SITE PLAN	JH
5	08/18/2026	REVISED SITE PLAN	JH

LEGEND

ID
HA | RC

ID: CATCHMENT ID
HA: CATCHMENT AREA (hectares)
RC: RUNOFF COEFFICIENT

CATCHMENT BOUNDARY

PROFESSIONAL ENGINEER
AUG. 18, 2026
G. G. J. POTTER
100139388
LICENSED
PROVINCE OF ONTARIO

JEWELL
ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

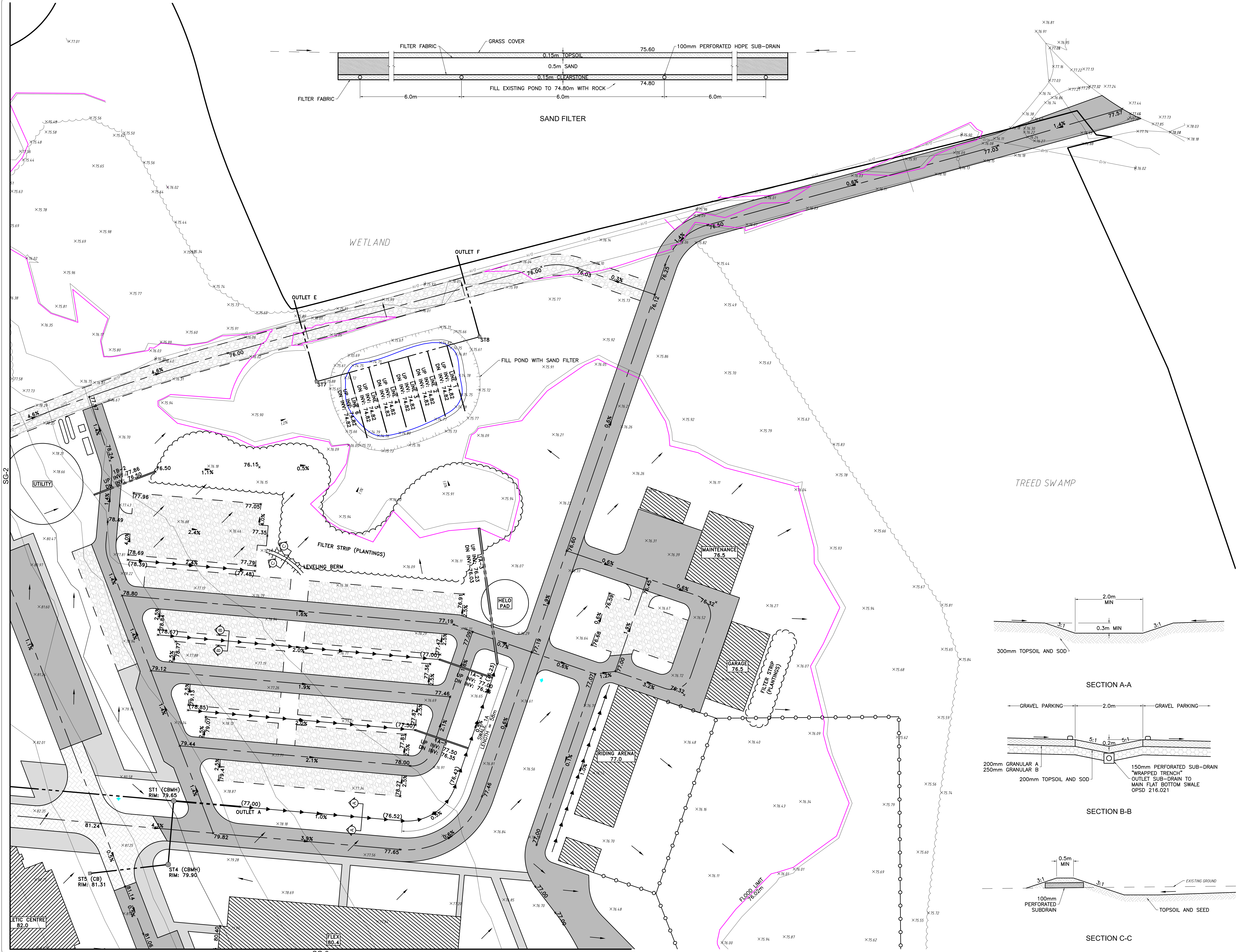
THE COUNTY OF PRINCE EDWARD

CATCHMENT PLAN
STORM
CULVERT CATCHMENTS

DRAWN BY: JH
PROJECT NO: 230-5322
DESIGNED BY:
DATE: August 2026
CHECKED BY: GP
SCALE: HORIZONTAL - 1:500
VERTICAL - N/A
APPROVED BY:
CONTRACT NO:
DRAWING NO: CT-3

APPENDIX C:
GRADING PLAN

08/18/2026



GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

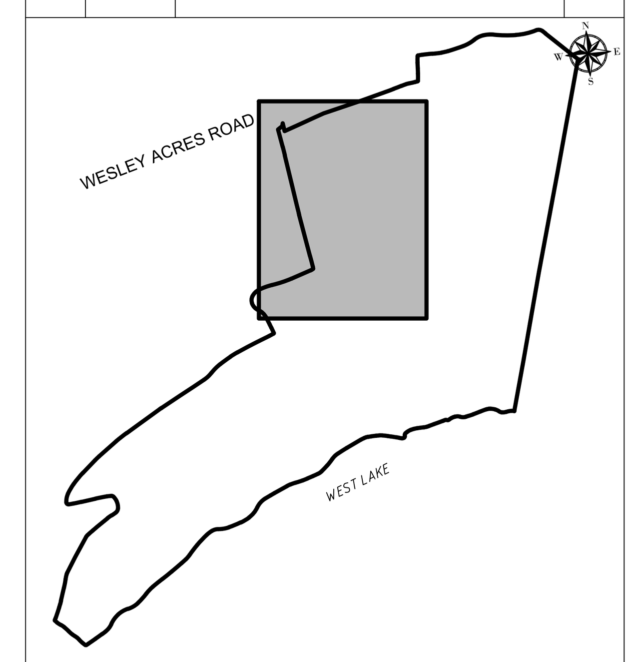
GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH
2	06/01/2026	ISSUED FOR SITE PLAN APPROVAL	JH
3	06/18/2026	REVISED SITE PLAN	JH
4	07/06/2026	REVISED SITE PLAN	JH
5	08/18/2026	REVISED SITE PLAN	JH



KEY PLAN

LEGEND

BUILDING
ASPHALT
CONCRETE
GRAVEL
PAVING STONES
SWALE
VEGETATION/GARDEN
OVERLAND FLOW
CULVERT
STORM SEWER
STORM STRUCTURES

LICENSED PROFESSIONAL ENGINEER
AUG. 18, 2026
G. G. J. POTTER
100139388
PROVINCE OF ONTARIO

JEWELL ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

THE COUNTY OF PRINCE EDWARD

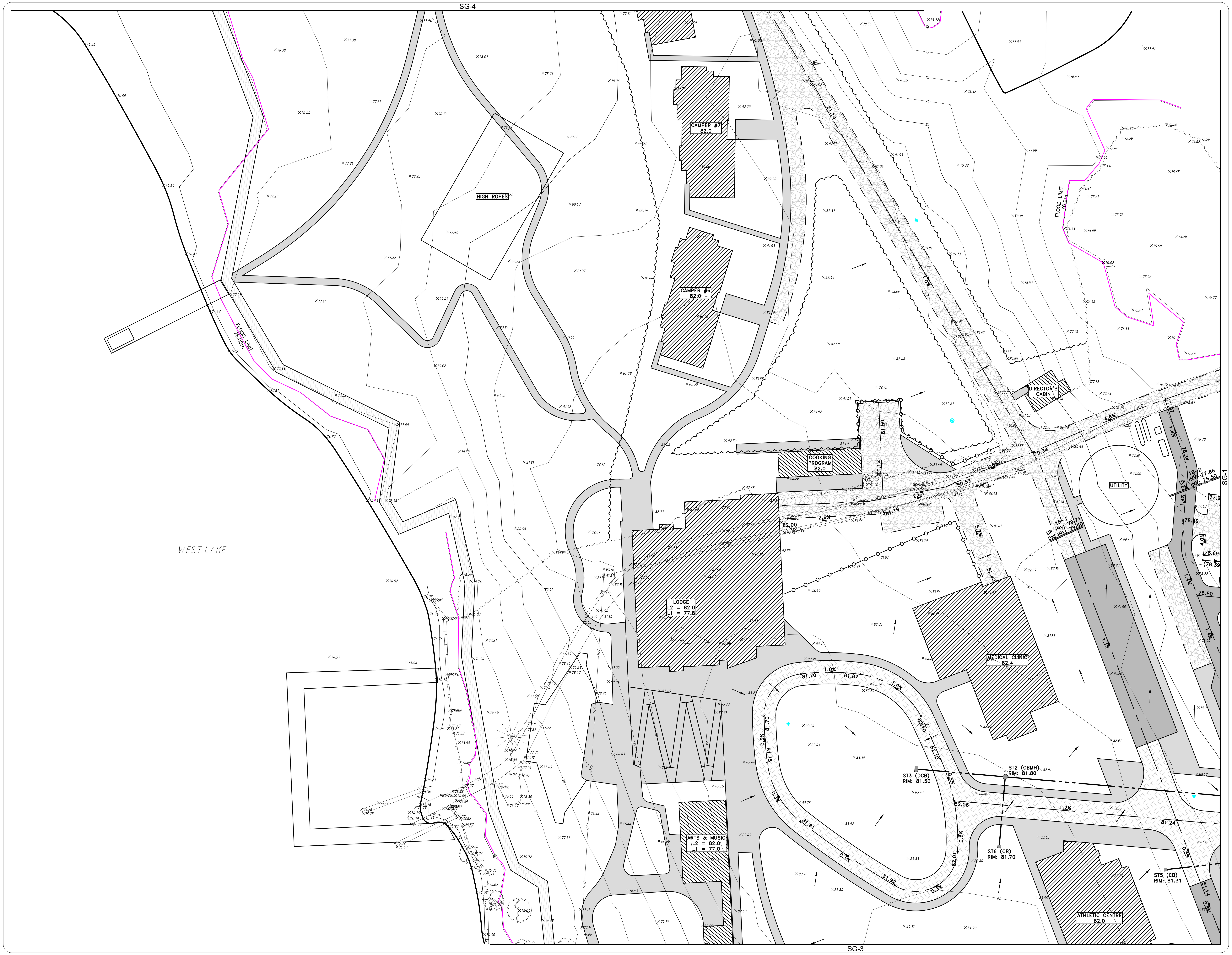
SITE GRADING PLAN

1 of 4

DRAWN BY: JH
PROJECT NO: 230-5322
DESIGNED BY:
DATE: August 2026
CHECKED BY: GP
SCALE: HORIZONTAL - 1:500 VERTICAL - N/A
APPROVED BY:
CONTRACT NO:
DRAWING NO: SG-1

F:\FTP\PROJECT FILES\COPE GROUP INC\CAMPFIRE CIRCLE\DRAWINGS\3 SHEETS\5322 - SITE GRADING PLAN (SG)

08/18/2026



GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

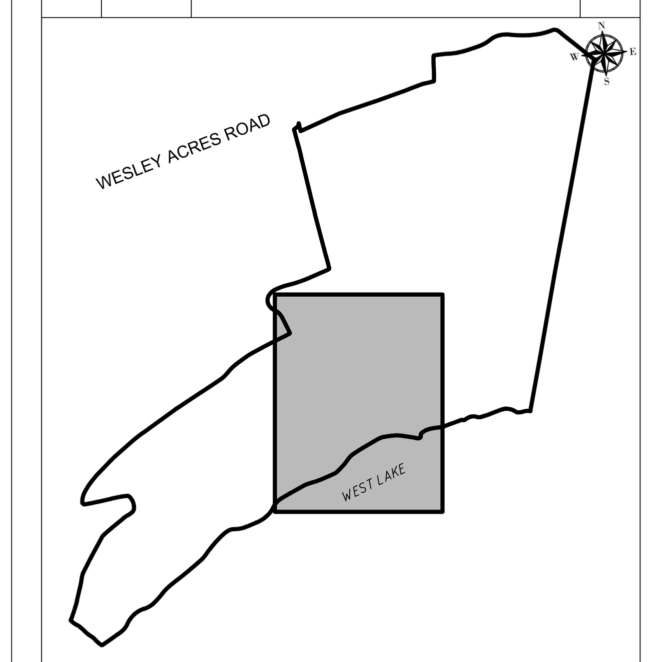
GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH
2	06/01/2026	ISSUED FOR SITE PLAN APPROVAL	JH
3	06/18/2026	REVISED SITE PLAN	JH
4	07/06/2026	REVISED SITE PLAN	JH
5	08/18/2026	REVISED SITE PLAN	JH



KEY PLAN

LEGEND

BUILDING
ASPHALT
CONCRETE
GRAVEL
PAVING STONES
SWALE
VEGETATION/GARDEN
OVERLAND FLOW
CULVERT
STORM SEWER
STORM STRUCTURES

LICENSED PROFESSIONAL ENGINEER
AUG. 18, 2026
G. G. J. POTTER
100139388
PROVINCE OF ONTARIO

JEWELL ENGINEERING

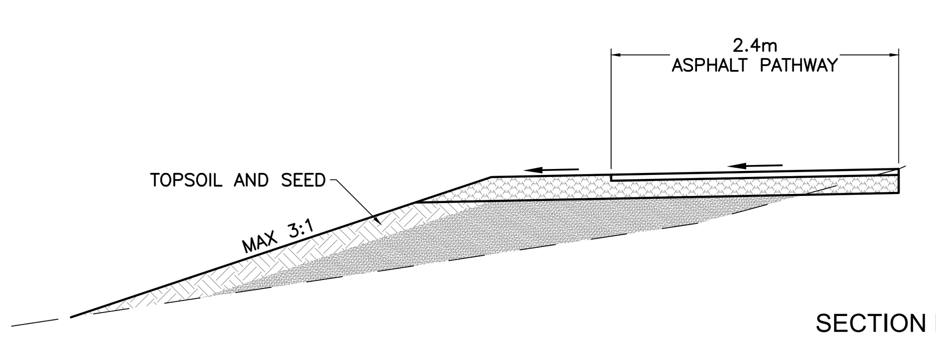
COPE GROUP
CAMPFIRE CIRCLE

THE COUNTY OF PRINCE EDWARD

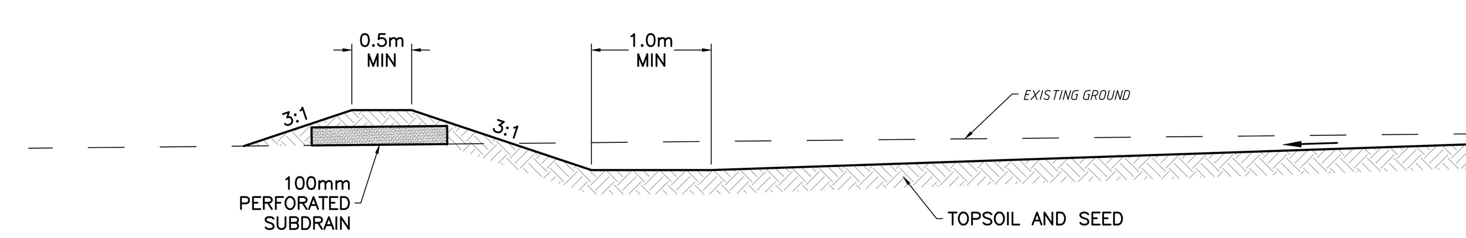
SITE GRADING PLAN
2 of 4

DRAWN BY: JH	PROJECT NO: 230-5322
DESIGNED BY:	DATE: August 2026
CHECKED BY: GP	SCALE: HORIZONTAL - 1:500; VERTICAL - N/A
APPROVED BY:	CONTRACT NO:
	DRAWING NO: SG-2

F:\FTP\PROJECT FILES\COPE GROUP INC\CAMPFIRE CIRCLE\DRAWINGS\3 SHEETS\5322 - SITE GRADING PLAN (SG)



SECTION D-D



SECTION E-E

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

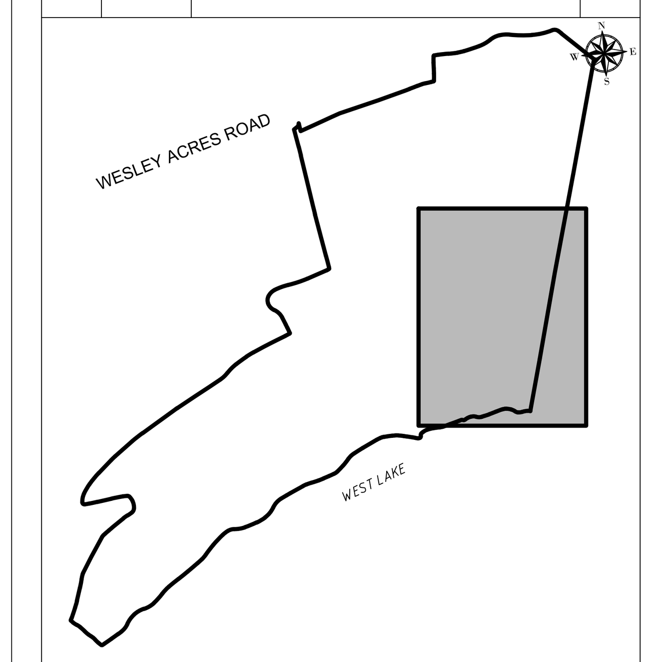
GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

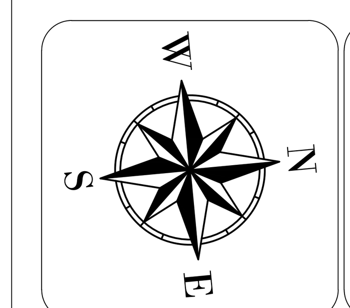
NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH
2	06/01/2026	ISSUED FOR SITE PLAN APPROVAL	JH
3	06/18/2026	REVISED SITE PLAN	JH
4	07/06/2026	REVISED SITE PLAN	JH
5	08/18/2026	REVISED SITE PLAN	JH



KEY PLAN

LEGEND

BUILDING
ASPHALT
CONCRETE
GRAVEL
PAVING STONES
SWALE
VEGETATION/GARDEN
OVERLAND FLOW
CULVERT
STORM SEWER
STORM STRUCTURES



JEWELL ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

THE COUNTY OF PRINCE EDWARD

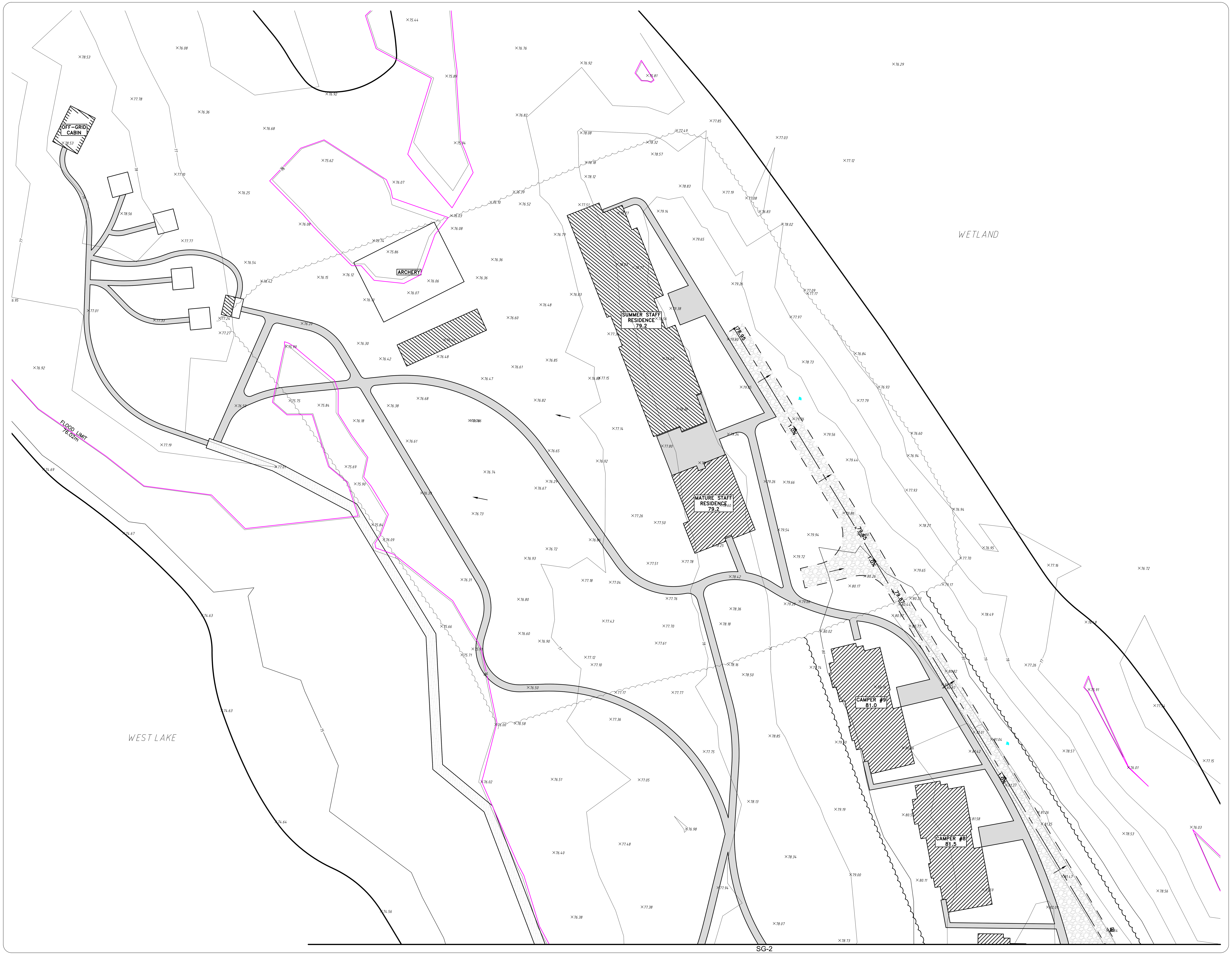
SITE GRADING PLAN

3 of 4

DRAWN BY: JH	PROJECT NO: 230-5322
DESIGNED BY:	DATE: August 2026
CHECKED BY: GP	SCALE: HORIZONTAL - 1:500 VERTICAL - N/A
APPROVED BY:	CONTRACT NO:
	DRAWING NO: SG-3

08/18/2026

F:\FTP\PROJECT FILES\COPE GROUP INC\CAMPFIRE CIRCLE\DRAWINGS\3 SHEETS\5322 - SITE GRADING PLAN (SG)



GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

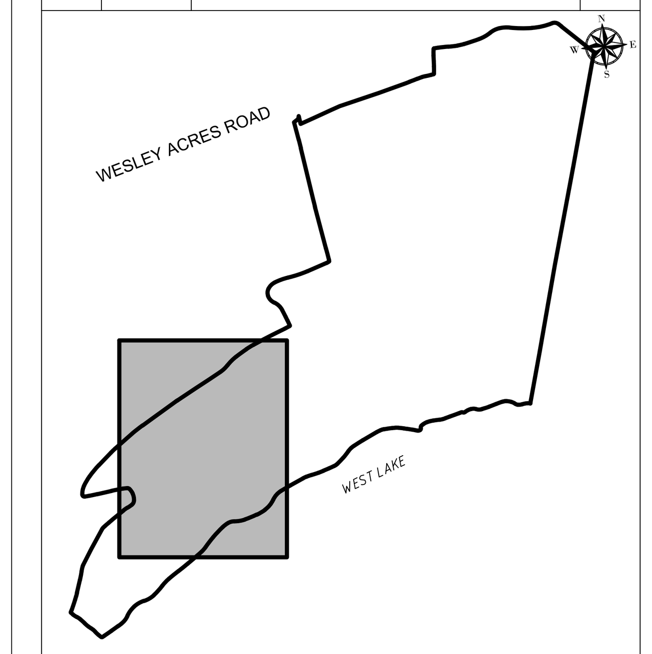
GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH
2	06/01/2026	ISSUED FOR SITE PLAN APPROVAL	JH
3	06/18/2026	REVISED SITE PLAN	JH
4	07/06/2026	REVISED SITE PLAN	JH
5	08/18/2026	REVISED SITE PLAN	JH



KEY PLAN

LEGEND

- BUILDING
- ASPHALT
- CONCRETE
- GRAVEL
- PAVING STONES
- SWALE
- VEGETATION/GARDEN
- OVERLAND FLOW
- CULVERT
- STORM SEWER
- STORM STRUCTURES

LICENSED PROFESSIONAL ENGINEER
AUG. 18, 2026
G. G. J. POTTER
100139388
PROVINCE OF ONTARIO

JEWELL ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

THE COUNTY OF PRINCE EDWARD

SITE GRADING PLAN

4 of 4

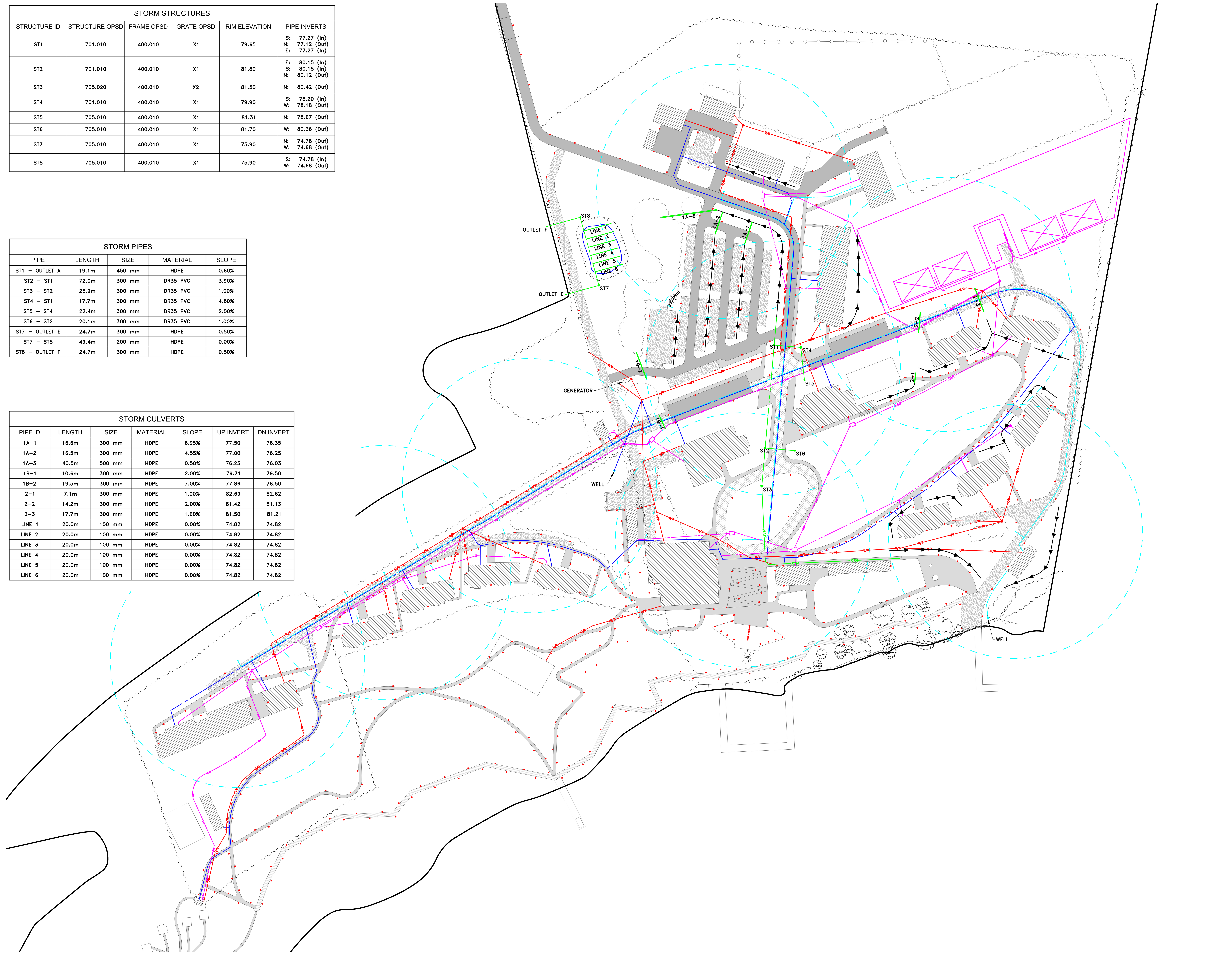
DRAWN BY: JH	PROJECT NO: 230-5322
DESIGNED BY:	DATE: August 2026
CHECKED BY: GP	SCALE: HORIZONTAL - 1:500; VERTICAL - N/A
APPROVED BY:	CONTRACT NO:
	DRAWING NO: SG-4

08/18/2026

STORM STRUCTURES					
STRUCTURE ID	STRUCTURE OPSD	FRAME OPSD	GRATE OPSD	RIM ELEVATION	PIPE INVERTS
ST1	701.010	400.010	X1	79.65	S: 77.27 (In) N: 77.12 (Out) E: 77.27 (In)
ST2	701.010	400.010	X1	81.80	E: 80.15 (In) S: 80.15 (In) N: 80.12 (Out)
ST3	705.020	400.010	X2	81.50	N: 80.42 (Out)
ST4	701.010	400.010	X1	79.90	S: 78.20 (In) W: 78.18 (Out)
ST5	705.010	400.010	X1	81.31	N: 78.67 (Out)
ST6	705.010	400.010	X1	81.70	W: 80.36 (Out)
ST7	705.010	400.010	X1	75.90	N: 74.78 (Out) W: 74.68 (Out)
ST8	705.010	400.010	X1	75.90	S: 74.78 (In) W: 74.68 (Out)

STORM PIPES				
PIPE	LENGTH	SIZE	MATERIAL	SLOPE
ST1 – OUTLET A	19.1m	450 mm	HDPE	0.60%
ST2 – ST1	72.0m	300 mm	DR35 PVC	3.90%
ST3 – ST2	25.9m	300 mm	DR35 PVC	1.00%
ST4 – ST1	17.7m	300 mm	DR35 PVC	4.80%
ST5 – ST4	22.4m	300 mm	DR35 PVC	2.00%
ST6 – ST2	20.1m	300 mm	DR35 PVC	1.00%
ST7 – OUTLET E	24.7m	300 mm	HDPE	0.50%
ST7 – ST8	49.4m	200 mm	HDPE	0.00%
ST8 – OUTLET F	24.7m	300 mm	HDPE	0.50%

STORM CULVERTS						
PIPE ID	LENGTH	SIZE	MATERIAL	SLOPE	UP INVERT	DN INVERT
1A–1	16.6m	300 mm	HDPE	6.95%	77.50	76.35
1A–2	16.5m	300 mm	HDPE	4.55%	77.00	76.25
1A–3	40.5m	500 mm	HDPE	0.50%	76.23	76.03
1B–1	10.6m	300 mm	HDPE	2.00%	79.71	79.50
1B–2	19.5m	300 mm	HDPE	7.00%	77.86	76.50
2–1	7.1m	300 mm	HDPE	1.00%	82.69	82.62
2–2	14.2m	300 mm	HDPE	2.00%	81.42	81.13
2–3	17.7m	300 mm	HDPE	1.60%	81.50	81.21
LINE 1	20.0m	100 mm	HDPE	0.00%	74.82	74.82
LINE 2	20.0m	100 mm	HDPE	0.00%	74.82	74.82
LINE 3	20.0m	100 mm	HDPE	0.00%	74.82	74.82
LINE 4	20.0m	100 mm	HDPE	0.00%	74.82	74.82
LINE 5	20.0m	100 mm	HDPE	0.00%	74.82	74.82
LINE 6	20.0m	100 mm	HDPE	0.00%	74.82	74.82



F:\FTP\PROJECT FILES\COPE GROUP INC\CAMPFIRE CIRCLE\DRAWINGS\3 SHEETS\5322 - SITE SERVICING PLAN (SS)

GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS			
NO.	DATE	DESCRIPTION	BY
0	08/15/2025	ISSUED FOR SITE PLAN APPROVAL	JH
1	02/02/2026	ISSUED FOR SITE PLAN APPROVAL	JH
2	06/01/2026	ISSUED FOR SITE PLAN APPROVAL	JH
3	06/18/2026	REVISED SITE PLAN	JH
4	07/06/2026	REVISED SITE PLAN	JH
5	08/18/2026	REVISED SITE PLAN	JH

LEGEND

- FIRE WATER SUPPLY
- DOMESTIC WATER SUPPLY
- SAN — SANITARY FORCEMAIN
- SANITARY GRAVITY MAIN
- SANITARY SERVICE
- SANITARY MANHOLE
- SANITARY PUMP CHAMBER
- STORM CULVERT
- STORM SEWER
- STM — POOL DRAIN (DESIGNED BY OTHERS)
- STORM STRUCTURES
- U/G — JOINT UTILITY TRENCH

PIPE SEPARATION NOTES:
- WHEN WATERMAIN CROSS A SEWER, A VERTICAL SEPARATION OF 0.5m SHALL BE MAINTAINED.
- WHEN A WATERMAIN PASSES SEWER STRUCTURES, A MINIMUM 0.5m HORIZONTAL SEPARATION SHALL BE MAINTAINED.
- HORIZONTAL SEPARATION BETWEEN WATERMAIN AND SEWER TO BE 3.0m (CENTRE-TO-CENTRE).

N
W
E
S

LICENSED PROFESSIONAL ENGINEER
AUG. 18, 2026
G. G. J. POTTER
100139388
PROVINCE OF ONTARIO

JEWELL ENGINEERING

COPE GROUP
CAMPFIRE CIRCLE

THE COUNTY OF PRINCE EDWARD

SITE SERVICING PLAN

1 of 1

DRAWN BY: JH	PROJECT NO: 230-5322
DESIGNED BY:	DATE: July 2026
CHECKED BY: GP	SCALE: HORIZONTAL - 1:1200 VERTICAL - N/A
APPROVED BY:	CONTRACT NO:
	DRAWING NO: SS-1

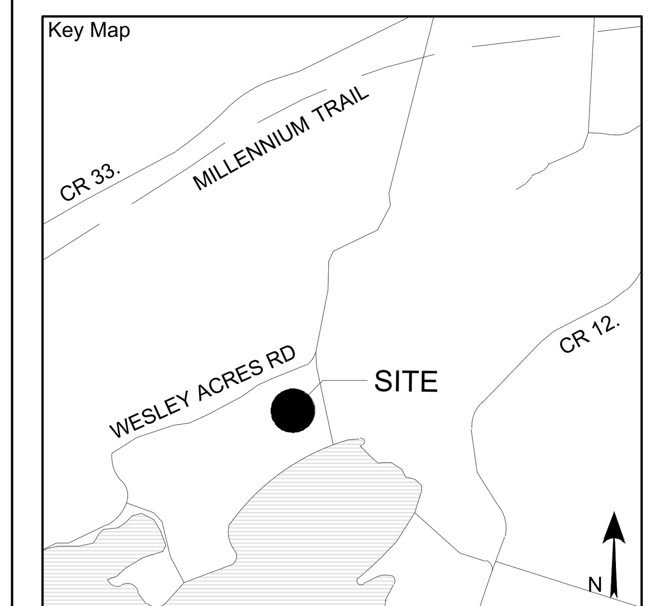
G:\Shared drives\Commercial Department\02 - PROJECTS\2023\23011-DC - Campfire Circle - SW\SHEET SET\23011 - Campfire Circle - L2.4 - Stormwater Management.dwg

Seal

North

No.	Issues and Revisions	Date
1.	ISSUED FOR SPA	2025-08-15
2.	ISSUED FOR COORDINATION	2026-01-27
3.	REISSUED FOR SPA	2026-02-06
4.	REISSUED FOR COORDINATION	2026-07-28

Key Map



Project Notes

This design and drawing are the property of The Scott Wentworth Landscape Group Ltd. and are not to be copied or used for construction purposes without the Landscape Architect's express written consent.

The contractor shall check and verify all dimensions and report any discrepancies, error, or omissions to the Landscape Architect prior to commencing work.

Base plan information taken from Site Plan provided by:
Company Name:
Dated:

Wentworth Landscapes
13392 Loyalist Parkway R.R.1, Picton ON K0K 2T0
613.547.3772

Consultants

WENTWORTH LANDSCAPES

Client
CAMPFIRE CIRCLE

Project
CAMPFIRE CIRCLE

Project Location
565 WESLEY ACRES ROAD
BLOOMFIELD, ON

Drawing Title
STORMWATER MANAGEMENT

Scale
1:1500

Date
2025-06-25

Plot Date
2026-07-28

Designed By
MH

Drawn By
PL/LT

Approved By
SW

Drawing Number
L2.4

Project Number
23011-DC

APPENDIX D:
STORM SEWER DESIGN SHEET

STORM SEWER DESIGN SHEET

Peak Runoff Estimate by Rational Method

$$Q = \frac{1}{360}\, C\, i\, A$$

Where:

Q = Peak Flow in cms
C = Runoff Coefficient
i = Rainfall Intensity in mm/hr
A = Area in hectares

Intensity for:

$$i = A * T_c^{B}$$

Where:

i = Rainfall Intensity in mm/hr
T_c = Time of Concentration in hours

5-Year Parameters

A = 25.2
B = -0.664

100-Year Parameters

A = 43.4
B = -0.674

Manning's Coef

CSP	0.024
RCP/PVC/HDI	0.013

Pipe Capacity by Manning's Equation

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

A = area of pipe in m^2
R = Hydraulic radius = A / P
P = Wetted perimeter
S = Slope (m/m)
n = Manning's friction coef.

Check

$q \leq Q$

$V \leq 6\, m/s$

LOCATION			PEAK FLOW CALCULATION									PROPOSED SEWER								
Catchment	Upstream Structure	Downstream Structure	Catchment Areas Runoff Coefficient 0.15	0.60	0.90	R.C. x A ha	Cumulative R.C. x A ha	Time of Concentration min	Intensity mm/hr	Peak Flow m^3/s	Pipe Size/ Swale Width (mm)	Length (m)	Type	Grade (use m/m) (%)	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow min	Actual Velocity Q_d (m/s)	Check Capacity
5-Yr																			
1A-1	ST3	ST2	0.30		0.25	0.27	0.27	10.00	82.8	0.06	300	25.9	PVC	1.00%	0.10	1.37	0.30	1.45	OK
1A-2	ST6	ST2	0.15		0.01	0.03	0.03	13.86	66.7	0.01	300	20.1	PVC	1.00%	0.10	1.37	0.45	0.75	OK
1A-3	ST2	ST1	0.04		0.14	0.13	0.43	14.31	65.3	0.08	300	72.0	PVC	3.90%	0.19	2.70	0.47	2.56	OK
1A-4	ST5	ST4	0.03		0.09	0.09	0.09	10.00	82.8	0.02	300	22.4	PVC	2.00%	0.14	1.93	0.27	1.37	OK
1A-5	ST4	ST1	0.09			0.01	0.10	10.27	81.4	0.02	300	17.7	PVC	4.80%	0.21	3.00	0.15	1.95	OK
1A-6	ST1	Outlet A	0.02		0.13	0.12	0.65	14.77	63.9	0.12	450	19.1	HDPE	0.60%	0.22	1.39	0.23	1.40	OK

Jewell Engineering Inc
1-71 Millennium Parkway
Belleville, ON, K8N 4Z5
Ph. 613-969-1111
Fx. 613-969-8988
www.jewelleng.ca

Designed: Graham Potter, P.Eng.
Checked: Graham Potter, P.Eng.
Date: Wednesday, August 19, 2026

Project:
Campfire Circle
Bloomfield, Ontario