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TOWN OF DURHAM
STORMWATER MANAGEMENT PLAN
FOR
CLARK PROPERTIES, LLC

74 MAIN STREET
TAX MAP 2, LOT 14-1

SUBMITTED ON
19 JULY 2021

Project Number NM18054

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1. PROJECT INFORMATION NARRATIVE

1.1. Project narrative

1.1.1. Project summary

Clark Properties, LLC intends to redevelop the property at 74 Main Street in Durham, New Hampshire (Tax Map 2, Lot 14-1-1). The project will demolish the existing 1100 ft^2 building on the property and construct five-story mixed-use building. Additionally, the parking and traffic flow will be modified. This report was prepared by Horizons Engineering to ensure the design of the stormwater management for 74 Main Street complies with the applicable federal, state and local regulations for stormwater.

1.1.2. Existing conditions

The proposed work is located at the corner of Main Street and Pettee Brook Lane. The project site currently consists of an office building and two paved parking areas with a combined 13 spaces. The stormwater runoff from the office building and the larger parking area in the north drain to catch basins on Pettee Brook Lane at the northeast side of the property. The stormwater runoff from the western portion of the site is collected in catch basins along Main Street. All the existing catch basins are part of Durham's municipal separate storm sewer system (MS4). The flow is split between two drainage points. The first point (PA-1) is located at a catch basin on Main Street. This catch basin is routed to the west into UNH property and ultimately outlets to College Brook. The second point (PA-2) is located at a catch basin on the northeast corner of the property along Pettee Brook Lane. The storm sewer ultimately outlets to the Pettee Brook.

1.1.3. Proposed site conditions & disturbances

The project proposes the removal of the existing 1100 ft^2 office building, construction of a 6400 ft^2 mixed-use building, and the reconstruction of the site's driveway and parking lot. Minor grading will be required during the reconstruction of the parking area to ensure proper drainage of the site. An underground chamber system will be located below the parking lot and will detain and infiltrate stormwater from the proposed building. Approximately 15 000 ft^2 of disturbance will be required to construct the proposed building, associated utilities, and drainage practices.

1.1.4. Hydrologic data and methods

The stormwater model was built in the software program HydroCAD (Version 10.00 25). HydroCAD uses the methods described in the NRCS National Engineering Handbook [2] to create rainfall-runoff relationships, determine time of concentration, generate unit hydrographs for each subcatchment area.

The direct runoff from the site was estimated using the Weighted-Q method. Synthetic design storms used rainfall data from the Northeast Regional Climate Center (NRCC). Soils maps generated by the Natural Resources Conservation Service (NRCS), and land cover data from the field survey were used to determine the soil-complex CN values.

Using SCS TR-20, run under HydroCAD Version 10.0 with 24-hour NRCC Type D rainfall events, pre- and post-development cover types and drainage paths were modeled to generate peak discharge rates. Rainfall events modeled have intensities described by data provided by the Northeast Regional Climate Center for the geographic location of the project. These data are provided in full in section 1.3 of this report and are summarized below in Table 1.1.

Table 1.1: Project design storm depths from NRCC

Storm	Depth [inches]
1”	1.00
2-YR	3.13
10-YR	4.74
25-YR	6.01

1.1.5. Peak runoff control requirement

Town of Durham Site Design Standards require that measures be taken to control the post-development peak rate runoff so that it does not exceed pre-development runoff for the 1 inch, 2-, 10-, and 17[1]- year, 24-hour storm events. Due to the post-project grading of the site and changes in land cover, stormwater devices were used to attenuate flow in order to meet these Peak Runoff Control requirements. Table 1.2 summarizes the stormwater runoff peak flow rate for the 1 inch, 2-, 10- and 25-year storm events.

Table 1.2: Peak flow from 74 Main Street

Peak flow [ft2/s]				
	PA-1		PA-2	
Storm	Pre	Post	Pre	Post
1”	0.24	0.20	0.17	0.21
2-YR	0.90	0.81	0.70	0.77
10-YR	1.43	1.33	1.16	1.14
25-YR	1.86	1.75	1.54	1.46

The peak flows directed towards Main Street have been decreased in all storms. The peak flows directed towards Pettee Brook Road drainage system (PA-2) are nearly equal for all the events. There is a small increase during 1” and 1-year storm events.

1.1.6. Infiltration volume requirement

Town of Durham site plan regulations require that a portion of the stormwater runoff be infiltrated to protect groundwater resources. It was determined that infiltration on the site was not feasible due to the subsurface soils. An infiltration test was performed on the soils present on the site and an infiltration rate of 0.004 inch/hour was found. For additional details on the testing and results, please see section 3. Due to the low permeability of the soils (SM and ML) tested and the proximity to ledge, it is expected that the soils will not reliably infiltrate water over the course of a storm event.

The location of the infiltration test was not in the same side of the building as the ultimate location of the subsurface storage. If, during construction the soils found are more favorable to infiltration, the subsurface storage should be modified to allow for infiltration.

1.1.7. Runoff volume control

The runoff volume from each storm event is summarized in table 1.3. Due to the inability to infiltrate and the increased impervious area, the overall runoff volume from the site increases.

[1] Understood to be a typo and the 25-year rainfall event is intended

Table 1.3: 74 Main Street storm runoff volumes

Peak flow [ft3]				
	PA-1		PA-2	
Storm	Pre	Post	Pre	Post
1”	834	701	591	856
2-YR	3322	2976	2572	3356
10-YR	5344	4902	4273	5272
25-YR	6975	6474	5668	6787

The runoff volumes directed towards Main Street have been decreased in all storms. The peak flows directed towards Pettee Brook Road drainage system (PA-2) increase for all the events.

1.2. NRCS soils information

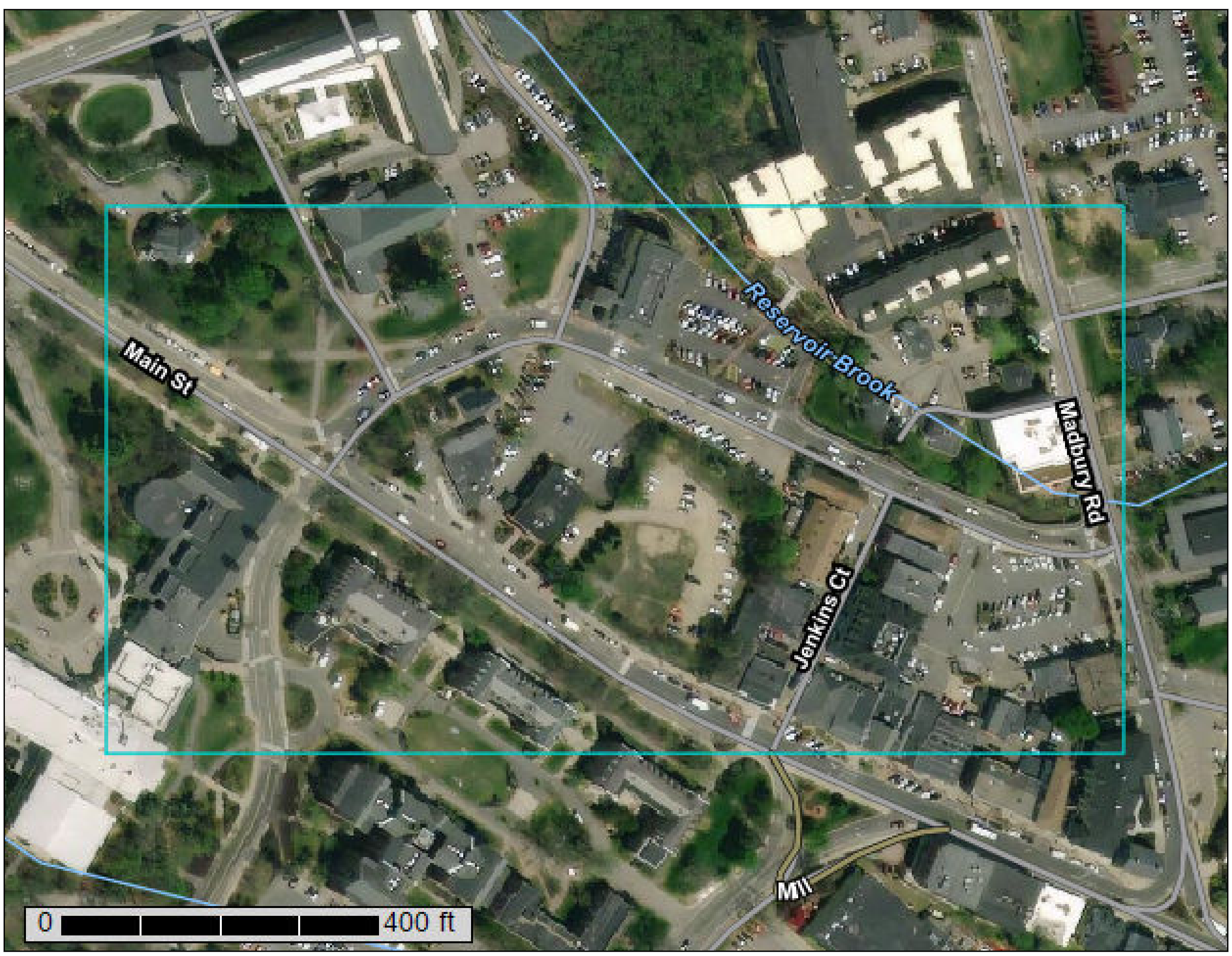
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Strafford County, New Hampshire



March 1, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:2,150 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Strafford County, New Hampshire
Survey Area Data: Version 20, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Sep 9, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BzB	Buxton silt loam, 3 to 8 percent slopes	6.1	29.8%
HdB	Hollis-Charlton very rocky fine sandy loams, 3 to 8 percent slopes	6.6	32.4%
HdC	Hollis-Charlton very rocky fine sandy loams, 8 to 15 percent slopes	5.4	26.6%
Sb	Saugatuck loamy sand	2.2	10.6%
SfC	Suffield silt loam, 8 to 15 percent slopes	0.1	0.6%
Totals for Area of Interest		**20.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Strafford County, New Hampshire

BzB—Buxton silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d6p
Elevation: 0 to 260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Buxton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Buxton

Setting

Parent material: Glaciomarine

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 28 inches: silty clay loam
H3 - 28 to 43 inches: silty clay

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F145XY006CT - Semi-Rich Moist Lake Plain
Hydric soil rating: No

Minor Components

Elmwood

Percent of map unit: 10 percent
Hydric soil rating: No

Not named

Percent of map unit: 5 percent
Hydric soil rating: No

HdB—Hollis-Charlton very rocky fine sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d7m
Elevation: 0 to 1,000 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 40 percent
Charlton and similar soils: 30 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: very stony fine sandy loam
H2 - 14 to 18 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

Parent material: Till

Typical profile

H1 - 0 to 13 inches: very stony fine sandy loam
H2 - 13 to 36 inches: fine sandy loam
H3 - 36 to 40 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Not named

Percent of map unit: 5 percent
Hydric soil rating: No

Sutton

Percent of map unit: 5 percent
Hydric soil rating: No

Buxton

Percent of map unit: 5 percent
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

HdC—Hollis-Charlton very rocky fine sandy loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9d7n
Elevation: 0 to 1,200 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 120 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 40 percent
Charlton and similar soils: 30 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: very stony fine sandy loam
H2 - 14 to 18 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

Parent material: Till

Typical profile

H1 - 0 to 13 inches: very stony fine sandy loam
H2 - 13 to 36 inches: fine sandy loam
H3 - 36 to 40 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Not named

Percent of map unit: 10 percent
Hydric soil rating: No

Woodbridge

Percent of map unit: 5 percent
Hydric soil rating: No

Sutton

Percent of map unit: 5 percent
Hydric soil rating: No

Sb—Saugatuck loamy sand

Map Unit Setting

National map unit symbol: 9d8r
Elevation: 300 to 1,000 feet
Mean annual precipitation: 27 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 125 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Saugatuck and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saugatuck

Setting

Landform: Outwash terraces
Parent material: Outwash

Typical profile

H1 - 0 to 4 inches: loamy sand
H2 - 4 to 7 inches: sand
H3 - 7 to 26 inches: loamy sand
H4 - 26 to 42 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 10 to 16 inches to undefined
Drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Not named wet

Percent of map unit: 15 percent

Landform: Outwash terraces
Hydric soil rating: Yes

SfC—Suffield silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9d8v
Elevation: 0 to 250 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Suffield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Suffield

Typical profile

H1 - 0 to 19 inches: silt loam
H2 - 19 to 28 inches: silt loam
H3 - 28 to 41 inches: silty clay

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY017NH - Well Drained Lake Plain
Hydric soil rating: No

Minor Components

Not named

Percent of map unit: 9 percent
Hydric soil rating: No

Buxton

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Hydric soil rating: No

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1.3. Extreme precipitation tables

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	70.928 degrees West
Latitude	43.136 degrees North
Elevation	0 feet
Date/Time	Tue, 02 Mar 2021 10:07:51 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.03	**1yr**	0.70	0.98	1.20	1.55	2.00	2.61	2.84	**1yr**	2.31	2.73	3.13	3.85	4.43	**1yr**
2yr	0.32	0.49	0.61	0.81	1.01	1.29	**2yr**	0.88	1.17	1.50	1.91	2.44	3.13	3.47	**2yr**	2.77	3.34	3.84	4.57	5.20	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.58	**5yr**	1.06	1.44	1.85	2.38	3.07	3.97	4.45	**5yr**	3.51	4.28	4.89	5.78	6.54	**5yr**
10yr	0.40	0.63	0.80	1.09	1.42	1.84	**10yr**	1.22	1.69	2.18	2.82	3.66	4.74	5.37	**10yr**	4.20	5.17	5.88	6.91	7.78	**10yr**
25yr	0.46	0.74	0.94	1.29	1.72	2.27	**25yr**	1.48	2.09	2.69	3.52	4.61	6.01	6.90	**25yr**	5.32	6.63	7.51	8.75	9.80	**25yr**
50yr	0.51	0.83	1.06	1.48	1.99	2.66	**50yr**	1.72	2.46	3.17	4.18	5.49	7.19	8.34	**50yr**	6.37	8.02	9.04	10.47	11.68	**50yr**
100yr	0.58	0.93	1.20	1.70	2.31	3.12	**100yr**	2.00	2.89	3.74	4.96	6.54	8.62	10.08	**100yr**	7.62	9.69	10.88	12.54	13.92	**100yr**
200yr	0.64	1.04	1.35	1.94	2.69	3.66	**200yr**	2.32	3.40	4.42	5.89	7.81	10.32	12.19	**200yr**	9.13	11.72	13.10	15.02	16.60	**200yr**
500yr	0.75	1.24	1.61	2.34	3.28	4.52	**500yr**	2.83	4.21	5.48	7.38	9.86	13.11	15.67	**500yr**	11.60	15.07	16.75	19.07	20.97	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.90	**1yr**	0.64	0.88	0.91	1.26	1.55	2.00	2.51	**1yr**	1.77	2.42	2.94	3.28	4.03	**1yr**
2yr	0.32	0.49	0.60	0.81	1.00	1.18	**2yr**	0.86	1.16	1.37	1.83	2.36	3.04	3.38	**2yr**	2.69	3.25	3.73	4.45	5.05	**2yr**
5yr	0.35	0.54	0.67	0.92	1.17	1.40	**5yr**	1.01	1.37	1.62	2.15	2.78	3.71	4.13	**5yr**	3.29	3.97	4.58	5.42	6.13	**5yr**
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.57	1.82	2.45	3.14	4.29	4.81	**10yr**	3.79	4.62	5.33	6.29	7.06	**10yr**
25yr	0.44	0.67	0.83	1.19	1.56	1.91	**25yr**	1.35	1.87	2.11	2.85	3.67	5.06	5.86	**25yr**	4.48	5.63	6.53	7.66	8.53	**25yr**
50yr	0.48	0.74	0.92	1.32	1.77	2.19	**50yr**	1.53	2.14	2.36	3.21	4.13	5.81	6.79	**50yr**	5.14	6.53	7.62	8.88	9.83	**50yr**
100yr	0.54	0.82	1.02	1.48	2.03	2.51	**100yr**	1.75	2.46	2.64	3.60	4.62	6.66	7.87	**100yr**	5.89	7.56	8.89	10.30	11.29	**100yr**
200yr	0.60	0.91	1.15	1.66	2.32	2.87	**200yr**	2.00	2.81	2.94	4.03	5.17	7.63	9.12	**200yr**	6.75	8.77	10.39	11.96	13.01	**200yr**
500yr	0.70	1.05	1.35	1.96	2.79	3.46	**500yr**	2.40	3.39	3.42	4.67	6.02	9.10	11.08	**500yr**	8.05	10.65	12.76	14.58	15.61	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.08	**1yr**	0.75	1.05	1.24	1.74	2.21	2.82	3.02	**1yr**	2.50	2.91	3.36	4.16	4.76	**1yr**
2yr	0.33	0.51	0.62	0.84	1.04	1.25	**2yr**	0.90	1.22	1.48	1.95	2.50	3.24	3.57	**2yr**	2.87	3.43	3.94	4.70	5.38	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.58	**5yr**	1.13	1.54	1.85	2.49	3.19	4.22	4.76	**5yr**	3.73	4.58	5.21	6.15	6.92	**5yr**
10yr	0.46	0.70	0.87	1.21	1.57	1.92	**10yr**	1.35	1.88	2.23	3.04	3.84	5.20	5.93	**10yr**	4.60	5.70	6.47	7.54	8.43	**10yr**
25yr	0.55	0.84	1.05	1.49	1.97	2.47	**25yr**	1.70	2.42	2.87	3.95	4.92	6.98	7.93	**25yr**	6.18	7.63	8.57	9.91	10.98	**25yr**
50yr	0.64	0.97	1.21	1.74	2.34	2.98	**50yr**	2.02	2.92	3.48	4.81	5.96	8.63	9.90	**50yr**	7.64	9.52	10.63	12.17	13.43	**50yr**
100yr	0.74	1.12	1.40	2.03	2.78	3.60	**100yr**	2.40	3.52	4.22	5.89	7.24	10.67	12.36	**100yr**	9.45	11.89	13.15	14.98	16.43	**100yr**
200yr	0.86	1.29	1.63	2.37	3.30	4.37	**200yr**	2.85	4.27	5.12	7.21	8.77	13.24	15.46	**200yr**	11.72	14.87	16.29	18.41	20.13	**200yr**
500yr	1.04	1.55	2.00	2.90	4.13	5.61	**500yr**	3.56	5.48	6.61	9.43	11.32	17.65	20.76	**500yr**	15.62	19.97	21.62	24.23	26.35	**500yr**

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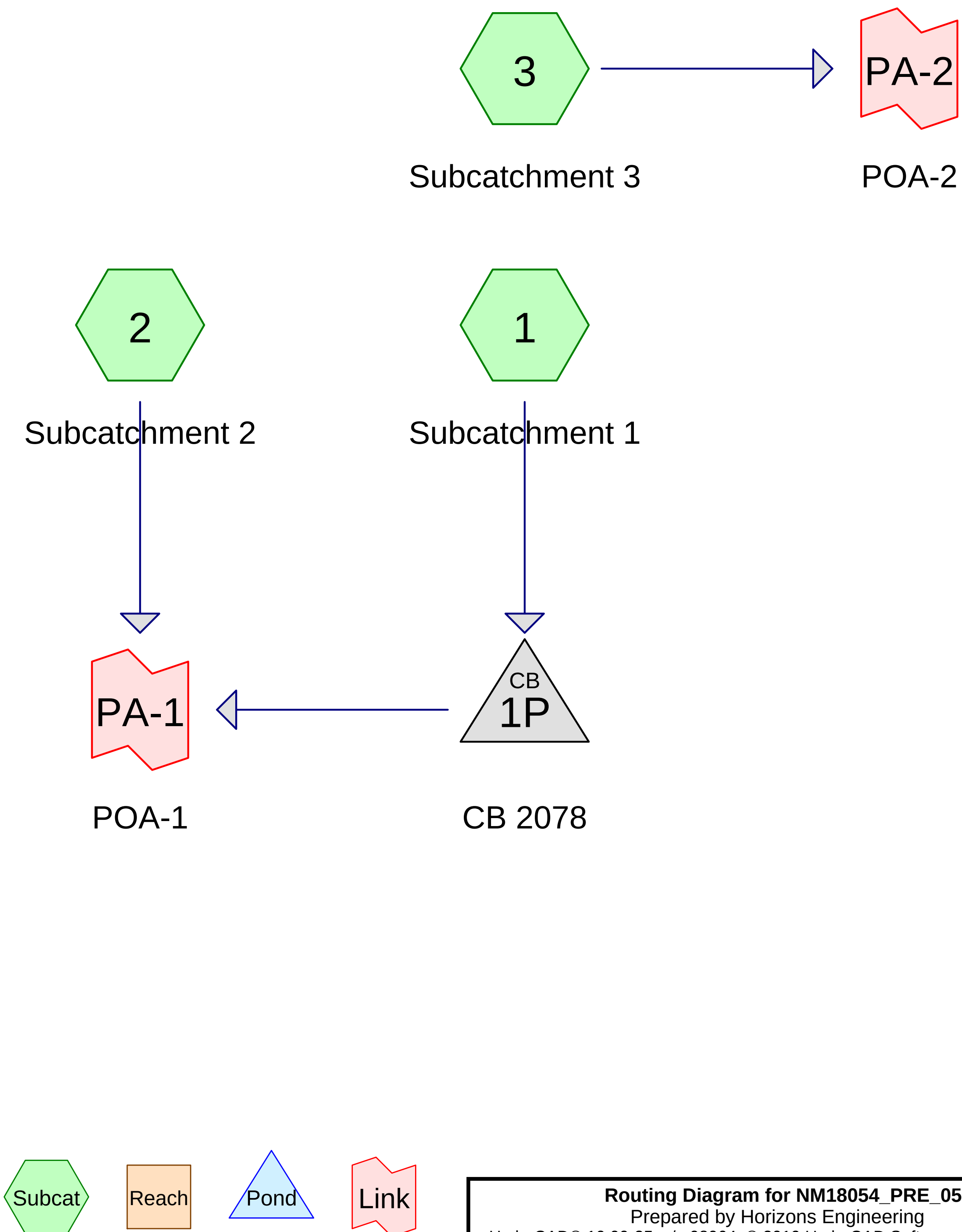
2. DRAINAGE CALCULATIONS

2.1. Pre-development analysis



Routing Diagram for NM18054_PRE_05
Prepared by Horizons Engineering
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,902	74	>75% Grass cover, Good, HSG C (1, 2, 3)
18,468	98	Paved parking & roofs, HSG C (1, 2, 3)
2,892	98	Paved parking, HSG C (1, 2, 3)
30,262	**91**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
30,262	HSG C	1, 2, 3
0	HSG D	
0	Other	
30,262		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=14,023 sf 82.49% Impervious Runoff Depth=0.66"
Tc=6.0 min CN=WQ Runoff=0.22 cfs 767 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,059 sf 47.50% Impervious Runoff Depth=0.39"
Tc=6.0 min CN=WQ Runoff=0.02 cfs 67 cf

Subcatchment 3: Subcatchment 3 Runoff Area=14,180 sf 62.17% Impervious Runoff Depth=0.50"
Tc=6.0 min CN=WQ Runoff=0.17 cfs 591 cf

Pond 1P: CB 2078 Peak Elev=50.23' Inflow=0.22 cfs 767 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=0.22 cfs 767 cf

Link PA-1: POA-1 Inflow=0.24 cfs 834 cf
Primary=0.24 cfs 834 cf

Link PA-2: POA-2 Inflow=0.17 cfs 591 cf
Primary=0.17 cfs 591 cf

Total Runoff Area = 30,262 sf Runoff Volume = 1,425 cf Average Runoff Depth = 0.57"
29.42% Pervious = 8,902 sf 70.58% Impervious = 21,360 sf

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=14,023 sf 82.49% Impervious Runoff Depth=2.56"
Tc=6.0 min CN=WQ Runoff=0.81 cfs 2,996 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,059 sf 47.50% Impervious Runoff Depth=1.90"
Tc=6.0 min CN=WQ Runoff=0.09 cfs 326 cf

Subcatchment 3: Subcatchment 3 Runoff Area=14,180 sf 62.17% Impervious Runoff Depth=2.18"
Tc=6.0 min CN=WQ Runoff=0.70 cfs 2,572 cf

Pond 1P: CB 2078 Peak Elev=50.46' Inflow=0.81 cfs 2,996 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=0.81 cfs 2,996 cf

Link PA-1: POA-1 Inflow=0.90 cfs 3,322 cf
Primary=0.90 cfs 3,322 cf

Link PA-2: POA-2 Inflow=0.70 cfs 2,572 cf
Primary=0.70 cfs 2,572 cf

Total Runoff Area = 30,262 sf Runoff Volume = 5,894 cf Average Runoff Depth = 2.34"
29.42% Pervious = 8,902 sf 70.58% Impervious = 21,360 sf

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=14,023 sf 82.49% Impervious Runoff Depth=5.32"
Tc=6.0 min CN=WQ Runoff=1.65 cfs 6,217 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,059 sf 47.50% Impervious Runoff Depth=4.42"
Tc=6.0 min CN=WQ Runoff=0.21 cfs 758 cf

Subcatchment 3: Subcatchment 3 Runoff Area=14,180 sf 62.17% Impervious Runoff Depth=4.80"
Tc=6.0 min CN=WQ Runoff=1.54 cfs 5,668 cf

Pond 1P: CB 2078 Peak Elev=50.69' Inflow=1.65 cfs 6,217 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=1.65 cfs 6,217 cf

Link PA-1: POA-1 Inflow=1.86 cfs 6,975 cf
Primary=1.86 cfs 6,975 cf

Link PA-2: POA-2 Inflow=1.54 cfs 5,668 cf
Primary=1.54 cfs 5,668 cf

Total Runoff Area = 30,262 sf Runoff Volume = 12,643 cf Average Runoff Depth = 5.01"
29.42% Pervious = 8,902 sf 70.58% Impervious = 21,360 sf

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=14,023 sf 82.49% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=WQ Runoff=2.42 cfs 9,200 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,059 sf 47.50% Impervious Runoff Depth=6.86"
Tc=6.0 min CN=WQ Runoff=0.33 cfs 1,177 cf

Subcatchment 3: Subcatchment 3 Runoff Area=14,180 sf 62.17% Impervious Runoff Depth=7.28"
Tc=6.0 min CN=WQ Runoff=2.33 cfs 8,607 cf

Pond 1P: CB 2078 Peak Elev=50.91' Inflow=2.42 cfs 9,200 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=2.42 cfs 9,200 cf

Link PA-1: POA-1 Inflow=2.75 cfs 10,377 cf
Primary=2.75 cfs 10,377 cf

Link PA-2: POA-2 Inflow=2.33 cfs 8,607 cf
Primary=2.33 cfs 8,607 cf

Total Runoff Area = 30,262 sf Runoff Volume = 18,984 cf Average Runoff Depth = 7.53"
29.42% Pervious = 8,902 sf 70.58% Impervious = 21,360 sf

Summary for Subcatchment 1: Subcatchment 1

Runoff = 1.28 cfs @ 12.13 hrs, Volume= 4,783 cf, Depth= 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
21	74	>75% Grass cover, Good, HSG C
2,435	74	>75% Grass cover, Good, HSG C
147	98	Paved parking, HSG C
11,420	98	Paved parking & roofs, HSG C
14,023		Weighted Average
2,456		17.51% Pervious Area
11,567		82.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 2: Subcatchment 2

Runoff = 0.16 cfs @ 12.13 hrs, Volume= 562 cf, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
123	74	>75% Grass cover, Good, HSG C
958	74	>75% Grass cover, Good, HSG C
310	98	Paved parking, HSG C
668	98	Paved parking & roofs, HSG C
2,059		Weighted Average
1,081		52.50% Pervious Area
978		47.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3: Subcatchment 3

Runoff = 1.16 cfs @ 12.13 hrs, Volume= 4,273 cf, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
658	74	>75% Grass cover, Good, HSG C
4,707	74	>75% Grass cover, Good, HSG C
2,435	98	Paved parking, HSG C
6,380	98	Paved parking & roofs, HSG C
14,180		Weighted Average
5,365		37.83% Pervious Area
8,815		62.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 1P: CB 2078

Inflow Area = 14,023 sf, 82.49% Impervious, Inflow Depth = 4.09" for 10yr (NRCC) event
Inflow = 1.28 cfs @ 12.13 hrs, Volume= 4,783 cf
Outflow = 1.28 cfs @ 12.13 hrs, Volume= 4,783 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.28 cfs @ 12.13 hrs, Volume= 4,783 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 50.59' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	50.00'	**12.0" Round Outlet** L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 50.00' / 49.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=1.27 cfs @ 12.13 hrs HW=50.59' TW=0.00' (Dynamic Tailwater)
1=Outlet (Inlet Controls 1.27 cfs @ 2.62 fps)

Summary for Link PA-1: POA-1

Inflow Area = 16,082 sf, 78.01% Impervious, Inflow Depth = 3.99" for 10yr (NRCC) event
Inflow = 1.43 cfs @ 12.13 hrs, Volume= 5,344 cf
Primary = 1.43 cfs @ 12.13 hrs, Volume= 5,344 cf, Atten= 0%, Lag= 0.0 min

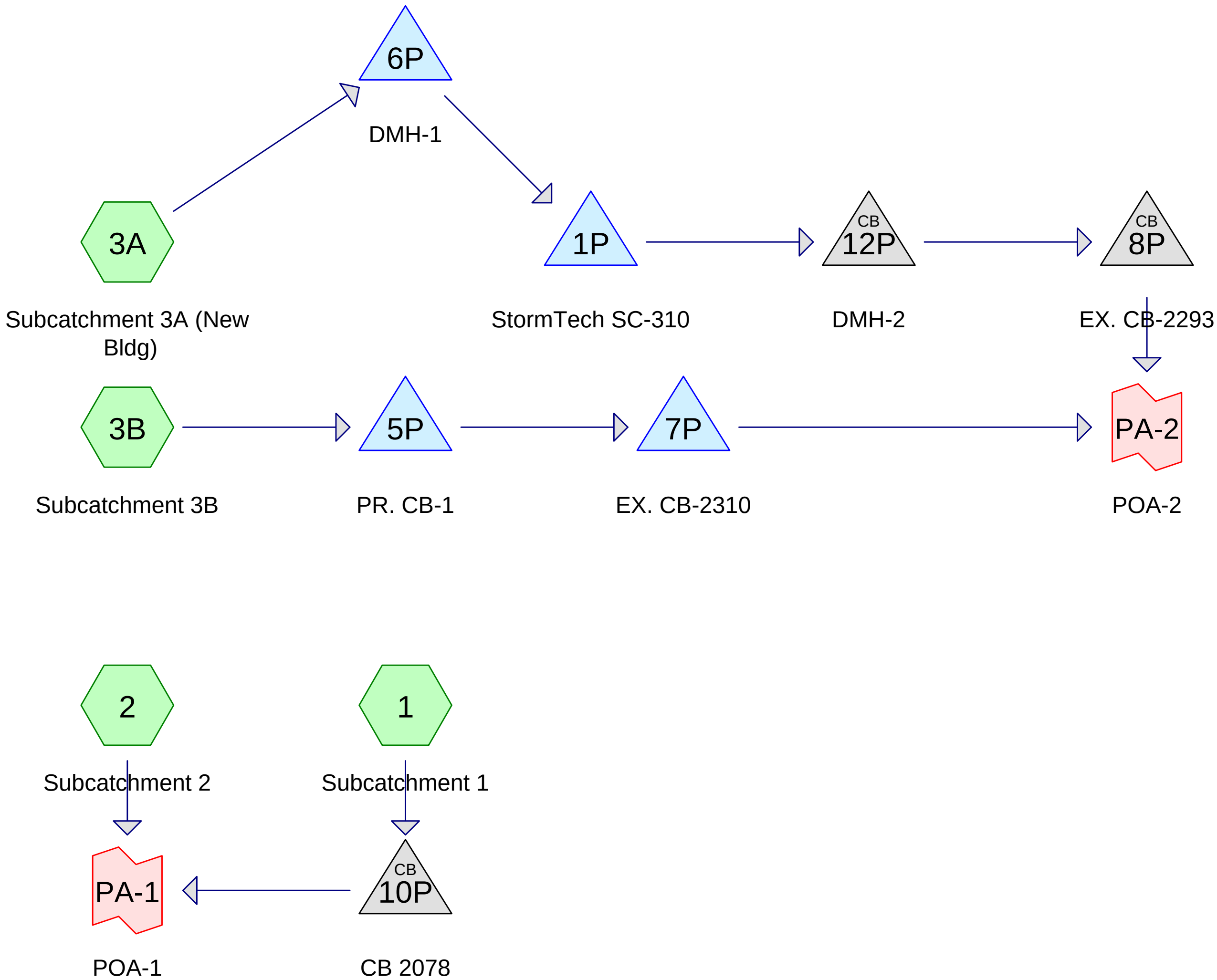
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

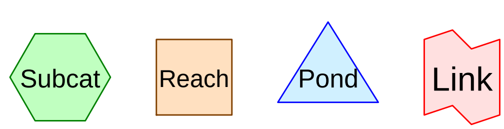
Summary for Link PA-2: POA-2

Inflow Area = 14,180 sf, 62.17% Impervious, Inflow Depth = 3.62" for 10yr (NRCC) event
Inflow = 1.16 cfs @ 12.13 hrs, Volume= 4,273 cf
Primary = 1.16 cfs @ 12.13 hrs, Volume= 4,273 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

2.2. Post-development analysis





Routing Diagram for NM18054_POST_05
Prepared by Horizons Engineering
HydroCAD® 10.00-25 s/n 08064 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,669	74	>75% Grass cover, Good, HSG C (1, 2, 3B)
21,260	98	Paved parking & roofs, HSG C (1, 2, 3A, 3B)
3,331	98	Paved parking, HSG C (1, 2, 3A, 3B)
30,260	**94**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
30,260	HSG C	1, 2, 3A, 3B
0	HSG D	
0	Other	
30,260		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=13,368 sf 71.09% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=WQ Runoff=0.18 cfs 634 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,499 sf 39.14% Impervious Runoff Depth=0.32"
Tc=6.0 min CN=WQ Runoff=0.02 cfs 67 cf

Subcatchment 3A: Subcatchment 3A (New Runoff Area=6,418 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=WQ Runoff=0.12 cfs 423 cf

Subcatchment 3B: Subcatchment 3B Runoff Area=7,975 sf 96.45% Impervious Runoff Depth=0.76"
Tc=6.0 min CN=WQ Runoff=0.15 cfs 508 cf

Pond 1P: StormTech SC-310 Peak Elev=48.25' Storage=94 cf Inflow=0.12 cfs 416 cf
Outflow=0.07 cfs 412 cf

Pond 5P: PR. CB-1 Peak Elev=49.57' Storage=40 cf Inflow=0.15 cfs 508 cf
Outflow=0.15 cfs 469 cf

Pond 6P: DMH-1 Peak Elev=48.80' Storage=10 cf Inflow=0.12 cfs 423 cf
8.0" Round Culvert n=0.013 L=2.0' S=0.0000 '/' Outflow=0.12 cfs 416 cf

Pond 7P: EX. CB-2310 Peak Elev=49.18' Storage=27 cf Inflow=0.15 cfs 469 cf
12.0" Round Culvert n=0.025 L=22.4' S=0.0893 '/' Outflow=0.15 cfs 443 cf

Pond 8P: EX. CB-2293 Peak Elev=47.93' Inflow=0.07 cfs 412 cf
12.0" Round Culvert n=0.012 L=33.0' S=0.0364 '/' Outflow=0.07 cfs 412 cf

Pond 10P: CB 2078 Peak Elev=50.21' Inflow=0.18 cfs 634 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=0.18 cfs 634 cf

Pond 12P: DMH-2 Peak Elev=49.03' Inflow=0.07 cfs 412 cf
Outflow=0.07 cfs 412 cf

Link PA-1: POA-1 Inflow=0.20 cfs 701 cf
Primary=0.20 cfs 701 cf

Link PA-2: POA-2 Inflow=0.21 cfs 856 cf
Primary=0.21 cfs 856 cf

Total Runoff Area = 30,260 sf Runoff Volume = 1,632 cf Average Runoff Depth = 0.65"
18.73% Pervious = 5,669 sf 81.27% Impervious = 24,591 sf

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=13,368 sf 71.09% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=WQ Runoff=0.71 cfs 2,614 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,499 sf 39.14% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=WQ Runoff=0.10 cfs 362 cf

Subcatchment 3A: Subcatchment 3A (New Runoff Area=6,418 sf 100.00% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=WQ Runoff=0.41 cfs 1,550 cf

Subcatchment 3B: Subcatchment 3B Runoff Area=7,975 sf 96.45% Impervious Runoff Depth=2.83"
Tc=6.0 min CN=WQ Runoff=0.50 cfs 1,881 cf

Pond 1P: StormTech SC-310 Peak Elev=48.52' Storage=201 cf Inflow=0.41 cfs 1,543 cf
Outflow=0.29 cfs 1,539 cf

Pond 5P: PR. CB-1 Peak Elev=49.66' Storage=41 cf Inflow=0.50 cfs 1,881 cf
Outflow=0.50 cfs 1,842 cf

Pond 6P: DMH-1 Peak Elev=49.02' Storage=13 cf Inflow=0.41 cfs 1,550 cf
8.0" Round Culvert n=0.013 L=2.0' S=0.0000 '/' Outflow=0.41 cfs 1,543 cf

Pond 7P: EX. CB-2310 Peak Elev=49.35' Storage=30 cf Inflow=0.50 cfs 1,842 cf
12.0" Round Culvert n=0.025 L=22.4' S=0.0893 '/' Outflow=0.50 cfs 1,817 cf

Pond 8P: EX. CB-2293 Peak Elev=48.06' Inflow=0.29 cfs 1,539 cf
12.0" Round Culvert n=0.012 L=33.0' S=0.0364 '/' Outflow=0.29 cfs 1,539 cf

Pond 10P: CB 2078 Peak Elev=50.43' Inflow=0.71 cfs 2,614 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=0.71 cfs 2,614 cf

Pond 12P: DMH-2 Peak Elev=49.10' Inflow=0.29 cfs 1,539 cf
Outflow=0.29 cfs 1,539 cf

Link PA-1: POA-1 Inflow=0.81 cfs 2,976 cf
Primary=0.81 cfs 2,976 cf

Link PA-2: POA-2 Inflow=0.77 cfs 3,356 cf
Primary=0.77 cfs 3,356 cf

Total Runoff Area = 30,260 sf Runoff Volume = 6,407 cf Average Runoff Depth = 2.54"
18.73% Pervious = 5,669 sf 81.27% Impervious = 24,591 sf

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=13,368 sf 71.09% Impervious Runoff Depth=5.03"
Tc=6.0 min CN=WQ Runoff=1.51 cfs 5,599 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,499 sf 39.14% Impervious Runoff Depth=4.20"
Tc=6.0 min CN=WQ Runoff=0.25 cfs 875 cf

Subcatchment 3A: Subcatchment 3A (New Runoff Area=6,418 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=WQ Runoff=0.80 cfs 3,087 cf

Subcatchment 3B: Subcatchment 3B Runoff Area=7,975 sf 96.45% Impervious Runoff Depth=5.68"
Tc=6.0 min CN=WQ Runoff=0.99 cfs 3,775 cf

Pond 1P: StormTech SC-310 Peak Elev=48.75' Storage=350 cf Inflow=0.80 cfs 3,080 cf
Outflow=0.56 cfs 3,076 cf

Pond 5P: PR. CB-1 Peak Elev=49.74' Storage=42 cf Inflow=0.99 cfs 3,775 cf
Outflow=0.99 cfs 3,736 cf

Pond 6P: DMH-1 Peak Elev=49.26' Storage=16 cf Inflow=0.80 cfs 3,087 cf
8.0" Round Culvert n=0.013 L=2.0' S=0.0000 '/' Outflow=0.80 cfs 3,080 cf

Pond 7P: EX. CB-2310 Peak Elev=49.51' Storage=32 cf Inflow=0.99 cfs 3,736 cf
12.0" Round Culvert n=0.025 L=22.4' S=0.0893 '/' Outflow=0.99 cfs 3,711 cf

Pond 8P: EX. CB-2293 Peak Elev=48.18' Inflow=0.56 cfs 3,076 cf
12.0" Round Culvert n=0.012 L=33.0' S=0.0364 '/' Outflow=0.56 cfs 3,076 cf

Pond 10P: CB 2078 Peak Elev=50.66' Inflow=1.51 cfs 5,599 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=1.51 cfs 5,599 cf

Pond 12P: DMH-2 Peak Elev=49.16' Inflow=0.56 cfs 3,076 cf
Outflow=0.56 cfs 3,076 cf

Link PA-1: POA-1 Inflow=1.75 cfs 6,474 cf
Primary=1.75 cfs 6,474 cf

Link PA-2: POA-2 Inflow=1.46 cfs 6,787 cf
Primary=1.46 cfs 6,787 cf

Total Runoff Area = 30,260 sf Runoff Volume = 13,337 cf Average Runoff Depth = 5.29"
18.73% Pervious = 5,669 sf 81.27% Impervious = 24,591 sf

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=13,368 sf 71.09% Impervious Runoff Depth=7.54"
Tc=6.0 min CN=WQ Runoff=2.24 cfs 8,402 cf

Subcatchment 2: Subcatchment 2 Runoff Area=2,499 sf 39.14% Impervious Runoff Depth=6.62"
Tc=6.0 min CN=WQ Runoff=0.39 cfs 1,378 cf

Subcatchment 3A: Subcatchment 3A (New Runoff Area=6,418 sf 100.00% Impervious Runoff Depth=8.38"
Tc=6.0 min CN=WQ Runoff=1.15 cfs 4,482 cf

Subcatchment 3B: Subcatchment 3B Runoff Area=7,975 sf 96.45% Impervious Runoff Depth=8.28"
Tc=6.0 min CN=WQ Runoff=1.42 cfs 5,501 cf

Pond 1P: StormTech SC-310 Peak Elev=48.91' Storage=453 cf Inflow=1.16 cfs 4,475 cf
Outflow=0.89 cfs 4,471 cf

Pond 5P: PR. CB-1 Peak Elev=49.84' Storage=43 cf Inflow=1.42 cfs 5,501 cf
Outflow=1.42 cfs 5,462 cf

Pond 6P: DMH-1 Peak Elev=49.49' Storage=19 cf Inflow=1.15 cfs 4,482 cf
8.0" Round Culvert n=0.013 L=2.0' S=0.0000 '/' Outflow=1.16 cfs 4,475 cf

Pond 7P: EX. CB-2310 Peak Elev=49.63' Storage=33 cf Inflow=1.42 cfs 5,462 cf
12.0" Round Culvert n=0.025 L=22.4' S=0.0893 '/' Outflow=1.42 cfs 5,437 cf

Pond 8P: EX. CB-2293 Peak Elev=48.28' Inflow=0.89 cfs 4,471 cf
12.0" Round Culvert n=0.012 L=33.0' S=0.0364 '/' Outflow=0.89 cfs 4,471 cf

Pond 10P: CB 2078 Peak Elev=50.85' Inflow=2.24 cfs 8,402 cf
12.0" Round Culvert n=0.012 L=90.0' S=0.0100 '/' Outflow=2.24 cfs 8,402 cf

Pond 12P: DMH-2 Peak Elev=49.23' Inflow=0.89 cfs 4,471 cf
Outflow=0.89 cfs 4,471 cf

Link PA-1: POA-1 Inflow=2.63 cfs 9,780 cf
Primary=2.63 cfs 9,780 cf

Link PA-2: POA-2 Inflow=2.22 cfs 9,908 cf
Primary=2.22 cfs 9,908 cf

Total Runoff Area = 30,260 sf Runoff Volume = 19,763 cf Average Runoff Depth = 7.84"
18.73% Pervious = 5,669 sf 81.27% Impervious = 24,591 sf

Summary for Subcatchment 1: Subcatchment 1

Runoff = 1.15 cfs @ 12.13 hrs, Volume= 4,262 cf, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
21	74	>75% Grass cover, Good, HSG C
3,844	74	>75% Grass cover, Good, HSG C
560	98	Paved parking, HSG C
8,943	98	Paved parking & roofs, HSG C
13,368		Weighted Average
3,865		28.91% Pervious Area
9,503		71.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 2: Subcatchment 2

Runoff = 0.18 cfs @ 12.13 hrs, Volume= 641 cf, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
123	74	>75% Grass cover, Good, HSG C
1,398	74	>75% Grass cover, Good, HSG C
310	98	Paved parking, HSG C
668	98	Paved parking & roofs, HSG C
2,499		Weighted Average
1,521		60.86% Pervious Area
978		39.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3A: Subcatchment 3A (New Bldg)

Runoff = 0.63 cfs @ 12.13 hrs, Volume= 2,409 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
115	98	Paved parking, HSG C
6,303	98	Paved parking & roofs, HSG C
6,418		Weighted Average
6,418		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3B: Subcatchment 3B

Runoff = 0.77 cfs @ 12.13 hrs, Volume= 2,938 cf, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
218	74	>75% Grass cover, Good, HSG C
65	74	>75% Grass cover, Good, HSG C
2,346	98	Paved parking, HSG C
5,346	98	Paved parking & roofs, HSG C
7,975		Weighted Average
283		3.55% Pervious Area
7,692		96.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 1P: StormTech SC-310

Inflow Area = 6,418 sf,100.00% Impervious, Inflow Depth = 4.49" for 10yr (NRCC) event
Inflow = 0.63 cfs @ 12.13 hrs, Volume= 2,402 cf
Outflow = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf, Atten= 36%, Lag= 4.0 min
Primary = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 48.65' @ 12.20 hrs Surf.Area= 934 sf Storage= 288 cf

Plug-Flow detention time= 33.8 min calculated for 2,398 cf (100% of inflow)
Center-of-Mass det. time= 32.6 min (786.9 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.00'	706 cf	**26.17'W x 35.68'L x 2.33'H Field A**
			2,178 cf Overall - 413 cf Embedded = 1,766 cf x 40.0% Voids
#2A	48.50'	413 cf	**ADS_StormTech SC-310 +Cap** x 28 Inside #1
			Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
			Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
			28 Chambers in 7 Rows

1,119 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	48.00'	**6.0" Round 6" Underdrain** L= 20.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 48.00' / 48.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	48.55'	**8.0" Round 8" Outlet Manifold** L= 2.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 48.55' / 48.50' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 12.20 hrs HW=48.65' TW=49.13' (Dynamic Tailwater)
1=6" Underdrain (Controls 0.00 cfs)
2=8" Outlet Manifold (Controls 0.00 cfs)

Summary for Pond 5P: PR. CB-1

Inflow Area = 7,975 sf, 96.45% Impervious, Inflow Depth = 4.42" for 10yr (NRCC) event
Inflow = 0.77 cfs @ 12.13 hrs, Volume= 2,938 cf
Outflow = 0.77 cfs @ 12.13 hrs, Volume= 2,899 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.13 hrs, Volume= 2,899 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 49.71' @ 12.13 hrs Surf.Area= 13 sf Storage= 42 cf

Plug-Flow detention time= 17.6 min calculated for 2,899 cf (99% of inflow)
Center-of-Mass det. time= 8.7 min (762.3 - 753.6)

Volume	Invert	Avail.Storage	Storage Description
#1	46.40'	75 cf	**4.00'D x 6.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	49.50'	**2.5' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)

Primary OutFlow Max=0.77 cfs @ 12.13 hrs HW=49.71' TW=49.45' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.77 cfs @ 1.49 fps)

Summary for Pond 6P: DMH-1

Inflow Area = 6,418 sf,100.00% Impervious, Inflow Depth = 4.50" for 10yr (NRCC) event
Inflow = 0.63 cfs @ 12.13 hrs, Volume= 2,409 cf
Outflow = 0.63 cfs @ 12.13 hrs, Volume= 2,402 cf, Atten= 0%, Lag= 0.1 min
Primary = 0.63 cfs @ 12.13 hrs, Volume= 2,402 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 49.16' @ 12.13 hrs Surf.Area= 13 sf Storage= 15 cf

Plug-Flow detention time= 4.7 min calculated for 2,401 cf (100% of inflow)

Center-of-Mass det. time= 2.7 min (754.3 - 751.6)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	57 cf	**4.00'D x 4.50'H Manhole**

Device	Routing	Invert	Outlet Devices
#1	Primary	48.55'	**8.0" Round 8" CPP (to StormTech)** L= 2.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 48.55' / 48.55' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.63 cfs @ 12.13 hrs HW=49.16' TW=48.60' (Dynamic Tailwater)
└─**1=8" CPP (to StormTech)** (Barrel Controls 0.63 cfs @ 2.48 fps)

Summary for Pond 7P: EX. CB-2310

Inflow Area = 7,975 sf, 96.45% Impervious, Inflow Depth = 4.36" for 10yr (NRCC) event
Inflow = 0.77 cfs @ 12.13 hrs, Volume= 2,899 cf
Outflow = 0.77 cfs @ 12.13 hrs, Volume= 2,874 cf, Atten= 0%, Lag= 0.1 min
Primary = 0.77 cfs @ 12.13 hrs, Volume= 2,874 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 49.45' @ 12.13 hrs Surf.Area= 13 sf Storage= 31 cf

Plug-Flow detention time= 11.4 min calculated for 2,873 cf (99% of inflow)
Center-of-Mass det. time= 5.5 min (767.8 - 762.3)

Volume	Invert	Avail.Storage	Storage Description
#1	47.00'	54 cf	**4.00'D x 4.30'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	49.00'	**12.0" Round 12" CMP** L= 22.4' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 49.00' / 47.00' S= 0.0893 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.13 hrs HW=49.45' TW=0.00' (Dynamic Tailwater)
└─**1=12" CMP** (Inlet Controls 0.77 cfs @ 2.28 fps)

Summary for Pond 8P: EX. CB-2293

Inflow Area = 6,418 sf,100.00% Impervious, Inflow Depth = 4.48" for 10yr (NRCC) event
Inflow = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf
Outflow = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 48.12' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	47.80'	**12.0" Round 12" RCP**

L= 33.0' RCP, end-section conforming to fill, Ke= 0.500
Inlet / Outlet Invert= 47.80' / 46.60' S= 0.0364 '/' Cc= 0.900
n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=0.41 cfs @ 12.20 hrs HW=48.12' TW=0.00' (Dynamic Tailwater)
└─**1=12" RCP** (Inlet Controls 0.41 cfs @ 1.91 fps)

Summary for Pond 10P: CB 2078

Inflow Area = 13,368 sf, 71.09% Impervious, Inflow Depth = 3.83" for 10yr (NRCC) event
Inflow = 1.15 cfs @ 12.13 hrs, Volume= 4,262 cf
Outflow = 1.15 cfs @ 12.13 hrs, Volume= 4,262 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.13 hrs, Volume= 4,262 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 50.56' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	50.00'	**12.0" Round Outlet** L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 50.00' / 49.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=1.15 cfs @ 12.13 hrs HW=50.56' TW=0.00' (Dynamic Tailwater)
└─**1=Outlet** (Inlet Controls 1.15 cfs @ 2.55 fps)

Summary for Pond 12P: DMH-2

Inflow Area = 6,418 sf,100.00% Impervious, Inflow Depth = 4.48" for 10yr (NRCC) event
Inflow = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf
Outflow = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.41 cfs @ 12.20 hrs, Volume= 2,398 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 49.13' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	47.80'	**8.0" Round 8" CPP** L= 30.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 47.80' / 47.40' S= 0.0133 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	48.00'	**1.0" Vert. Weep holes** C= 0.600
#3	Device 1	49.00'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.41 cfs @ 12.20 hrs HW=49.13' TW=48.12' (Dynamic Tailwater)
└─**1=8" CPP** (Passes 0.41 cfs of 1.60 cfs potential flow)
  ├─**2=Weep holes** (Orifice Controls 0.03 cfs @ 4.85 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.38 cfs @ 1.18 fps)

Summary for Link PA-1: POA-1

Inflow Area =	15,867 sf,	66.06% Impervious,	Inflow Depth = 3.71"	for 10yr (NRCC) event		
Inflow =	1.33 cfs @	12.13 hrs,	Volume=	4,902 cf		
Primary =	1.33 cfs @	12.13 hrs,	Volume=	4,902 cf,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link PA-2: POA-2

Inflow Area =	14,393 sf,	98.03% Impervious,	Inflow Depth = 4.40"	for 10yr (NRCC) event		
Inflow =	1.14 cfs @	12.14 hrs,	Volume=	5,272 cf		
Primary =	1.14 cfs @	12.14 hrs,	Volume=	5,272 cf,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

3. INFILTRATION TEST REPORT

JOHN TURNER
CONSULTING

June 29, 2021

Horizons Engineering, Inc.
5 Railroad Street
Newmarket, NH 03857

Attn: Michael Sievert, PE – VP of Structural Engineering
O: 603.659.4979
msievert@horizonsengineering.com

RE: In-Situ Infiltration Testing
72 Main Street
Durham, New Hampshire
JTC Project No. 21-04-058

Dear Mr. Sievert:

In accordance with our proposal and your authorization to proceed, John Turner Consulting, Inc. (JTC) has completed the in-situ infiltration testing at the above-referenced site. Presented herein and attached are the results of the subsurface investigation and our testing.

SITE AND PROJECT DESCRIPTION

Presently, the project area developed with retail and restaurant space, with associated paved parking and drive lanes. The project includes construction of on-site stormwater management areas within a grassy area to the west of the parking area.

EXPLORATIONS AND SUBSURFACE CONDITIONS

JTC observed the excavation of two test pits, designated as TP-1 and TP-2, at the site on June 18, 2021. The approximate test pit locations are depicted on the attached Exploration and Testing Location Diagram. JTC logged the subsurface conditions, which were similar at each location, as summarized below:

- 0 to 1 ft: 12 inches of Topsoil, dark brown Sandy Silt (ML), with roots and organics.
- 1 to 1.4ft: 5 inches of Orange-brown, well-graded sand (SW), trace gravel.
- 1.4 to 5ft: Gray-brown, Silty sand (SM-SC), with gravel, with cobbles and boulders.
- 5ft to 6 ft: Gray-brown, Clayey sand (SC), with gravel
- 6ft: Excavation refusal on bedrock.

IN-SITU INFILTRATION TESTING

At TP-2, JTC performed an in-situ, constant-head, infiltration test in accordance with ASTM D5126 using a Guelph permeameter. The infiltration testing results are summarized in the following table:

Table 1 – Summary of Infiltration Testing Results							
Infiltration Test #	Location	Approx. Depth (in. bgs)	Soil Type	Method	Head (inches)	Measured Infiltration Rate (inch/hour)	Average Measured Infiltration Rate (inch/hour)
IT-1	TP-2	3.8	SM	Single Head	2	0.004	0.004

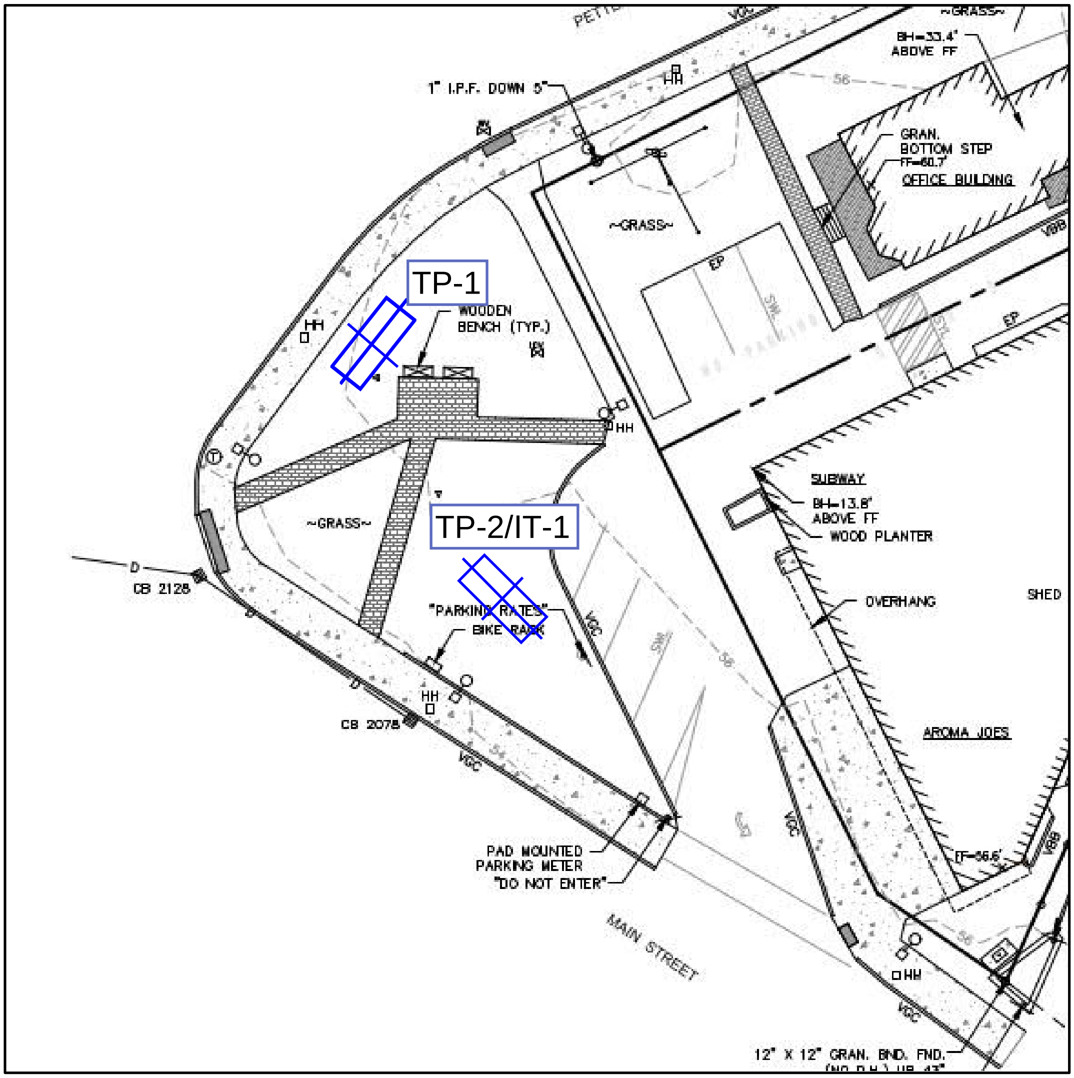
No factors of safety have been applied to the measured rates presented in the table.

At the conclusion of the first test, Horizons informed JTC that no additional infiltration testing would be needed.

We appreciate the opportunity to assist you on this project. Please do not hesitate to contact us if you have any questions or require additional information.

Respectfully,
JOHN TURNER CONSULTING, INC.

Stephen C. Lanne, P.E.
Vice President of Engineering
slanne@consultjtc.com
413.222.1675



Notes:

1. Test pit excavation and in-situ infiltration testing were performed on June 18, 2021.
2. Locations should be considered approximate.
3. Basemap source: “Topographic Plan”, Revision 1, dated August 21, 2018, prepared by Doucet Survey, Inc.
4. Not to scale.

Client: Horizons Engineering Inc **5 Railroad Street** **Newmarket, New Hampshire 03857**	**Project: 72 Main Street** **Durham, New Hampshire**
JOHN TURNER CONSULTING	**EXPLORATION AND TESTING LOCATION DIAGRAM**

4. PLANS