

STORMWATER ANALYSIS AND CALCULATIONS

for

62 MAPLE STREET WENHAM, MASSACHUSETTS

Applicant:

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November 6, 2014

Revised: February 4, 2015

Revised: February 18, 2015



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- TR 20 SCS Unit Hydrograph Procedure
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SOURCE OF DATA

- Technical Report No. 20
- Technical Report No. 55
- Technical Paper No. 40
- Partial Field Survey by MAI
- Massachusetts Stormwater Management Handbook, February 2008

REPORT SUMMARY:

Calculation Objectives

The objective of these calculations is to document that the proposed project described in the Stormwater Management Report does not result in an increase of offsite rates of runoff or flooding down gradient of the site. The analysis is separated into existing and proposed conditions. Watershed plans have been incorporated into this report to depict existing and proposed watershed areas.

Selection of Storm Events

The storm events have been compiled from the Soil Conservation Service Technical Report No. 55 and the U.S. Department of Commerce Technical Paper No. 40. Rainfall frequency data has been provided as follows:

<u>Frequency (Years)</u>	<u>Rainfall [24-Hour Event (inches)]</u>
2	3.1
10	4.5
100	6.5

Classification of Soils

Drainage classes have been established based on soil maps provided by U.S. Department of Agriculture Soil Conservation Service as well as onsite soil testing. Soil maps and descriptions are part of "Soil Survey of Essex County, Southern Part". According to NRCS, the following soil types and hydrologic groups are delineated within the limit of the hydrologic study:

242B: Hinckley gravelly fine sandy loam - hydrologic soil group A
600: Pits, gravel - hydrologic soil group not established

Hydrologic soil groups are assigned to each soil type by NRCS based on their potential rate of water infiltration. Group A soils typically have a high infiltration rate when thoroughly wet and consist of deep well drained sands or gravelly sands. Soil testing performed on the locus property confirm the presence of sands and gravels. Due to these results, area within soil type 600 also utilize a hydrologic soil group of A within the hydrologic model.

Existing Conditions Overview

The locus property is part of an existing 16.1± acre parcel located at 62 Maple Street in Wenham, MA. The site is bordered on the north by existing woods and wetland areas and to the south by residentially developed properties along Maple Street. Burley Brook cuts through the property on the western side.

The project area for the hydrologic study consists of approximately 11 acres on and adjoining the locus property. This area includes an existing dwelling and associated driveway located directly off Maple Street. Lawn area extends back from Maple Street approximately 400'. Existing wooded areas with paths comprise the remainder of the project area groundcover up to an existing bordering vegetated wetland. The topography of the site consists of mild slopes ranging from 1% to 10% on the majority of the property.

For the purpose of analyzing existing and proposed stormwater runoff, a single design point has been designated for comparison. The design point selected is the limit of bordering vegetated wetland delineated on the plan. Two (2) subcatchment areas have been delineated based on topography.

Existing Design Point and Subcatchment Areas:

Design Point #1 is designated as the limit of bordering vegetated wetlands delineated on the plan. Stormwater from each of the two (2) subcatchment areas culminates at some point along the wetland line.

Subcatchment #1 includes area along the eastern edge of the locus property down gradient of existing berm to the central area of the project site including additional area estimated to contribute stormwater from offsite properties. High topographic points within the subcatchment direct stormwater overland to the wetland area.

Subcatchment #2 encompasses the remaining portion of locus property on the northern side up to the wetland boundary. Stormwater flows overland through the woods to the existing wetland.

Proposed Conditions Overview

The applicant is proposing a multi-family residential apartment building under a comprehensive permit. A 24' wide access driveway is proposed from Maple Street to an associated parking lot. Area to the north of the proposed building will remain undeveloped.

Stormwater Management:

This proposal utilizes conventional stormwater management techniques for stormwater management. Incorporated in this design are subsurface infiltration basins, Stormceptor vortex units and deep sump catchbasins for treatment and recharge of stormwater. Design strategies for the stormwater system follow methods from the Massachusetts Stormwater Handbook.

Subsurface Infiltration Basin:

Subsurface infiltration facilities have been incorporated into this design to provide recharge of stormwater from impervious surfaces. The facilities consist of plastic chambers with an open bottom placed atop a stone bed. Chambers are constructed to store stormwater temporarily and let it infiltrate

into the underlying soil. The facilities have been designed to recharge stormwater from the proposed roof and the proposed impervious areas. A TSS removal rate of 80% is achieved by this BMP.

Stormceptor:

The Stormceptor is a Proprietary Separator Vortex Stormwater Treatment Unit that consists of a precast concrete vault with a plastic weir and drop pipe that separates the top chamber and bottom sediment holding chamber. Incoming stormwater is diverted down through the drop pipe into the lower sediment chamber, where suspended solids are removed and settled. The treated runoff can then flow through the outlet pipe. This BMP achieves a TSS Removal Rate of 77% based on MA STEP program and proprietary structure sizing calculations issued by MA DEP effective on October 15, 2013.

Deep Sump Catchbasin:

Deep sump catchbasins are similar to an ordinary catchbasin but fitted with an outlet hood to separate floatables such as oil, grease, trash and debris. They also have four foot deep sumps that promote settling of suspended solids. A TSS removal rate of 25% is achieved by this BMP.

Proposed Design Points and Subcatchment Areas

The design point remains the same in the existing and proposed conditions as the limit of bordering vegetated wetland delineated on the plans. The proposed development has been divided into eight (8) subcatchment areas based on existing and proposed topography. General descriptions of these are as follows:

Subcatchment #11 includes the proposed rooftop runoff which is collected and directly discharged into subsurface infiltration system #2.

Subcatchment #12 falls in a similar location to existing subcatchment #2 residing on the northern portion of the locus property up to the wetland boundary. It also includes the cleared area around the back of the length of proposed structure, which will act as a fire access. Stormwater flows overland through the woods to the existing wetland.

Subcatchment #13 includes the southern portion of the parking area adjacent to the proposed building and the grassed area bounded by the southern end of the proposed building and the property line. Stormwater will flow overland and onto the paved parking lot where it will collect at a set of double catchbasins and directed to a Stormceptor Vortex unit, followed by drainage manholes to subsurface infiltration facility #1 for storage and recharge. Excess stormwater will be directed from the facility by means of an emergency overflow drainage grate discharging any flow through existing wooded topography toward the design point.

Subcatchment #14 includes the grassed community space along the southern property line and abutting offsite area estimated to contribute to

stormwater to the site. Stormwater will flow down overland and be captured by a proposed yard drain that will pipe the runoff into proposed subsurface infiltration facility #1.

Subcatchment #15 is composed of the northern half of the parking lot and incidental impervious and grass areas around the northern portion of the proposed building. Similar to Subcatchment #13, stormwater will collect at a set of double catchbasins and directed to a Stormceptor Vortex unit, followed by drainage manholes to subsurface infiltration facility #1 for storage and recharge.

Subcatchment #16 includes the eastern half of the access drive from the crown of the road to the curb and bounded by Maple Street and the parking lot. Runoff will be collected by a catchbasin that is located on the same side of the driveway and is directed into a Stormceptor Vortex unit and then into subsurface infiltration facility #1 for storage and recharge.

Subcatchment #17 contains area abutting Maple Street which houses an existing structure with impervious driveway through the western half of the proposed driveway. Stormwater will flow overland and similar to Subcatchment #16 runoff will be collected by a catchbasin that is located on the same side of the driveway and is directed into a Stormceptor Vortex unit and then into subsurface infiltration facility #1 for storage and recharge.

Subcatchment #18 includes the area to the east of the proposed driveway. Stormwater flow is directed overland culminating at design point #1.

Summary of Flows at All Design Points (CFS)

A detailed analysis of existing and proposed subcatchment areas, ponds, and reaches is included in the HydroCAD analysis section of this report.

	<u>2-Year 24-Hour Storm Event</u>	<u>10-Year 24-Hour Storm Event</u>	<u>100-Year 24-Hour Storm Event</u>
Existing	0.0 CFS	0.11 CFS	1.42 CFS
Proposed	0.0 CFS	0.00 CFS	0.14 CFS

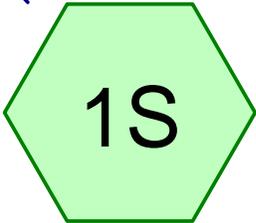
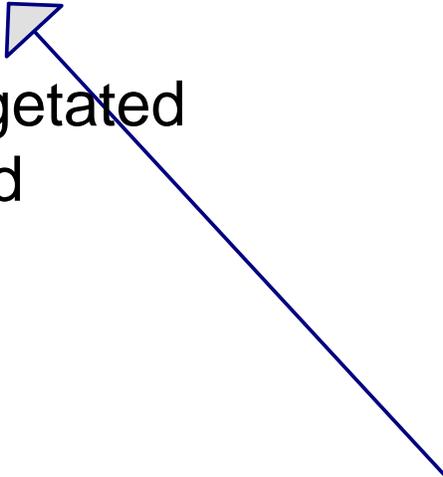
Conclusion

The calculations indicate peaks have been met or reduced for the 2-year, 10-year, and 100-year storm events. We can therefore anticipate no adverse impacts or downstream flooding with the completion of this project. In addition the design provides for the required TSS removal and recharge volumes required by the MA DEP Stormwater Management Requirements.

**EXISTING CONDITIONS
WATERSHED ROUTING DIAGRAM**



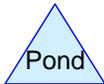
bordering vegetated
wetland



southeast half



northwest half



**EXISTING CONDITIONS
2-YEAR 24-HOUR STORM EVENT ANALYSIS**

Summary for Subcatchment 1S: southeast half

Runoff = 0.00 cfs @ 24.08 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
* 4,280	98	impervious area
85,505	30	Woods, Good, HSG A
60,175	39	>75% Grass cover, Good, HSG A
71,925	51	1 acre lots, 20% imp, HSG A
* 1,135	98	impervious area
23,760	30	Woods, Good, HSG A
5,215	39	>75% Grass cover, Good, HSG A
251,995	40	Weighted Average
232,195		92.14% Pervious Area
19,800		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8	50	0.0050	0.04		Sheet Flow, central plateau Woods: Light underbrush n= 0.400 P2= 3.10"
2.7	85	0.0110	0.52		Shallow Concentrated Flow, overland path Woodland Kv= 5.0 fps
2.4	147	0.0400	1.00		Shallow Concentrated Flow, overland path Woodland Kv= 5.0 fps
2.7	176	0.0480	1.10		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
29.7	458	Total			

Summary for Subcatchment 2S: northwest half

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
239,210	30	Woods, Good, HSG A
239,210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		Sheet Flow, central high point Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	123	0.0260	0.81		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
1.9	136	0.0570	1.19		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
11.6	309	Total			

5652-PRE

Type III 24-hr 2 yr Rainfall=3.10"

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Summary for Reach DP1: bordering vegetated wetland

Inflow Area = 11.277 ac, 4.03% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 24.08 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.08 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

EXISTING CONDITIONS
10-YEAR 24-HOUR STORM EVENT ANALYSIS

Summary for Subcatchment 1S: southeast half

Runoff = 0.11 cfs @ 14.16 hrs, Volume= 0.066 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
* 4,280	98	impervious area
85,505	30	Woods, Good, HSG A
60,175	39	>75% Grass cover, Good, HSG A
71,925	51	1 acre lots, 20% imp, HSG A
* 1,135	98	impervious area
23,760	30	Woods, Good, HSG A
5,215	39	>75% Grass cover, Good, HSG A
251,995	40	Weighted Average
232,195		92.14% Pervious Area
19,800		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8	50	0.0050	0.04		Sheet Flow, central plateau Woods: Light underbrush n= 0.400 P2= 3.10"
2.7	85	0.0110	0.52		Shallow Concentrated Flow, overland path Woodland Kv= 5.0 fps
2.4	147	0.0400	1.00		Shallow Concentrated Flow, overland path Woodland Kv= 5.0 fps
2.7	176	0.0480	1.10		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
29.7	458	Total			

Summary for Subcatchment 2S: northwest half

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
239,210	30	Woods, Good, HSG A
239,210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		Sheet Flow, central high point Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	123	0.0260	0.81		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
1.9	136	0.0570	1.19		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
11.6	309	Total			

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Type III 24-hr 10 yr Rainfall=4.50"

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Summary for Reach DP1: bordering vegetated wetland

Inflow Area = 11.277 ac, 4.03% Impervious, Inflow Depth = 0.07" for 10 yr event
Inflow = 0.11 cfs @ 14.16 hrs, Volume= 0.066 af
Outflow = 0.11 cfs @ 14.16 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

EXISTING CONDITIONS
100-YEAR 24-HOUR STORM EVENT ANALYSIS

Summary for Subcatchment 1S: southeast half

Runoff = 1.42 cfs @ 12.63 hrs, Volume= 0.319 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
* 4,280	98	impervious area
85,505	30	Woods, Good, HSG A
60,175	39	>75% Grass cover, Good, HSG A
71,925	51	1 acre lots, 20% imp, HSG A
* 1,135	98	impervious area
23,760	30	Woods, Good, HSG A
5,215	39	>75% Grass cover, Good, HSG A
251,995	40	Weighted Average
232,195		92.14% Pervious Area
19,800		7.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8	50	0.0050	0.04		Sheet Flow, central plateau Woods: Light underbrush n= 0.400 P2= 3.10"
2.7	85	0.0110	0.52		Shallow Concentrated Flow, overland path Woodland Kv= 5.0 fps
2.4	147	0.0400	1.00		Shallow Concentrated Flow, overland path Woodland Kv= 5.0 fps
2.7	176	0.0480	1.10		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
29.7	458	Total			

Summary for Subcatchment 2S: northwest half

Runoff = 0.10 cfs @ 14.99 hrs, Volume= 0.061 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
239,210	30	Woods, Good, HSG A
239,210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		Sheet Flow, central high point Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	123	0.0260	0.81		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
1.9	136	0.0570	1.19		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
11.6	309	Total			

5652-PRE

Type III 24-hr 100 yr Rainfall=6.50"

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Summary for Reach DP1: bordering vegetated wetland

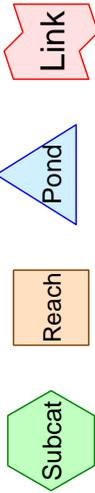
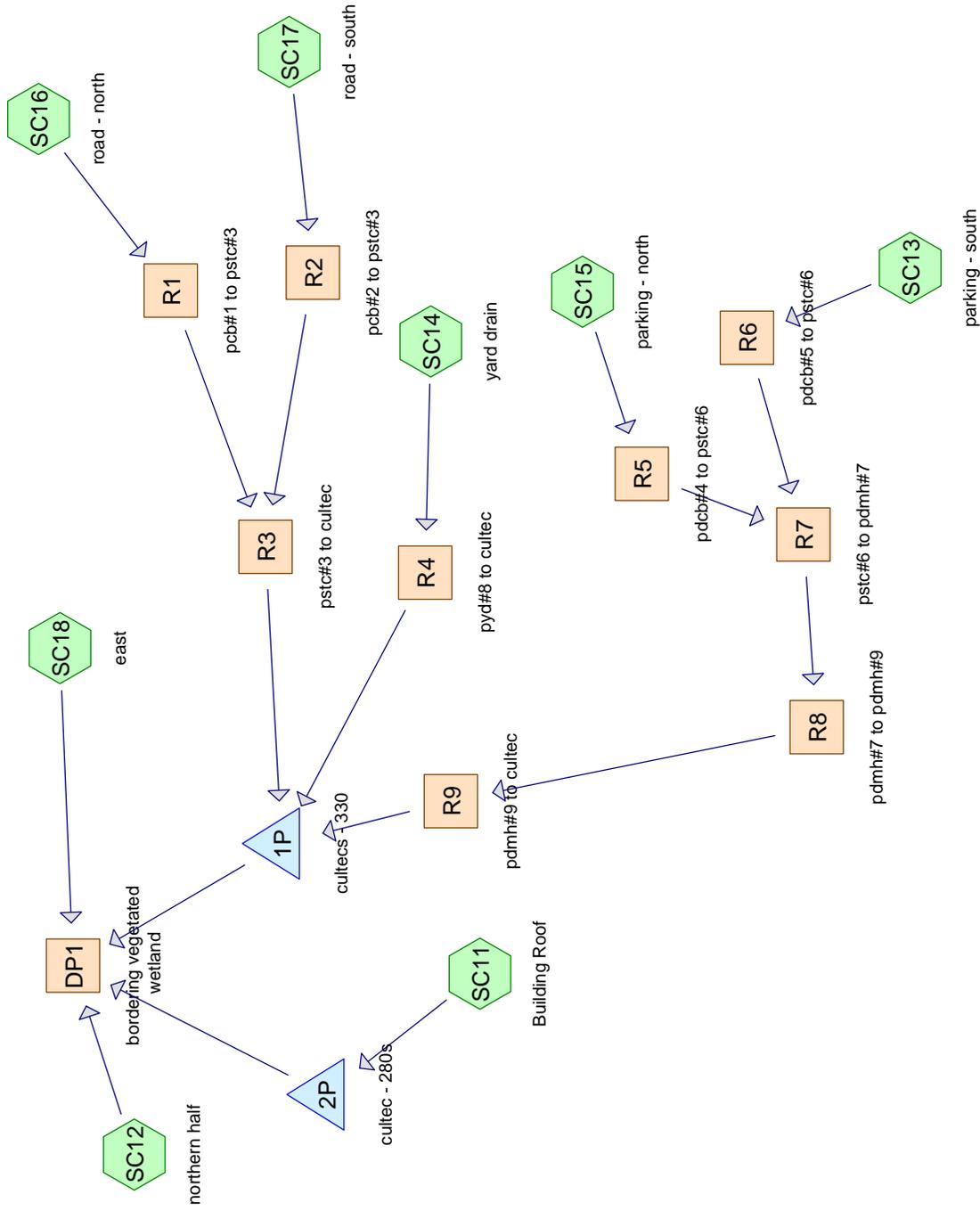
Inflow Area = 11.277 ac, 4.03% Impervious, Inflow Depth = 0.40" for 100 yr event

Inflow = 1.42 cfs @ 12.63 hrs, Volume= 0.380 af

Outflow = 1.42 cfs @ 12.63 hrs, Volume= 0.380 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

**PROPOSED CONDITIONS
WATERSHED ROUTING DIAGRAM**



**PROPOSED CONDITIONS
2-YEAR 24-HOUR STORM EVENT ANALYSIS**

Summary for Subcatchment SC11: Building Roof

Runoff = 1.37 cfs @ 12.08 hrs, Volume= 4,759 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
19,911	98	Roofs, HSG A
19,911		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC12: northern half

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

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
209,103	30	Woods, Good, HSG A
22,028	39	>75% Grass cover, Good, HSG A
231,131	31	Weighted Average
231,131		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		Sheet Flow, central point Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	123	0.0260	0.81		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
1.9	136	0.0570	1.19		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
11.6	309	Total			

Summary for Subcatchment SC13: parking - south

Runoff = 1.01 cfs @ 12.09 hrs, Volume= 3,168 cf, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

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Type III 24-hr 2 yr Rainfall=3.10"

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Area (sf)	CN	Description
20,448	98	Paved parking, HSG A
9,673	39	>75% Grass cover, Good, HSG A
30,121	79	Weighted Average
9,673		32.11% Pervious Area
20,448		67.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC14: yard drain

Runoff = 0.02 cfs @ 14.74 hrs, Volume= 621 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
28,715	39	>75% Grass cover, Good, HSG A
71,925	51	1 acre lots, 20% imp, HSG A
100,640	48	Weighted Average
86,255		85.71% Pervious Area
14,385		14.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC15: parking - north

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 3,491 cf, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
16,973	98	Paved parking, HSG A
2,380	39	>75% Grass cover, Good, HSG A
19,353	91	Weighted Average
2,380		12.30% Pervious Area
16,973		87.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC16: road - north

Runoff = 0.10 cfs @ 12.14 hrs, Volume= 625 cf, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
8,028	98	Paved parking, HSG A
11,924	39	>75% Grass cover, Good, HSG A
2,270	30	Woods, Good, HSG A
22,222	59	Weighted Average
14,194		63.87% Pervious Area
8,028		36.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC17: road - south

Runoff = 0.21 cfs @ 12.13 hrs, Volume= 1,210 cf, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
12,442	98	Paved parking, HSG A
1,571	98	Roofs, HSG A
25,208	39	>75% Grass cover, Good, HSG A
39,221	60	Weighted Average
25,208		64.27% Pervious Area
14,013		35.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC18: east

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

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
8,086	39	>75% Grass cover, Good, HSG A
21,080	30	Woods, Good, HSG A
29,166	32	Weighted Average
29,166		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Reach DP1: bordering vegetated wetland

Inflow Area = 491,765 sf, 19.07% Impervious, Inflow Depth = 0.00" for 2 yr event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

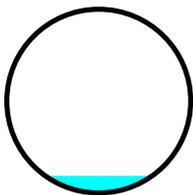
Summary for Reach R1: pcb#1 to pstc#3

Inflow Area = 22,222 sf, 36.13% Impervious, Inflow Depth = 0.34" for 2 yr event
 Inflow = 0.10 cfs @ 12.14 hrs, Volume= 625 cf
 Outflow = 0.10 cfs @ 12.14 hrs, Volume= 625 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Max. Velocity= 2.59 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 1.37 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 12.14 hrs
 Average Depth at Peak Storage= 0.09'
 Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.31 cfs

12.0" Round Pipe
 n= 0.013
 Length= 18.0' Slope= 0.0222 '/'
 Inlet Invert= 58.50', Outlet Invert= 58.10'



Summary for Reach R2: pcb#2 to pstc#3

Inflow Area = 39,221 sf, 35.73% Impervious, Inflow Depth = 0.37" for 2 yr event
 Inflow = 0.21 cfs @ 12.13 hrs, Volume= 1,210 cf
 Outflow = 0.21 cfs @ 12.13 hrs, Volume= 1,210 cf, Atten= 0%, Lag= 0.0 min

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Type III 24-hr 2 yr Rainfall=3.10"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 5.13 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 2.59 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 12.13 hrs

Average Depth at Peak Storage= 0.10'

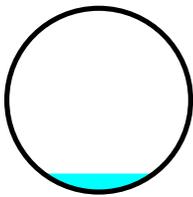
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.08 cfs

12.0" Round Pipe

n= 0.013

Length= 5.0' Slope= 0.0800 '/'

Inlet Invert= 58.50', Outlet Invert= 58.10'



Summary for Reach R3: pstc#3 to cultec

Inflow Area = 61,443 sf, 35.87% Impervious, Inflow Depth = 0.36" for 2 yr event

Inflow = 0.30 cfs @ 12.14 hrs, Volume= 1,835 cf

Outflow = 0.30 cfs @ 12.14 hrs, Volume= 1,835 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 6.21 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 3.17 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 12.14 hrs

Average Depth at Peak Storage= 0.11'

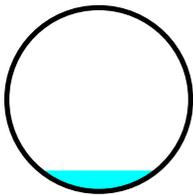
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.27 cfs

12.0" Round Pipe

n= 0.013

Length= 5.0' Slope= 0.1000 '/'

Inlet Invert= 57.80', Outlet Invert= 57.30'



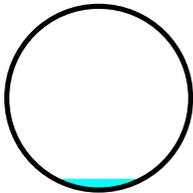
Summary for Reach R4: pyd#8 to cultec

Inflow Area = 100,640 sf, 14.29% Impervious, Inflow Depth = 0.07" for 2 yr event
Inflow = 0.02 cfs @ 14.74 hrs, Volume= 621 cf
Outflow = 0.02 cfs @ 14.74 hrs, Volume= 621 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.68 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.31 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 14.74 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 3.23 cfs

8.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 7.0' Slope= 0.0714 '/'
Inlet Invert= 58.20', Outlet Invert= 57.70'



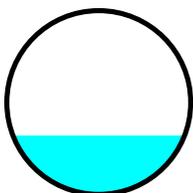
Summary for Reach R5: pdcb#4 to pstc#6

Inflow Area = 19,353 sf, 87.70% Impervious, Inflow Depth = 2.16" for 2 yr event
Inflow = 1.11 cfs @ 12.09 hrs, Volume= 3,491 cf
Outflow = 1.11 cfs @ 12.09 hrs, Volume= 3,491 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.15 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 10.0' Slope= 0.0200 '/'
Inlet Invert= 60.90', Outlet Invert= 60.70'



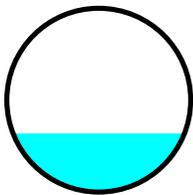
Summary for Reach R6: pdc#5 to pstc#6

Inflow Area = 30,121 sf, 67.89% Impervious, Inflow Depth = 1.26" for 2 yr event
Inflow = 1.01 cfs @ 12.09 hrs, Volume= 3,168 cf
Outflow = 1.01 cfs @ 12.09 hrs, Volume= 3,168 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.69 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.60 cfs

12.0" Round Pipe
n= 0.013
Length= 12.0' Slope= 0.0167 '/'
Inlet Invert= 60.90', Outlet Invert= 60.70'



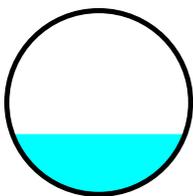
Summary for Reach R7: pstc#6 to pdmh#7

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 1.62" for 2 yr event
Inflow = 2.11 cfs @ 12.09 hrs, Volume= 6,659 cf
Outflow = 2.11 cfs @ 12.09 hrs, Volume= 6,659 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.06 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.01 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 9.14 cfs

15.0" Round Pipe
n= 0.013
Length= 5.0' Slope= 0.0200 '/'
Inlet Invert= 60.40', Outlet Invert= 60.30'



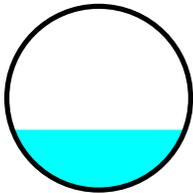
Summary for Reach R8: pdmh#7 to pdmh#9

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 1.62" for 2 yr event
Inflow = 2.11 cfs @ 12.09 hrs, Volume= 6,659 cf
Outflow = 2.11 cfs @ 12.09 hrs, Volume= 6,659 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.06 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.01 fps, Avg. Travel Time= 0.3 min

Peak Storage= 12 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 9.14 cfs

15.0" Round Pipe
n= 0.013
Length= 33.0' Slope= 0.0200 '/'
Inlet Invert= 60.00', Outlet Invert= 59.34'



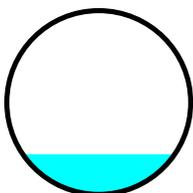
Summary for Reach R9: pdmh#9 to cultec

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 1.62" for 2 yr event
Inflow = 2.11 cfs @ 12.09 hrs, Volume= 6,659 cf
Outflow = 2.11 cfs @ 12.09 hrs, Volume= 6,659 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.75 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.55 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 20.43 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 57.10', Outlet Invert= 56.90'



Summary for Pond 1P: cultecs - 330

Inflow Area = 211,557 sf, 34.91% Impervious, Inflow Depth = 0.52" for 2 yr event
 Inflow = 2.37 cfs @ 12.10 hrs, Volume= 9,115 cf
 Outflow = 0.54 cfs @ 12.55 hrs, Volume= 9,115 cf, Atten= 77%, Lag= 27.4 min
 Discarded = 0.54 cfs @ 12.55 hrs, Volume= 9,115 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 55.98' @ 12.55 hrs Surf.Area= 9,473 sf Storage= 1,803 cf

Plug-Flow detention time= 18.3 min calculated for 9,112 cf (100% of inflow)
 Center-of-Mass det. time= 18.3 min (879.5 - 861.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.50'	7,786 cf	93.33'W x 101.50'L x 3.54'H Field A 33,551 cf Overall - 14,086 cf Embedded = 19,465 cf x 40.0% Voids
#2A	56.00'	14,086 cf	Cultec R-330XL x 266 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 19 rows
		21,872 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.50'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	58.70'	8.0" Round Culvert L= 3.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.70' / 58.70' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.54 cfs @ 12.55 hrs HW=55.98' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.50' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Controls 0.00 cfs)

Summary for Pond 2P: cultec - 280s

Inflow Area = 19,911 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2 yr event
 Inflow = 1.37 cfs @ 12.08 hrs, Volume= 4,759 cf
 Outflow = 0.15 cfs @ 12.71 hrs, Volume= 4,759 cf, Atten= 89%, Lag= 37.6 min
 Discarded = 0.15 cfs @ 12.71 hrs, Volume= 4,759 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 59.60' @ 12.71 hrs Surf.Area= 2,481 sf Storage= 1,534 cf

Plug-Flow detention time= 65.8 min calculated for 4,757 cf (100% of inflow)
 Center-of-Mass det. time= 65.8 min (822.9 - 757.1)

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Type III 24-hr 2 yr Rainfall=3.10"

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Volume	Invert	Avail.Storage	Storage Description
#1A	58.60'	2,018 cf	20.17'W x 123.00'L x 3.21'H Field A 7,958 cf Overall - 2,914 cf Embedded = 5,044 cf x 40.0% Voids
#2A	59.10'	2,914 cf	Cultec R-280HD x 68 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 4 rows
		4,932 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	61.30'	8.0" Round Culvert L= 32.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 61.30' / 61.30' S= 0.0000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.15 cfs @ 12.71 hrs HW=59.60' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.15 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=58.60' TW=0.00' (Dynamic Tailwater)↑**2=Culvert** (Controls 0.00 cfs)

PROPOSED CONDITIONS
10-YEAR 24-HOUR STORM EVENT ANALYSIS

Summary for Subcatchment SC11: Building Roof

Runoff = 2.01 cfs @ 12.08 hrs, Volume= 7,075 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
19,911	98	Roofs, HSG A
19,911		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC12: northern half

Runoff = 0.00 cfs @ 24.04 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
209,103	30	Woods, Good, HSG A
22,028	39	>75% Grass cover, Good, HSG A
231,131	31	Weighted Average
231,131		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		Sheet Flow, central point Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	123	0.0260	0.81		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
1.9	136	0.0570	1.19		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
11.6	309	Total			

Summary for Subcatchment SC13: parking - south

Runoff = 1.93 cfs @ 12.09 hrs, Volume= 5,965 cf, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

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Type III 24-hr 10 yr Rainfall=4.50"

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Area (sf)	CN	Description
20,448	98	Paved parking, HSG A
9,673	39	>75% Grass cover, Good, HSG A
30,121	79	Weighted Average
9,673		32.11% Pervious Area
20,448		67.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC14: yard drain

Runoff = 0.44 cfs @ 12.30 hrs, Volume= 3,468 cf, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
28,715	39	>75% Grass cover, Good, HSG A
71,925	51	1 acre lots, 20% imp, HSG A
100,640	48	Weighted Average
86,255		85.71% Pervious Area
14,385		14.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC15: parking - north

Runoff = 1.76 cfs @ 12.09 hrs, Volume= 5,641 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
16,973	98	Paved parking, HSG A
2,380	39	>75% Grass cover, Good, HSG A
19,353	91	Weighted Average
2,380		12.30% Pervious Area
16,973		87.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC16: road - north

Runoff = 0.48 cfs @ 12.10 hrs, Volume= 1,781 cf, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
8,028	98	Paved parking, HSG A
11,924	39	>75% Grass cover, Good, HSG A
2,270	30	Woods, Good, HSG A
22,222	59	Weighted Average
14,194		63.87% Pervious Area
8,028		36.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC17: road - south

Runoff = 0.92 cfs @ 12.10 hrs, Volume= 3,333 cf, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
12,442	98	Paved parking, HSG A
1,571	98	Roofs, HSG A
25,208	39	>75% Grass cover, Good, HSG A
39,221	60	Weighted Average
25,208		64.27% Pervious Area
14,013		35.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC18: east

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 7 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
8,086	39	>75% Grass cover, Good, HSG A
21,080	30	Woods, Good, HSG A
29,166	32	Weighted Average
29,166		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Reach DP1: bordering vegetated wetland

Inflow Area = 491,765 sf, 19.07% Impervious, Inflow Depth = 0.00" for 10 yr event
 Inflow = 0.00 cfs @ 24.02 hrs, Volume= 9 cf
 Outflow = 0.00 cfs @ 24.02 hrs, Volume= 9 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

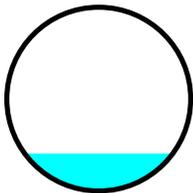
Summary for Reach R1: pcb#1 to pstc#3

Inflow Area = 22,222 sf, 36.13% Impervious, Inflow Depth = 0.96" for 10 yr event
 Inflow = 0.48 cfs @ 12.10 hrs, Volume= 1,781 cf
 Outflow = 0.48 cfs @ 12.11 hrs, Volume= 1,781 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Max. Velocity= 4.19 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 1.78 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 12.11 hrs
 Average Depth at Peak Storage= 0.20'
 Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.31 cfs

12.0" Round Pipe
 n= 0.013
 Length= 18.0' Slope= 0.0222 '/'
 Inlet Invert= 58.50', Outlet Invert= 58.10'



Summary for Reach R2: pcb#2 to pstc#3

Inflow Area = 39,221 sf, 35.73% Impervious, Inflow Depth = 1.02" for 10 yr event
 Inflow = 0.92 cfs @ 12.10 hrs, Volume= 3,333 cf
 Outflow = 0.92 cfs @ 12.10 hrs, Volume= 3,333 cf, Atten= 0%, Lag= 0.0 min

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Type III 24-hr 10 yr Rainfall=4.50"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 7.99 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 3.34 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.20'

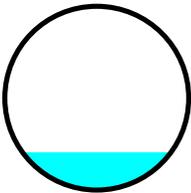
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.08 cfs

12.0" Round Pipe

n= 0.013

Length= 5.0' Slope= 0.0800 '/'

Inlet Invert= 58.50', Outlet Invert= 58.10'



Summary for Reach R3: pstc#3 to cultec

Inflow Area = 61,443 sf, 35.87% Impervious, Inflow Depth = 1.00" for 10 yr event

Inflow = 1.40 cfs @ 12.10 hrs, Volume= 5,114 cf

Outflow = 1.40 cfs @ 12.10 hrs, Volume= 5,114 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 9.77 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 4.10 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.24'

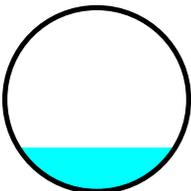
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.27 cfs

12.0" Round Pipe

n= 0.013

Length= 5.0' Slope= 0.1000 '/'

Inlet Invert= 57.80', Outlet Invert= 57.30'



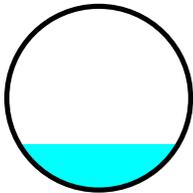
Summary for Reach R4: pyd#8 to cultec

Inflow Area = 100,640 sf, 14.29% Impervious, Inflow Depth = 0.41" for 10 yr event
Inflow = 0.44 cfs @ 12.30 hrs, Volume= 3,468 cf
Outflow = 0.44 cfs @ 12.30 hrs, Volume= 3,468 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.47 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.65 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 3.23 cfs

8.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 7.0' Slope= 0.0714 '/
Inlet Invert= 58.20', Outlet Invert= 57.70'



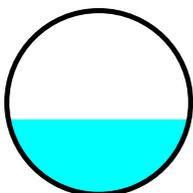
Summary for Reach R5: pdcb#4 to pstc#6

Inflow Area = 19,353 sf, 87.70% Impervious, Inflow Depth = 3.50" for 10 yr event
Inflow = 1.76 cfs @ 12.09 hrs, Volume= 5,641 cf
Outflow = 1.76 cfs @ 12.09 hrs, Volume= 5,641 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.84 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 10.0' Slope= 0.0200 '/
Inlet Invert= 60.90', Outlet Invert= 60.70'



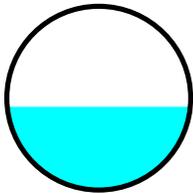
Summary for Reach R6: pdc#5 to pstc#6

Inflow Area = 30,121 sf, 67.89% Impervious, Inflow Depth = 2.38" for 10 yr event
Inflow = 1.93 cfs @ 12.09 hrs, Volume= 5,965 cf
Outflow = 1.93 cfs @ 12.09 hrs, Volume= 5,965 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.60 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.02 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.60 cfs

12.0" Round Pipe
n= 0.013
Length= 12.0' Slope= 0.0167 '/'
Inlet Invert= 60.90', Outlet Invert= 60.70'



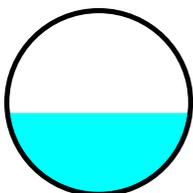
Summary for Reach R7: pstc#6 to pdmh#7

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 2.82" for 10 yr event
Inflow = 3.68 cfs @ 12.09 hrs, Volume= 11,607 cf
Outflow = 3.68 cfs @ 12.09 hrs, Volume= 11,607 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.04 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.29 fps, Avg. Travel Time= 0.0 min

Peak Storage= 3 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 9.14 cfs

15.0" Round Pipe
n= 0.013
Length= 5.0' Slope= 0.0200 '/'
Inlet Invert= 60.40', Outlet Invert= 60.30'



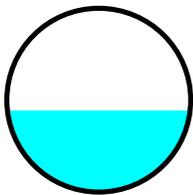
Summary for Reach R8: pdmh#7 to pdmh#9

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 2.82" for 10 yr event
Inflow = 3.68 cfs @ 12.09 hrs, Volume= 11,607 cf
Outflow = 3.68 cfs @ 12.09 hrs, Volume= 11,607 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.04 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.29 fps, Avg. Travel Time= 0.2 min

Peak Storage= 17 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 9.14 cfs

15.0" Round Pipe
n= 0.013
Length= 33.0' Slope= 0.0200 '/'
Inlet Invert= 60.00', Outlet Invert= 59.34'



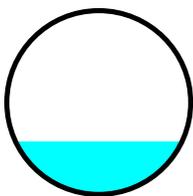
Summary for Reach R9: pdmh#9 to cultec

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 2.82" for 10 yr event
Inflow = 3.68 cfs @ 12.09 hrs, Volume= 11,607 cf
Outflow = 3.68 cfs @ 12.09 hrs, Volume= 11,607 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 12.62 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.05 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 20.43 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 57.10', Outlet Invert= 56.90'



Summary for Pond 1P: cultecs - 330

Inflow Area = 211,557 sf, 34.91% Impervious, Inflow Depth = 1.15" for 10 yr event
 Inflow = 5.32 cfs @ 12.10 hrs, Volume= 20,188 cf
 Outflow = 0.55 cfs @ 13.67 hrs, Volume= 20,188 cf, Atten= 90%, Lag= 94.5 min
 Discarded = 0.55 cfs @ 13.67 hrs, Volume= 20,188 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 56.59' @ 13.67 hrs Surf.Area= 9,473 sf Storage= 6,754 cf

Plug-Flow detention time= 110.4 min calculated for 20,182 cf (100% of inflow)
 Center-of-Mass det. time= 110.3 min (962.6 - 852.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.50'	7,786 cf	93.33'W x 101.50'L x 3.54'H Field A 33,551 cf Overall - 14,086 cf Embedded = 19,465 cf x 40.0% Voids
#2A	56.00'	14,086 cf	Cultec R-330XL x 266 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 19 rows
		21,872 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.50'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	58.70'	8.0" Round Culvert L= 3.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.70' / 58.70' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.55 cfs @ 13.67 hrs HW=56.59' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.55 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.50' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Controls 0.00 cfs)

Summary for Pond 2P: cultec - 280s

Inflow Area = 19,911 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10 yr event
 Inflow = 2.01 cfs @ 12.08 hrs, Volume= 7,075 cf
 Outflow = 0.16 cfs @ 13.03 hrs, Volume= 7,075 cf, Atten= 92%, Lag= 56.7 min
 Discarded = 0.16 cfs @ 13.03 hrs, Volume= 7,075 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 60.15' @ 13.03 hrs Surf.Area= 2,481 sf Storage= 2,620 cf

Plug-Flow detention time= 119.9 min calculated for 7,075 cf (100% of inflow)
 Center-of-Mass det. time= 119.9 min (869.7 - 749.8)

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Type III 24-hr 10 yr Rainfall=4.50"

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Volume	Invert	Avail.Storage	Storage Description
#1A	58.60'	2,018 cf	20.17'W x 123.00'L x 3.21'H Field A 7,958 cf Overall - 2,914 cf Embedded = 5,044 cf x 40.0% Voids
#2A	59.10'	2,914 cf	Cultec R-280HD x 68 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 4 rows
		4,932 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	61.30'	8.0" Round Culvert L= 32.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 61.30' / 61.30' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.16 cfs @ 13.03 hrs HW=60.15' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.16 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=58.60' TW=0.00' (Dynamic Tailwater)↑**2=Culvert** (Controls 0.00 cfs)

PROPOSED CONDITIONS
100-YEAR 24-HOUR STORM EVENT ANALYSIS

Summary for Subcatchment SC11: Building Roof

Runoff = 2.91 cfs @ 12.08 hrs, Volume= 10,389 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
19,911	98	Roofs, HSG A
19,911		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC12: northern half

Runoff = 0.12 cfs @ 14.68 hrs, Volume= 3,325 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
209,103	30	Woods, Good, HSG A
22,028	39	>75% Grass cover, Good, HSG A
231,131	31	Weighted Average
231,131		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		Sheet Flow, central point Woods: Light underbrush n= 0.400 P2= 3.10"
2.5	123	0.0260	0.81		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
1.9	136	0.0570	1.19		Shallow Concentrated Flow, overland to wetland Woodland Kv= 5.0 fps
11.6	309	Total			

Summary for Subcatchment SC13: parking - south

Runoff = 3.33 cfs @ 12.09 hrs, Volume= 10,365 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

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Type III 24-hr 100 yr Rainfall=6.50"

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Area (sf)	CN	Description
20,448	98	Paved parking, HSG A
9,673	39	>75% Grass cover, Good, HSG A
30,121	79	Weighted Average
9,673		32.11% Pervious Area
20,448		67.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC14: yard drain

Runoff = 2.64 cfs @ 12.11 hrs, Volume= 10,383 cf, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
28,715	39	>75% Grass cover, Good, HSG A
71,925	51	1 acre lots, 20% imp, HSG A
100,640	48	Weighted Average
86,255		85.71% Pervious Area
14,385		14.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC15: parking - north

Runoff = 2.67 cfs @ 12.08 hrs, Volume= 8,785 cf, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
16,973	98	Paved parking, HSG A
2,380	39	>75% Grass cover, Good, HSG A
19,353	91	Weighted Average
2,380		12.30% Pervious Area
16,973		87.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC16: road - north

Runoff = 1.23 cfs @ 12.10 hrs, Volume= 4,010 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
8,028	98	Paved parking, HSG A
11,924	39	>75% Grass cover, Good, HSG A
2,270	30	Woods, Good, HSG A
22,222	59	Weighted Average
14,194		63.87% Pervious Area
8,028		36.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC17: road - south

Runoff = 2.29 cfs @ 12.09 hrs, Volume= 7,373 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
12,442	98	Paved parking, HSG A
1,571	98	Roofs, HSG A
25,208	39	>75% Grass cover, Good, HSG A
39,221	60	Weighted Average
25,208		64.27% Pervious Area
14,013		35.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Subcatchment SC18: east

Runoff = 0.02 cfs @ 13.70 hrs, Volume= 524 cf, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
8,086	39	>75% Grass cover, Good, HSG A
21,080	30	Woods, Good, HSG A
29,166	32	Weighted Average
29,166		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min. Standard Engineering Practice

Summary for Reach DP1: bordering vegetated wetland

Inflow Area = 491,765 sf, 19.07% Impervious, Inflow Depth = 0.09" for 100 yr event
 Inflow = 0.14 cfs @ 14.68 hrs, Volume= 3,848 cf
 Outflow = 0.14 cfs @ 14.68 hrs, Volume= 3,848 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

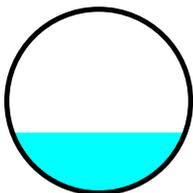
Summary for Reach R1: pcb#1 to pstc#3

Inflow Area = 22,222 sf, 36.13% Impervious, Inflow Depth = 2.17" for 100 yr event
 Inflow = 1.23 cfs @ 12.10 hrs, Volume= 4,010 cf
 Outflow = 1.23 cfs @ 12.10 hrs, Volume= 4,010 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Max. Velocity= 5.51 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.10 hrs
 Average Depth at Peak Storage= 0.33'
 Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.31 cfs

12.0" Round Pipe
 n= 0.013
 Length= 18.0' Slope= 0.0222 '/'
 Inlet Invert= 58.50', Outlet Invert= 58.10'



Summary for Reach R2: pcb#2 to pstc#3

Inflow Area = 39,221 sf, 35.73% Impervious, Inflow Depth = 2.26" for 100 yr event
 Inflow = 2.29 cfs @ 12.09 hrs, Volume= 7,373 cf
 Outflow = 2.29 cfs @ 12.09 hrs, Volume= 7,373 cf, Atten= 0%, Lag= 0.0 min

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Type III 24-hr 100 yr Rainfall=6.50"

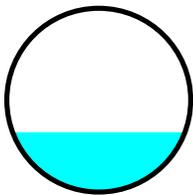
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Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.38 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 10.08 cfs

12.0" Round Pipe
n= 0.013
Length= 5.0' Slope= 0.0800 '/'
Inlet Invert= 58.50', Outlet Invert= 58.10'



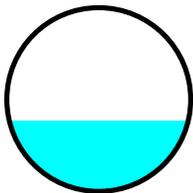
Summary for Reach R3: pstc#3 to cultec

Inflow Area = 61,443 sf, 35.87% Impervious, Inflow Depth = 2.22" for 100 yr event
Inflow = 3.52 cfs @ 12.10 hrs, Volume= 11,383 cf
Outflow = 3.52 cfs @ 12.10 hrs, Volume= 11,383 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 12.67 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.92 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 11.27 cfs

12.0" Round Pipe
n= 0.013
Length= 5.0' Slope= 0.1000 '/'
Inlet Invert= 57.80', Outlet Invert= 57.30'



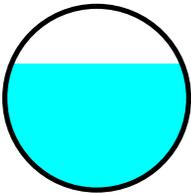
Summary for Reach R4: pyd#8 to cultec

Inflow Area = 100,640 sf, 14.29% Impervious, Inflow Depth = 1.24" for 100 yr event
Inflow = 2.64 cfs @ 12.11 hrs, Volume= 10,383 cf
Outflow = 2.64 cfs @ 12.11 hrs, Volume= 10,383 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.32 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.79 fps, Avg. Travel Time= 0.0 min

Peak Storage= 2 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 3.23 cfs

8.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 7.0' Slope= 0.0714 '/
Inlet Invert= 58.20', Outlet Invert= 57.70'



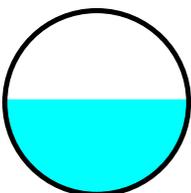
Summary for Reach R5: pdcb#4 to pstc#6

Inflow Area = 19,353 sf, 87.70% Impervious, Inflow Depth = 5.45" for 100 yr event
Inflow = 2.67 cfs @ 12.08 hrs, Volume= 8,785 cf
Outflow = 2.67 cfs @ 12.08 hrs, Volume= 8,785 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.51 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 10.0' Slope= 0.0200 '/
Inlet Invert= 60.90', Outlet Invert= 60.70'



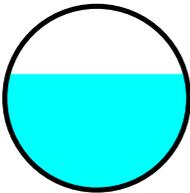
Summary for Reach R6: pdc#5 to pstc#6

Inflow Area = 30,121 sf, 67.89% Impervious, Inflow Depth = 4.13" for 100 yr event
Inflow = 3.33 cfs @ 12.09 hrs, Volume= 10,365 cf
Outflow = 3.33 cfs @ 12.09 hrs, Volume= 10,365 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.38 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.29 fps, Avg. Travel Time= 0.1 min

Peak Storage= 6 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.60 cfs

12.0" Round Pipe
n= 0.013
Length= 12.0' Slope= 0.0167 '/
Inlet Invert= 60.90', Outlet Invert= 60.70'



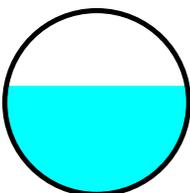
Summary for Reach R7: pstc#6 to pdmh#7

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 4.64" for 100 yr event
Inflow = 6.00 cfs @ 12.09 hrs, Volume= 19,150 cf
Outflow = 6.00 cfs @ 12.09 hrs, Volume= 19,150 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.94 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.61 fps, Avg. Travel Time= 0.0 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 9.14 cfs

15.0" Round Pipe
n= 0.013
Length= 5.0' Slope= 0.0200 '/
Inlet Invert= 60.40', Outlet Invert= 60.30'



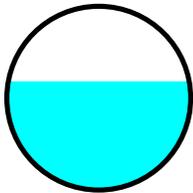
Summary for Reach R8: pdmh#7 to pdmh#9

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 4.64" for 100 yr event
Inflow = 6.00 cfs @ 12.09 hrs, Volume= 19,150 cf
Outflow = 6.00 cfs @ 12.09 hrs, Volume= 19,150 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.94 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.61 fps, Avg. Travel Time= 0.2 min

Peak Storage= 25 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 9.14 cfs

15.0" Round Pipe
n= 0.013
Length= 33.0' Slope= 0.0200 '/'
Inlet Invert= 60.00', Outlet Invert= 59.34'



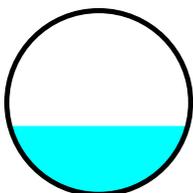
Summary for Reach R9: pdmh#9 to cultec

Inflow Area = 49,474 sf, 75.64% Impervious, Inflow Depth = 4.64" for 100 yr event
Inflow = 6.00 cfs @ 12.09 hrs, Volume= 19,150 cf
Outflow = 6.00 cfs @ 12.09 hrs, Volume= 19,150 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 14.46 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.60 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 20.43 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 57.10', Outlet Invert= 56.90'



Summary for Pond 1P: cultecs - 330

Inflow Area = 211,557 sf, 34.91% Impervious, Inflow Depth = 2.32" for 100 yr event
 Inflow = 12.10 cfs @ 12.09 hrs, Volume= 40,917 cf
 Outflow = 0.60 cfs @ 15.65 hrs, Volume= 40,909 cf, Atten= 95%, Lag= 213.2 min
 Discarded = 0.60 cfs @ 15.65 hrs, Volume= 40,909 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 58.62' @ 15.65 hrs Surf.Area= 9,473 sf Storage= 20,270 cf

Plug-Flow detention time= 352.5 min calculated for 40,909 cf (100% of inflow)
 Center-of-Mass det. time= 352.4 min (1,191.7 - 839.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	55.50'	7,786 cf	93.33'W x 101.50'L x 3.54'H Field A 33,551 cf Overall - 14,086 cf Embedded = 19,465 cf x 40.0% Voids
#2A	56.00'	14,086 cf	Cultec R-330XL x 266 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 19 rows
		21,872 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.50'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	58.70'	8.0" Round Culvert L= 3.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 58.70' / 58.70' S= 0.0000 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.60 cfs @ 15.65 hrs HW=58.62' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.60 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.50' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Controls 0.00 cfs)

Summary for Pond 2P: cultec - 280s

Inflow Area = 19,911 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100 yr event
 Inflow = 2.91 cfs @ 12.08 hrs, Volume= 10,389 cf
 Outflow = 0.18 cfs @ 13.61 hrs, Volume= 10,389 cf, Atten= 94%, Lag= 91.8 min
 Discarded = 0.18 cfs @ 13.61 hrs, Volume= 10,389 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 61.27' @ 13.61 hrs Surf.Area= 2,481 sf Storage= 4,399 cf

Plug-Flow detention time= 205.5 min calculated for 10,386 cf (100% of inflow)
 Center-of-Mass det. time= 205.4 min (949.4 - 744.0)

5652-POST

Type III 24-hr 100 yr Rainfall=6.50"

Prepared by Meridian Associates, Inc.

Printed 2/18/2015

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Volume	Invert	Avail.Storage	Storage Description
#1A	58.60'	2,018 cf	20.17'W x 123.00'L x 3.21'H Field A 7,958 cf Overall - 2,914 cf Embedded = 5,044 cf x 40.0% Voids
#2A	59.10'	2,914 cf	Cultec R-280HD x 68 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 4 rows
		4,932 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#2	Primary	61.30'	8.0" Round Culvert L= 32.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 61.30' / 61.30' S= 0.0000 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.18 cfs @ 13.61 hrs HW=61.27' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.18 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=58.60' TW=0.00' (Dynamic Tailwater)↑**2=Culvert** (Controls 0.00 cfs)

APPENDIX

SOIL NOTE

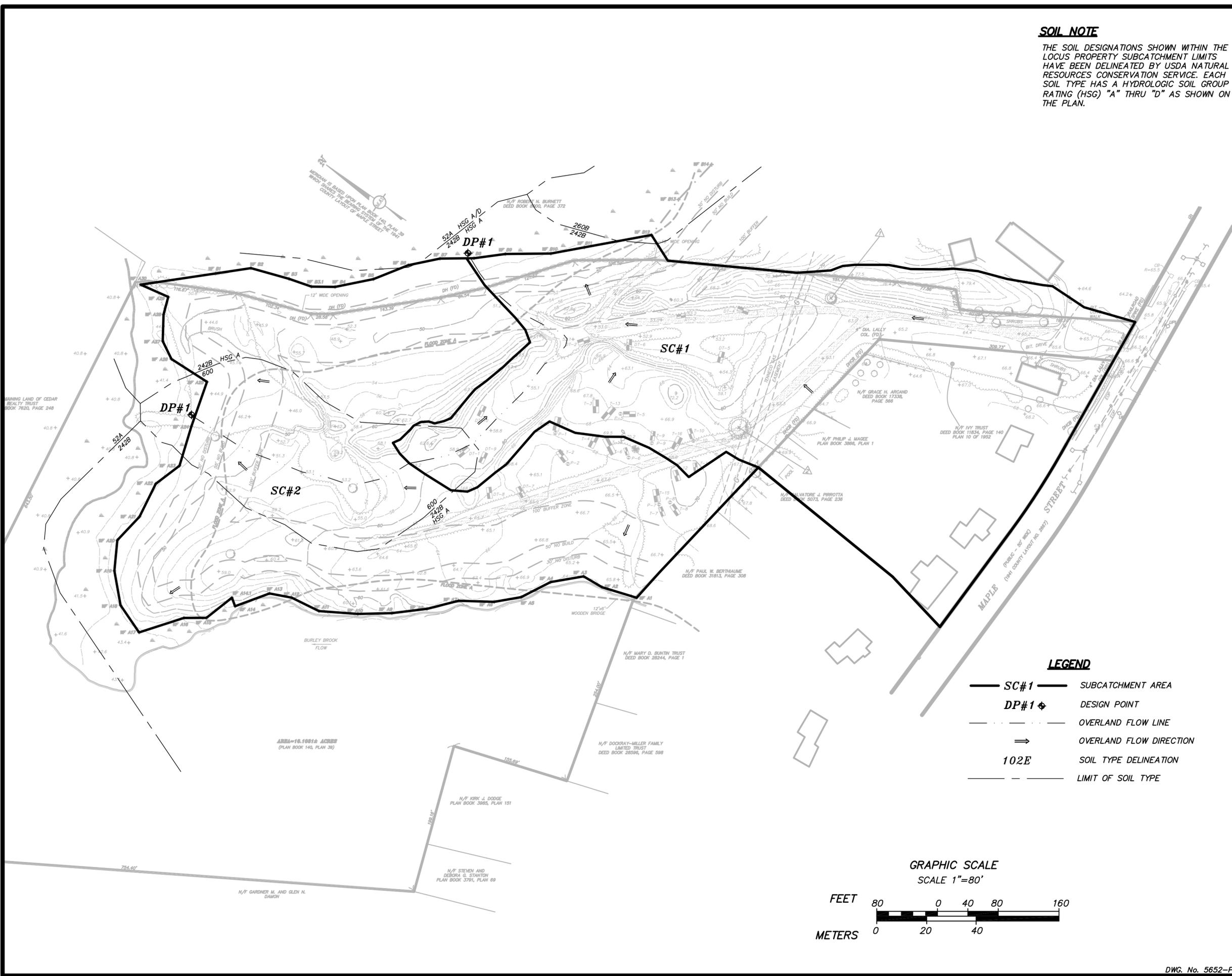
THE SOIL DESIGNATIONS SHOWN WITHIN THE LOCUS PROPERTY SUBCATCHMENT LIMITS HAVE BEEN DELINEATED BY USDA NATURAL RESOURCES CONSERVATION SERVICE. EACH SOIL TYPE HAS A HYDROLOGIC SOIL GROUP RATING (HSG) "A" THRU "D" AS SHOWN ON THE PLAN.

DATE	DESCRIPTION	BY
02/04/15	NO. REVISIONS THIS SHEET	ACF
02/18/15	NO. REVISIONS THIS SHEET	ACF

EXISTING CONDITIONS WATERSHED PLAN
 LOCATED IN
 WENHAM, MASSACHUSETTS
 ASSESSORS MAP 23 LOT 16
 62 MAPLE STREET
 PREPARED FOR
 MAPLE WOODS HOUSING, LLC

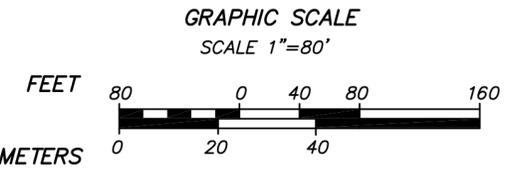
MERIDIAN ASSOCIATES
 500 CUMMINGS CENTER, SUITE 5050
 BEVERLY, MASSACHUSETTS 01915
 TELEPHONE: (978) 299-9447
 WWW.MERIDIANASSOC.COM

DATE:
 NOVEMBER 6, 2014
 SCALE:
 1" = 80'
 SHEET No.
1 OF 2
 PROJECT No.
5652



LEGEND

	SC#1	SUBCATCHMENT AREA
	DP#1	DESIGN POINT
		OVERLAND FLOW LINE
		OVERLAND FLOW DIRECTION
	102E	SOIL TYPE DELINEATION
		LIMIT OF SOIL TYPE



AREA=16.1081± ACRES
 (PLAN BOOK 140, PLAN 38)

SOIL NOTE

THE SOIL DESIGNATIONS SHOWN WITHIN THE LOCUS PROPERTY SUBCATCHMENT LIMITS HAVE BEEN DELINEATED BY USDA NATURAL RESOURCES CONSERVATION SERVICE. EACH SOIL TYPE HAS A HYDROLOGIC SOIL GROUP RATING (HSG) "A" THRU "D" AS SHOWN ON THE PLAN.

DATE	DESCRIPTION	BY
02/04/15	INFIL SYST. #2/PEER REVIEW	ACF
02/18/15	ADV. INFIL SYST. #1 ELEV	ACF

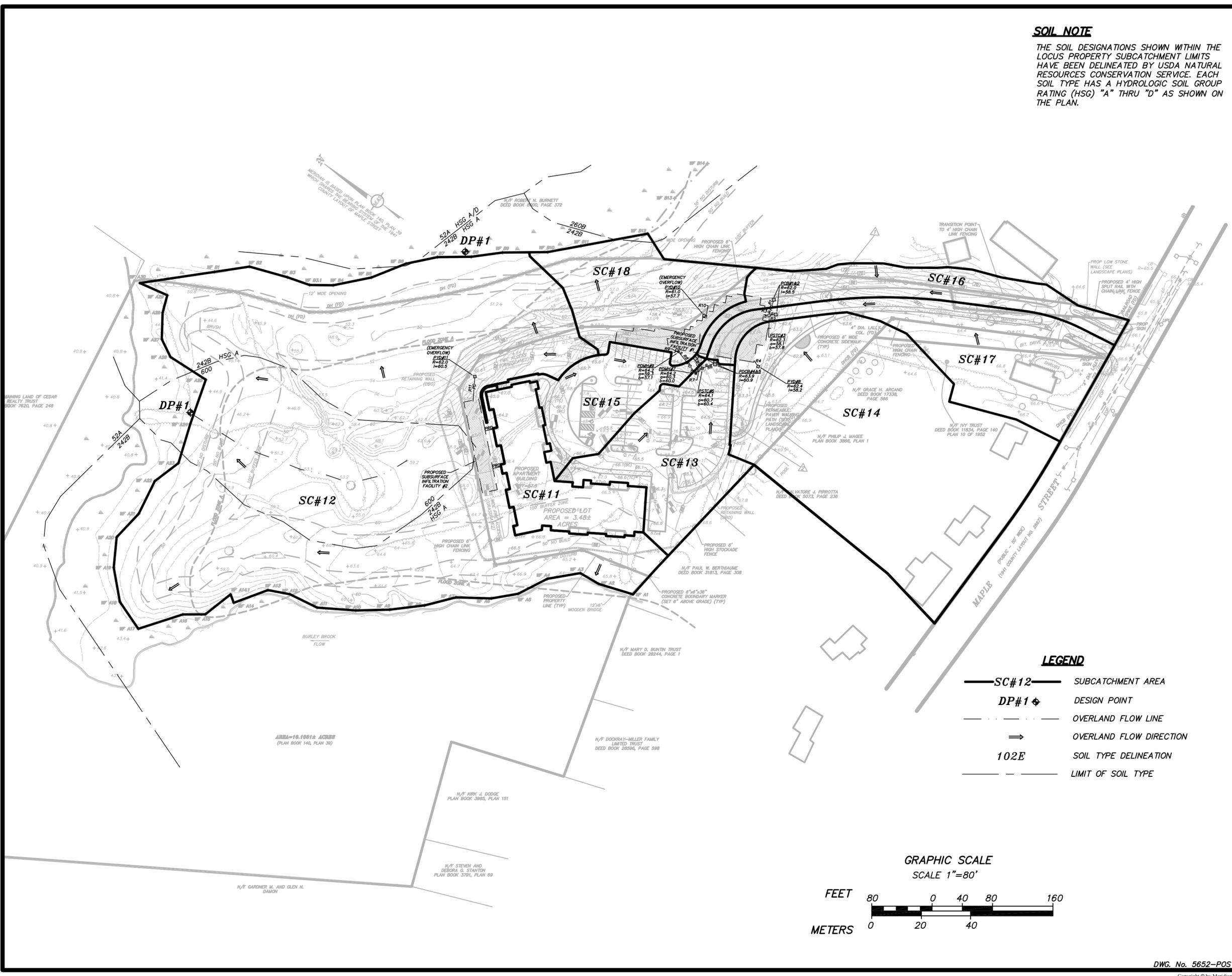
PROPOSED CONDITIONS WATERSHED PLAN
 LOCATED IN
 WENHAM, MASSACHUSETTS
 ASSESSORS MAP 23 LOT 16
 62 MAPLE STREET
 PREPARED FOR
 MAPLE WOODS HOUSING, LLC

MERIDIAN ASSOCIATES
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 BEVERLY, MASSACHUSETTS 01915
 WESTBOROUGH, MASSACHUSETTS 01581
 TELEPHONE: (978) 299-9447
 WWW.MERIDIANASSOC.COM

DATE:
 NOVEMBER 6, 2014
 SCALE:
 1" = 80'
 SHEET No.
2 OF 2
 PROJECT No.
5652

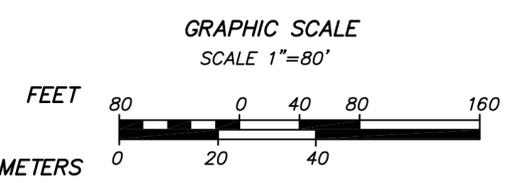
DWG. No. 5652-POST

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LEGEND

	SC#12	SUBCATCHMENT AREA
	DP#1	DESIGN POINT
		OVERLAND FLOW LINE
		OVERLAND FLOW DIRECTION
	102E	SOIL TYPE DELINEATION
		LIMIT OF SOIL TYPE



AREA=16.1081± ACRES
 (PLAN BOOK 140, PLAN 39)

N/F MARY D. BLUNTIN TRUST
 DEED BOOK 28244, PAGE 1

N/F KIRK J. DODGE
 PLAN BOOK 3885, PLAN 151

N/F STEVEN AND
 DEBORA G. STANTON
 PLAN BOOK 3791, PLAN 69

N/F GARDNER M. AND GLEN H.
 DAMON

MAINTENANCE LAND OF CEDAR
 REALTY TRUST
 DEED BOOK 7020, PAGE 248

N/F PAUL W. BERTHAUME
 DEED BOOK 31813, PAGE 308

N/F SALVATORE J. PIRROTTA
 DEED BOOK 3073, PAGE 238

N/F PHILIP J. MAGEE
 PLAN BOOK 3896, PLAN 1

N/F GRACE H. ARGAND
 DEED BOOK 17338,
 PAGE 588

PROPOSED 4" HIGH
 SPLIT RAIL WITH
 CHAIN-LINK FENCE

PROPOSED 4" HIGH CHAIN
 LINK FENCING

TRANSITION POINT
 TO 4" HIGH CHAIN
 LINK FENCING

PROPOSED 6" HIGH CHAIN LINK
 FENCING

PROPOSED 6" HIGH CHAIN LINK
 FENCING

PROPOSED 6" HIGH CHAIN LINK
 FENCING

MERIDIAN IS BASED UPON PLAN BOOK 140, PLAN 39
 WHICH SHOWS THE BEARING SYSTEM OF THE 1911
 COUNTY LAYOUT OF MAPLE STREET

N/F ROBERT N. BURNETT
 DEED BOOK 3003, PAGE 372

52A HSG A/D
 242B HSG A

260B
 242B

52A
 242B