GREER GALLOWAY
CONSULTING ENGINEERS

Stormwater Brief
1990 Fry Road, Prince Edward County

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Prepared for:

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c/o RFA Planning

Submitted by:

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1 INTRODUCTION

The Greer Galloway Group has been retained to complete a stormwater brief for the rural property located at 1990 Fry Road. Due to the rural and minor (as it relates to stormwater) nature of the proposed changes relative to the overall property and its surroundings, a less intensive 'brief' has been confirmed as acceptable by County staff.

2 EXISTING CONDITIONS

The subject property is located at #1990 Fry Road in Prince Edward County.

The property is largely agricultural with a single family home residence.

The property is roughly 16.7 hectare (41 acres) in size, is agriculturally based, with an existing house and 2 farm buildings, including barn (with silos) and quonset hut.

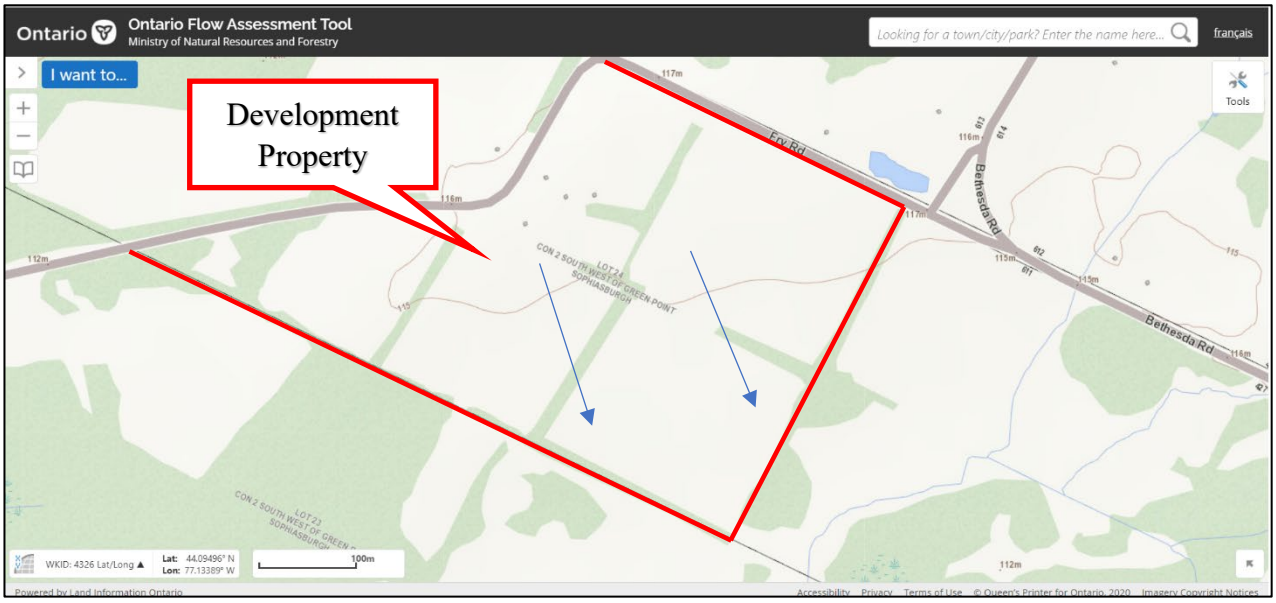
The lands associated with these buildings will be the focus of the proposed development. Surrounding agricultural lands will remain agricultural and in the context of stormwater, unchanged.

An aerial image (GoogleMaps) of the property is provided below with additional images from other sources appended.

The Ontario Flow Assessment Tool (website) provides general grade and watercourse information for the property and surroundings lands.

As illustrated in the image below, the following is understood:

- Fry Road has an elevation in the range of 116-117m along the property frontage.
- The portion of the property that contains the existing structures is roughly similar in elevation to the road, and higher than 115m.
- Lands fall to the east and south to a series of watercourses and wetland areas whose elevation is roughly 112m.
- With the closest watercourse scaled to be 385m away, this would reflect an average slope of 0.8%.



Consulting the Ontario Soil Mapping / Soil Survey Report No. 10 for Prince Edward County (1947) the following soil conditions are likely to be found on the property:

- Soil Material: Moderately shallow over bedrock; 1-3 feet of soil over bedrock.
- Natural Drainage: Good
- Soil Type: Ameliasburg Loam (Al)

(It's noted that this soil mapping identifies a gravel pit on the north side of Fry Road in the general area of the subject property.)

Grades are irregular and lands are fully vegetated providing for areas of isolated ponding and irregular localized drainage.

3 PROPOSED DEVELOPMENT

A preliminary development plan image (appended) was provided which notes the following development elements across the property:

- 4 acre wild flower meadow and honey collection.
- 8 acres of planned fruit and botanical orchards.
- Public botanical garden.
- 20 acres of working farm (corn, wheat, oats, cereals).
- 3 bedroom boutique bed and breakfast (converted existing home).
- 1500 ft2 quanset hut licensed for alcohol manufacturing.
- Licensed barn tap room and retail bottle shop.
- 2 severed parcels.

RFA Planners has prepared a site plan drawing of the proposed development, an excerpt is below.

The proposed plan includes:

- Repurposing of the existing buildings (no significant building additions are anticipated).
- Removal of 1 of the 2 existing gravel entrances and associated laneway.
- Addition of 2 gravel parking areas. A 4 space parking area will be provided for the bed and breakfast building; and a 17 space parking area for the distillery and commercial elements.
- Various landscaping works to reflect the inclusion of commercial / tourism based land uses along with continued agricultural land use.

(Note: It is reasonable to anticipate some minor changes in the site plan as the approval process runs its course. Only changes that are felt to be significant and directly relevant may warrant a revision to this document.)

4 ANALYSIS BACKGROUND

4.1 LEVEL OF DETAIL REQUIRED

Being a rural site where the development is small relative to the property (which is largely vegetated with permeable surfaces) and there are unlikely to be any measurable impacts on adjacent lands, we believe a highly detailed stormwater report is not necessary. Accordingly, the following is intended to show, with reasonable certainty, what if any impact the proposed development will have on surrounding lands and whether a more detailed investigation is warranted.

4.2 PEAK FLOW RATE CALCULATION

The most common methods used to assess peak flow rates are those based on modelling of the precipitation-runoff process. These methods use statistical representations of the precipitation record, from a rainfall gauging station (e.g. Intensity-Duration-Frequency IDF curve), combined with physical parameters representing the catchment (e.g. area, length, slope, and runoff coefficient), to calculate the peak flow rate at a particular location in a catchment area. One of these methods is the Rational Method which is suitable for small land development sites.

4.3 RATIONAL METHOD

The Rational Method calculates the peak flow rate at a particular location in a catchment due to the runoff contributed from the entire upstream catchment area. The Rational Method is represented by then following equation:

$Q = 0.0028CiA$, where

C = Runoff Coefficient; i = Rainfall Intensity (mm/h); A = Area of Catchment (m2)

The Ministry of Environment (now Ministry of Environment, Conservation and Parks) Drainage Management Manual states applications where it's appropriate to use the Rational Method to estimate peak flows include:

- Small drainage areas including watersheds less than 100 hectare in size.
- Determination of peak flows to size channels, sewers, ditches and culverts.
- Preliminary design estimation for drainage systems.
- Flow estimation to design erosion and sediment control devices.

As this subject site is a small rural catchment with a low level of detail required, the Rational Method will be used to estimate peak flows.

4.4 TIME OF CONCENTRATION

The time of concentration is a measure of the total time that it takes a drop of rain to travel the longest flow path in a catchment area.

When the time of concentration is reached, the entire catchment is contributing to the flow at the catchment confluence point.

A minimum time of concentration of 15 minutes will be used.

Time of concentration is calculated using one of the following formulas:

Bransby William Formula – Used if Rational Method runoff coefficient is greater than 0.40.

$$Tc = 0.057L / S_w^{0.2}A^{0.1}$$

Airport Equation – Used if Rational Method runoff coefficient is less than 0.40.

$$Tc = 3.26(1.1-C)L^{0.5} / S_w^{0.33}$$ where,

Tc = time of concentration, minutes
C = Rational Method runoff coefficient
L = catchment or watershed length, m
S_w = catchment or watershed slope, %
A = catchment or watershed area, ha

4.5 INTENSITY-DURATION-FREQUENCY

An IDF curve is a statistical relationship of rainfall intensity corresponding to a specified storm duration and frequency for a given location.

IDF curves are used where precipitation field measurements on a drainage system are not available, and precipitation must be estimated from secondary sources. Besides being quick and

easy to use, this data is readily available. IDF curves are one of the most widely used forms of rainfall data.

IDF rainfall data is used to estimate flows for the design of minor drainage systems with the Rational method. With IDF curves, it is possible to determine the average rainfall intensity likely to be attained or exceeded in a specific location and for a specific frequency at a given location.

IDF information is obtained through the MTO IDF Curve Lookup website.

5 PRE DEVELOPMENT PEAK FLOW

Following the Rational Method principals previously noted, the following is provided:

Existing Peak Flow Calculations - 100 Year Event (Major Event Design Flow)

Drainage Area #1 - Subject Property

Runoff Coefficients:			
10 Year			
Pasture (Open Space) =	0.28	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)	
Woodland or Cutover =	0.25	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)	
Gravel Surface =	0.60	(MTO Design Chart 1.07, Max Value)	
Impervious Surfaces =	0.95	(MTO Design Chart 1.07, Max Value)	
100 Year (+25%)			
Pasture (Open Space) =	0.35	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)	
Woodland or Cutover =	0.31	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)	
Gravel Surface =	0.75	(MTO Design Chart 1.07, Max Value)	
Impervious Surfaces =	0.95	(MTO Design Chart 1.07, Max Value)	
Contributing Areas (Excluding Severed Lots):			
Pasture (Open Space) =	13.527	ha	
Woodland or Cutover =	0.000	ha	
Gravel Surface =	0.106	ha	
Impervious Surfaces (Buildings) =	0.067	ha	
Total Area =	13.700	ha	
Composite Runoff Coefficient:	0.36		
Drainage Length:	350	meters	
Elevation (Upper):	-	meters	
Elevation (Lower):	-	meters	
Drainage Slope (85-10):	0.8	%	
Kirpich	Tc:	11.4	
Airport (C<0.4)	Tc:	48.8	
Bransby-Williams (C>0.4)	Tc:	6.4	
Time of Concentration:	49	minutes	
Intensity:	57	mm/h	
Peak Flow:	**0.774**	**m^3/s**	
Peak Flow:	**774.4**	**l/s**	

IDF Curve Values - East of Picton

$i = A / (t_d+B)^c$

A = 46.4 c = -0.699

Belleville IDF Curve Data - 100 Year Event

Storm Event (min.)		Intensity (mm/h)	
5	-	264	-
10	-	162	-
15	-	122	-
-	0.0	-	0.0
30	-	75	-
-	48.8	-	57.2
60	-	46	-
-	0.0	-	0.0
120	-	29	-
-	0.0	-	0.0
360	-	13	-
-	0.0	-	0.0
720	-	8	-
-	0.0	-	0.0
1440	-	5	-

6 POST DEVELOPMENT PEAK FLOW

Post Development Peak Flow Calculations - 100 Year Event (Major Event Design Flow)

Drainage Area #1 - Subject Property

Runoff Coefficients:				
10 Year				
Pasture (Open Space) =	0.28	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)		
Woodland or Cutover =	0.25	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)		
Gravel Surface =	0.60	(MTO Design Chart 1.07, Max Value)		
Impervious Surfaces =	0.95	(MTO Design Chart 1.07, Max Value)		
100 Year (+25%)				
Pasture (Open Space) =	0.35	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)		
Woodland or Cutover =	0.31	(MTO Design Chart 1.07, Rural, 0-5%, Average Soil Drainage)		
Gravel Surface =	0.75	(MTO Design Chart 1.07, Max Value)		
Impervious Surfaces =	0.95	(MTO Design Chart 1.07, Max Value)		
Contributing Areas:				
Pasture (Open Space) =	13.496	ha	IDF Curve Values - East of Picton	
Woodland or Cutover =	0.000	ha	$i = A / (t_d+B)^c$	
Gravel Surface =	0.137	ha	A = 46	c = -0.699
Impervious Surfaces (Buildings) =	0.067	ha	Belleville IDF Curve Data - 100 Year Event	
Total Area =	13.7	ha		
Composite Runoff Coefficient:	0.36			
Drainage Length:	350	meters		
Elevation (Upper):	-	meters		
Elevation (Lower):	-	meters		
Drainage Slope (85-10):	0.8	%		
Kirpich	Tc:	11.4		
Airport (C<0.4)	Tc:	48.8		
Bransby-Williams (C>0.4)	Tc:	6.4		
Time of Concentration:	49	minutes		
Intensity:	57	mm/h		
Peak Flow:	**0.777**	**m^3/s**		
Peak Flow:	**777.2**	**l/s**		
Change: **Peak Flow:**	**0.004**	**m^3/s**	0.35%	
Peak Flow:	**2.743**	**l/s**		

Storm Event (min.)		Intensity (mm/h)	
5	-	264	-
10	-	162	-
15	-	122	-
-	0.0	-	0.0
30	-	75	-
-	48.8	-	57.2
60	-	46	-
-	0.0	-	0.0
120	-	29	-
-	0.0	-	0.0
360	-	13	-
-	0.0	-	0.0
720	-	8	-
-	0.0	-	0.0
1440	-	5	-

The calculations suggest the proposed site works may result in an increase in runoff of less than 1% of the existing. This magnitude of increase is negligible and unlikely to result in any measurable impact on the surrounding lands and/or watercourses based on the rural nature of the area and the small scale of the development relative to the property as a whole.

It is likely that site grading typical to developments such as this (isolated shallow grassed ditches or swales combined with sheet flow over vegetated surfaces) will be utilized for drainage conveyance on the property. We believe existing conditions and these measures are adequate to address any development stormwater quality and quantity concerns.

7 SUMMARY

Based on the information presented in this stormwater brief, we can provide the following:

1. The proposed development will not significantly impact stormwater runoff conditions on the property.
2. Existing conditions combined with any constructed vegetated ditches, swales and sheet flow will be adequate to address any stormwater concerns that may result from the development.
3. There is no risk of damage to up or downstream property; the public road system is not impacted; and there is no threat to safety or the natural environment that warrants a more detailed analysis.

Respectfully submitted,

THE GREER GALLOWAY GROUP INC.
CONSULTING ENGINEERS

Matthew McIntosh, P. Eng.
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APPENDIX A
Images

Image 1: Prince Edward County GIS: Property Boundary and Aerial Imaging

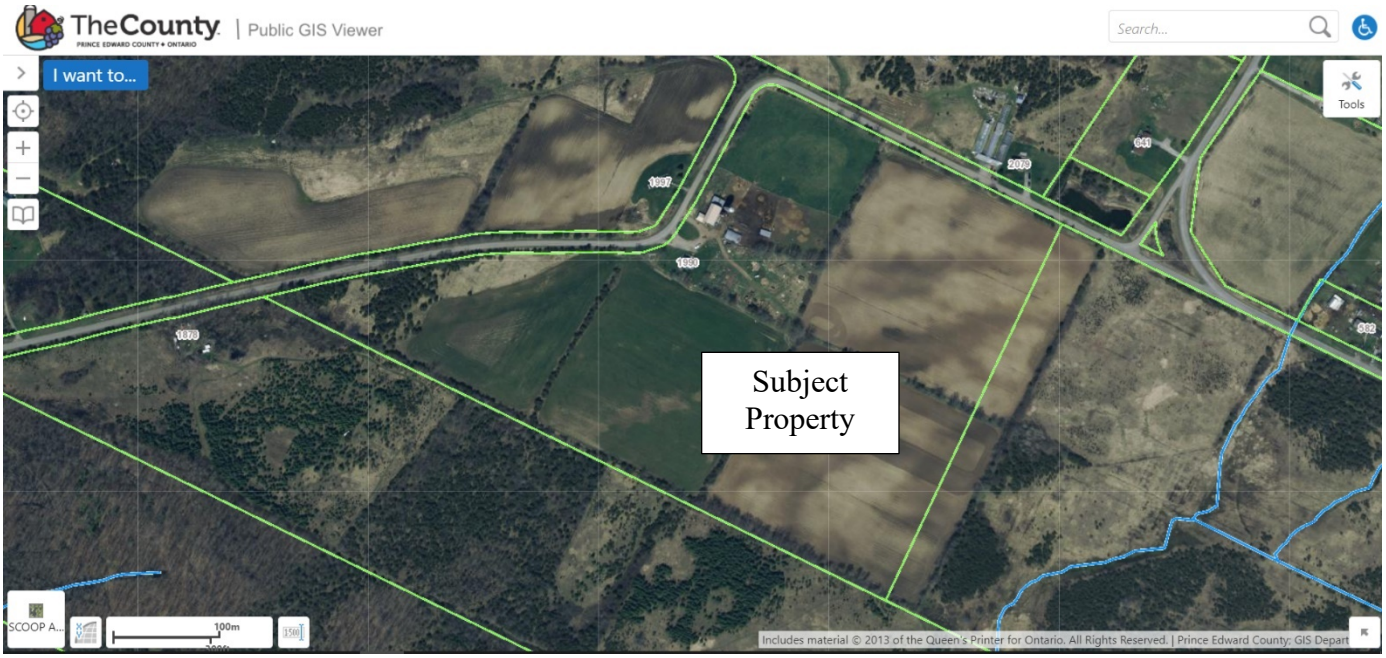

Image 2: Prince Edward County GIS: Property Boundary; Zoning and Surrounding Watercourses

Image 3: Preliminary Development Plan

Image 4: Site Visit Photo of Principal Development Area