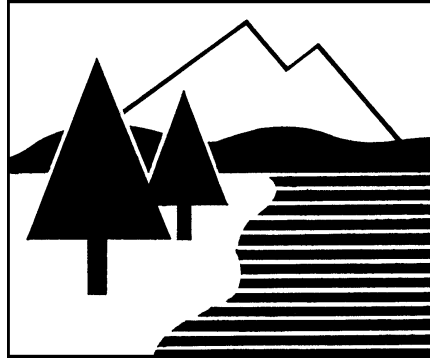


DRAINAGE ANALYSIS

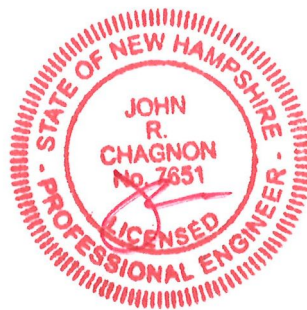
PROPOSED HOUSING DEVELOPMENT

10 LEE ROAD
MADBURY, NH



FOR
10 LEE ROAD, LLC

29 October 2021



10-29-2021



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(Ambit Job Number 3142)

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EXECUTIVE SUMMARY

This drainage analysis examines the pre-development (existing) and post-development (proposed) stormwater drainage patterns for the proposed building and associated future site improvements at 10 Lee Road in Madbury, NH. The site is shown on the Town of Madbury Assessor's Tax Map 8 as Lot 9. The total size of the lot is 1,586,706 square-feet (36.4258 acres).

The development will provide for the future construction of a 6,996 square-foot building, with associated landscaping, utilities, and parking. The new buildings will be serviced by public water and electricity. Septic systems will be provided on-site. The development has the potential to increase stormwater runoff to adjacent properties, and therefore must be designed in a manner to prevent that occurrence. This will be done primarily by capturing stormwater runoff and routing it through appropriate stormwater facilities, designed to ensure that there will be no increase in peak runoff from the site as a result of this project.

The hydrologic modeling utilized for this analysis uses the "Extreme Precipitation" values for rainfall from The Northeast Regional Climate Center (Cornell University).

INTRODUCTION / PROJECT DESCRIPTION

This drainage report is designed to assist the owner, planning board, contractor, regulatory reviewer, and others in understanding the impact of the proposed development project on local surface water runoff and quality. The project site is shown on the Town of Madbury, NH Assessor's Tax Map 8 as Lot 9. Bounding the site to north is NH Route 155 and a trust. Bounding the site to east and south is Town property, private residences, and an LLC. Bounding the site to the west is private residences and a Town conservation area. A vicinity map is included in the Appendix to this report.

The proposed development will add a new building and a new parking area adjacent to existing buildings on the site. This report makes some concept assumptions as to the future impervious coverage of the proposed lots, as requested by the Town.

This report includes information about the existing site and the proposed building necessary to analyze stormwater runoff and to design any required mitigation. The report includes maps of pre-development and post-development watersheds, subcatchment areas and calculations of runoff. The report will provide a narrative of the stormwater runoff and describe numerically and graphically the surface water runoff patterns for this site.

Proposed stormwater management methods will also be described, as well as erosion and sediment control practices. To fully understand the proposed site development the reader should also review a complete site plan set in addition to this report.

METHODOLOGY

"Extreme Precipitation" values from The Northeast Regional Climate Center (Cornell University) have been used for modeling purposes. These values have been used in this analysis.

This report uses the US Soil Conservation Service (SCS) Method for estimating stormwater runoff. The SCS method is published in The National Engineering Handbook (NEH), Section 4 "Hydrology" and includes the Technical Release No. 20, (TR-20) "Computer Program for Project Formulation Hydrology", and Technical Release No. 55 (TR-55) "Urban Hydrology for Small Watersheds" methods. This report uses the HydroCAD version 10.0 program,

written by HydroCAD Software Solutions LLC, Chocorua, N.H., to apply these methods for the calculation of runoff and for pond modeling. Rainfall data and runoff curve numbers are taken from “The Stormwater Management and Erosion Control Handbook for Urban and Developing Areas in New Hampshire.”

Time of Concentration (Tc) is calculated by entering measured flow path data such as flow path type, length, slope and surface characteristics into the HydroCAD program. For the purposes of this report, a minimum time of concentration of 5 minutes is used.

The storm events used for the calculations in this report are the 2-year, 10-year, and 25-year (24-hour) storms. Watershed basin boundaries have been delineated using topographic maps prepared by Ambit Engineering and field observations to confirm.

SITE SPECIFIC INFORMATION

Based on the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Soil Survey of Rockingham County, New Hampshire the site is made up of eight soil types:

Soil Symbol	Soil Name and Slopes
CfB	Charlton fine sandy loam, 3 to 8 percent slopes
CsB	Charlton fine sandy loam, 3 to 8 percent slopes, very stony
PdB	Paxton fine sandy loam, 0 to 8 percent slopes, very stony
PdD	Paxton fine sandy loam, 15 to 25 percent slopes, very stony
PdE	Paxton very stony fine sandy loam, 25 to 60 percent slopes
ScA	Scantic silt loam, 0 to 3 percent slopes
SuB	Sutton fine sandy loam, 0 to 8 percent slopes, very stony
WsB	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony

All existing and proposed site development takes place on one soil type:

CfB – Charlton fine sandy loam, 3 to 8 percent slopes. The soil report qualifies the depth to the water table or restrictive feature as greater than 80 inches. The Hydrologic Soil Group

is class B, with an estimated infiltrative capacity of moderately low to high (0.14 to 14.17 in/hr).

A copy of the custom soil survey for this project site is included in the Appendix to this report.

The physical characteristics of the site consist of flat (1-3%) to steep (25-60%) grades that generally slope from the north to the south of the lot. Elevations on the site range from 140 to 194 feet above sea level. The existing site is partially developed and includes two existing buildings located at the north of the lot, with an asphalt parking area. Vegetation around the developed portion of the lot consists of established grasses, shrubs, and trees. The rest of the lot is undeveloped, forested land.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) number 33017C0320E (effective date September 30, 2015), the project site is located in Zone X and is determined to be outside of the 0.2% annual chance floodplain. A copy of the FIRM map is included in the Appendix.

PRE-DEVELOPMENT DRAINAGE

In the pre-development condition, the site has been analyzed as five subcatchment basins (E1, E2, E3, E4, and E5) based on localized topography and discharge location.

Subcatchment E1 contains all the proposed development area and most of the existing development, and drains to the west of the north “arm” of the lot. Subcatchment E2 contains a minor amount of developed area and drains to the east of the north arm of the lot. Subcatchment E3 drains south to Beards Creek running through the middle of the lot and then to the east. Subcatchment E4 is a small area diverted from subcatchment E3, which drains to the east. Subcatchment E5 forms the entire southern “arm” of the property, which drains to the north in the direction of Beards Creek. E5 contains some development in the form of electrical lines, but that land use is not expected to change the impervious area in the analysis, and will not be altered by the proposed development.

Table 1: Pre-Development Watershed Basin Summary

Watershed Basin ID	Basin Area (SF)	Tc (MIN)	CN	10-Year Runoff (CFS)	25-Year Runoff (CFS)	To Design Point
E1	295,488	19.0	60	7.75	13.94	DP1
E2	15,070	5.5	75	1.36	1.98	DP1
E3	232,162	58.3	58	2.35	4.51	DP1
E4	371	5.0	55	0.01	0.02	DP1
E5	1,032,671	24.0	68	38.00	60.48	DP1

POST-DEVELOPMENT DRAINAGE

The proposed development has been designed to match the pre-development drainage patterns to the greatest extent feasible. In the post-development condition, the site has been analyzed as six major watershed basins, (P1a, P1b, P2, P3, P4, and P5). Since the design of the future houses is currently conceptual, some assumptions were made regarding the delineation of watershed basins and the determination of land usage. The delineation between Basins P2, P3, P4 and P5 correspond to approximately the same as the delineation between E2, E3, E4 and E5, respectively. Subcatchments P1a and P1b were subdivided from subcatchment P1, to represent the distinction between relatively unchanged land in P1a, and proposed development in P1b. Subcatchments P1a, P1b, and P2 are the only lots with any expected change from the proposed development.

Subcatchment P1a contains a significant increase in impervious area, and as such, will be detained in a detention pond, and released with an outlet control structure. In the event of a 100-year storm event or an outlet control structure failure, an emergency bypass was designed to release stormwater. Since all subcatchments ultimately flow to Beards Creek, the creek will serve as the considered discharge point for the entire property.

Table 2: Post-Development Watershed Basin Summary

Watershed Basin ID	Basin Area (SF)	Tc (MIN)	CN	10-Year Runoff (CFS)	25-Year Runoff (CFS)	Design Point
P1a	214,195	19.0	58	4.82	9.06	DP1
P1b	83,653	6.9	81	8.82	12.28	DP1
P2	13,441	5.5	66	0.83	1.32	DP1
P3	231,924	58.3	58	2.35	4.50	DP1
P4	382	5.0	55	0.01	0.02	DP1
P5	1,032,212	24.0	70	38.00	60.48	DP1

The overall impervious coverage of the area analyzed in this report for all basins **increases** from 0.704 acres (1.95%) in the pre-development condition to 1.238 acres (3.42%) in the post-development condition. Since the site represents an increase in impervious area, the project proposes the construction of a detention pond to reduce the peak flow discharge from the site.

Table 3 shows a summary of the comparison between pre-developed flows and post-developed flows for the design point in Beards Creek (DP1). The comparison considers the reduced flows as a result of infiltration.

Table 3: Pre-Development to Post-Development Comparison

Design Point	Q2 (CFS)		Q10 (CFS)		Q25 (CFS)		Description
	Pre	Post	Pre	Post	Pre	Post	
DP1	15.49	15.21	46.17	45.28	75.59	74.37	Beards Creek

Note that all drainage points of interest experience lower or equal peak flows.

OFFSITE INFRASTRUCTURE CAPACITY

There is no Town infrastructure utilized in this project in regard to storm drainage. All retention and routing to the final destination of the stormwater is done on-site.

EROSION AND SEDIMENT CONTROL PRACTICES

The erosion potential for this site as it exists is moderate due to the presence of gravel areas that are highly erodible. During construction, the major potential for erosion is wind and stormwater runoff. The contractor will be required to inspect and maintain all necessary erosion control measures, as well as installing any additional measures as required. All erosion control practices shall conform to “The Stormwater Management and Erosion Control Handbook for Urban and Developing Areas in New Hampshire.” Some examples of erosion and sediment control measures to be utilized for this project during construction may include:

- Silt Soxx (or approved alternative) located at the toe of disturbed slopes
- Catch Basin Filters
- Stabilized construction entrance at access point to the site
- Temporary mulching and seeding for disturbed areas
- Spraying water over disturbed areas to minimize wind erosion

After construction, permanent stabilization will be accomplished by permanent seeding, landscaping, and surfacing the access drives and parking areas with asphalt paving and other areas with concrete walkways.

CONCLUSION

The proposed development has been designed to match the pre-development drainage patterns to the greatest extent feasible. With the design of the holding pond, the post-development runoff rates are reduced to be below the pre-development runoff rates. Erosion and sediment control practices will be implemented for both the temporary condition during construction and for final stabilization after construction. Therefore, there are no negative impacts to downstream receptors or adjacent properties anticipated as a result of this project.

REFERENCES

1. Comprehensive Environmental Inc. and New Hampshire Department of Environmental Services. *New Hampshire Stormwater Manual (Volumes 1, 2 and 3)*, December 2008 (Revision 1.0).
2. Minnick, E.L. and H.T. Marshall. *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire*, prepared by Rockingham County Conservation District, prepared for New Hampshire Department of Environmental Services, in cooperation with USDA Soil Conservation Service, August 1992.
3. HydroCAD Software Solution, LLC. *HydroCAD Stormwater Modeling System Version 10.0* copyright 2013.