GREER GALLOWAY
CONSULTING ENGINEERS

Blocknote Preliminary Stormwater Management Report
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Submitted by:

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1. Introduction

The Greer Galloway Group (GGG) has been retained by Blocknote Canada Inc. to provide engineering services to support the development of a winery and Destination Resort. This report has been prepared as a preliminary stormwater design to support rezoning approval.

The proposed development will include the addition of a hotel, restaurant, spa and winery building, parking for each building and new roadway. Stormwater elements will include the following:

- Post development drainage will continue to follow the existing 'lay of the land' flowing in a south easterly direction to the existing water course crossing the property.
- Conveyance will be via rural style open ditch / culvert roadside features and shallow swales or perimeter grading around buildings and other development features.
- Treed areas will remain generally undisturbed and several existing agricultural fields will continue as vineyards or be used for other crops.
- Stormwater quality and quantity treatment will be provided by a series of low impact development (LID) approaches.
- Due to the variable depth to bedrock across the site, the location and depth of LID systems will be confirmed once a more thorough understanding of these conditions are known via geotechnical investigation. Observations made during well drilling and knowledge of the area suggests shallow rock will be present but can be accommodated.
- There are 4 principal development areas: the spa; hotel / restaurant; winery; and access laneways.
- Separate bioretention features will be constructed to provide stormwater quality treatment for each of the spa, hotel / restaurant and winery development areas.
- Enhanced grassed swales and flow check dams will provide stormwater quality treatment for roadside drainage.
- A perimeter ditch along the east property line will capture runoff and convey both minor and major storm events to the existing water course.
- Quality treatment bioswales will be constructed in coordination with quantity conveyance perimeter ditches.

1.1 Design Criteria

The design criteria for the stormwater management system are based on the requirements of Quinte Conservation, the Ministry of the Environment, Conservation, and Parks (MECP), and Prince Edward County. The key design criteria are listed below:

- Post development runoff quantities are to be controlled to pre development levels for applicable storm events;
- The proposed development will require Enhanced (Level 1) treatment as defined by the MECP is required; and
- Sediment transference and erosion is to be mitigated during and after construction.

2. Existing Conditions

The development site is located in Prince Edward County, on the east side of the intersection of Partridge Hollow Road and Loyalist Parkway. The portion of the property where all development is proposed drains south/southeast to an existing water course.

Figure 2-1: Project Site and Drainage Patterns

The existing site is composed of agricultural field and woodland. The Ontario Soil Survey identifies the soil as clay loam and clay (Figure 2-2). Based on the clay soil the catchment has been assigned to hydrologic soil group D and is considered to be poorly drained.

	Good	Imperfect
	HILLIER	ELMBROOK
	Clay loam Hc—25,600	Clay Ec—14,500 Clay loam Ec-l—4,600
	Undulating to rolling	Level to undulating
	Very stony	Stonefree
	Alkaline	Slightly acid to neutral
	Moderately shallow, 3 feet and less, well developed. Surface soil contains an abundance of angular limestone fragments.	Weakly developed. Some mottling in A_3 horizon. Areas where bedrock occurs at depths less than 3½ feet mapped as shallow over bedrock (Ec-s).

Group D soils are clay loam, silty clay loam, sandy clay, silty clay or clay. This HSG has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.

Figure 2-2: Site Soil Conditions

3. Proposed Development

The proposed development is to include new buildings, roadway and parking resulting in approximately 19,150 m^2 of new impervious land cover. The proposed post development site is shown below in Figure 3-1 below.

Post development stormwater treatment for buildings and parking lots will be provided by three bioretention swales each treating runoff from a different group of buildings and parking area. The exact location of the bioretention swales will be finalized as part of the site plan approval process but they will be located immediately downstream of their proposed treatment areas and convey flow along a path parallel to the proposed grading.

The significant size of the land and relatively low impervious to natural lands ratio of the development provides ample opportunity to accommodate any necessary stormwater quality or quantity treatment.

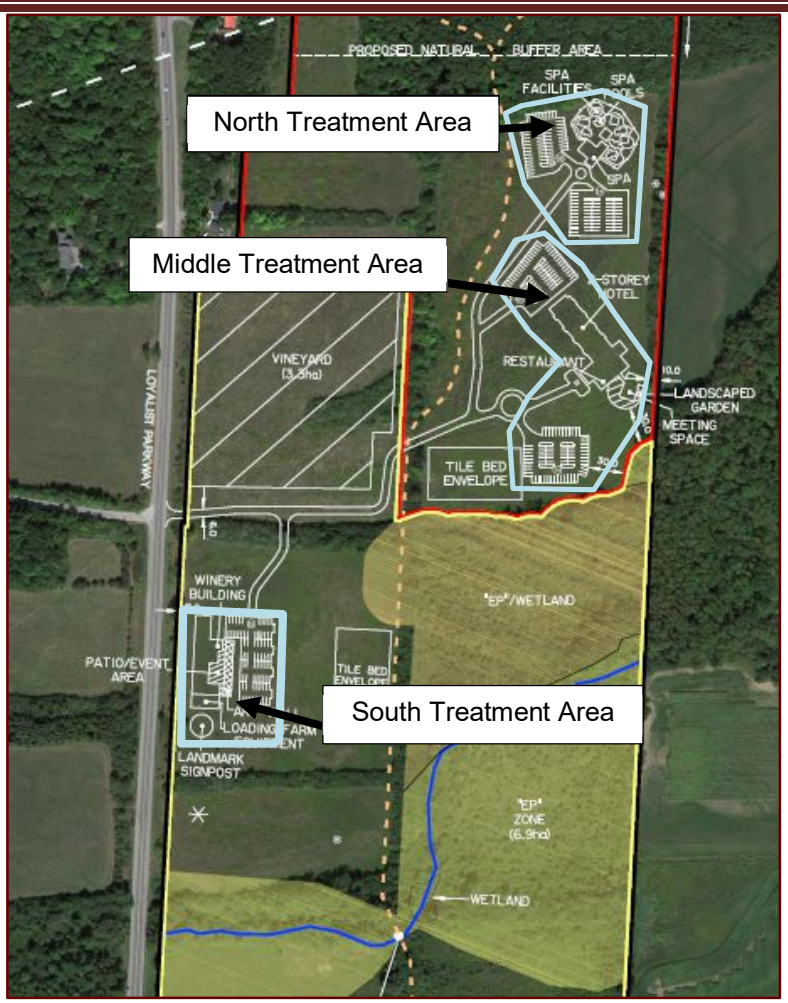

Figure 3-1: Post Development Drainage Catchment

Drainage form the site will be conveyed to the existing watercourse via a ditch along the east property boundary. It is intended to tie the bioretention swales into this ditch so all run off is conveyed to and treated prior to being outlet to the existing watercourse.

3.1 Bioretention Swales

Due to the poor drainage of the soils on site the bioretention swales will not be designed for infiltration but will still provide effect removal of pollutants via sedimentation, filtering, soil adsorption, microbial processes and plant uptake.

The bioretention swales have been sized to have adequate water quality storage based on MOECP requirements (shown in Figure 3-2) below, sizing has been performed based on hybrid wet pond/ wetland criteria.

The bioretention swales will consist of a 0.5 m deep, 5.0 m wide trench filled with an engineered soil media having a design porosity of 0.4. A summary of proposed bioretention swale dimensions is shown in Table 3-1 below. The bioretention swales have been designed to be shallow due to the typically shallow depth to bedrock in Prince Edward County. Swale depth may be modified once more information is provided by the geotechnical report.

To ensure the bioretention swales have adequate conveyance capacity for large storm events a ponding area on top of the bioretention swale will be created by banks allowing for a ponding depth of 0.3-0.4 m. A series of check dams can be installed in this ponding area to limit storm flow to predevelopment levels during storm events.

Additional Quantity control and pretreatment can be provided in a forebay immediately upstream of the bioswale. This forebay can account for a part of the water quality treatment volumes which would allow sizing of the bioswales to be reduced.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Figure 3-2: MOECP Water Quality Volume Requirements

Table 3-1: Summary of Pre-Development Catchment Properties			
Bioretention Swale	**North**	**Middle**	**South**
Catchment Area (ha)	1.20	1.26	0.58
Impervious Area (ha)	0.50	0.57	0.36
% Impervious	41.77	44.86	62.35
Water Quality Volume/Area (m3/ha)	130	130	175
Water Quality Volume (m3)	156	163.8	102.3
Depth (m)	0.5	0.5	0.5
Void Ratio	0.4	0.4	0.4
Footprint Area (m2)	780	819	512
Width (m)	5	5	5
Length (m)	102.3	163.8	156.0

3.2 Enhanced Grass Swales

The proposed enhanced grass swales will be used to convey storm flows and provide quantity and quality control for stormwater drainage from onsite laneways. Swales will be adequately sized to convey design storm flows. Check dams and vegetation in the swales will slow flows and allow for sedimentation and filtration of runoff and check dams will be designed to allow pond for periods no greater than 24 hours.

4. Conclusions

Based on the analysis conducted as part of this review, it is concluded that it is possible to provide the necessary stormwater management measures to mitigate any adverse effects of the proposed development relating to stormwater quality and quantity. It can also be concluded that:

1. Sufficient capacity for the conveyance of storms to the storm water management facility will be provided for up to the 100 year return period storm.
2. Peak runoff flows will be controlled to existing rate or less for storm events with return periods ranging up to 100 years.
3. The bioretention swales and enhanced grass swales provides adequate treatment of for enhanced quality stormwater effluent.

Respectfully submitted,

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