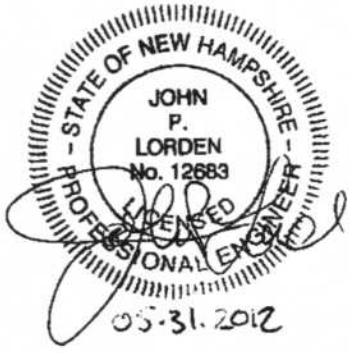
MSC Job No. 11100

DRAINAGE ANALYSIS

Carriage Hill Assisted Living Facility
304 Knox Marsh Road
Madbury, New Hampshire

May 31, 2012



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EXECUTIVE SUMMARY

The subject property is located on Knox Marsh Road (NH Route 155) in Madbury, NH and is currently owned by Jason W. Berndtson. The proposed development includes two parcels (to be combined) identified as Map 9, Lots 8 and 8A on the Town of Madbury's assessor's maps. This stormwater drainage analysis will investigate the storm water flow rates associated with proposed site development on the subject properties. Lot 8 is 1.9 acres, Lot 8A is 2.1 acres and both lots are considered upland. The site is currently developed with a two family dwelling, garage, two sheds, two storage barns and gravel driveways and accessways. The proposed development is for the construction of an assisted living facility with associated parking, access and utilities and the rehabilitation of the existing garage.

As a result of decreasing the amount of impervious gravel onsite, the post-development exhibits a decrease in peak flow, velocity and volume compared to pre-development conditions.

INTRODUCTION

This analysis and the corresponding drainage it references is based on the 2-year, 25-year and 100-year storm events using HydroCAD Software Solutions, LLC's HydroCAD® Release 8.00. This program is based on the Computer Program for Project Formulation Hydrology, Technical Release Number 20 (TR 20). TR 20 is sometimes referred to as the SCS method. The method was developed by the United States Department of Agriculture Soil Conservation Service (SCS) and is the standard for storm runoff studies with the use of computers.

THE SCS METHOD

A) Rainfall: The amounts of rainfall used for this analysis are 3.0 inches for the 2-year, 24 hour storm event, 5.2 inches for the 25-year, 24 hour storm event and 6.4 inches for the 100-year, 24 hour storm event per the New Hampshire Stormwater Manual, Volume 2, Post-Construction Best Management Practices Selection & Design, December 2008 (NH Department of Environmental Services).

B) Coefficient of Runoff (Cn): This coefficient is used to represent soil permeability. Runoff curve number worksheets show values for Cn given land usage and hydrologic soil group. The soil classifications for the site have been determined to be hydrologic soil groups (HSG) A and C. Once the group type for the soil is determined, the respective runoff coefficients for the noted soil group are then classified and given a weighted composite number to be used in the drainage analysis.

C) Subcatchment: For this study the extents of the lot lines are being used for the subcatchment area to determine the contributing flow. The subcatchment has a calculated runoff curve number associated with it.

D) Concentration Time (Tc): Concentration time is the time it takes for water to flow from the highest elevation to the lowest elevation (collection point) following the longest hydrologic route within a particular subcatchment. This time is determined by calculating the time it takes runoff to travel this route under one of three hydrologic conditions: sheet flow, shallow concentrated flow or channel flow. An alternate method is the Lag or Cn Method, so called because it determines the time of concentration based on the coefficient of runoff (see B above). The advantage of using this method is that it does not require a determination of when stormwater transitions from sheet flow to shallow concentrated flow, etc. A determination of the average slope of the subcatchment (not average slope of the flow path) must be determined along with the length of the flow path. The Lag Method was employed in the preparation of this analysis.

EXISTING CONDITIONS:

The existing site is developed with the presence of various buildings including a 2 story dwelling, a garage, a 1 story storage barn, a 2-1/2 story storage barn and two sheds. In addition to the buildings, the site is a mixture of wooded and grass areas and gravel driveways. Topographically, existing stormwater is mostly directed from the southern portion of the lots to the northern portion of the lots and directed to a road side ditch and culvert and flows along the ditch to the northeast corner of the site. In addition, the lots have varying slopes but overall tend to slope to the north.

Characteristics	Area (sf)	CN	Time of Concentration (min)
Subcatchment	175,028	62	10.1

PROPOSED CONDITIONS:

The proposed development of the site consists of removing the existing dwelling, refurbishing the existing garage and replacing the storage barns with a 1 story assisted living facility with associated parking. The building, driveway and accessway will generally be located in the same area as pre-development conditions. The proposed site drainage system will direct stormwater in the same general directions as outlined in the existing conditions. The difference in the flow path is that it is now directed to a catch basin and section of pipe. Following the pipe it then outlets in the approximately the same general area of the existing flow path. The proposed path is approximately the same length as the existing flow path.

Characteristics	Area (sf)	CN	Time of Concentration (min)
Subcatchment	175,028	59	11.0

ANALYSIS CONCLUSIONS:

The total peak rate, velocity and volume of runoff will decrease in all modeled storms as a result of the proposed development having less impervious area when compared to pre-development conditions.

The table below summarizes the results of the analysis.

	2-Year, 24 Hr Storm		25-Year, 24 Hr Storm		100-Year, 24 Hr Storm	
Runoff	Pre-	Post-	Pre-	Post-	Pre-	Post-
Peak Flow (cubic feet per second)	0.97	0.57	5.94	4.77	9.39	7.91
Velocity (feet/second)	0.89	0.82	0.89	0.82	0.89	0.82
Volume (acre feet)	0.133	0.101	0.522	0.450	0.791	0.701

As shown in the table above, the post-development runoff is decreased compared to the pre-development runoff in each of the three storm events analyzed. In addition, the velocity and volume of the runoff is decreased in the post development analysis.