

STORMWATER MANAGEMENT ANALYSIS

FOR

**30-32 CABLE AVE,
SALISBURY, MA**

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Project No. 2021-043
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TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 STORMWATER MANAGEMENT POLICY.....	1
3.0 EXISTING CONDITION	1
3.1 FEMA Flood Insurance Rate Map.....	1
3.2 Soils	1
4.0 PROPOSED CONDITION.....	1
4.1 Hydrologic Model	1
5.0 CONSISTENCY WITH DEP STORMWATER MANAGEMENT POLICY.....	2
5.1 Standard 1 – Untreated Stormwater.....	2
5.2 Standard 2 – Post Development Peak Discharge Rates	2
5.2.1 Existing Hydrology	2
5.2.2 Proposed Hydrology.....	3
Table 5.2.3: Hydrological Calculation Summary	3
5.3 Standard 3 – Recharge to Groundwater.....	3
5.4 Standard 4 – Removal of 80% Total Suspended Solids.....	4
5.5 Standard 5 – Lands Uses with Higher Potential Pollutant Loads.....	5
5.6 Standard 6 – Critical Areas	5
5.7 Standard 7 – Redevelopment	5
5.8 Standard 8 – Erosion and Sediment Controls	6
5.9 Standard 9 – Operation and Maintenance Plan.....	6
5.10 Standard 10 – Illicit Discharge to Drainage System	6
6.0 CONCLUSION.....	6

APPENDICES

Appendix A	Site Plans
Appendix B	Existing & Proposed Drainage Areas
Appendix C	FEMA Flood Insurance Rate Map
Appendix D	Soils Information
Appendix E	Existing & Proposed Hydrology
Appendix F	Operation & Maintenance Plan

1.0 INTRODUCTION

The client is proposing to redevelop the site located at 30 to 32 Cable Avenue, Salisbury, MA with the construction of a new 6-unit residential building. The following report addresses the hydrologic calculations and stormwater management design proposed at the site.

2.0 STORMWATER MANAGEMENT POLICY

This project is a redevelopment of an existing site that falls under the jurisdiction of the Massachusetts Wetlands Protection (M.G.L. Ch. 131 Section 40) as it is located within a Barrier Beach System and within the 100-YR Flood Zone. The reference documents used for the proposed stormwater management system for the project were the MassDEP's Stormwater Management Handbook. The following report explains how these policies are met.

3.0 EXISTING CONDITION

The limit of work for the project is the parcels of land shown on the Town of Salisbury's Assessor's Database as Map 32, Parcels 46 and 45. These two parcels are identified as 30-32 Cable Avenue. The total area of the two parcels is approximately 6,984 SF. The parcel currently consists of a single-story, single-family residential dwelling. The surrounding area consists of grass, gravel, vegetated gravel area and a small section of broken pavement. The existing site is 13% impervious.

3.1 FEMA Flood Insurance Rate Map

According to the FEMA Flood Insurance Rate Map Number 25009C0129F, with an effective date of July 3, 2012, the site is located within a Zone AE or the 100 YR Flood Zone, with an Base Flood Elevation of 9 FT. (*See Appendix C: FEMA Flood Insurance Rate Map*)

3.2 Soils

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, soils at the site are categorized as Udorthents. This soil category tends to be a mixture of urban fill and natural soil and does not have a provided Hydrologic Soil Group (HSG) by the NRCS. Therefore, for the purposes of this study, HSG A is used along with an infiltration rate of 8.2in/hr. This decision was made based on previous understanding of the soils in the area, however it will be confirmed by gathering greater subsurface information prior to any final design planning.

4.0 PROPOSED CONDITION

The project proposes to redevelop the site at 30-32 Cable Avenue with the construction of a 6-unit residential building. The proposed residential dwelling will also include a gravel driveway that will access the street via a new curb cut at the sidewalk. The rest of the site will be converted to grass/landscaping area. The building will also be set on beams and therefore all runoff will be able to run directly across the site.

4.1 Hydrologic Model

The hydrologic model was developed in HydroCAD, a computer program based on USDA's Technical Release TR-55, Urban Hydrology for Small Watersheds. Both existing and proposed conditions are modeled for the 2-year, 10-year, 25-year, and 100-year 24-hour storm events. HydroCAD allows for variable rainfall intensity throughout the storm duration, peaking near the middle of the Type III, 24-hour storm. The drainage area's time of concentration (t_c) have been

calculated for each subcatchment with a minimum Tc of 6 minutes. Complete calculations, performed using the HydroCAD software, are included in the appendix.

5.0 CONSISTENCY WITH DEP STORMWATER MANAGEMENT POLICY

The project was designed with the consideration of the MassDEP's Stormwater Management Policy and associated standards.

5.1 Standard 1 – Untreated Stormwater

“No New untreated stormwater conveyances (e.g. outfalls) will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.”

The proposed drainage system does not include any new conveyances of paved surfaces that discharge stormwater directly to any wetlands or waters of the Commonwealth without pre-treatment. The design discharge point currently discharges to the border of Hunt Memorial Parking Lot to the west, however the eventual receiving water is the salt marsh located on the opposite side of the parking lot. The design proposes a bioretention area with a sediment forebay to treat stormwater prior to it leaving the property. Since no new conveyances will directly discharge untreated stormwater, this project meets Standard 1.

5.2 Standard 2 – Post Development Peak Discharge Rates

“Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.”

The site was analyzed under both existing and proposed conditions to compare the pre and post development peak discharge rates at the single design discharge point leaving the property that drains across the property line to the rear, to the Hunt Memorial Parking Lot. As mentioned above, the eventual receiving water is the salt marsh on the rear side of the parking lot. The design point was analyzed to ensure that there is no impact on abutting properties and resource areas as a result of the project. A detailed description of both the existing conditions hydrology and proposed condition hydrology is described below. A copy of the HydroCAD reports for both the existing and proposed conditions are provided in Appendix E.

The Hydrologic Calculation Summary below also shows that the proposed design mimics the offsite rates for all storms shown. Seeing as the receiving water that this project discharges to is ultimately below Mean High Water (MHW) at the salt marsh. DCI believes that this project still meets the expectations of Standard 2.

5.2.1 Existing Hydrology

The existing hydrology on site consists of a single subcatchment that flows to a single design discharge point across the property to the rear. For the design purposes of this study, and the topography of the site, the drainage areas have been defined largely by the parcel boundaries. The edge of the catchment area is defined as the edge of the concrete sidewalk, where there is a high point along the boundary of the parcel edge and the edge of the sidewalk. From there all the runoff flows across the gravel, grass and roof, and down the topography to the rear of the site. The site slopes very slightly toward the rear where the runoff crosses the fence line into the Hunt Memorial Parking Lot. As mentioned above, the site surfaces consist of a small portion of pavement, mostly grass, some gravel and a mixture of vegetated gravel area. (*Existing & Proposed Drainage Areas*)

5.2.2 Proposed Hydrology

In the proposed design, the catchment area and the design point to the rear will remain almost entirely the same, with proposed stormwater improvements within the site. The runoff from the roof area will drain across the roof surface and to a drip line trench that runs alongside the edge of the building. The drip line trench will consist of a 6" perforated pipe set in a 1.25' x 1.25' trench filled with ¾" crushed stone. These pipes will have outlets that allow remaining flow to run into the bio-retention area. The runoff from the gravel parking area will drain to the west across the site below the building, as the building will be set up on beams. The area below the building will also consist of a gravel surface will for the most part, drain along with the rest of the runoff, to a bioretention area with a sediment forebay in the rear. The bioretention area will provided water quality volume and TSS removal to the runoff from the site. The bioretention area will have overflow weir with a rim at 5.7' and will drain any overflow to the design point across the property line.

Table 5.2.3: Hydrological Calculation Summary

	Existing Conditions		Proposed Conditions	
Drainage Area	7,204 +/- Square Feet		7,204 +/- Square Feet	
Storm Event (Year)	Offsite Peak Runoff (CFS)	Offsite Runoff Volume (CF)	Offsite Peak Runoff (CFS)	Offsite Runoff Volume (CF)
2	0.17	515	0.08	45
10	0.40	1181	0.38	272
25	0.61	1784	0.46	534
100	1.06	3153	0.71	1283

5.3 Standard 3 – Recharge to Groundwater

"Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post development site shall approximate the annual recharge from pre-development conditions based on soil type. This condition is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook."

The project has been designed to fully comply with Standard 3. The standard states that "the annual recharge from post development site shall approximate the annual recharge from pre-development conditions based on soil type." The net increase in impervious area between the existing and proposed conditions is as follows:

$$2997 \text{ SF (Proposed impervious area)} - 930 \text{ SF (Existing impervious area)} = 2067 \text{ SF (Net change)}$$

Groundwater recharge is provided through the drip line trenches and the bioretention area. Therefore, using the net change in impervious area calculated above, and HSG A is used for the recharge calculations as 0.6", then the calculations are as follows:

$$2,067 \text{ SF of impervious area} \times 0.6" = \mathbf{103 \text{ CF of required GW recharge}}$$

As mentioned above, in the proposed conditions there are 3 sources of groundwater recharge, the two dripline trenches and the bioretention area. The quantities of recharge that they provide is calculated below:

$$\begin{array}{r} 39 \text{ CF} - \text{Drip Line Trench 1} \\ 39 \text{ CF} - \text{Drip Line Trench 2} \\ + \quad 55 \text{ CF 0 Bioretention Area (12" depth)} \\ \hline \mathbf{133 \text{ CF of GW Recharge volume provided}} \end{array}$$

With approximately 133 CF of groundwater recharge volume provided, the proposed stormwater design exceeds the required volume of 103 CF (See HydroCAD calculations for details on volumes of system sizes). Therefore, this project exceeds Standard 3.

5.4 Standard 4 – Removal of 80% Total Suspended Solids

"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when: (a) Suitable practices for source control and pollution prevention are identified in long-term pollution prevention plan, and thereafter implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook."

Stormwater management standards shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This project has been designed to provide TSS removal through the bioretention area and sediment forebay located at the rear of the site. The bioretention areas have been selected to remove 90% of TSS from onsite runoff as provided with adequate pretreatment (provided by the sediment forebay).

This project has also been designed to meet the Water Quality Volume (WQV) required by the MassDEP Stormwater Handbook. As discussed in Standard 6, the project does not fall within any critical areas relating to WQV. Therefore, per MassDEP Standards, this project is required to hold 0.5" of runoff for all pavement areas in the proposed conditions. This project proposes only 71 SF of pavement areas in the proposed conditions (the roof area is not included as the roof runoff is clean). However, this project has been designed to also hold 0.5" of runoff over the pea stone gravel area as well, as it is to be used as a driveway. Therefore, the calculations for required WQV for the pea stone gravel and pavement area in the proposed conditions are as follows:

$$1238 \text{ SF (Proposed pavement/gravel)} \times 0.5" = \mathbf{52 \text{ CF of WQV required}}$$

The required WQV is provided by a bioretention area in the rear of the site that will collect runoff from the majority of the site, including all of the driveway area, outside of and below the building. The bioretention area **provides 55 CF of WQV** below the overflow berm at the rim.

Therefore, the bioretention area provides more than the required WQV and this project exceeds Standard 4.

5.5 Standard 5 – Lands Uses with Higher Potential Pollutant Loads

“For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMP’s determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook.”

This project is not considered a Land Use with Higher Potential Pollutant Loads. Therefore, this standard is not applicable to this project.

5.6 Standard 6 – Critical Areas

“Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook.”

As mentioned above, this project is not located within Zone II wellhead protection area and does not discharge to any Outstanding Resource Waters (ORW). Therefore, the project only requires 0.5” of WQV be provided for all pavement areas. However, the site is located in a barrier beach system and the receiving water for the design point is a salt marsh. The site is also located within a Zone AE Flood Zone, or the 100 YR Flood Zone. Both its location within a barrier beach system, as well as the 100 Year Flood Zone are resources protected under the Massachusetts Wetlands Protection Act (M.G.L. c. 131 Section 40) and its implementing regulations (310 CMR 10.00). These resource areas have been heavily taken into consideration during the planning and stormwater design of this project, and an NOI will be filed with the Salisbury Conservation Commission for work within the 100 YR Flood Zone and within a barrier beach system.

5.7 Standard 7 – Redevelopment

“A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.”

This project does not qualify as a “redevelopment project” as defined by the Massachusetts Stormwater Handbook as it does not result in the net decrease in impervious area. Therefore, this standard does not apply to this project.

5.8 Standard 8 – Erosion and Sediment Controls

“A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.”

Erosion and sediment controls will be placed throughout the site during all phases of demolition and construction. Silt sacks will be placed in any catch basins in the area that may receive runoff from the site. Compost socks will line the edge of the site to protect the neighboring properties. The contractor will be responsible for checking all of the erosion and sediment control measures periodically and after every major storm. The contractor will repair, replace, and maintain all erosion/sediment control measures through construction until all disturbed areas have been stabilized.

5.9 Standard 9 – Operation and Maintenance Plan

“A long-term operation and maintenance plan shall be delivered and implemented to ensure that stormwater management systems function as designed.”

A long term Operation and Maintenance Plan is included in Appendix F. The plan includes provisions for Construction Phase measures, as well as long term maintenance and inspections.

5.10 Standard 10 – Illicit Discharge to Drainage System

“All illicit discharges to the stormwater management system are prohibited.”

There are no known or suspected illicit discharged to the stormwater management system at the project site. Therefore, this project complies with Standard 10.

6.0 CONCLUSION

Based on DCI’s analysis of the existing and proposed conditions, the proposed site conditions meet the stormwater management criteria set by MassDEP. Design point runoff volumes and peak flow rates have been decreased for the 2-year, 10-year, 25-year and 100-year storm will have no negative impact seeing as the receiving water is below MHW and the whole site is within the 100-YR Flood Zone. All additional standards set by MassDEP are met and the standards regarding TSS removal, WQV and groundwater recharge are exceeded. DCI concludes that the proposed development at 30-32 Cable Ave, Salisbury, MA adheres to all applicable stormwater management policies.

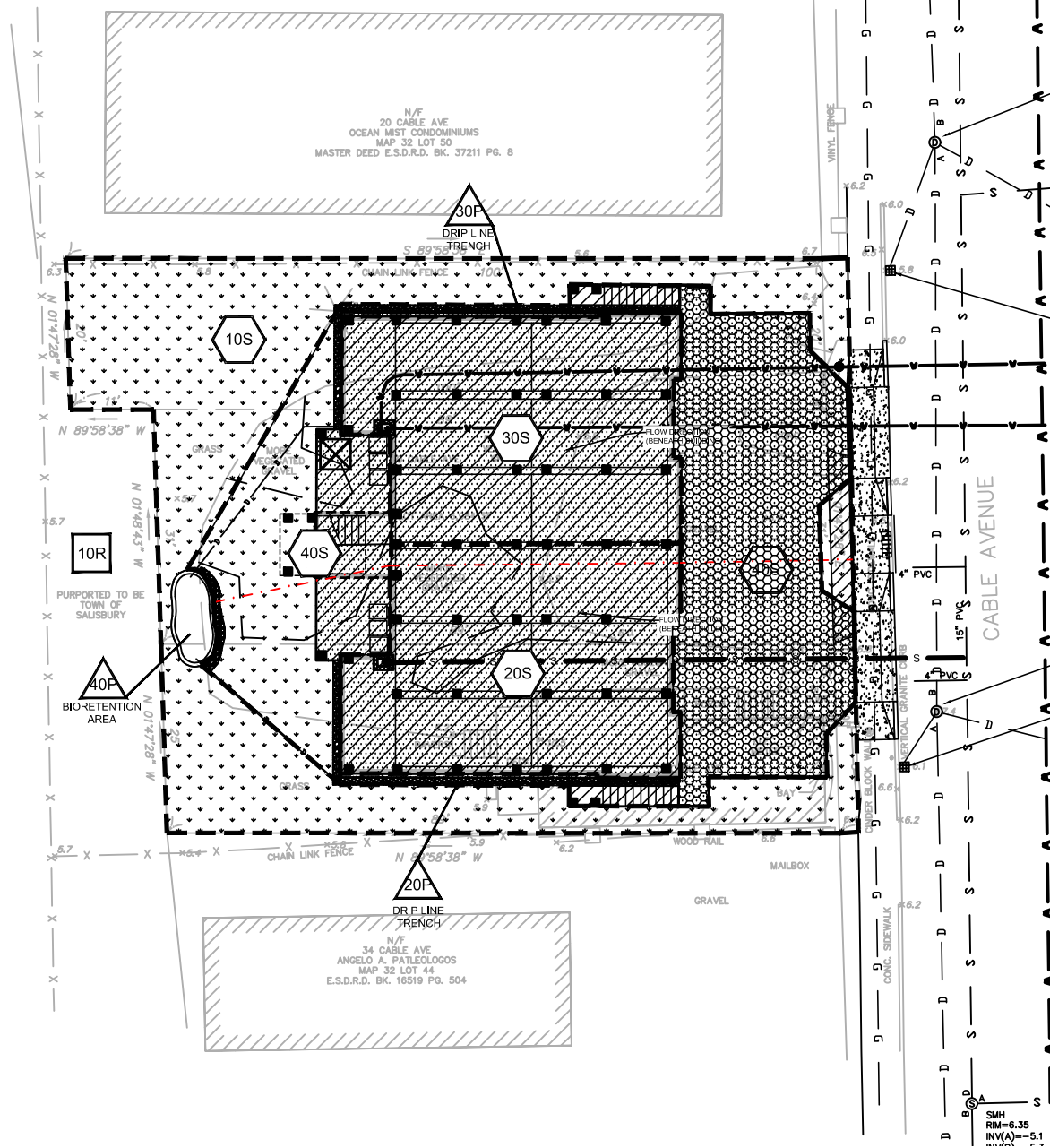
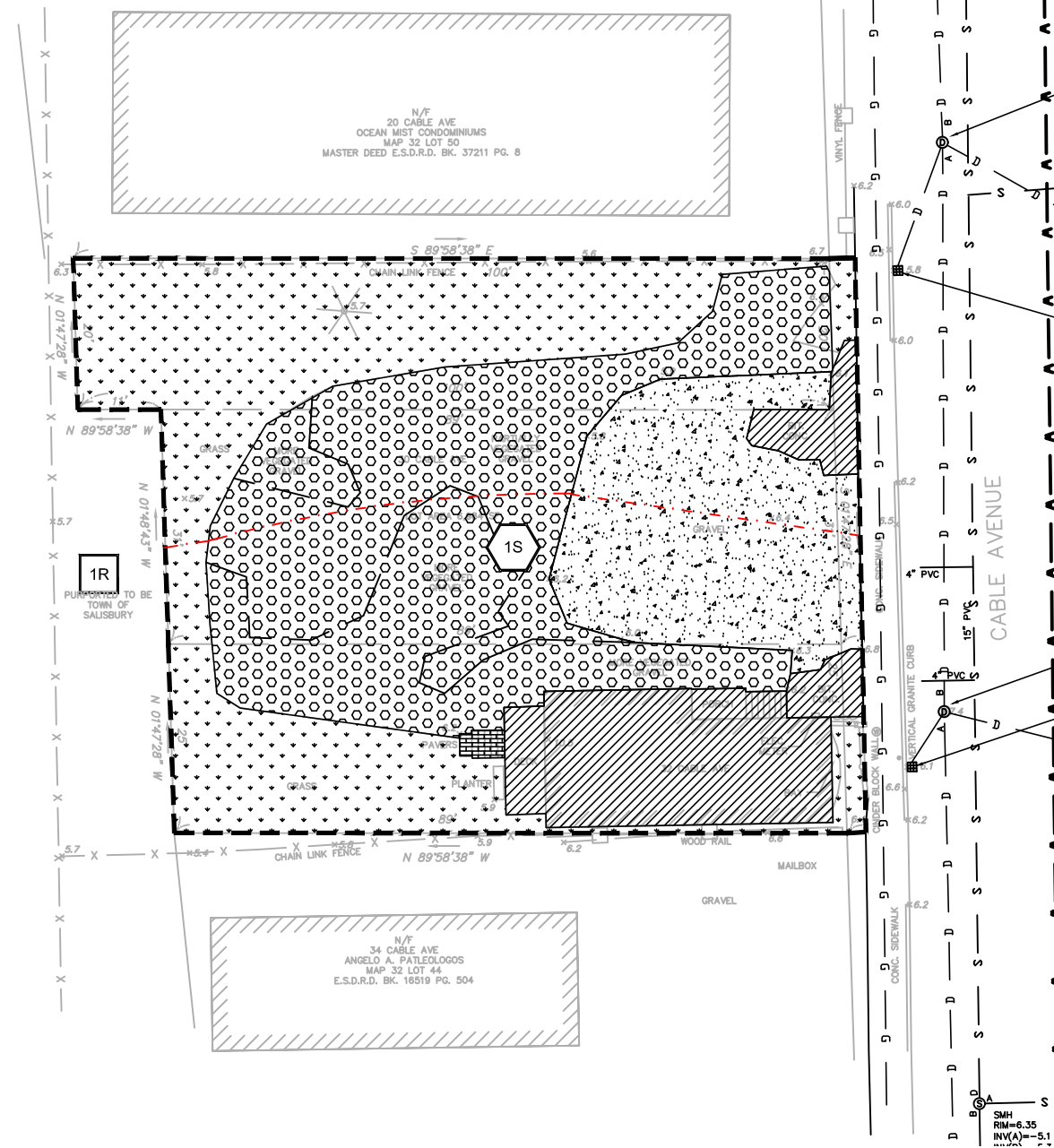
Appendix A

SITE PLANS

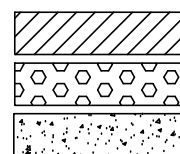


Appendix B

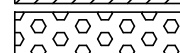
EXISTING & PROPOSED DRAINAGE ZONES



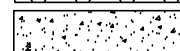
LEGEND



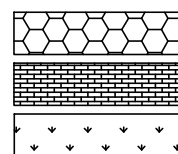
IMPERVIOUS AREA



VEGETATED GRAVEL



GRAVEL



PEA STONE GRAVEL



BRICK SURFACE



GRASS/LANDSCAPING



SUBCATCHMENT



POND



DESIGN POINT



DRAINAGE AREA BOUNDARY



TIME OF CONCENTRATION



NORTH



Design Consultants Inc.
Somerville - Quincy - Newburyport
www.dci-inc.com

DEVELOPER:
DOWNEAST RESIDENTIAL LLC
110 MAPLE LANE
NORTHBOROUGH, MA 01532

ARCHITECT:

SURVEYOR
WINTER GEC
44 MERRIMAC ST. UNIT 312
NEWBURYPORT, MA

PROJECT TEAM

30-32 CABLE AVE,
SALISBURY, MA.

PROJECT INFO

[illegible]

REV	DESCRIPTION	DATE
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STAMP:

DRAINAGE AREA PLAN

SHEET NAME:

D1

SHT NO:

DR BY: MCH

CHK BY: SBS

PROJ NO: 21-043

DATE: 5-17-20

SCALE: 1"=10'

Appendix C

FEMA FLOOD INSURANCE RATE MAP

National Flood Hazard Layer FIRMette



70°49'25"W 42°50'40"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **5/17/2021 at 3:15 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix D

SOILS INFORMATION

Soil Map—Essex County, Massachusetts, Northern Part



Map Scale: 1:1,670 if printed on A landscape (11" x 8.5") sheet.



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



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

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

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

Soil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, Jun 9, 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 12, 2016

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.

USDA
Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

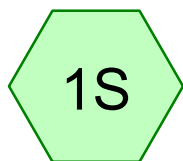
5/17/2021
Page 2 of 3

Map Unit Legend

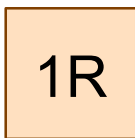
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	5.5	37.9%
638B	Hooksan-Urban land complex, 0 to 8 percent slopes	1.8	12.7%
651	Udorthents, smoothed	4.6	31.3%
712A	Ipswich and Westbrook mucky peats, 0 to 2 percent slopes, very frequently flooded	2.6	18.1%
Totals for Area of Interest		14.6	100.0%

Appendix E

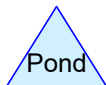
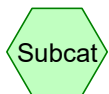
EXISTING AND PROPOSED HYDROLOGY



EXISTING SITE



HUNT PARKING LOT



21-043 HydroCAD PRE DEV

Prepared by DCI a GM2 Company

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,011	39	>75% Grass cover, Good, HSG A (1S)
20	60	Brick (1S)
2,556	76	Gravel roads, HSG A (1S)
1,625	96	Gravel surface, HSG A (1S)
198	98	Paved parking, HSG A (1S)
732	98	Roofs, HSG A (1S)
7,142	73	TOTAL AREA

21-043 HydroCAD PRE DEV

Prepared by DCI a GM2 Company

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
7,122	HSG A	1S
0	HSG B	
0	HSG C	
0	HSG D	
20	Other	1S
7,142		TOTAL AREA

21-043 HydroCAD PRE DEV*Type III 24-hr 2-Year Rainfall=3.15"*

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Page 4

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING SITE

Runoff Area=7,142 sf 13.02% Impervious Runoff Depth>0.86"

Tc=6.0 min CN=73 Runoff=0.17 cfs 515 cf

Reach 1R: HUNT PARKING LOT

Inflow=0.17 cfs 515 cf

Outflow=0.17 cfs 515 cf

Total Runoff Area = 7,142 sf Runoff Volume = 515 cf Average Runoff Depth = 0.86"
86.98% Pervious = 6,212 sf 13.02% Impervious = 930 sf

Summary for Subcatchment 1S: EXISTING SITE

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 515 cf, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
198	98	Paved parking, HSG A
1,625	96	Gravel surface, HSG A
2,556	76	Gravel roads, HSG A
2,011	39	>75% Grass cover, Good, HSG A
* 20	60	Brick
732	98	Roofs, HSG A
7,142	73	Weighted Average
6,212		86.98% Pervious Area
930		13.02% Impervious Area

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

Summary for Reach 1R: HUNT PARKING LOT

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,142 sf, 13.02% Impervious, Inflow Depth > 0.86" for 2-Year event
Inflow = 0.17 cfs @ 12.10 hrs, Volume= 515 cf
Outflow = 0.17 cfs @ 12.10 hrs, Volume= 515 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

21-043 HydroCAD PRE DEV*Type III 24-hr 10-Year Rainfall=4.83"*

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Page 6

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING SITE

Runoff Area=7,142 sf 13.02% Impervious Runoff Depth>1.99"

Tc=6.0 min CN=73 Runoff=0.40 cfs 1,181 cf

Reach 1R: HUNT PARKING LOT

Inflow=0.40 cfs 1,181 cf

Outflow=0.40 cfs 1,181 cf

Total Runoff Area = 7,142 sf Runoff Volume = 1,181 cf Average Runoff Depth = 1.99"
86.98% Pervious = 6,212 sf 13.02% Impervious = 930 sf

Summary for Subcatchment 1S: EXISTING SITE

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 1,181 cf, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
198	98	Paved parking, HSG A
1,625	96	Gravel surface, HSG A
2,556	76	Gravel roads, HSG A
2,011	39	>75% Grass cover, Good, HSG A
* 20	60	Brick
732	98	Roofs, HSG A
7,142	73	Weighted Average
6,212		86.98% Pervious Area
930		13.02% Impervious Area

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

Summary for Reach 1R: HUNT PARKING LOT

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,142 sf, 13.02% Impervious, Inflow Depth > 1.99" for 10-Year event
Inflow = 0.40 cfs @ 12.10 hrs, Volume= 1,181 cf
Outflow = 0.40 cfs @ 12.10 hrs, Volume= 1,181 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

21-043 HydroCAD PRE DEV*Type III 24-hr 25-Year Rainfall=6.16"*

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Page 8

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING SITE

Runoff Area=7,142 sf 13.02% Impervious Runoff Depth>3.00"

Tc=6.0 min CN=73 Runoff=0.61 cfs 1,784 cf

Reach 1R: HUNT PARKING LOT

Inflow=0.61 cfs 1,784 cf

Outflow=0.61 cfs 1,784 cf

Total Runoff Area = 7,142 sf Runoff Volume = 1,784 cf Average Runoff Depth = 3.00"
86.98% Pervious = 6,212 sf 13.02% Impervious = 930 sf

Summary for Subcatchment 1S: EXISTING SITE

Runoff = 0.61 cfs @ 12.09 hrs, Volume= 1,784 cf, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
198	98	Paved parking, HSG A
1,625	96	Gravel surface, HSG A
2,556	76	Gravel roads, HSG A
2,011	39	>75% Grass cover, Good, HSG A
* 20	60	Brick
732	98	Roofs, HSG A
7,142	73	Weighted Average
6,212		86.98% Pervious Area
930		13.02% Impervious Area

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

Summary for Reach 1R: HUNT PARKING LOT

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,142 sf, 13.02% Impervious, Inflow Depth > 3.00" for 25-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 1,784 cf
Outflow = 0.61 cfs @ 12.09 hrs, Volume= 1,784 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

21-043 HydroCAD PRE DEV*Type III 24-hr 100-Year Rainfall=8.94"*

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Page 10

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING SITE

Runoff Area=7,142 sf 13.02% Impervious Runoff Depth>5.30"

Tc=6.0 min CN=73 Runoff=1.06 cfs 3,153 cf

Reach 1R: HUNT PARKING LOT

Inflow=1.06 cfs 3,153 cf

Outflow=1.06 cfs 3,153 cf

Total Runoff Area = 7,142 sf Runoff Volume = 3,153 cf Average Runoff Depth = 5.30"
86.98% Pervious = 6,212 sf 13.02% Impervious = 930 sf

Summary for Subcatchment 1S: EXISTING SITE

Runoff = 1.06 cfs @ 12.09 hrs, Volume= 3,153 cf, Depth> 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
198	98	Paved parking, HSG A
1,625	96	Gravel surface, HSG A
2,556	76	Gravel roads, HSG A
2,011	39	>75% Grass cover, Good, HSG A
* 20	60	Brick
732	98	Roofs, HSG A
7,142	73	Weighted Average
6,212		86.98% Pervious Area
930		13.02% Impervious Area

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

Summary for Reach 1R: HUNT PARKING LOT

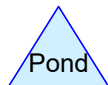
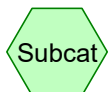
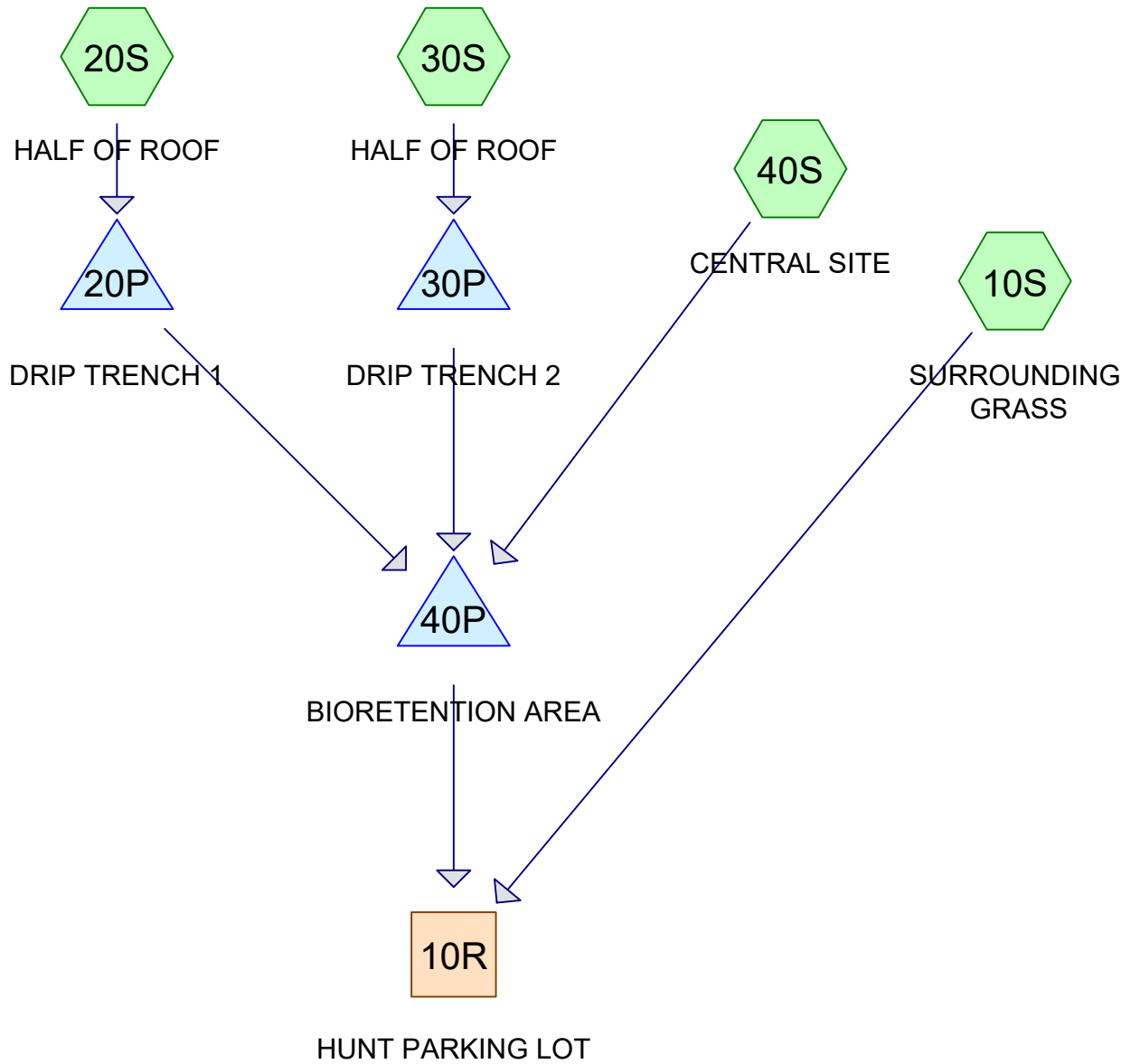
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,142 sf, 13.02% Impervious, Inflow Depth > 5.30" for 100-Year event

Inflow = 1.06 cfs @ 12.09 hrs, Volume= 3,153 cf

Outflow = 1.06 cfs @ 12.09 hrs, Volume= 3,153 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,994	39	>75% Grass cover, Good, HSG A (10S, 40S)
1,151	55	Gravel surface, HSG A (40S)
71	98	Paved parking, HSG A (40S)
2,926	98	Roofs, HSG A (20S, 30S, 40S)
7,142	66	TOTAL AREA

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
7,142	HSG A	10S, 20S, 30S, 40S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
7,142		TOTAL AREA

21-043 HydroCAD POST DEV*Type III 24-hr 2-Year Rainfall=3.15"*

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Page 4

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: SURROUNDING GRASS Runoff Area=2,409 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment 20S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>2.73"
Tc=6.0 min CN=98 Runoff=0.09 cfs 297 cf

Subcatchment 30S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>2.73"
Tc=6.0 min CN=98 Runoff=0.09 cfs 297 cf

Subcatchment 40S: CENTRAL SITE Runoff Area=2,123 sf 18.23% Impervious Runoff Depth>0.28"
Tc=6.0 min CN=58 Runoff=0.01 cfs 49 cf

Reach 10R: HUNT PARKING LOT Inflow=0.08 cfs 45 cf
Outflow=0.08 cfs 45 cf

Pond 20P: DRIP TRENCH 1 Peak Elev=6.23' Storage=35 cf Inflow=0.09 cfs 297 cf
Discarded=0.01 cfs 246 cf Primary=0.10 cfs 51 cf Outflow=0.12 cfs 297 cf

Pond 30P: DRIP TRENCH 2 Peak Elev=6.23' Storage=35 cf Inflow=0.09 cfs 297 cf
Discarded=0.01 cfs 246 cf Primary=0.10 cfs 51 cf Outflow=0.12 cfs 297 cf

Pond 40P: BIORETENTION AREA Peak Elev=5.64' Storage=51 cf Inflow=0.21 cfs 151 cf
Discarded=0.01 cfs 106 cf Primary=0.08 cfs 45 cf Outflow=0.09 cfs 151 cf

Total Runoff Area = 7,142 sf Runoff Volume = 642 cf Average Runoff Depth = 1.08"
58.04% Pervious = 4,145 sf 41.96% Impervious = 2,997 sf

21-043 HydroCAD POST DEV

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Type III 24-hr 2-Year Rainfall=3.15"

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Page 5

Summary for Subcatchment 10S: SURROUNDING GRASS

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
2,409	39	>75% Grass cover, Good, HSG A
2,409		100.00% Pervious Area

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

Summary for Subcatchment 20S: HALF OF ROOF

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 297 cf, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

Summary for Subcatchment 30S: HALF OF ROOF

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 297 cf, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

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Type III 24-hr 2-Year Rainfall=3.15"

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Page 6

Summary for Subcatchment 40S: CENTRAL SITE

Runoff = 0.01 cfs @ 12.15 hrs, Volume= 49 cf, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
585	39	>75% Grass cover, Good, HSG A
316	98	Roofs, HSG A
* 1,151	55	Gravel surface, HSG A
71	98	Paved parking, HSG A
2,123	58	Weighted Average
1,736		81.77% Pervious Area
387		18.23% Impervious Area

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

Summary for Reach 10R: HUNT PARKING LOT

Inflow Area = 7,142 sf, 41.96% Impervious, Inflow Depth = 0.08" for 2-Year event
 Inflow = 0.08 cfs @ 12.22 hrs, Volume= 45 cf
 Outflow = 0.08 cfs @ 12.22 hrs, Volume= 45 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 20P: DRIP TRENCH 1

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 2.73" for 2-Year event
 Inflow = 0.09 cfs @ 12.09 hrs, Volume= 297 cf
 Outflow = 0.12 cfs @ 12.11 hrs, Volume= 297 cf, Atten= 0%, Lag= 1.1 min
 Discarded = 0.01 cfs @ 11.65 hrs, Volume= 246 cf
 Primary = 0.10 cfs @ 12.11 hrs, Volume= 51 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 6.23' @ 12.11 hrs Surf.Area= 76 sf Storage= 35 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 9.4 min (748.1 - 738.7)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismatic 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

21-043 HydroCAD POST DEV

Type III 24-hr 2-Year Rainfall=3.15"

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Page 7

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.65 hrs HW=5.17' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.09 cfs @ 12.11 hrs HW=6.22' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.09 cfs @ 0.86 fps)**Summary for Pond 30P: DRIP TRENCH 2**

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 2.73" for 2-Year event
 Inflow = 0.09 cfs @ 12.09 hrs, Volume= 297 cf
 Outflow = 0.12 cfs @ 12.11 hrs, Volume= 297 cf, Atten= 0%, Lag= 1.1 min
 Discarded = 0.01 cfs @ 11.65 hrs, Volume= 246 cf
 Primary = 0.10 cfs @ 12.11 hrs, Volume= 51 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 6.23' @ 12.11 hrs Surf.Area= 76 sf Storage= 35 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 9.4 min (748.1 - 738.7)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismatic 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.65 hrs HW=5.17' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.09 cfs @ 12.11 hrs HW=6.22' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.09 cfs @ 0.86 fps)**Summary for Pond 40P: BIORETENTION AREA**

Inflow Area = 4,733 sf, 63.32% Impervious, Inflow Depth > 0.38" for 2-Year event
 Inflow = 0.21 cfs @ 12.11 hrs, Volume= 151 cf
 Outflow = 0.09 cfs @ 12.22 hrs, Volume= 151 cf, Atten= 56%, Lag= 6.6 min
 Discarded = 0.01 cfs @ 12.20 hrs, Volume= 106 cf
 Primary = 0.08 cfs @ 12.22 hrs, Volume= 45 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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Type III 24-hr 2-Year Rainfall=3.15"

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Page 8

Peak Elev= 5.64' @ 12.20 hrs Surf.Area= 61 sf Storage= 51 cf

Plug-Flow detention time= 25.1 min calculated for 151 cf (100% of inflow)

Center-of-Mass det. time= 25.0 min (802.8 - 777.8)

Volume	Invert	Avail.Storage	Storage Description
#1	4.70'	55 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)
4.70	48	29.0	0	0	48
5.70	62	32.0	55	55	82

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.70'	8.270 in/hr Exfiltration over Surface area
#2	Primary	5.60'	4.0' long x 2.0' breadth Broad-Crested Rectangular Weir
			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
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
			2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.20 hrs HW=5.64' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.07 cfs @ 12.22 hrs HW=5.64' (Free Discharge)↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.49 fps)

21-043 HydroCAD POST DEV

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Type III 24-hr 10-Year Rainfall=4.83"

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Page 9

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: SURROUNDING GRASS Runoff Area=2,409 sf 0.00% Impervious Runoff Depth>0.13"
Tc=6.0 min CN=39 Runoff=0.00 cfs 26 cf

Subcatchment 20S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>4.26"
Tc=6.0 min CN=98 Runoff=0.14 cfs 464 cf

Subcatchment 30S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>4.26"
Tc=6.0 min CN=98 Runoff=0.14 cfs 464 cf

Subcatchment 40S: CENTRAL SITE Runoff Area=2,123 sf 18.23% Impervious Runoff Depth>0.97"
Tc=6.0 min CN=58 Runoff=0.05 cfs 171 cf

Reach 10R: HUNT PARKING LOT Inflow=0.38 cfs 272 cf
Outflow=0.38 cfs 272 cf

Pond 20P: DRIP TRENCH 1 Peak Elev=6.24' Storage=35 cf Inflow=0.14 cfs 464 cf
Discarded=0.01 cfs 337 cf Primary=0.14 cfs 127 cf Outflow=0.15 cfs 464 cf

Pond 30P: DRIP TRENCH 2 Peak Elev=6.24' Storage=35 cf Inflow=0.14 cfs 464 cf
Discarded=0.01 cfs 337 cf Primary=0.14 cfs 127 cf Outflow=0.15 cfs 464 cf

Pond 40P: BIORETENTION AREA Peak Elev=5.71' Storage=55 cf Inflow=0.33 cfs 425 cf
Discarded=0.01 cfs 179 cf Primary=0.38 cfs 246 cf Outflow=0.40 cfs 425 cf

Total Runoff Area = 7,142 sf Runoff Volume = 1,124 cf Average Runoff Depth = 1.89"
58.04% Pervious = 4,145 sf 41.96% Impervious = 2,997 sf

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Type III 24-hr 10-Year Rainfall=4.83"

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Page 10

Summary for Subcatchment 10S: SURROUNDING GRASS

Runoff = 0.00 cfs @ 13.65 hrs, Volume= 26 cf, Depth> 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
2,409	39	>75% Grass cover, Good, HSG A
2,409		100.00% Pervious Area

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

Summary for Subcatchment 20S: HALF OF ROOF

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 464 cf, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

Summary for Subcatchment 30S: HALF OF ROOF

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 464 cf, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

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Type III 24-hr 10-Year Rainfall=4.83"

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Page 11

Summary for Subcatchment 40S: CENTRAL SITE

Runoff = 0.05 cfs @ 12.11 hrs, Volume= 171 cf, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (sf)	CN	Description
585	39	>75% Grass cover, Good, HSG A
316	98	Roofs, HSG A
* 1,151	55	Gravel surface, HSG A
71	98	Paved parking, HSG A
2,123	58	Weighted Average
1,736		81.77% Pervious Area
387		18.23% Impervious Area

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

Summary for Reach 10R: HUNT PARKING LOT

Inflow Area = 7,142 sf, 41.96% Impervious, Inflow Depth > 0.46" for 10-Year event
 Inflow = 0.38 cfs @ 12.10 hrs, Volume= 272 cf
 Outflow = 0.38 cfs @ 12.10 hrs, Volume= 272 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 20P: DRIP TRENCH 1

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 4.26" for 10-Year event
 Inflow = 0.14 cfs @ 12.09 hrs, Volume= 464 cf
 Outflow = 0.15 cfs @ 12.10 hrs, Volume= 464 cf, Atten= 0%, Lag= 0.7 min
 Discarded = 0.01 cfs @ 11.45 hrs, Volume= 337 cf
 Primary = 0.14 cfs @ 12.10 hrs, Volume= 127 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 6.24' @ 12.10 hrs Surf.Area= 76 sf Storage= 35 cf

Plug-Flow detention time= 8.9 min calculated for 462 cf (100% of inflow)
 Center-of-Mass det. time= 8.8 min (744.1 - 735.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismatic 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

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Type III 24-hr 10-Year Rainfall=4.83"

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Page 12

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.45 hrs HW=5.16' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.14 cfs @ 12.10 hrs HW=6.24' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.14 cfs @ 0.98 fps)**Summary for Pond 30P: DRIP TRENCH 2**

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 4.26" for 10-Year event
 Inflow = 0.14 cfs @ 12.09 hrs, Volume= 464 cf
 Outflow = 0.15 cfs @ 12.10 hrs, Volume= 464 cf, Atten= 0%, Lag= 0.7 min
 Discarded = 0.01 cfs @ 11.45 hrs, Volume= 337 cf
 Primary = 0.14 cfs @ 12.10 hrs, Volume= 127 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 6.24' @ 12.10 hrs Surf.Area= 76 sf Storage= 35 cf

Plug-Flow detention time= 8.9 min calculated for 462 cf (100% of inflow)

Center-of-Mass det. time= 8.8 min (744.1 - 735.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismatic 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.45 hrs HW=5.16' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.14 cfs @ 12.10 hrs HW=6.24' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.14 cfs @ 0.98 fps)**Summary for Pond 40P: BIORETENTION AREA**

Inflow Area = 4,733 sf, 63.32% Impervious, Inflow Depth > 1.08" for 10-Year event
 Inflow = 0.33 cfs @ 12.10 hrs, Volume= 425 cf
 Outflow = 0.40 cfs @ 12.10 hrs, Volume= 425 cf, Atten= 0%, Lag= 0.2 min
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 179 cf
 Primary = 0.38 cfs @ 12.10 hrs, Volume= 246 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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Type III 24-hr 10-Year Rainfall=4.83"

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Page 13

Peak Elev= 5.71' @ 12.10 hrs Surf.Area= 62 sf Storage= 55 cf

Plug-Flow detention time= 15.7 min calculated for 425 cf (100% of inflow)

Center-of-Mass det. time= 15.7 min (788.1 - 772.5)

Volume	Invert	Avail.Storage	Storage Description
#1	4.70'	55 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)
4.70	48	29.0	0	0	48
5.70	62	32.0	55	55	82

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.70'	8.270 in/hr Exfiltration over Surface area
#2	Primary	5.60'	4.0' long x 2.0' breadth Broad-Crested Rectangular Weir
			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
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
			2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=5.71' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.37 cfs @ 12.10 hrs HW=5.71' (Free Discharge)↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.37 cfs @ 0.84 fps)

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Type III 24-hr 25-Year Rainfall=6.16"

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Page 14

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: SURROUNDING GRASS Runoff Area=2,409 sf 0.00% Impervious Runoff Depth>0.41"
Tc=6.0 min CN=39 Runoff=0.01 cfs 83 cf

Subcatchment 20S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>5.47"
Tc=6.0 min CN=98 Runoff=0.18 cfs 595 cf

Subcatchment 30S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>5.47"
Tc=6.0 min CN=98 Runoff=0.18 cfs 595 cf

Subcatchment 40S: CENTRAL SITE Runoff Area=2,123 sf 18.23% Impervious Runoff Depth>1.69"
Tc=6.0 min CN=58 Runoff=0.10 cfs 299 cf

Reach 10R: HUNT PARKING LOT Inflow=0.46 cfs 534 cf
Outflow=0.46 cfs 534 cf

Pond 20P: DRIP TRENCH 1 Peak Elev=6.25' Storage=36 cf Inflow=0.18 cfs 595 cf
Discarded=0.01 cfs 400 cf Primary=0.17 cfs 195 cf Outflow=0.19 cfs 595 cf

Pond 30P: DRIP TRENCH 2 Peak Elev=6.25' Storage=36 cf Inflow=0.18 cfs 595 cf
Discarded=0.01 cfs 400 cf Primary=0.17 cfs 195 cf Outflow=0.19 cfs 595 cf

Pond 40P: BIORETENTION AREA Peak Elev=5.73' Storage=55 cf Inflow=0.44 cfs 690 cf
Discarded=0.01 cfs 239 cf Primary=0.46 cfs 451 cf Outflow=0.47 cfs 689 cf

Total Runoff Area = 7,142 sf Runoff Volume = 1,573 cf Average Runoff Depth = 2.64"
58.04% Pervious = 4,145 sf 41.96% Impervious = 2,997 sf

Summary for Subcatchment 10S: SURROUNDING GRASS

Runoff = 0.01 cfs @ 12.33 hrs, Volume= 83 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
2,409	39	>75% Grass cover, Good, HSG A
2,409		100.00% Pervious Area

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

Summary for Subcatchment 20S: HALF OF ROOF

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 595 cf, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

Summary for Subcatchment 30S: HALF OF ROOF

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 595 cf, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

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Type III 24-hr 25-Year Rainfall=6.16"

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Page 16

Summary for Subcatchment 40S: CENTRAL SITE

Runoff = 0.10 cfs @ 12.10 hrs, Volume= 299 cf, Depth> 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.16"

Area (sf)	CN	Description
585	39	>75% Grass cover, Good, HSG A
316	98	Roofs, HSG A
* 1,151	55	Gravel surface, HSG A
71	98	Paved parking, HSG A
2,123	58	Weighted Average
1,736		81.77% Pervious Area
387		18.23% Impervious Area

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

Summary for Reach 10R: HUNT PARKING LOT

Inflow Area = 7,142 sf, 41.96% Impervious, Inflow Depth > 0.90" for 25-Year event
 Inflow = 0.46 cfs @ 12.10 hrs, Volume= 534 cf
 Outflow = 0.46 cfs @ 12.10 hrs, Volume= 534 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 20P: DRIP TRENCH 1

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 5.47" for 25-Year event
 Inflow = 0.18 cfs @ 12.09 hrs, Volume= 595 cf
 Outflow = 0.19 cfs @ 12.10 hrs, Volume= 595 cf, Atten= 0%, Lag= 0.5 min
 Discarded = 0.01 cfs @ 11.20 hrs, Volume= 400 cf
 Primary = 0.17 cfs @ 12.10 hrs, Volume= 195 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 6.25' @ 12.10 hrs Surf.Area= 76 sf Storage= 36 cf

Plug-Flow detention time= 8.9 min calculated for 595 cf (100% of inflow)
 Center-of-Mass det. time= 8.8 min (742.8 - 734.0)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismatic 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

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Type III 24-hr 25-Year Rainfall=6.16"

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Page 17

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.20 hrs HW=5.16' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.17 cfs @ 12.10 hrs HW=6.25' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.17 cfs @ 1.04 fps)**Summary for Pond 30P: DRIP TRENCH 2**

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 5.47" for 25-Year event
 Inflow = 0.18 cfs @ 12.09 hrs, Volume= 595 cf
 Outflow = 0.19 cfs @ 12.10 hrs, Volume= 595 cf, Atten= 0%, Lag= 0.5 min
 Discarded = 0.01 cfs @ 11.20 hrs, Volume= 400 cf
 Primary = 0.17 cfs @ 12.10 hrs, Volume= 195 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 6.25' @ 12.10 hrs Surf.Area= 76 sf Storage= 36 cf

Plug-Flow detention time= 8.9 min calculated for 595 cf (100% of inflow)

Center-of-Mass det. time= 8.8 min (742.8 - 734.0)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismaoid 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.20 hrs HW=5.16' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.17 cfs @ 12.10 hrs HW=6.25' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.17 cfs @ 1.04 fps)**Summary for Pond 40P: BIORETENTION AREA**

Inflow Area = 4,733 sf, 63.32% Impervious, Inflow Depth > 1.75" for 25-Year event
 Inflow = 0.44 cfs @ 12.10 hrs, Volume= 690 cf
 Outflow = 0.47 cfs @ 12.10 hrs, Volume= 689 cf, Atten= 0%, Lag= 0.1 min
 Discarded = 0.01 cfs @ 12.09 hrs, Volume= 239 cf
 Primary = 0.46 cfs @ 12.10 hrs, Volume= 451 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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Type III 24-hr 25-Year Rainfall=6.16"

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Page 18

Peak Elev= 5.73' @ 12.10 hrs Surf.Area= 62 sf Storage= 55 cf

Plug-Flow detention time= 14.8 min calculated for 689 cf (100% of inflow)

Center-of-Mass det. time= 14.7 min (784.4 - 769.7)

Volume	Invert	Avail.Storage	Storage Description
#1	4.70'	55 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)
4.70	48	29.0	0	0	48
5.70	62	32.0	55	55	82

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.70'	8.270 in/hr Exfiltration over Surface area
#2	Primary	5.60'	4.0' long x 2.0' breadth Broad-Crested Rectangular Weir
			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
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
			2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.09 hrs HW=5.72' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.45 cfs @ 12.10 hrs HW=5.73' (Free Discharge)↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.45 cfs @ 0.90 fps)

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Page 19

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: SURROUNDING GRASS Runoff Area=2,409 sf 0.00% Impervious Runoff Depth>1.39"
Tc=6.0 min CN=39 Runoff=0.08 cfs 280 cf

Subcatchment 20S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>8.00"
Tc=6.0 min CN=98 Runoff=0.26 cfs 870 cf

Subcatchment 30S: HALF OF ROOF Runoff Area=1,305 sf 100.00% Impervious Runoff Depth>8.00"
Tc=6.0 min CN=98 Runoff=0.26 cfs 870 cf

Subcatchment 40S: CENTRAL SITE Runoff Area=2,123 sf 18.23% Impervious Runoff Depth>3.51"
Tc=6.0 min CN=58 Runoff=0.21 cfs 622 cf

Reach 10R: HUNT PARKING LOT Inflow=0.74 cfs 1,283 cf
Outflow=0.74 cfs 1,283 cf

Pond 20P: DRIP TRENCH 1 Peak Elev=6.28' Storage=36 cf Inflow=0.26 cfs 870 cf
Discarded=0.01 cfs 509 cf Primary=0.24 cfs 361 cf Outflow=0.26 cfs 870 cf

Pond 30P: DRIP TRENCH 2 Peak Elev=6.28' Storage=36 cf Inflow=0.26 cfs 870 cf
Discarded=0.01 cfs 509 cf Primary=0.24 cfs 361 cf Outflow=0.26 cfs 870 cf

Pond 40P: BIORETENTION AREA Peak Elev=5.76' Storage=55 cf Inflow=0.70 cfs 1,344 cf
Discarded=0.01 cfs 340 cf Primary=0.67 cfs 1,003 cf Outflow=0.68 cfs 1,343 cf

Total Runoff Area = 7,142 sf Runoff Volume = 2,641 cf Average Runoff Depth = 4.44"
58.04% Pervious = 4,145 sf 41.96% Impervious = 2,997 sf

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Type III 24-hr 100-Year Rainfall=8.94"

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Page 20

Summary for Subcatchment 10S: SURROUNDING GRASS

Runoff = 0.08 cfs @ 12.11 hrs, Volume= 280 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
2,409	39	>75% Grass cover, Good, HSG A
2,409		100.00% Pervious Area

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

Summary for Subcatchment 20S: HALF OF ROOF

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 870 cf, Depth> 8.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

Summary for Subcatchment 30S: HALF OF ROOF

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 870 cf, Depth> 8.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,305	98	Roofs, HSG A
1,305		100.00% Impervious Area

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

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Type III 24-hr 100-Year Rainfall=8.94"

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Page 21

Summary for Subcatchment 40S: CENTRAL SITE

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 622 cf, Depth> 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.94"

Area (sf)	CN	Description
585	39	>75% Grass cover, Good, HSG A
316	98	Roofs, HSG A
* 1,151	55	Gravel surface, HSG A
71	98	Paved parking, HSG A
2,123	58	Weighted Average
1,736		81.77% Pervious Area
387		18.23% Impervious Area

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

Summary for Reach 10R: HUNT PARKING LOT

Inflow Area = 7,142 sf, 41.96% Impervious, Inflow Depth > 2.16" for 100-Year event
 Inflow = 0.74 cfs @ 12.09 hrs, Volume= 1,283 cf
 Outflow = 0.74 cfs @ 12.09 hrs, Volume= 1,283 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 20P: DRIP TRENCH 1

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 8.00" for 100-Year event
 Inflow = 0.26 cfs @ 12.09 hrs, Volume= 870 cf
 Outflow = 0.26 cfs @ 12.09 hrs, Volume= 870 cf, Atten= 0%, Lag= 0.3 min
 Discarded = 0.01 cfs @ 10.35 hrs, Volume= 509 cf
 Primary = 0.24 cfs @ 12.09 hrs, Volume= 361 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 6.28' @ 12.09 hrs Surf.Area= 76 sf Storage= 36 cf

Plug-Flow detention time= 9.5 min calculated for 867 cf (100% of inflow)
 Center-of-Mass det. time= 9.4 min (742.1 - 732.7)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismatic 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

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Type III 24-hr 100-Year Rainfall=8.94"

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Page 22

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 10.35 hrs HW=5.16' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.24 cfs @ 12.09 hrs HW=6.28' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.24 cfs @ 1.17 fps)**Summary for Pond 30P: DRIP TRENCH 2**

Inflow Area = 1,305 sf, 100.00% Impervious, Inflow Depth > 8.00" for 100-Year event
 Inflow = 0.26 cfs @ 12.09 hrs, Volume= 870 cf
 Outflow = 0.26 cfs @ 12.09 hrs, Volume= 870 cf, Atten= 0%, Lag= 0.3 min
 Discarded = 0.01 cfs @ 10.35 hrs, Volume= 509 cf
 Primary = 0.24 cfs @ 12.09 hrs, Volume= 361 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 6.28' @ 12.09 hrs Surf.Area= 76 sf Storage= 36 cf

Plug-Flow detention time= 9.5 min calculated for 867 cf (100% of inflow)

Center-of-Mass det. time= 9.4 min (742.1 - 732.7)

Volume	Invert	Avail.Storage	Storage Description
#1	5.15'	28 cf	1.25'W x 61.00'L x 1.25'H Prismaoid 95 cf Overall - 12 cf Embedded = 83 cf x 33.0% Voids
#2	5.65'	12 cf	6.0" Round Pipe Storage Inside #1 L= 61.0'
		39 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.15'	8.270 in/hr Exfiltration over Surface area
#2	Primary	6.15'	6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 10.35 hrs HW=5.16' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.24 cfs @ 12.09 hrs HW=6.28' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.24 cfs @ 1.17 fps)**Summary for Pond 40P: BIORETENTION AREA**

Inflow Area = 4,733 sf, 63.32% Impervious, Inflow Depth > 3.41" for 100-Year event
 Inflow = 0.70 cfs @ 12.09 hrs, Volume= 1,344 cf
 Outflow = 0.68 cfs @ 12.09 hrs, Volume= 1,343 cf, Atten= 2%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 12.00 hrs, Volume= 340 cf
 Primary = 0.67 cfs @ 12.09 hrs, Volume= 1,003 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

21-043 HydroCAD POST DEV

Type III 24-hr 100-Year Rainfall=8.94"

Prepared by DCI a GM2 Company

Printed 8/16/2021

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Page 23

Peak Elev= 5.76' @ 12.09 hrs Surf.Area= 62 sf Storage= 55 cf

Plug-Flow detention time= 12.7 min calculated for 1,343 cf (100% of inflow)

Center-of-Mass det. time= 12.6 min (777.6 - 764.9)

Volume	Invert	Avail.Storage	Storage Description
#1	4.70'	55 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)
4.70	48	29.0	0	0	48
5.70	62	32.0	55	55	82

Device	Routing	Invert	Outlet Devices
#1	Discarded	4.70'	8.270 in/hr Exfiltration over Surface area
#2	Primary	5.60'	4.0' long x 2.0' breadth Broad-Crested Rectangular Weir
			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
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88
			2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.00 hrs HW=5.71' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.66 cfs @ 12.09 hrs HW=5.76' (Free Discharge)↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.66 cfs @ 1.02 fps)

Appendix F

OPERATION & MAINTENANCE PLAN

Operation & Maintenance Plan (Permanent BMPs)

FOR

**30-32 Cable Ave,
Salisbury, MA**

Date: August, 2021

Owner: Edward Foote
123 Central Avenue
Salisbury, MA

Operator: Downeast Residential LLC
110 Maple Lane
Northborough, MA 01532
damonamato1@gmail.com
(508) 873-7230

Inspection and Maintenance Schedule

Facility personnel will inspect the stormwater management system on a routine basis not less than once per month for the first six (6) months of operation and annually thereafter. The estimated cost for this inspection and maintenance schedule is \$800/yr. Refer to project design and as-built plans for stormwater systems and landscaped area locations. Inspection and maintenance shall be performed as follows:

1. Landscaped Areas:

Landscaped areas shall be inspected and maintained on a regular basis. Areas that may be subject to erosion will be stabilized and reseeded immediately. Inspect soil and repair eroded areas monthly. Re-plant void areas as needed. Remove litter and debris monthly. Remove and replace dead vegetation twice per year in spring and fall. Replace soil media if ponding is witnessed more than 48 hours after rainfall event.

2. Bioretention Area

Inspections & Maintenance:

Following construction, inspect site following rain events. Add/replace vegetation in any eroded areas. Water to promote plant growth and survival, especially during the first two years and during dry spells.

Monthly:

- prune and weed swale to maintain appearance
- remove accumulated trash and debris
- replace mulch as needed

Annually:

- Inspect inflow area for sediment accumulation. Remove accumulated sediment or debris.
- Inspect site for erosion as well as sediment and mulch which have been moved around in the garden. Add/replace vegetation in any eroded areas.
- Inspect rain garden for dead or dying vegetation. Replace vegetation as needed.
- Test planting bed for pH. If the pH is below 5.2, limestone should be applied. If the pH is above 8.0, iron sulfate and sulfur should be applied.

Every 2 to 3 years:

- Remove and replace mulch

Stormwater System Inspection Report

General Information			
Location: 30-32 Cable Ave, Salisbury			
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Purpose of Inspection			
Weather Information			
Has it rained since the last inspection? ☐ Yes ☐ No			
Weather at time of this inspection?			

Site-Specific Stormwater Devices: (See above for inspection frequency)

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
1		☐ Yes ☐ No		
2		☐ Yes ☐ No		
3		☐ Yes ☐ No		
4		☐ Yes ☐ No		
5		☐ Yes ☐ No		
6		☐ Yes ☐ No		
7		☐ Yes ☐ No		

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
8		☐ Yes ☐ No		

Overall Site Issues

	Description		Corrective Action	Date for Corrective Action/Responsible Person
1	Are all slopes properly stabilized?	☐ Yes ☐ No		
2	Are natural resource areas (e.g., streams, wetlands, etc.) being subjected to erosion?	☐ Yes ☐ No		
3	Are discharge points free of sediment deposits?	☐ Yes ☐ No		

Certification Statement:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name:

Signature:

Date: