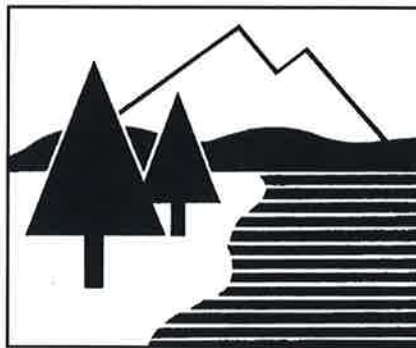


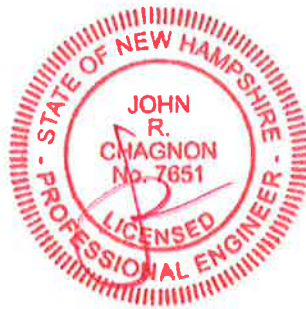
DRAINAGE ANALYSIS

SITE REDEVELOPMENT

Tax Map 147/30
Chevrolet Avenue
PORTSMOUTH, NH



March 20, 2016



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- A. Vicinity (Tax) Map
- B. Tables, Charts, Etc.
- C. HydroCAD Drainage Analysis Calculations
- D. Soil Survey Information
- E. FEMA FIRM Map
- F. Inspection & Maintenance Plan

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- Existing Drainage Plan - W1
- Proposed Drainage Plan - W2

EXECUTIVE SUMMARY

This drainage analysis examines the pre-development (existing) and post-development (proposed) stormwater drainage patterns for the proposed construction of a multi-family residential building and associated site improvements at Tax Map 147 Lot 30 in Portsmouth, NH. The project consists of a 3 unit Townhouse style structure and associated infrastructure. The lot area is 10,071 square-feet (0.231 acres).

The development plan is to demolish the two existing structures on the lot, remove a portion of pavement and to construct a 3 family structure. The new building will be serviced by public water and sewer. The development has the potential to increase runoff to the existing City of Portsmouth storm water system, and therefore must be designed in a manner to prevent that occurrence. This will be done primarily by capturing and infiltrating storm water 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.

SITE REDEVELOPMENT

Tax Map 147 Lot 30

PORTSMOUTH, NH

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 City of Portsmouth, NH Assessor's Tax Map 147 as Lot 30. Bounding the site to northwest is Chevrolet Avenue. Bounding the site to the northeast, are single and multi-family residential properties that front on Cass Street. Bounding the site to the southwest is an undeveloped lot. Bounding the site to south east is Friend Street. The property is situated in the General Residence C (GRC) District. A vicinity map is included in the Appendix to this report.

The proposed development will remove two garage structures and construct a new 3-unit residential building, new parking area, and other associated improvements such as a utilities and landscaping. The project is anticipated to begin construction in the summer of 2017 and be substantially completed by the fall of 2017.

This report includes information about the existing site and the proposed development necessary to analyze stormwater runoff and to design any required mitigation. The report includes maps of pre-development and post-development watersheds, sub-catchment 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 and treatment structures and 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

This report uses the US Soil Conservation Service (SCS) Method for estimating storm water 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, 25-year and 50-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, and confirmed by field exploration conducted by Ambit Engineering, Inc., the site is made up of one soil type:

799 – Urban land – Canton Complex (3-15% slopes), well drained with a typical depth to restrictive feature of more than 80 inches. This soil has a Hydrologic Soil Group (HSG) classification of A, with a low runoff classification.

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%) grades that generally slope downward from the southeast side (rear at Friend Street) of the lot to the northwest (front at Chevrolet Avenue). Elevations on the site range from 14 to 20 feet above sea level. The existing site is partially developed and includes two existing buildings located at the front of the lot, with asphalt parking. Vegetation around the developed portion of the lot consists of established grasses, shrubs and trees.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) number 33015C0259E (effective date May 17, 2005), 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.

As allowed by NHDES Alteration of Terrain Rules, the Saturated Hydraulic Conductivity (Ksat) Value as published in SSSNE Special Publication No. 5, September, 2009 is being used. The Ksat Value in the C Horizon for Canton Urban Complex is 20 inches per Hour. Using a safety factor of 2 or 20 inches per divided by 2 we use an adjusted Ksat value of 10 inches per hour.

PRE-DEVELOPMENT DRAINAGE

The existing site drains via overland flow from the rear of the lot towards the front of the site. Runoff that does not infiltrate into the soil enters an existing catch basin and closed storm sewer system in Chevrolet Avenue. There is no existing stormwater detention or treatment on the site (aside from the minimal treatment achieved from infiltration).

In the pre-development condition, the site has been analyzed as a single watershed basin (ES1) based on localized topography and discharge location. The majority of the lot is previously developed consisting of two existing buildings and a mix of grass parking and asphalt pavement. The discharge location is identified in this report as Design Point 1 (DP1). The runoff curve number (CN) for basin ES1 is calculated to be 65 with impervious coverage of 66.34%.

Table 1: Pre-Development Watershed Basin Summary

Watershed Basin ID	Basin Area (SF)	Tc (MIN)	CN	10-Year Runoff (CFS)	50-Year Runoff (CFS)	Design Point
ES1	14,407	10.5	65	0.38	0.71	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 a single watershed (PS1) but has been broken down into five sub-watershed basins (PS1, PS1a, PS1b, PS1c and PS1d) based on localized topography and discharge locations. Basin PS1 consists of the area of the site that drains to the existing storm sewer system in Chevrolet Avenue without being routed through the proposed infiltration trenches. This basin includes an existing abutting building, existing parking at Friend Street and some landscape area that will not be disturbed by the proposed construction. Basin PS1a consists of the roof area that drains to the proposed infiltration trench 1a and includes the right side of the roof. Basin PS1b consists of the roof area that drains to the proposed infiltration trench 1b and includes the center back of the roof. Basin PS1c consists of the roof area that drains to the proposed infiltration trench 1c and includes the right side center back of the roof. Basin PS1d consists of the roof area that drains to the proposed infiltration trench 1d and includes the left side of the roof. All runoff from the sub-watershed basins that does not infiltrate into the soil, is discharged to Design Point 1 (DP1). This

allows for a direct review of Design Points to show the comparison of runoff from the site in the pre-development and post-development conditions.

The runoff curve number (CN) for basin PS1a through PS1d inclusive is 98 with impervious coverage of 100%.

Watershed Basin ID	Basin Area (SF)	Tc (MIN)	CN	10-Year Runoff (CFS)	50-Year Runoff (CFS)	Design Point
PS1	12,874	10.5	65	0.34	0.63	DP1
PS1a	320	5	98	0.03	0.04	DP1
PS1b	295	5	98	0.03	0.04	DP1
PS1c	589	5	98	0.06	0.08	DP1
PS1d	320	5	98	0.03	0.04	DP1

The overall impervious coverage of the area analyzed in this report for all basins **increases** from 4,850 square feet (34%) in the pre-development condition to 6,163 square feet (43%) in the post-development condition. Since the site represents an increase in impervious area, the project proposes the construction of an infiltration trench system that uses the porous nature of the soil to provide treatment and infiltrate stormwater back into the soil. Since no treatment or dedicated infiltration systems currently exist for site, providing the infiltration trenches represents an improvement on the water quality of the runoff.

Table 3 shows a summary of the comparison between pre-developed flows and post-developed flows for the design point. The comparison takes into account the reduced flows as a result of infiltration from the infiltration trenches.

Table 3: Pre-Development to Post-Development Comparison

Design Point	Q2 (CFS)		Q10 (CFS)		Q25 (CFS)		Q50 (CFS)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP 1	0.14	0.12	0.38	0.34	0.57	0.51	0.71	0.63

EROSION AND SEDIMENT CONTROL PRACTICES

The erosion potential for this site as it exists is low due to the existing vegetation. 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 fence (or approved alternative) located at the toe of disturbed slopes
- Stabilized construction entrances at all access points 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 either compacted gravel or asphalt paving.

CONCLUSION

The proposed development has been designed to match the pre-development drainage patterns to the greatest extent feasible. With the design of the infiltration trenches, the post-development runoff rates are reduced to be below the pre-development runoff rates and will provide treatment. 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. City of Portsmouth, NH. Site Plan Review Regulations, amended December 18, 2014.
2. Comprehensive Environmental Inc. and New Hampshire Department of Environmental Services. *New Hampshire Stormwater Manual (Volumes 1, 2 and 3)*, December 2008 (Revision 1.0).
3. 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.
4. HydroCAD Software Solution, LLC. *HydroCAD Stormwater Modeling System Version 10.0*, dated 2007.