

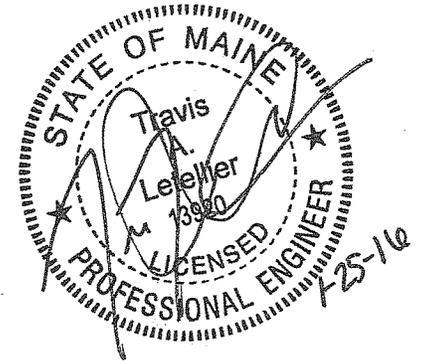


***Northeast  
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***Memorandum***

TO: Town of Manchester, Maine  
FROM: Travis Letellier, P.E.  
DATE: January 26, 2016  
RE: Drainage Analysis – Dollar General



Northeast Civil Solutions, INC. (NCS) has completed a drainage analysis of a proposed Dollar General Retail Store development located at 1034 Western Avenue, in Manchester, Maine.

**Site Layout**

The existing site consists of a relatively flat front section with a drainage swale along the easterly property line. The rear and east side of the property drops sharply and is largely undevelopable due to the severe elevation change. The placement of the building takes full advantage of the flatter section in the front site, however due to the standard building length, parking stalls and extended aisle width a small retaining wall will be required to avoid disturbance too close to the stream. The layout of the building will preserve the natural drainage paths of the site.

44 parking spaces will be provided for the development and a waiver will be needed as the town requires 48 spaces. Two spaces will be designed per ADA accessible parking standards. The proposed driveway will include one entrance and two exit lanes and will be a total of 36 feet in width, easily handling the anticipated average daily and peak hourly traffic demands. The parking aisles are designed wider than needed to accommodate a WB-67 delivery truck without impacting any parking stalls.

Construction will disturb 63,270 sf (1.45 ac) and will result in 34,924sf (0.80 ac) of impervious area and 10,000 sf (0.23 ac) of landscaped area.

**Study Methodology**

In this study, the Soil Conservation Services Urban Hydrology for Small watersheds, Technical Release 20 (also known as SCS-TR20) was utilized to model the surface water drainage patterns for the post development drainage conditions. HydroCAD Stormwater Modeling System Software (Version 10.00) was used for the SCS TR20 calculations. The SCS TR-55 method was used to estimate the Time of Concentration (Tc). This method involves estimating the length of sheet flow, shallow concentrated flow and channel flow that occurs within each sub-catchment. From this information, the time of concentration is determined for the watershed. HydroCAD calculations are included with this report.

Modeling was conducted using the 2, 10 and 25-year storm events. The estimated watershed area of 2.44 acres was derived from an on the ground survey completed by NCS, Inc.

**Stormwater Quality/Quantity**

The development is located in the watershed of Cobbosseecontee Lake and is identified as an impaired lake per the state Department of Environmental Protection (DEP). The development will also disturb more than an acre of land and will require a Stormwater Law Permit through the DEP. Treatment will be handled by an underground collection system within the bounds of the parking lot which will direct stormwater to a large forested buffer in the rear of the site beyond the electric easement. The buffer is designed per Maine DEP standards and will mitigate both the peak stormwater flow and phosphorous export. Please see the attached phosphorous export and buffer sizing calculations that show conformance with the town ordinance for meeting the phosphorous budget on phosphorous export.

During construction the site will utilize erosion control measures, per Maine DEP standards, to ensure there is no adverse impact downstream.

Table 1 below compares the pre-development and post-development peak stormwater flows from the area of analysis at study point #1 (SP-1)

**Table 1**

Storm Event	Pre-Development (cfs)	Post-Development (cfs)	Difference (cfs)
2-year	2.4	2.7	+0.3
10-year	5.1	4.8	(0.3)
25-year	7.1	6.5	(0.6)

By inspection of table 1 above the peak discharge only increases minimally in the 2 year storm even and due to the length of the stone lipped spreader where stormwater will be discharged there is no anticipated detrimental downstream effect due to the slight increase.

## **Maintenance Plan**

Franklin Land Associates, LLC will be responsible for the maintenance of the stormwater infrastructure as well as the establishment of maintenance contracts. At a minimum the appropriate and relevant activities for each of the stormwater management facilities will be performed on the prescribed schedule.

A sample of the Maintenance Log is included with this report. Records of all inspections and maintenance work accomplished must be kept on file and retained for a minimum 5-year time span. The maintenance logbook shall be made available to the DEP upon request.

### **Recertification Requirement**

Within three months of the expiration of each five-year interval from the date of issuance of the permit, the permittee shall certify the following to the department.

- (a) All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.
- (b) All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the facilities.
- (c) The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the department, and the maintenance log is being maintained.

### Sweeping

Paved surfaces shall be swept or vacuumed at least twice annually in the spring to remove all winter sand, and periodically during the year on an as-needed basis to minimize transportation of sediment during rainfall events. The Town of Scarborough will accept the maintenance responsibilities within the public right-of-way.

### Closed Drainage Structures

If sediment in culverts or piped drainage systems exceeds 20% of the diameter of the pipe, it should be removed. This may be accomplished by hydraulic flushing or any mechanical means; however, care should be taken as to not flush the sediment into the pond or filter as it will reduce the capacity and hasten the time when it must be cleaned. All pipes should be inspected on an annual basis.

### Ditches and Swales

Open swales and ditches need to be inspected on a monthly basis or after a major rainfall event to ensure that debris or sediments do not reduce the effectiveness of the system. All debris needs to be removed. Any sign of erosion or blockage shall be immediately repaired to promote a vigorous growth of vegetation. Vegetated ditches should be mowed at least monthly during the growing season. Larger brush or trees must be prevented from becoming established in the channel. Any areas where the vegetation fails will be subject to erosion and should be repaired and re-vegetated.

### Rip Rap

Areas where stone is displaced should be repaired to assure stability. With time, riprap may need to be added. Vegetation growing through riprap should be removed on a yearly schedule.



## FORESTED BUFFER SIZING CALCULATIONS

### • LEVEL LIP LENGTH

- FORESTED BUFFER, 0-8%, DSDILS (NON-WETLAND)

$$L = 150'(\text{ACRE IMPERVIOUS}) + 45'(\text{ACRE LANDSCAPE})$$

TO BUFFER:

$$34,924 \text{ SF IMPERVIOUS} = 0.80 \text{ AC}$$

$$0 \text{ SF LANDSCAPE} = 0.00 \text{ AC}$$

$$L = 150'(0.80) + 45'(0.00)$$

$$L = 120'$$

### • TREATMENT FACTOR (TF)

- TF = 0.40 @ LEVEL LIP LENGTH OF 120 FEET

- TO MEET THE PHOSPHOROUS BUDGET THE  $TF_D$  MUST EQUAL 0.32

$$- TF_D = TF (L_{\text{PROVIDED}} / L_{\text{DESIGN}})$$

$$L_{\text{PROVIDED}} = L_{\text{DESIGN}} (TF / TF_D)$$

$$L_{\text{PROVIDED}} = 120' (0.40 / 0.32) = \underline{150'}$$

Worksheet 1 PPB Calculations			
Project Name:	Dollar General Manchester		
<b>Standard Calculations</b>			
Watershed per acre phosphorus allocation (Appendix C):	P	0.045	lbs/acre/year
Total acreage of development parcel	TA	8.333	acres
Existing impervious area (Pre 1980)	EIA <sub>B</sub>	0.000	acres
Existing impervious area (Post 1980)	EIA <sub>A</sub>	0.0000	acres
NWI wetland acreage:	WA	0.0000	acres
Steep slope acreage:	SA	0.283	acres
Project acreage: A = TA - (WA + SA + EIA <sub>B</sub> + EIA <sub>A</sub> )	A	8.050	acres
Project Phosphorus Budget: PPB = P x A	PPB	0.3623	lbs P/yr

Worksheet 2  
Pre-PPE Calculations

Project Name: Dollar General Manchester		Development Type: Commercial				
Land Surface Type of Lot #(s) with description	Acres/#	Export Coefficient from Table 3.1	Pre-treatment Algal Av. P Export (lbs P/year)	Treatment Factor for BMP(s) from Chapter 6	Post-treatment Algal Av. P Export (lbs P/year)	Description of BMPs
Untreated	0.00	1.25	0.0000	1.0	0.0000	
	0.00	1.75	0.0000	1.0	0.0000	
	0.00	0.50	0.0000	1.0	0.0000	
	0.23	0.40	0.0916	1.0	0.0916	
Treated via Buffers	0.59	1.25	0.7385	0.32	0.2363	Forested Buffer
	0.00	1.75	0.0000	0.32	0.0000	Forested Buffer
	0.21	0.50	0.1055	0.32	0.0337	Forested Buffer
	0.00	0.40	0.0000	0.32	0.0000	Forested Buffer
		Pre-PPE (lbs P/year)	0.9355	Post-PPE (lbs P/year)	0.3616	

Worksheet 3 Mitigation: Source Elimination Credit								
Project Name: Retail Facility				Development Type: Commercial				
Mitigation Source Area Land Use	Acres	Export Coefficient (lbs P/acre/year)	Modifier	Pre-Treatment Historical P Export (lbs P/year)	Treatment Factor for Historical BMP(s) (1.0 if no BMPs)	Historical P Export (lbs P/year)	Mitigation Credit (lbs P/year)	Comments
Access Road/Driveway (low export)	0.0000	0	0	0.0000	1.0	0.0000	0.0000	
Total Source Elimination Mitigation Credit							0.0000 lbs P/year	

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**Worksheet 4**  
**Project Phosphorus Export Summary**

Summarizing the project's algal available phosphorus export (PPE)

Project Name: Dollar General Sabattus			
Project Phosphorus Budget	PPB	0.3623	lbs P/year
Mitigation Credit- Source Elimination Credit	SEC	0.0000	lbs P/year
Source Treatment Credit	STC	0.0000	lbs P/year
Total Phosphorus Mitigation Credit (SEC+STC)	TMC	0.0000	lbs P/year
Total Pre-treatment Phosphorus Export Worksheet 2	Pre-PPE	0.9355	lbs P/year
Total Post-treatment Phosphorus Export Worksheet 2	Post-PPE	0.3616	lbs P/year
Project Phosphorus Export (Post-PPE - TMC)	PPE	0.3616	lbs P/year