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TOWN OF DURHAM
STORMWATER MANAGEMENT PLAN
FOR
DUMONT REALTY & DEVELOPMENT, LLC

32 MADBURY ROAD
TAX MAP 2, LOT 10-3

SUBMITTED ON
2 MARCH 2022

Project Number 21585

CONTENTS

1 PROJECT INFORMATION NARRATIVE

1.1. Project Narrative

1.1.1. Project summary

AAM Durham Residences, LLC intends to build a new 2200 ft^2 residential building and build a new parking lot (to replace an older existing lot) on the site. The project will increase the impervious area on the site by about 4000 ft^2.

The stormwater from the new building and parking lot will be collected in gutter and catch basins to a new stormwater pond. Currently there is no treatment for any stormwater on the site. Tables 1 and 2 show the predicted impact that the proposed project will have on stormwater from the site.

Table 1: 2-, 10-, 25-, and 50-year peak flow comparison

PEAK FLOW (ft3/s)												
	1-inch		2 year		10 year		25 year		50 year		100 year	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
P1	**0.17**	0.03	**1.74**	1.23	**3.26**	2.13	**4.51**	3.64	**5.68**	5.02	**7.10**	6.19
P2	0.00	**0.01**	0.26	0.26	**0.54**	0.52	**0.77**	0.74	**0.98**	0.94	**1.25**	1.19

Table 2: 1-inch 2-, 10-, 25-, and 50-year runoff volume comparison

RUNOFF VOLUME (ft3)												
	1-inch		2 year		10 year		25 year		50 year		100 year	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
P1	**687**	131	**5713**	3912	**10611**	8492	**14725**	12500	**18661**	16389	**23523**	21211
P2	**46**	52	**847**	834	**1700**	1650	**2431**	2345	**3136**	3013	**4012**	3842

Impacts to watershed water quality from grading within the watersheds would be likely to occur from uncontrolled discharge of site runoff during construction activities and stabilized post-project surfaces. To minimize the impacts to the watershed, the site has been designed to cause no increase in runoff and erosion control methods have been sized in accordance with the *New Hampshire Stormwater Management Manual* (December, 2008).

1.1.2. Existing site conditions

The proposed work is located at the corner of Garrison Ave and Madbury Road. The lot is 1.11 Ac and has an existing building that is about 5000 ft^2. There are two existing asphalt parking lots, one of Garrison and the other off Madbury, that provide parking for the existing building. The remainder of the site is mostly grassed or otherwise landscaped. Along the northerly border there are some small ledge outcroppings. There are no wetlands located within the property bounds and the site is not within a 100-year flood plain delineated by FEMA.

1.1.3. Proposed site conditions

The proposed project is for the construction of a new building that is about 2200 ft^2. The building will be located along Madbury Road. The parking lot on Madbury Road will removed and replaced with a new parking lot further north on the lot, adjacent to the new building. The project proposed an increase of about 3800 ft^2 of impervious area.

In order to mitigate stormwater impacts, the runoff from the new parking lot will be collected in deep sump catch basins routed to a stormwater pond. The treated stormwater some of the stormwater is infiltrated to the existing soils, while the majority of the water is routed to the existing stormwater drainage system in Madbury Road.

1.1.4. Rainfall data

Using SCS TR-20, run under HydroCAD Version 10.0 with Type II, 24-hour 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 (NRCC) for the geographic location of the project. These data are summarized in Table 2.

Table 2: Project design storm depths from NRCC

Storm	Depth [inches]
1-inch	1.00
2-YR	3.13
10-YR	4.74
25-YR	6.01
50-YR	7.19
100-YR	8.62

1.1.5. Peak flow runoff control requirement

In all the design storms analyzed, the peak flow is predicted to remain the same or decrease due to the proposed impacts. This is due to the proposed stormwater pond which retains stormwater and allows it to infiltrate into the existing soils.

Table 3: 1-inch, 2-, 10-, 25-, and 50-year peak flow comparison

PEAK FLOW (ft3/s)												
	1-inch		2 year		10 year		25 year		50 year		100 year	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
P1	**0.17**	0.03	**1.74**	1.23	**3.26**	2.13	**4.51**	3.64	**5.68**	5.02	**7.10**	6.19
P2	0.00	**0.01**	0.26	0.26	**0.54**	0.52	**0.77**	0.74	**0.98**	0.94	**1.25**	1.19

1.1.6. Runoff volume requirement

In all the design storms analyzed, the runoff volume is predicted to decrease due to the proposed impacts. This is due to the proposed stormwater pond which retains stormwater and allows it to infiltrate into the existing soils.

Table 4: 2-, 10-, 25-, and 50-year runoff volume comparison

RUNOFF VOLUME (ft3)												
	1-inch		2 year		10 year		25 year		50 year		100 year	
	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
P1	**687**	131	**5713**	3912	**10611**	8492	**14725**	12500	**18661**	16389	**23523**	21211
P2	**46**	52	**847**	834	**1700**	1650	**2431**	2345	**3136**	3013	**4012**	3842

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

October 13, 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: 1:861 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 10, 20, 40, 60

Feet: 0, 40, 80, 160, 240

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 22, Aug 31, 2021

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
HcB	Hollis-Charlton fine sandy loams, 3 to 8 percent slopes	3.5	100.0%
SfC	Suffield silt loam, 8 to 15 percent slopes	0.0	0.0%
Totals for Area of Interest		**3.5**	**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

HcB—Hollis-Charlton fine sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d7j
Elevation: 0 to 1,020 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: Farmland of local importance

Map Unit Composition

Hollis and similar soils: 55 percent
Charlton and similar soils: 35 percent
Minor components: 10 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: fine sandy loam
H2 - 14 to 18 inches: bedrock

Properties and qualities

Slope: 3 to 8 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 supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
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: 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
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 supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Not named

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

Buxton

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

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 supply, 0 to 60 inches: 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	70.926 degrees West
Latitude	43.138 degrees North
Elevation	0 feet
Date/Time	Wed, 13 Oct 2021 10:06:11 -0400

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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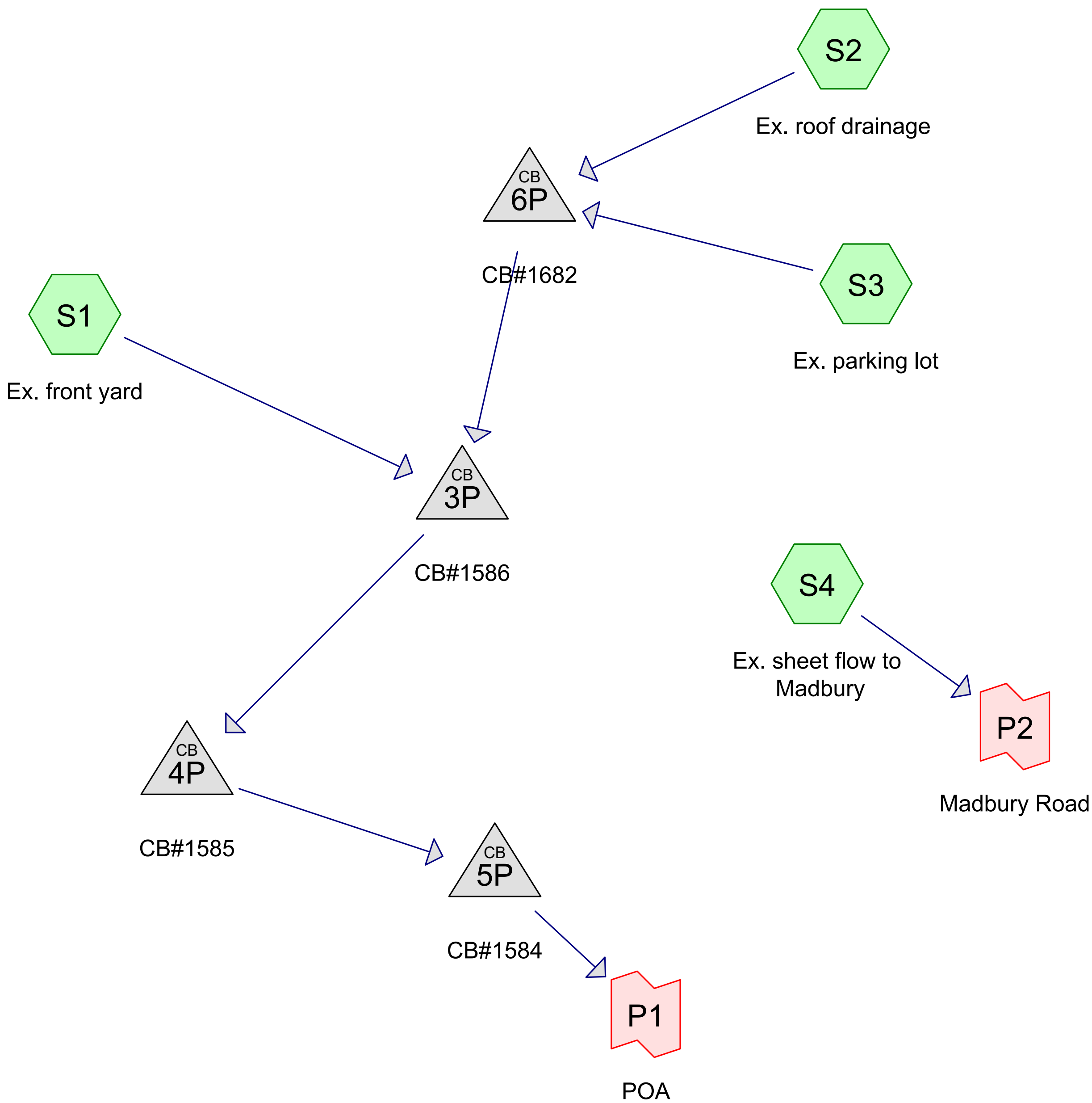
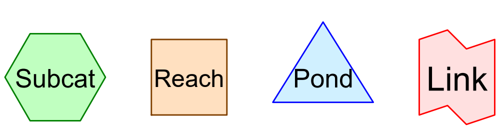
2 Drainage calculations, analysis & design

2.1. Pre-development analysis





Routing Diagram for 21585_Pre_01
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)
33,434	74	>75% Grass cover, Good, HSG C (S1, S3, S4)
7,958	98	Paved parking, HSG C (S3, S4)
5,111	98	Roofs, HSG C (S2)
4,668	98	Unconnected pavement, HSG C (S1, S3)
51,171	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
51,171	HSG C	S1, S2, S3, S4
0	HSG D	
0	Other	
51,171		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Ex. front yard Runoff Area=16,938 sf 10.84% Impervious Runoff Depth=0.03"
Tc=6.0 min UI Adjusted CN=75 Runoff=0.00 cfs 43 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=98 Runoff=0.10 cfs 337 cf

Subcatchment S3: Ex. parking lot Runoff Area=21,213 sf 43.83% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=85 Runoff=0.07 cfs 307 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,909 sf 18.88% Impervious Runoff Depth=0.07"
Tc=6.0 min CN=79 Runoff=0.00 cfs 46 cf

Pond 3P: CB#1586 Peak Elev=67.80' Inflow=0.17 cfs 687 cf
12.0" Round Culvert n=0.025 L=23.2' S=-0.0129 '/' Outflow=0.17 cfs 687 cf

Pond 4P: CB#1585 Peak Elev=65.88' Inflow=0.17 cfs 687 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=0.17 cfs 687 cf

Pond 5P: CB#1584 Peak Elev=65.80' Inflow=0.17 cfs 687 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=0.17 cfs 687 cf

Pond 6P: CB#1682 Peak Elev=70.40' Inflow=0.17 cfs 644 cf
12.0" Round Culvert n=0.013 L=73.4' S=0.0313 '/' Outflow=0.17 cfs 644 cf

Link P1: POA Inflow=0.17 cfs 687 cf
Primary=0.17 cfs 687 cf

Link P2: Madbury Road Inflow=0.00 cfs 46 cf
Primary=0.00 cfs 46 cf

Total Runoff Area = 51,171 sf Runoff Volume = 733 cf Average Runoff Depth = 0.17"
65.34% Pervious = 33,434 sf 34.66% Impervious = 17,737 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Ex. front yard Runoff Area=16,938 sf 10.84% Impervious Runoff Depth=1.05"
Tc=6.0 min UI Adjusted CN=75 Runoff=0.45 cfs 1,478 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,234 cf

Subcatchment S3: Ex. parking lot Runoff Area=21,213 sf 43.83% Impervious Runoff Depth=1.70"
Tc=6.0 min CN=85 Runoff=0.95 cfs 3,002 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,909 sf 18.88% Impervious Runoff Depth=1.28"
Tc=6.0 min CN=79 Runoff=0.26 cfs 847 cf

Pond 3P: CB#1586 Peak Elev=68.52' Inflow=1.74 cfs 5,713 cf
12.0" Round Culvert n=0.025 L=23.2' S=-0.0129 '/' Outflow=1.74 cfs 5,713 cf

Pond 4P: CB#1585 Peak Elev=66.49' Inflow=1.74 cfs 5,713 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=1.74 cfs 5,713 cf

Pond 5P: CB#1584 Peak Elev=66.32' Inflow=1.74 cfs 5,713 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=1.74 cfs 5,713 cf

Pond 6P: CB#1682 Peak Elev=70.80' Inflow=1.30 cfs 4,236 cf
12.0" Round Culvert n=0.013 L=73.4' S=0.0313 '/' Outflow=1.30 cfs 4,236 cf

Link P1: POA Inflow=1.74 cfs 5,713 cf
Primary=1.74 cfs 5,713 cf

Link P2: Madbury Road Inflow=0.26 cfs 847 cf
Primary=0.26 cfs 847 cf

Total Runoff Area = 51,171 sf Runoff Volume = 6,560 cf Average Runoff Depth = 1.54"
65.34% Pervious = 33,434 sf 34.66% Impervious = 17,737 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Ex. front yard Runoff Area=16,938 sf 10.84% Impervious Runoff Depth=3.29"
Tc=6.0 min UI Adjusted CN=75 Runoff=1.47 cfs 4,645 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=98 Runoff=0.67 cfs 2,458 cf

Subcatchment S3: Ex. parking lot Runoff Area=21,213 sf 43.83% Impervious Runoff Depth=4.31"
Tc=6.0 min CN=85 Runoff=2.36 cfs 7,622 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,909 sf 18.88% Impervious Runoff Depth=3.69"
Tc=6.0 min CN=79 Runoff=0.77 cfs 2,431 cf

Pond 3P: CB#1586 Peak Elev=70.44' Inflow=4.51 cfs 14,725 cf
12.0" Round Culvert n=0.025 L=23.2' S=-0.0129 '/' Outflow=4.51 cfs 14,725 cf

Pond 4P: CB#1585 Peak Elev=68.27' Inflow=4.51 cfs 14,725 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=4.51 cfs 14,725 cf

Pond 5P: CB#1584 Peak Elev=67.52' Inflow=4.51 cfs 14,725 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=4.51 cfs 14,725 cf

Pond 6P: CB#1682 Peak Elev=71.34' Inflow=3.04 cfs 10,081 cf
12.0" Round Culvert n=0.013 L=73.4' S=0.0313 '/' Outflow=3.04 cfs 10,081 cf

Link P1: POA Inflow=4.51 cfs 14,725 cf
Primary=4.51 cfs 14,725 cf

Link P2: Madbury Road Inflow=0.77 cfs 2,431 cf
Primary=0.77 cfs 2,431 cf

Total Runoff Area = 51,171 sf Runoff Volume = 17,157 cf Average Runoff Depth = 4.02"
65.34% Pervious = 33,434 sf 34.66% Impervious = 17,737 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Ex. front yard Runoff Area=16,938 sf 10.84% Impervious Runoff Depth=4.32"
Tc=6.0 min UI Adjusted CN=75 Runoff=1.93 cfs 6,094 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=6.95"
Tc=6.0 min CN=98 Runoff=0.81 cfs 2,960 cf

Subcatchment S3: Ex. parking lot Runoff Area=21,213 sf 43.83% Impervious Runoff Depth=5.43"
Tc=6.0 min CN=85 Runoff=2.94 cfs 9,607 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,909 sf 18.88% Impervious Runoff Depth=4.76"
Tc=6.0 min CN=79 Runoff=0.98 cfs 3,136 cf

Pond 3P: CB#1586 Peak Elev=71.71' Inflow=5.68 cfs 18,661 cf
12.0" Round Culvert n=0.025 L=23.2' S=-0.0129 '/' Outflow=5.68 cfs 18,661 cf

Pond 4P: CB#1585 Peak Elev=69.55' Inflow=5.68 cfs 18,661 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=5.68 cfs 18,661 cf

Pond 5P: CB#1584 Peak Elev=68.35' Inflow=5.68 cfs 18,661 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=5.68 cfs 18,661 cf

Pond 6P: CB#1682 Peak Elev=72.54' Inflow=3.75 cfs 12,567 cf
12.0" Round Culvert n=0.013 L=73.4' S=0.0313 '/' Outflow=3.75 cfs 12,567 cf

Link P1: POA Inflow=5.68 cfs 18,661 cf
Primary=5.68 cfs 18,661 cf

Link P2: Madbury Road Inflow=0.98 cfs 3,136 cf
Primary=0.98 cfs 3,136 cf

Total Runoff Area = 51,171 sf Runoff Volume = 21,797 cf Average Runoff Depth = 5.11"
65.34% Pervious = 33,434 sf 34.66% Impervious = 17,737 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Ex. front yard Runoff Area=16,938 sf 10.84% Impervious Runoff Depth=5.60"
Tc=6.0 min UI Adjusted CN=75 Runoff=2.48 cfs 7,911 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=8.38"
Tc=6.0 min CN=98 Runoff=0.97 cfs 3,569 cf

Subcatchment S3: Ex. parking lot Runoff Area=21,213 sf 43.83% Impervious Runoff Depth=6.81"
Tc=6.0 min CN=85 Runoff=3.65 cfs 12,043 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,909 sf 18.88% Impervious Runoff Depth=6.09"
Tc=6.0 min CN=79 Runoff=1.25 cfs 4,012 cf

Pond 3P: CB#1586 Peak Elev=74.96' Inflow=7.10 cfs 23,523 cf
12.0" Round Culvert n=0.025 L=23.2' S=-0.0129 '/' Outflow=7.10 cfs 23,523 cf

Pond 4P: CB#1585 Peak Elev=71.51' Inflow=7.10 cfs 23,523 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=7.10 cfs 23,523 cf

Pond 5P: CB#1584 Peak Elev=69.62' Inflow=7.10 cfs 23,523 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=7.10 cfs 23,523 cf

Pond 6P: CB#1682 Peak Elev=76.01' Inflow=4.62 cfs 15,612 cf
12.0" Round Culvert n=0.013 L=73.4' S=0.0313 '/' Outflow=4.62 cfs 15,612 cf

Link P1: POA Inflow=7.10 cfs 23,523 cf
Primary=7.10 cfs 23,523 cf

Link P2: Madbury Road Inflow=1.25 cfs 4,012 cf
Primary=1.25 cfs 4,012 cf

Total Runoff Area = 51,171 sf Runoff Volume = 27,535 cf Average Runoff Depth = 6.46"
65.34% Pervious = 33,434 sf 34.66% Impervious = 17,737 sf

Summary for Subcatchment S1: Ex. front yard

Runoff = 1.00 cfs @ 12.09 hrs, Volume= 3,162 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Adj	Description
1,836	98		Unconnected pavement, HSG C
15,102	74		>75% Grass cover, Good, HSG C
16,938	77	75	Weighted Average, UI Adjusted
15,102			89.16% Pervious Area
1,836			10.84% Impervious Area
1,836			100.00% Unconnected

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

Summary for Subcatchment S2: Ex. roof drainage

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,918 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
5,111	98	Roofs, HSG C
5,111		100.00% Impervious Area

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

Summary for Subcatchment S3: Ex. parking lot

Runoff = 1.73 cfs @ 12.09 hrs, Volume= 5,531 cf, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
6,465	98	Paved parking, HSG C
2,832	98	Unconnected pavement, HSG C
11,916	74	>75% Grass cover, Good, HSG C
21,213	85	Weighted Average
11,916		56.17% Pervious Area
9,297		43.83% Impervious Area
2,832		30.46% Unconnected

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

Summary for Subcatchment S4: Ex. sheet flow to Madbury

Runoff = 0.54 cfs @ 12.09 hrs, Volume= 1,700 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
6,416	74	>75% Grass cover, Good, HSG C
1,493	98	Paved parking, HSG C
7,909	79	Weighted Average
6,416		81.12% Pervious Area
1,493		18.88% Impervious Area

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

Summary for Pond 3P: CB#1586

Inflow Area = 43,262 sf, 37.55% Impervious, Inflow Depth = 2.94" for 10-yr (NRCC) event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf
Outflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 69.42' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	67.60'	**12.0" Round CMP_Round 12"** L= 23.2' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 67.30' / 67.60' S= -0.0129 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=3.20 cfs @ 12.09 hrs HW=69.38' TW=67.15' (Dynamic Tailwater)
↑—**1=CMP_Round 12"** (Barrel Controls 3.20 cfs @ 4.07 fps)

Summary for Pond 4P: CB#1585

Inflow Area = 43,262 sf, 37.55% Impervious, Inflow Depth = 2.94" for 10-yr (NRCC) event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf
Outflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 67.22' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	65.70'	**12.0" Round RCP_Round 12"** L= 20.7' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 65.50' / 65.70' S= -0.0097 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=2.67 cfs @ 12.09 hrs HW=67.15' TW=66.81' (Dynamic Tailwater)
└─**1=RCP_Round 12"** (Outlet Controls 2.67 cfs @ 3.40 fps)

Summary for Pond 5P: CB#1584

Inflow Area = 43,262 sf, 37.55% Impervious, Inflow Depth = 2.94" for 10-yr (NRCC) event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf
Outflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 66.84' @ 12.09 hrs
Flood Elev= 73.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.60'	**12.0" Round RCP_Round 12"** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.60' / 65.20' S= 0.0200 '/' Cc= 0.900 n= 0.014 Cast iron, coated, Flow Area= 0.79 sf

Primary OutFlow Max=3.20 cfs @ 12.09 hrs HW=66.81' TW=0.00' (Dynamic Tailwater)
└─**1=RCP_Round 12"** (Inlet Controls 3.20 cfs @ 4.07 fps)

Summary for Pond 6P: CB#1682

Inflow Area = 26,324 sf, 54.73% Impervious, Inflow Depth = 3.40" for 10-yr (NRCC) event
Inflow = 2.26 cfs @ 12.09 hrs, Volume= 7,449 cf
Outflow = 2.26 cfs @ 12.09 hrs, Volume= 7,449 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.26 cfs @ 12.09 hrs, Volume= 7,449 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 71.06' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	70.20'	**12.0" Round CMP_Round 12"** L= 73.4' Ke= 0.500 Inlet / Outlet Invert= 70.20' / 67.90' S= 0.0313 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=2.21 cfs @ 12.09 hrs HW=71.04' TW=69.37' (Dynamic Tailwater)
└─**1=CMP_Round 12"** (Inlet Controls 2.21 cfs @ 3.13 fps)

Summary for Link P1: POA

Inflow Area = 43,262 sf, 37.55% Impervious, Inflow Depth = 2.94" for 10-yr (NRCC) event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf
Primary = 3.26 cfs @ 12.09 hrs, Volume= 10,611 cf, Atten= 0%, Lag= 0.0 min

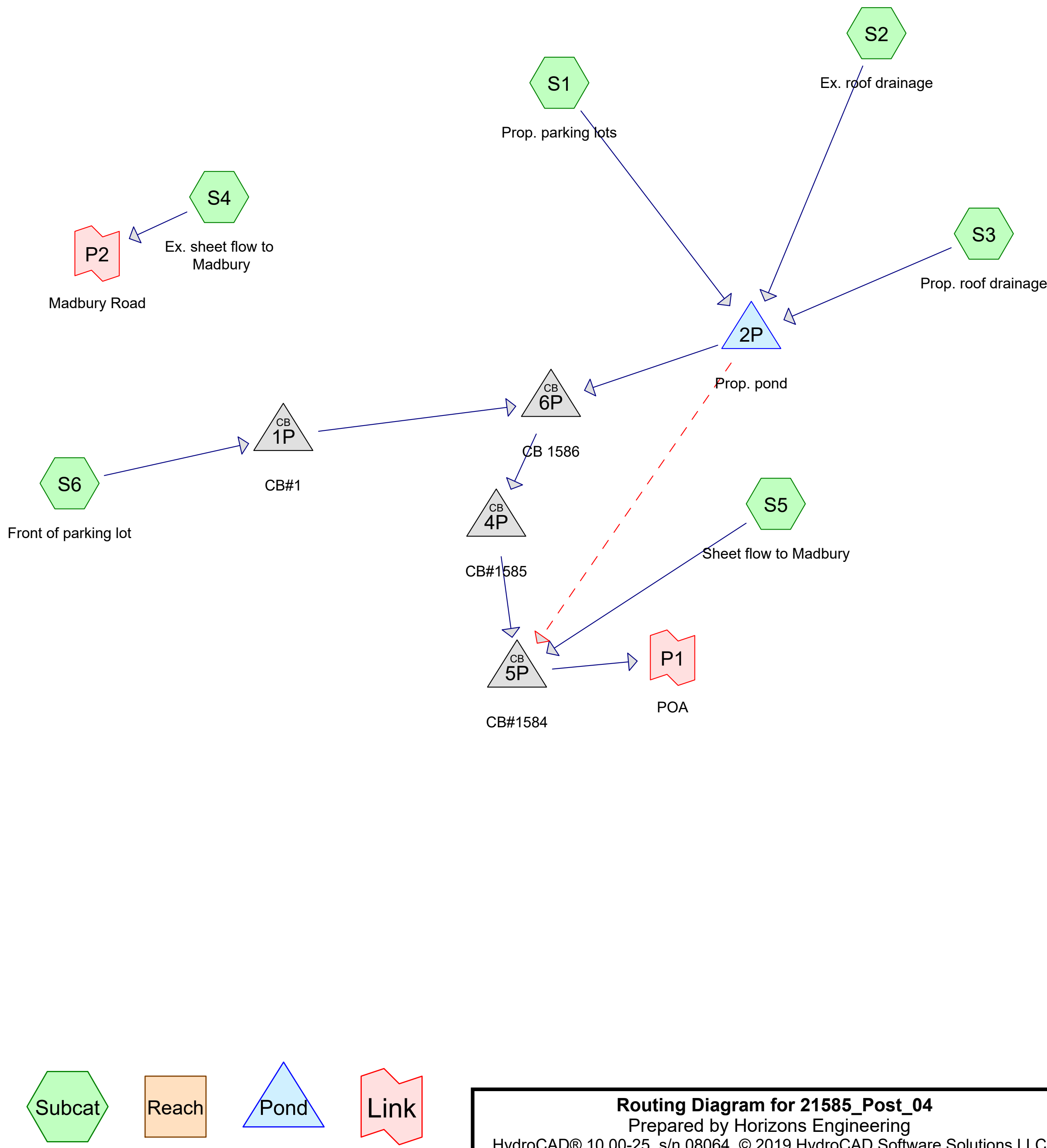
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link P2: Madbury Road

Inflow Area = 7,909 sf, 18.88% Impervious, Inflow Depth = 2.58" for 10-yr (NRCC) event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 1,700 cf
Primary = 0.54 cfs @ 12.09 hrs, Volume= 1,700 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

2.2. Post-development analysis



Routing Diagram for 21585_Post_04
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)
28,544	74	>75% Grass cover, Good, HSG C (S1, S4, S5, S6)
6,113	98	Paved parking, HSG C (S4, S5, S6)
7,319	98	Roofs, HSG C (S2, S3)
9,203	98	Unconnected pavement, HSG C (S1)
51,179	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
51,179	HSG C	S1, S2, S3, S4, S5, S6
0	HSG D	
0	Other	
51,179		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Prop. parking lots Runoff Area=26,646 sf 34.54% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=82 Runoff=0.04 cfs 254 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=98 Runoff=0.10 cfs 337 cf

Subcatchment S3: Prop. roof drainage Runoff Area=2,208 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=98 Runoff=0.04 cfs 146 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,425 sf 26.71% Impervious Runoff Depth=0.08"
Tc=6.0 min CN=80 Runoff=0.01 cfs 52 cf

Subcatchment S5: Sheet flow to Madbury Runoff Area=6,712 sf 37.51% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=83 Runoff=0.01 cfs 74 cf

Subcatchment S6: Front of parking lot Runoff Area=3,077 sf 52.39% Impervious Runoff Depth=0.22"
Tc=6.0 min CN=87 Runoff=0.02 cfs 57 cf

Pond 1P: CB#1 Peak Elev=70.07' Inflow=0.02 cfs 57 cf
6.0" Round Culvert n=0.013 L=121.0' S=0.0165 '/' Outflow=0.02 cfs 57 cf

Pond 2P: Prop. pond Peak Elev=71.51' Storage=220 cf Inflow=0.18 cfs 736 cf
Discarded=0.03 cfs 736 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.03 cfs 736 cf

Pond 4P: CB#1585 Peak Elev=65.75' Inflow=0.02 cfs 57 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=0.02 cfs 57 cf

Pond 5P: CB#1584 Peak Elev=65.68' Inflow=0.03 cfs 131 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=0.03 cfs 131 cf

Pond 6P: CB 1586 Peak Elev=67.96' Inflow=0.02 cfs 57 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0176 '/' Outflow=0.02 cfs 57 cf

Link P1: POA Inflow=0.03 cfs 131 cf
Primary=0.03 cfs 131 cf

Link P2: Madbury Road Inflow=0.01 cfs 52 cf
Primary=0.01 cfs 52 cf

Total Runoff Area = 51,179 sf Runoff Volume = 919 cf Average Runoff Depth = 0.22"
55.77% Pervious = 28,544 sf 44.23% Impervious = 22,635 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Prop. parking lots Runoff Area=26,646 sf 34.54% Impervious Runoff Depth=1.48"
Tc=6.0 min CN=82 Runoff=1.04 cfs 3,291 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,234 cf

Subcatchment S3: Prop. roof drainage Runoff Area=2,208 sf 100.00% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=98 Runoff=0.15 cfs 533 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,425 sf 26.71% Impervious Runoff Depth=1.35"
Tc=6.0 min CN=80 Runoff=0.26 cfs 834 cf

Subcatchment S5: Sheet flow to Madbury Runoff Area=6,712 sf 37.51% Impervious Runoff Depth=1.55"
Tc=6.0 min CN=83 Runoff=0.27 cfs 868 cf

Subcatchment S6: Front of parking lot Runoff Area=3,077 sf 52.39% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=87 Runoff=0.15 cfs 475 cf

Pond 1P: CB#1 Peak Elev=70.24' Inflow=0.15 cfs 475 cf
6.0" Round Culvert n=0.013 L=121.0' S=0.0165 '/' Outflow=0.15 cfs 475 cf

Pond 2P: Prop. pond Peak Elev=72.62' Storage=1,226 cf Inflow=1.54 cfs 5,058 cf
Discarded=0.06 cfs 2,489 cf Primary=0.91 cfs 2,569 cf Secondary=0.00 cfs 0 cf Outflow=0.97 cfs 5,058 cf

Pond 4P: CB#1585 Peak Elev=66.30' Inflow=1.01 cfs 3,044 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=1.01 cfs 3,044 cf

Pond 5P: CB#1584 Peak Elev=66.18' Inflow=1.23 cfs 3,912 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=1.23 cfs 3,912 cf

Pond 6P: CB 1586 Peak Elev=68.42' Inflow=1.01 cfs 3,044 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0176 '/' Outflow=1.01 cfs 3,044 cf

Link P1: POA Inflow=1.23 cfs 3,912 cf
Primary=1.23 cfs 3,912 cf

Link P2: Madbury Road Inflow=0.26 cfs 834 cf
Primary=0.26 cfs 834 cf

Total Runoff Area = 51,179 sf Runoff Volume = 7,236 cf Average Runoff Depth = 1.70"
55.77% Pervious = 28,544 sf 44.23% Impervious = 22,635 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Prop. parking lots Runoff Area=26,646 sf 34.54% Impervious Runoff Depth=4.00"
Tc=6.0 min CN=82 Runoff=2.78 cfs 8,874 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=98 Runoff=0.67 cfs 2,458 cf

Subcatchment S3: Prop. roof drainage Runoff Area=2,208 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=98 Runoff=0.29 cfs 1,062 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,425 sf 26.71% Impervious Runoff Depth=3.79"
Tc=6.0 min CN=80 Runoff=0.74 cfs 2,345 cf

Subcatchment S5: Sheet flow to Madbury Runoff Area=6,712 sf 37.51% Impervious Runoff Depth=4.10"
Tc=6.0 min CN=83 Runoff=0.72 cfs 2,294 cf

Subcatchment S6: Front of parking lot Runoff Area=3,077 sf 52.39% Impervious Runoff Depth=4.53"
Tc=6.0 min CN=87 Runoff=0.36 cfs 1,161 cf

Pond 1P: CB#1 Peak Elev=70.40' Inflow=0.36 cfs 1,161 cf
6.0" Round Culvert n=0.013 L=121.0' S=0.0165 '/' Outflow=0.36 cfs 1,161 cf

Pond 2P: Prop. pond Peak Elev=73.33' Storage=2,216 cf Inflow=3.75 cfs 12,394 cf
Discarded=0.07 cfs 3,348 cf Primary=2.83 cfs 9,046 cf Secondary=0.00 cfs 0 cf Outflow=2.90 cfs 12,394 cf

Pond 4P: CB#1585 Peak Elev=67.40' Inflow=3.09 cfs 10,207 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=3.09 cfs 10,207 cf

Pond 5P: CB#1584 Peak Elev=67.03' Inflow=3.64 cfs 12,500 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=3.64 cfs 12,500 cf

Pond 6P: CB 1586 Peak Elev=69.07' Inflow=3.09 cfs 10,207 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0176 '/' Outflow=3.09 cfs 10,207 cf

Link P1: POA Inflow=3.64 cfs 12,500 cf
Primary=3.64 cfs 12,500 cf

Link P2: Madbury Road Inflow=0.74 cfs 2,345 cf
Primary=0.74 cfs 2,345 cf

Total Runoff Area = 51,179 sf Runoff Volume = 18,194 cf Average Runoff Depth = 4.27"
55.77% Pervious = 28,544 sf 44.23% Impervious = 22,635 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Prop. parking lots Runoff Area=26,646 sf 34.54% Impervious Runoff Depth=5.09"
Tc=6.0 min CN=82 Runoff=3.51 cfs 11,312 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=6.95"
Tc=6.0 min CN=98 Runoff=0.81 cfs 2,960 cf

Subcatchment S3: Prop. roof drainage Runoff Area=2,208 sf 100.00% Impervious Runoff Depth=6.95"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,279 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,425 sf 26.71% Impervious Runoff Depth=4.87"
Tc=6.0 min CN=80 Runoff=0.94 cfs 3,013 cf

Subcatchment S5: Sheet flow to Madbury Runoff Area=6,712 sf 37.51% Impervious Runoff Depth=5.21"
Tc=6.0 min CN=83 Runoff=0.90 cfs 2,913 cf

Subcatchment S6: Front of parking lot Runoff Area=3,077 sf 52.39% Impervious Runoff Depth=5.66"
Tc=6.0 min CN=87 Runoff=0.44 cfs 1,452 cf

Pond 1P: CB#1 Peak Elev=70.46' Inflow=0.44 cfs 1,452 cf
6.0" Round Culvert n=0.013 L=121.0' S=0.0165 '/' Outflow=0.44 cfs 1,452 cf

Pond 2P: Prop. pond Peak Elev=73.45' Storage=2,406 cf Inflow=4.67 cfs 15,552 cf
Discarded=0.08 cfs 3,528 cf Primary=3.90 cfs 12,024 cf Secondary=0.00 cfs 0 cf Outflow=3.98 cfs 15,552 cf

Pond 4P: CB#1585 Peak Elev=68.65' Inflow=4.26 cfs 13,476 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=4.26 cfs 13,476 cf

Pond 5P: CB#1584 Peak Elev=67.86' Inflow=5.02 cfs 16,389 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=5.02 cfs 16,389 cf

Pond 6P: CB 1586 Peak Elev=69.66' Inflow=4.26 cfs 13,476 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0176 '/' Outflow=4.26 cfs 13,476 cf

Link P1: POA Inflow=5.02 cfs 16,389 cf
Primary=5.02 cfs 16,389 cf

Link P2: Madbury Road Inflow=0.94 cfs 3,013 cf
Primary=0.94 cfs 3,013 cf

Total Runoff Area = 51,179 sf Runoff Volume = 22,930 cf Average Runoff Depth = 5.38"
55.77% Pervious = 28,544 sf 44.23% Impervious = 22,635 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Prop. parking lots Runoff Area=26,646 sf 34.54% Impervious Runoff Depth=6.45"
Tc=6.0 min CN=82 Runoff=4.40 cfs 14,323 cf

Subcatchment S2: Ex. roof drainage Runoff Area=5,111 sf 100.00% Impervious Runoff Depth=8.38"
Tc=6.0 min CN=98 Runoff=0.97 cfs 3,569 cf

Subcatchment S3: Prop. roof drainage Runoff Area=2,208 sf 100.00% Impervious Runoff Depth=8.38"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,542 cf

Subcatchment S4: Ex. sheet flow to Madbury Runoff Area=7,425 sf 26.71% Impervious Runoff Depth=6.21"
Tc=6.0 min CN=80 Runoff=1.19 cfs 3,842 cf

Subcatchment S5: Sheet flow to Madbury Runoff Area=6,712 sf 37.51% Impervious Runoff Depth=6.57"
Tc=6.0 min CN=83 Runoff=1.12 cfs 3,675 cf

Subcatchment S6: Front of parking lot Runoff Area=3,077 sf 52.39% Impervious Runoff Depth=7.05"
Tc=6.0 min CN=87 Runoff=0.54 cfs 1,809 cf

Pond 1P: CB#1 Peak Elev=71.74' Inflow=0.54 cfs 1,809 cf
6.0" Round Culvert n=0.013 L=121.0' S=0.0165 '/' Outflow=0.54 cfs 1,809 cf

Pond 2P: Prop. pond Peak Elev=73.62' Storage=2,693 cf Inflow=5.79 cfs 19,434 cf
Discarded=0.08 cfs 3,707 cf Primary=4.63 cfs 15,720 cf Secondary=0.04 cfs 7 cf Outflow=4.75 cfs 19,434 cf

Pond 4P: CB#1585 Peak Elev=69.93' Inflow=5.07 cfs 17,529 cf
12.0" Round Culvert n=0.013 L=20.7' S=-0.0097 '/' Outflow=5.07 cfs 17,529 cf

Pond 5P: CB#1584 Peak Elev=68.77' Inflow=6.19 cfs 21,211 cf
12.0" Round Culvert n=0.014 L=20.0' S=0.0200 '/' Outflow=6.19 cfs 21,211 cf

Pond 6P: CB 1586 Peak Elev=71.44' Inflow=5.07 cfs 17,529 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0176 '/' Outflow=5.07 cfs 17,529 cf

Link P1: POA Inflow=6.19 cfs 21,211 cf
Primary=6.19 cfs 21,211 cf

Link P2: Madbury Road Inflow=1.19 cfs 3,842 cf
Primary=1.19 cfs 3,842 cf

Total Runoff Area = 51,179 sf Runoff Volume = 28,760 cf Average Runoff Depth = 6.74"
55.77% Pervious = 28,544 sf 44.23% Impervious = 22,635 sf

Summary for Subcatchment S1: Prop. parking lots

Runoff = 2.00 cfs @ 12.09 hrs, Volume= 6,323 cf, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
9,203	98	Unconnected pavement, HSG C
17,443	74	>75% Grass cover, Good, HSG C
26,646	82	Weighted Average
17,443		65.46% Pervious Area
9,203		34.54% Impervious Area
9,203		100.00% Unconnected

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

Summary for Subcatchment S2: Ex. roof drainage

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,918 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
5,111	98	Roofs, HSG C
5,111		100.00% Impervious Area

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

Summary for Subcatchment S3: Prop. roof drainage

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 829 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
2,208	98	Roofs, HSG C
2,208		100.00% Impervious Area

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

Summary for Subcatchment S4: Ex. sheet flow to Madbury

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,650 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
5,442	74	>75% Grass cover, Good, HSG C
1,983	98	Paved parking, HSG C
7,425	80	Weighted Average
5,442		73.29% Pervious Area
1,983		26.71% Impervious Area

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

Summary for Subcatchment S5: Sheet flow to Madbury

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,644 cf, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
4,194	74	>75% Grass cover, Good, HSG C
2,518	98	Paved parking, HSG C
6,712	83	Weighted Average
4,194		62.49% Pervious Area
2,518		37.51% Impervious Area

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

Summary for Subcatchment S6: Front of parking lot

Runoff = 0.27 cfs @ 12.09 hrs, Volume= 852 cf, Depth= 3.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.74"

Area (sf)	CN	Description
1,612	98	Paved parking, HSG C
1,465	74	>75% Grass cover, Good, HSG C
3,077	87	Weighted Average
1,465		47.61% Pervious Area
1,612		52.39% Impervious Area

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

Summary for Pond 1P: CB#1

Inflow Area = 3,077 sf, 52.39% Impervious, Inflow Depth = 3.32" for 10-yr (NRCC) event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 852 cf
Outflow = 0.27 cfs @ 12.09 hrs, Volume= 852 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.09 hrs, Volume= 852 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 70.33' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**6.0" Round Culvert** L= 121.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 70.00' / 68.00' S= 0.0165 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.26 cfs @ 12.09 hrs HW=70.32' TW=68.57' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.26 cfs @ 1.93 fps)

Summary for Pond 2P: Prop. pond

Inflow Area = 33,965 sf, 48.64% Impervious, Inflow Depth = 3.20" for 10-yr (NRCC) event
Inflow = 2.76 cfs @ 12.09 hrs, Volume= 9,070 cf
Outflow = 1.61 cfs @ 12.21 hrs, Volume= 9,070 cf, Atten= 42%, Lag= 7.2 min
Discarded = 0.07 cfs @ 12.22 hrs, Volume= 3,074 cf
Primary = 1.54 cfs @ 12.21 hrs, Volume= 5,996 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 73.13' @ 12.22 hrs Surf.Area= 1,478 sf Storage= 1,900 cf

Plug-Flow detention time= 73.5 min calculated for 9,070 cf (100% of inflow)
Center-of-Mass det. time= 73.5 min (870.9 - 797.4)

Volume	Invert	Avail.Storage	Storage Description
#1	71.00'	3,415 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
71.00	303	87.0	0	0	303
72.00	896	145.0	573	573	1,380
73.00	1,407	171.0	1,142	1,715	2,053
74.00	2,011	180.0	1,700	3,415	2,359

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**12.0" Round 12" Outlet** L= 26.4' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.00' S= 0.0379 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	72.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	73.10'	**12.0" Horiz. 12" Beehive Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	73.60'	**7.0' long x 7.0' breadth Emergency spillway** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78
#5	Discarded	71.00'	**2.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.07 cfs @ 12.22 hrs HW=73.12' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.53 cfs @ 12.21 hrs HW=73.12' TW=68.61' (Dynamic Tailwater)
└─**1=12" Outlet** (Passes 1.53 cfs of 7.20 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.49 cfs @ 4.28 fps)
  └─**3=12" Beehive Grate** (Weir Controls 0.04 cfs @ 0.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=71.00' TW=65.60' (Dynamic Tailwater)
└─**4=Emergency spillway** (Controls 0.00 cfs)

Summary for Pond 4P: CB#1585

Inflow Area = 37,042 sf, 48.96% Impervious, Inflow Depth = 2.22" for 10-yr (NRCC) event
Inflow = 1.70 cfs @ 12.19 hrs, Volume= 6,848 cf
Outflow = 1.70 cfs @ 12.19 hrs, Volume= 6,848 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.70 cfs @ 12.19 hrs, Volume= 6,848 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 66.58' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	65.70'	**12.0" Round RCP_Round 12"** L= 20.7' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 65.50' / 65.70' S= -0.0097 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=1.78 cfs @ 12.19 hrs HW=66.57' TW=66.39' (Dynamic Tailwater)
└─**1=RCP_Round 12"** (Outlet Controls 1.78 cfs @ 2.62 fps)

Summary for Pond 5P: CB#1584

Inflow Area = 43,754 sf, 47.20% Impervious, Inflow Depth = 2.33" for 10-yr (NRCC) event
Inflow = 2.13 cfs @ 12.12 hrs, Volume= 8,492 cf
Outflow = 2.13 cfs @ 12.12 hrs, Volume= 8,492 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 12.12 hrs, Volume= 8,492 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 66.42' @ 12.12 hrs
Flood Elev= 73.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.60'	**12.0" Round RCP_Round 12"** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.60' / 65.20' S= 0.0200 '/' Cc= 0.900 n= 0.014 Cast iron, coated, Flow Area= 0.79 sf

Primary OutFlow Max=2.09 cfs @ 12.12 hrs HW=66.41' TW=0.00' (Dynamic Tailwater)
└─**1=RCP_Round 12"** (Inlet Controls 2.09 cfs @ 3.07 fps)

Summary for Pond 6P: CB 1586

Inflow Area = 37,042 sf, 48.96% Impervious, Inflow Depth = 2.22" for 10-yr (NRCC) event
Inflow = 1.70 cfs @ 12.19 hrs, Volume= 6,848 cf
Outflow = 1.70 cfs @ 12.19 hrs, Volume= 6,848 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.70 cfs @ 12.19 hrs, Volume= 6,848 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 68.62' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	67.90'	**12.0" Round 12" RCP** L= 17.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 67.90' / 67.60' S= 0.0176 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf

Primary OutFlow Max=1.69 cfs @ 12.19 hrs HW=68.62' TW=66.57' (Dynamic Tailwater)
└─**1=12" RCP** (Barrel Controls 1.69 cfs @ 3.93 fps)

Summary for Link P1: POA

Inflow Area = 43,754 sf, 47.20% Impervious, Inflow Depth = 2.33" for 10-yr (NRCC) event
Inflow = 2.13 cfs @ 12.12 hrs, Volume= 8,492 cf
Primary = 2.13 cfs @ 12.12 hrs, Volume= 8,492 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link P2: Madbury Road

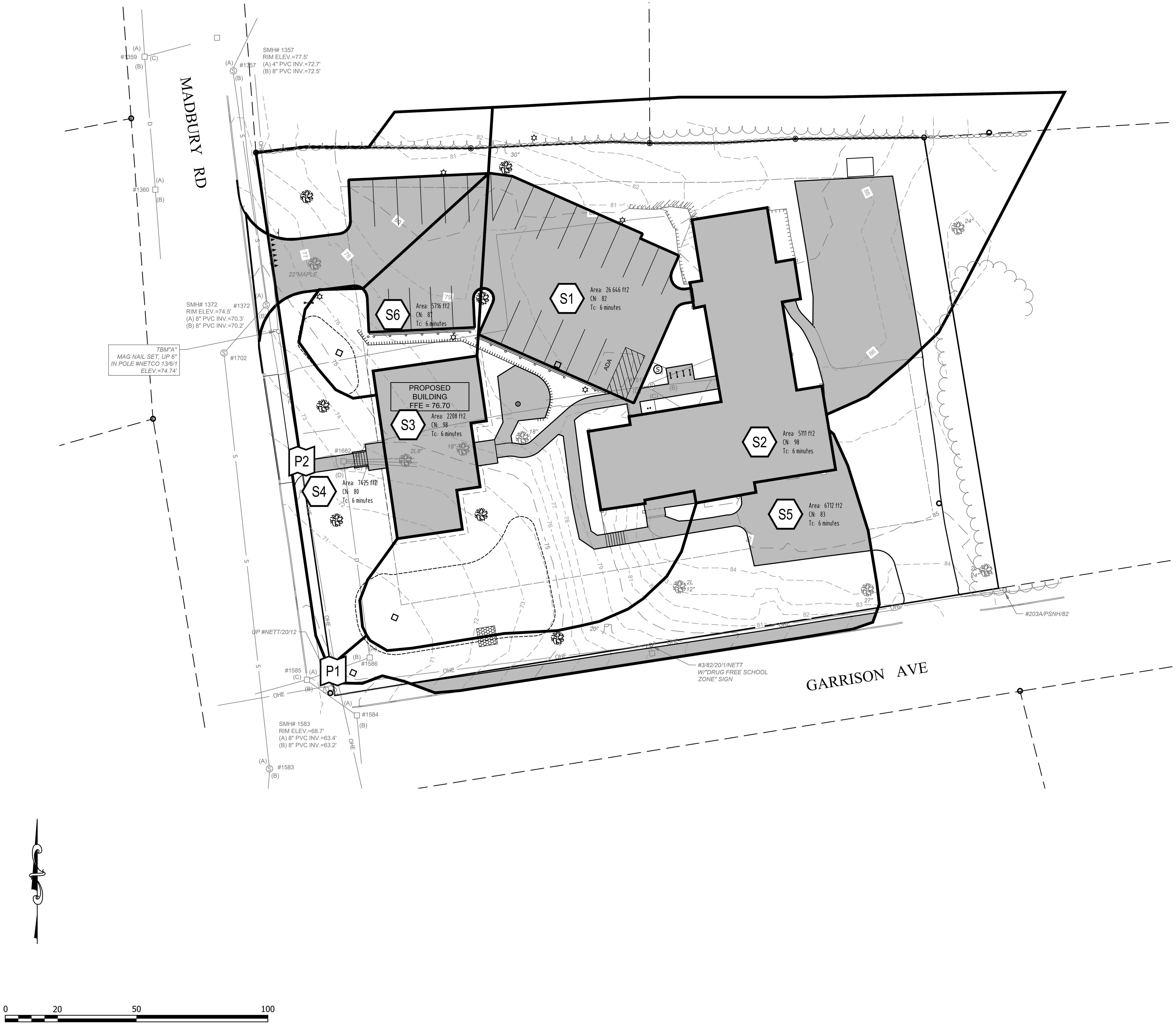
Inflow Area = 7,425 sf, 26.71% Impervious, Inflow Depth = 2.67" for 10-yr (NRCC) event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,650 cf
Primary = 0.52 cfs @ 12.09 hrs, Volume= 1,650 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

3 PLANS

2022-03-02T15:20:29 P:\21\proj\21585 AAM15 Management\Internal\Drawing Files\21585_Site_06.dwg

NOTES:
1. SSURGO DATA WAS ACCESSED THROUGH NRCS WEB SOIL SURVEY AND THE DATA WAS USED TO DETERMINE THE HYDROLOGIC SOIL GROUP (HSG) OF THE SOILS PRESENT ON THE LOT. ALL SOILS WERE IDENTIFIED AS HOLLIS-CHARLTON FINE SANDY LOAMS, 3 TO 8 PERCENT SLOPES (HcB)
2. TEST PITS WERE CONDUCTED BY MICHAEL J. SIEVERT, PE ON 2021-08-19 AND IT WAS DETERMINED THAT THE SOILS PRESENT AGREED WITH THE WEB SOIL SURVEY.



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AAM DURHAM RESIDENCES

32 & 34 MADBURY ROAD

DURHAM, NEW HAMPSHIRE

GRADING PLAN

NO.	DATE	REVISION DESCRIPTION	ENG	DWG
00	2022-03-02	INITIAL SUBMISSION	MCS	01

DATE: 2022-03-02	PROJECT #: 21585
ENG'D BY: MJS	DRAWN BY: MCS
CHECK'D BY: MJS	ARCHIVE #: H-___

POST

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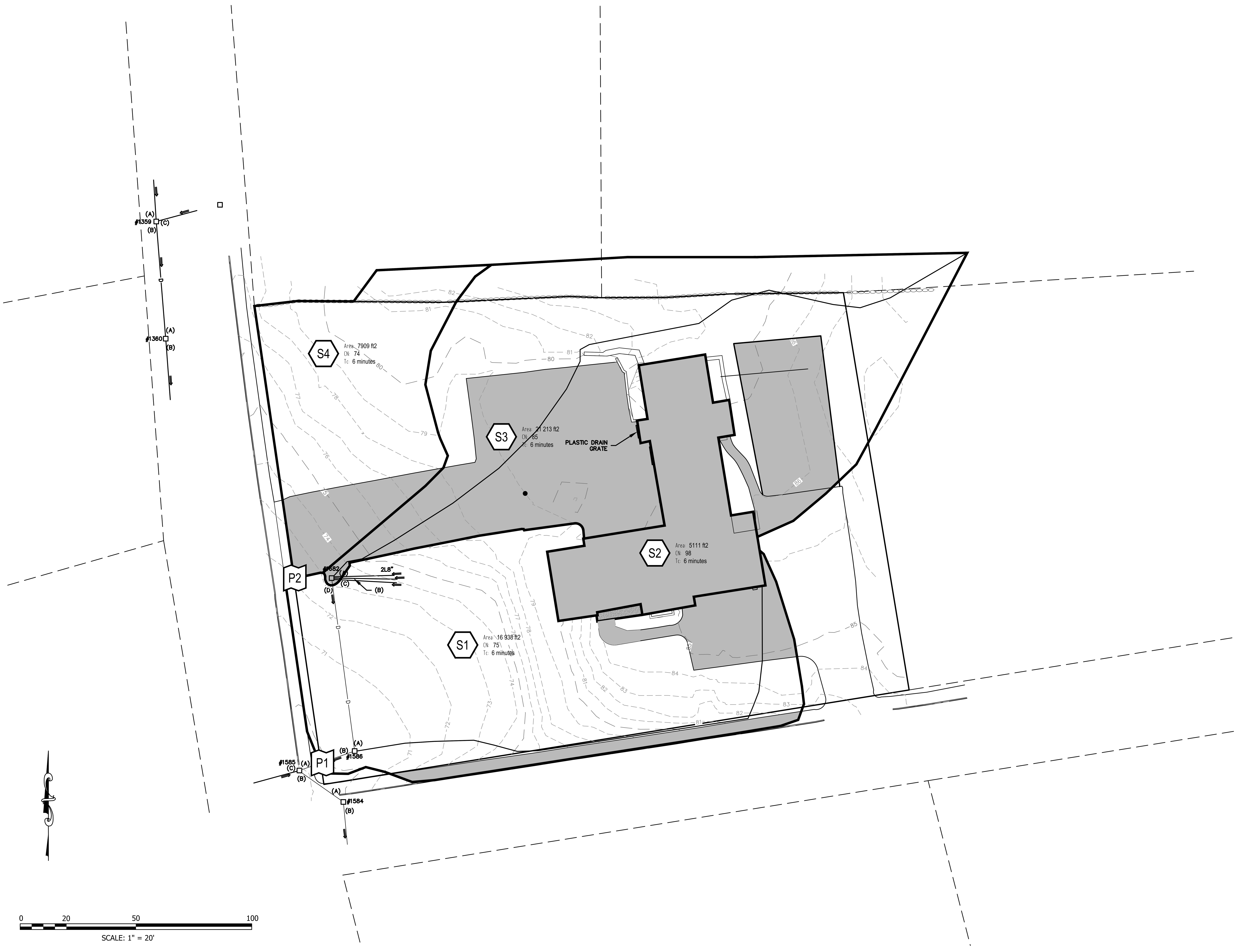
NOTES:
1. SSURGO DATA WAS ACCESSED THROUGH NRCS WEB SOIL SURVEY AND THE DATA WAS USED TO DETERMINE THE HYDROLOGIC SOIL GROUP (HSG) OF THE SOILS PRESENT ON THE LOT. ALL SOILS WERE IDENTIFIED AS HOLLIS-CHARLTON FINE SANDY LOAMS, 3 TO 8 PERCENT SLOPES (HcB)
2. TEST PITS WERE CONDUCTED BY MICHAEL J. SIEVERT, PE ON 2021-08-19 AND IT WAS DETERMINED THAT THE SOILS PRESENT AGREED WITH THE WEB SOIL SURVEY.



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DURHAM, NEW HAMPSHIRE

GRADING PLAN

NO.	DATE	REVISION DESCRIPTION	ENG	DWG
00	2022-03-02	INITIAL SUBMISSION	MCS	01

DATE:	PROJECT #:
2022-03-02	21585
ENG'D BY:	DRAWN BY:
MJS	MCS
CHECK'D BY:	ARCHIVE #:
MJS	H-___

PRE