



MERIDIAN
LAND SERVICES, INC.

CIVIL ENGINEERING | LAND SURVEYING | PERMITTING | SOIL & WETLAND MAPPING | SEPTIC DESIGN | ENVIRONMENTAL

Office: 31 Old Nashua Road, Suite 2, Amherst, NH 03031

Mailing: PO Box 118, Milford, NH 03055

Phone: 603-673-1441 * Fax 603-673-1584

www.MeridianLandServices.com

Stormwater Management Report

Lund Farm Subdivision

Tax Map D Lot 7

Route 13

Brookline, New Hampshire 03033

Prepared for:

Federal Hill Properties, LLC

25 Merrit Parkway

Nashua, New Hampshire 03062

July 5, 2023

Prepared by: Brandon L. Richards

Reviewed by: Samuel R. Foisie, PE

Index

Narrative

Rainfall Totals – NRCC

NRCS Web Soil Survey

Section 1.0: Pre-Developed Conditions

Routing Diagram

Area and Soils Listings

25-year Storm Nodes

Section 1.1: Pre-Developed Conditions, 25-year Storm

Section 2.0: Post-Developed Conditions

Routing Diagram

Area and Soils Listings

25-year Storm Nodes

Section 2.1: Post-Developed Conditions, 25-year Storm

Section 3.0: Drainage Area Plans

Pre-Developed Conditions Plan

Post-Developed Conditions Plan



MERIDIAN

LAND SERVICES, INC.

CIVIL ENGINEERING | LAND SURVEYING | PERMITTING | SOIL & WETLAND MAPPING | SEPTIC DESIGN | ENVIRONMENTAL

Office: 31 Old Nashua Road, Suite 2, Amherst, NH 03031

Mailing: PO Box 118, Milford, NH 03055

Phone: 603-673-1441 * Fax 603-673-1584

www.MeridianLandServices.com

Storm Water Management Report Lund Farm Subdivision Map D Parcel 7 Route 13, Brookline, New Hampshire

I. Introduction

These drainage calculations have been prepared in support of the above referenced development project on tax parcel D-7 in Brookline, New Hampshire. The project will involve the construction of approximately 800 linear feet of paved roadway and associated drainage. The parcel will be subdivided into seven (7) lots.

II. Site Description

This site is located on Route 13, Brookline. The site consists of mostly forested land. The property is north of Rumore way and on the east side of Route 13. The site has an existing quarry site at the entrance to the subdivision which is located on

The respective hydrologic soil group for each soil type was determined by using the Ksat Values for New Hampshire Soils, SSSNNE Special Publication No. 5. Soil series observed on the parcel consisted of the following:

III. Drainage Design

To meet the requirements of the Town of Brookline, storm water generated from the proposed development is conveyed to a series of detention basins at the entrance to the site. The site was analyzed for the 25 year storm event.

Two (2) observation points are modeled to compare peak flows from pre-development and post-development. The results of the analysis are denoted in the "Summary" section of this report.

- Observation Point 1 (OP-1) represents runoff that flows into the existing quarry, which will also double as a drafting basin.
- Observation Point 2 (OP-2) represents runoff that flows into the existing culvert that runs under Route 13, north of the proposed roadway intersection.



MERIDIAN

LAND SERVICES, INC.

CIVIL ENGINEERING | LAND SURVEYING | PERMITTING | SOIL & WETLAND MAPPING | SEPTIC DESIGN | ENVIRONMENTAL

Office: 31 Old Nashua Road, Suite 2, Amherst, NH 03031

Mailing: PO Box 118, Milford, NH 03055

Phone: 603-673-1441 * Fax 603-673-1584

www.MeridianLandServices.com

IV. Methodology

The quantity of runoff and the conveyance of that flow through the site are determined using the software package HydroCAD 10.20-2g by HydroCAD Software Solutions, LLC. HydroCAD is a computer aided design program for modeling storm water hydrology based on the Soil Conservation Service (SCS) TR-55 method combined with standard hydraulics calculations.

V. Summary

The proposed drainage design effectively mitigates runoff during the 25-year storm events. The runoff is effectively collected and discharged at a controlled rate. The proposed stormwater mitigation reduces peak flow rates generated from the site for all storms.

Summary tables below for pre and post-development peak runoff rates and volumes are shown on the following page.

Table 1: Peak Rate of Stormwater Discharge Summary

Location	Q 25-YR (CFS)		
	Pre	Post	Δ
OP-1	25.84	20.60	-5.24
OP-2	21.72	21.20	-0.52

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Metadata for Point	
Smoothing	Yes
State	New Hampshire
Location	New Hampshire, United States
Latitude	42.770 degrees North
Longitude	71.672 degrees West
Elevation	100 feet
Date/Time	Fri Feb 17 2023 14:29:34 GMT-0500 (Eastern Standard Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.69	0.86	1.09	1yr	0.75	1.02	1.26	1.58	1.99	2.51	2.78	1yr	2.22	2.67	3.08	3.81	4.41	1yr
2yr	0.33	0.52	0.64	0.85	1.06	1.33	2yr	0.92	1.22	1.54	1.93	2.40	2.99	3.35	2yr	2.65	3.22	3.73	4.45	5.07	2yr
5yr	0.40	0.62	0.77	1.03	1.32	1.68	5yr	1.14	1.52	1.95	2.43	3.02	3.75	4.25	5yr	3.32	4.09	4.73	5.59	6.27	5yr
10yr	0.44	0.70	0.88	1.20	1.56	2.00	10yr	1.35	1.80	2.32	2.91	3.60	4.44	5.09	10yr	3.93	4.90	5.66	6.64	7.36	10yr
25yr	0.53	0.84	1.07	1.47	1.95	2.51	25yr	1.68	2.25	2.93	3.66	4.54	5.56	6.47	25yr	4.92	6.22	7.19	8.35	9.12	25yr
50yr	0.59	0.95	1.22	1.71	2.31	3.00	50yr	1.99	2.66	3.51	4.39	5.41	6.60	7.77	50yr	5.84	7.47	8.61	9.92	10.72	50yr
100yr	0.68	1.10	1.42	2.01	2.74	3.58	100yr	2.36	3.16	4.18	5.23	6.44	7.84	9.32	100yr	6.94	8.96	10.32	11.80	12.61	100yr
200yr	0.77	1.26	1.64	2.35	3.24	4.26	200yr	2.80	3.74	5.00	6.25	7.68	9.31	11.20	200yr	8.24	10.77	12.38	14.04	14.84	200yr
500yr	0.93	1.53	1.99	2.90	4.06	5.38	500yr	3.51	4.69	6.32	7.91	9.69	11.70	14.29	500yr	10.36	13.74	15.74	17.68	18.41	500yr

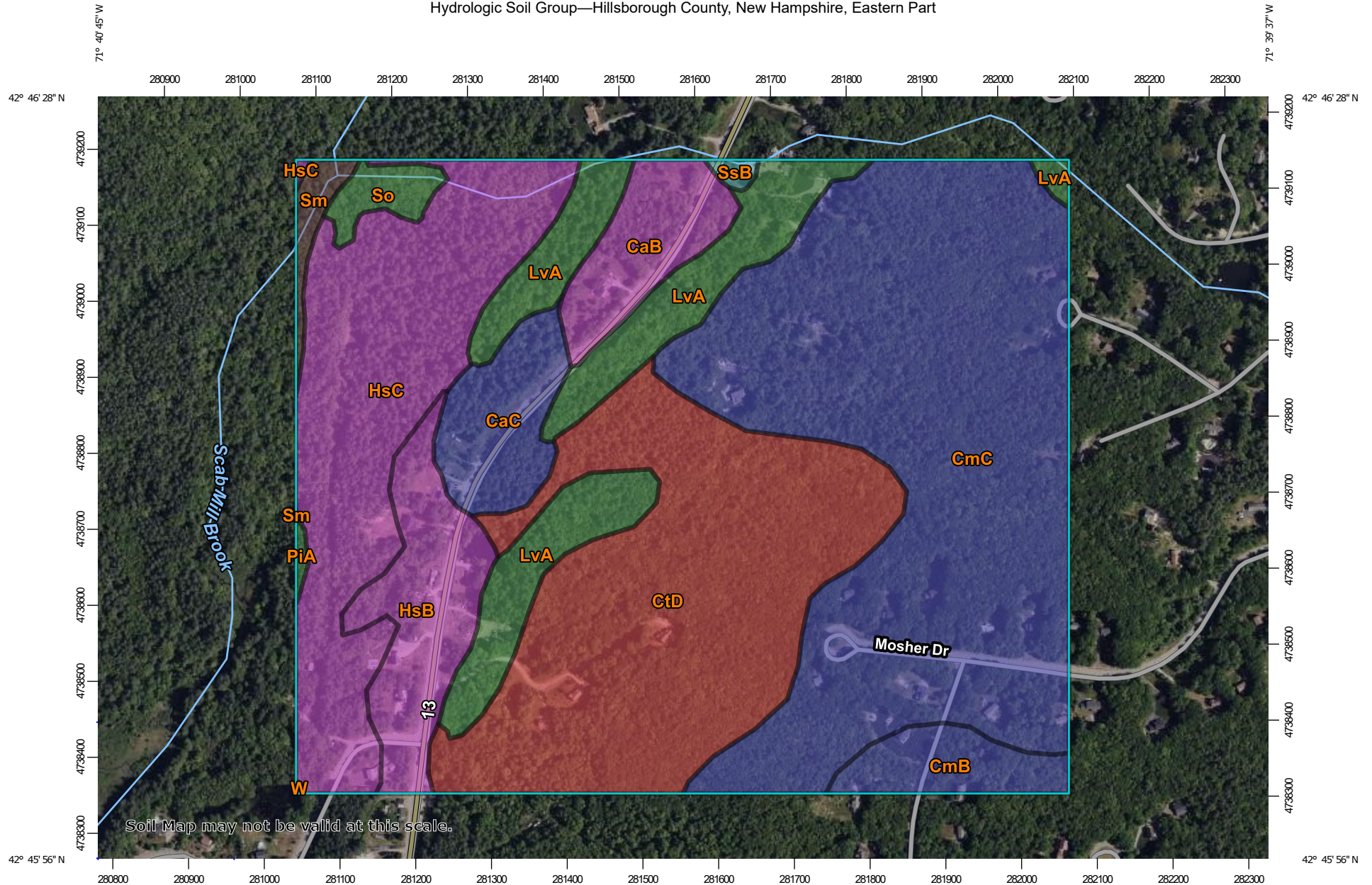
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.21	0.32	0.39	0.53	0.65	0.77	1yr	0.56	0.75	0.99	1.36	1.68	2.25	2.37	1yr	1.99	2.28	2.59	3.37	3.65	1yr
2yr	0.32	0.49	0.61	0.82	1.01	1.20	2yr	0.87	1.18	1.36	1.76	2.26	2.92	3.26	2yr	2.58	3.13	3.62	4.33	4.94	2yr
5yr	0.36	0.55	0.69	0.94	1.20	1.40	5yr	1.03	1.37	1.63	2.11	2.70	3.52	3.95	5yr	3.12	3.80	4.39	5.21	5.86	5yr
10yr	0.39	0.60	0.75	1.05	1.35	1.57	10yr	1.17	1.54	1.77	2.40	3.06	4.08	4.58	10yr	3.61	4.40	5.06	5.98	6.67	10yr
25yr	0.44	0.68	0.84	1.20	1.58	1.83	25yr	1.37	1.78	2.04	2.86	3.59	4.90	5.57	25yr	4.33	5.35	6.12	7.18	7.90	25yr
50yr	0.48	0.73	0.91	1.30	1.75	2.06	50yr	1.51	2.01	2.29	3.27	4.06	5.66	6.47	50yr	5.01	6.22	7.06	8.23	8.99	50yr
100yr	0.51	0.77	0.97	1.40	1.92	2.31	100yr	1.66	2.26	2.57	3.20	4.60	6.55	7.52	100yr	5.80	7.23	8.14	9.44	10.23	100yr
200yr	0.55	0.83	1.05	1.52	2.12	2.60	200yr	1.83	2.54	2.86	3.56	5.25	7.59	8.76	200yr	6.72	8.43	9.38	10.84	11.64	200yr
500yr	0.61	0.91	1.17	1.70	2.41	3.05	500yr	2.08	2.98	3.34	4.10	6.26	9.26	10.75	500yr	8.20	10.34	11.30	12.99	13.80	500yr

Upper Confidence Limits

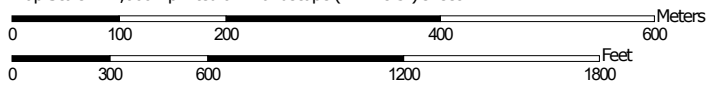
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.32	0.49	0.59	0.80	0.98	1.17	1yr	0.85	1.14	1.30	1.70	2.11	2.67	2.99	1yr	2.37	2.88	3.45	4.25	4.78	1yr
2yr	0.36	0.56	0.69	0.93	1.15	1.33	2yr	0.99	1.30	1.50	1.94	2.47	3.09	3.47	2yr	2.73	3.34	3.87	4.60	5.23	2yr
5yr	0.44	0.67	0.83	1.15	1.46	1.70	5yr	1.26	1.66	1.88	2.40	2.99	3.98	4.55	5yr	3.52	4.38	5.06	5.99	6.68	5yr
10yr	0.51	0.79	0.98	1.37	1.77	2.08	10yr	1.53	2.03	2.35	2.86	3.54	4.83	5.63	10yr	4.28	5.41	6.24	7.31	8.06	10yr
25yr	0.65	1.00	1.24	1.77	2.33	2.71	25yr	2.01	2.65	3.07	3.60	4.40	6.24	7.40	25yr	5.53	7.11	8.24	9.56	10.33	25yr
50yr	0.78	1.19	1.48	2.13	2.87	3.32	50yr	2.48	3.25	3.75	4.30	5.19	7.58	9.11	50yr	6.71	8.76	10.19	11.71	12.49	50yr
100yr	0.94	1.42	1.78	2.57	3.53	4.07	100yr	3.05	3.98	4.58	5.81	6.12	9.22	11.22	100yr	8.16	10.79	12.59	14.36	15.08	100yr
200yr	1.13	1.70	2.16	3.12	4.35	4.98	200yr	3.76	4.87	5.59	7.08	7.22	11.19	13.83	200yr	9.91	13.30	15.58	17.62	18.24	200yr
500yr	1.45	2.16	2.78	4.05	5.75	6.48	500yr	4.96	6.33	7.29	9.21	8.97	14.43	18.24	500yr	12.77	17.54	20.67	23.11	23.47	500yr

Hydrologic Soil Group—Hillsborough County, New Hampshire, Eastern Part



Soil Map may not be valid at this scale.

Map Scale: 1:7,060 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

2/17/2023
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Hillsborough County, New Hampshire, Eastern Part
 Survey Area Data: Version 25, Sep 12, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaB	Canton fine sandy loam, 0 to 8 percent slopes	A	7.6	3.6%
CaC	Canton fine sandy loam, 8 to 15 percent slopes	B	8.0	3.8%
CmB	Canton fine sandy loam, 0 to 8 percent slopes, very stony	B	5.3	2.5%
CmC	Canton fine sandy loam, 8 to 15 percent slopes, very stony	B	72.2	34.2%
CtD	Chatfield-Hollis-Rock outcrop complex, 15 to 35 percent slopes	D	47.4	22.5%
HsB	Hinckley loamy sand, 3 to 8 percent slopes	A	12.0	5.7%
HsC	Hinckley loamy sand, 8 to 15 percent slopes	A	33.1	15.7%
LvA	Leicester-Walpole complex stony, 0 to 3 percent slopes	A/D	20.6	9.7%
PiA	Pipestone loamy sand, 0 to 3 percent slopes	A/D	0.3	0.1%
Sm	Saco variant silt loam	B/D	1.8	0.8%
So	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	2.4	1.1%
SsB	Scituate fine sandy loam, 3 to 8 percent slopes	C	0.5	0.2%
W	Water (less than 40 acres)		0.0	0.0%
Totals for Area of Interest			211.2	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

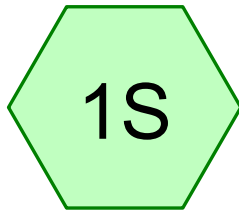
Rating Options

Aggregation Method: Dominant Condition

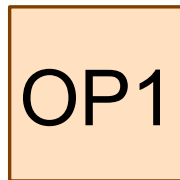
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

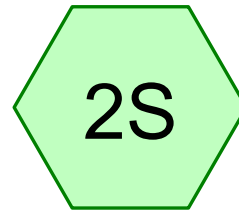
Section 1.0: Pre-Developed Conditions



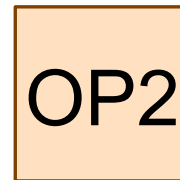
Subcatchment #1



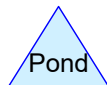
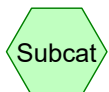
Observation Point #1



Subcatchment #2



Observation Point #2



Routing Diagram for 11474EX00

Prepared by Meridian Land Services Inc, Printed 5/30/2023
HydroCAD® 10.20-2g s/n 00595 © 2022 HydroCAD Software Solutions LLC

11474EX00

Prepared by Meridian Land Services Inc

Printed 5/30/2023

HydroCAD® 10.20-2g s/n 00595 © 2022 HydroCAD Software Solutions LLC

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.118	39	>75% Grass cover, Good HSG A (1S)
0.238	61	>75% Grass cover, Good HSG B (1S, 2S)
0.063	80	>75% Grass cover, Good HSG D (1S)
0.250	98	Gravel roads HSG B (2S)
0.042	98	Gravel roads HSG D (2S)
0.332	98	Paved parking HSG A (1S, 2S)
0.296	98	Paved parking HSG B (1S, 2S)
0.019	98	Paved parking HSG D (2S)
0.028	98	Roofs HSG A (1S)
0.088	98	Roofs HSG B (2S)
0.444	98	Water Surface HSG A (1S)
0.170	98	Water Surface HSG D (1S)
0.328	30	Woods, Good HSG A (1S, 2S)
7.857	55	Woods, Good HSG B (1S, 2S)
13.219	77	Woods, Good HSG D (1S, 2S)
23.491	70	TOTAL AREA

11474EX00

Prepared by Meridian Land Services Inc

Printed 5/30/2023

HydroCAD® 10.20-2g s/n 00595 © 2022 HydroCAD Software Solutions LLC

Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.249	HSG A	1S, 2S
8.729	HSG B	1S, 2S
0.000	HSG C	
13.513	HSG D	1S, 2S
0.000	Other	
23.491		TOTAL AREA

11474EX00

Prepared by Meridian Land Services Inc

Printed 5/30/2023

HydroCAD® 10.20-2g s/n 00595 © 2022 HydroCAD Software Solutions LLC

Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.118	0.238	0.000	0.063	0.000	0.418	>75% Grass cover, Good	1S, 2S
0.000	0.250	0.000	0.042	0.000	0.292	Gravel roads	2S
0.332	0.296	0.000	0.019	0.000	0.647	Paved parking	1S, 2S
0.028	0.088	0.000	0.000	0.000	0.117	Roofs	1S, 2S
0.444	0.000	0.000	0.170	0.000	0.614	Water Surface	1S
0.328	7.857	0.000	13.219	0.000	21.404	Woods, Good	1S, 2S
1.249	8.729	0.000	13.513	0.000	23.491	TOTAL AREA	

Section 1.1: Pre-Developed Conditions
25-year Storm – Full Summary

11474EX00

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-2g s/n 00595 © 2022 HydroCAD Software Solutions LLC

EXISTING CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 5/30/2023

Page 1

Summary for Subcatchment 1S: Subcatchment #1

CarlsonPlanXYPos|0.0000|0.0000|

Runoff = 25.84 cfs @ 12.20 hrs, Volume= 2.377 af, Depth= 2.82"
 Routed to Reach OP1 : Observation Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25YR Rainfall=5.56"

Area (sf)	CN	Description
19,324	98	Water Surface HSG A
11,862	30	Woods, Good HSG A
1,229	98	Roofs HSG A
6,479	98	Paved parking HSG A
7,112	98	Paved parking HSG B
7,404	98	Water Surface HSG D
75,633	55	Woods, Good HSG B
303,796	77	Woods, Good HSG D
5,121	39	>75% Grass cover, Good HSG A
157	61	>75% Grass cover, Good HSG B
2,726	80	>75% Grass cover, Good HSG D
440,843	74	Weighted Average
399,295		90.58% Pervious Area
41,548		9.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	1,458	0.1319	1.72		Lag/CN Method,

Summary for Subcatchment 2S: Subcatchment #2

CarlsonPlanXYPos|0.0000|0.0000|

Runoff = 21.72 cfs @ 12.36 hrs, Volume= 2.549 af, Depth= 2.29"
 Routed to Reach OP2 : Observation Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25YR Rainfall=5.56"

11474EX00

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-2g s/n 00595 © 2022 HydroCAD Software Solutions LLC

EXISTING CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 5/30/2023

Page 2

	Area (sf)	CN	Description
	829	98	Paved parking HSG D
*	1,845	98	Gravel roads HSG D
*	10,881	98	Gravel roads HSG B
	7,986	98	Paved parking HSG A
	5,762	98	Paved parking HSG B
	2,407	30	Woods, Good HSG A
	266,628	55	Woods, Good HSG B
	3,849	98	Roofs HSG B
	272,035	77	Woods, Good HSG D
	10,219	61	>75% Grass cover, Good HSG B
	582,441	68	Weighted Average
	551,289		94.65% Pervious Area
	31,152		5.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.5	1,897	0.0930	1.29		Lag/CN Method,

Summary for Reach OP1: Observation Point #1

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

Inflow Area = 10.120 ac, 9.42% Impervious, Inflow Depth = 2.82" for 25YR event
 Inflow = 25.84 cfs @ 12.20 hrs, Volume= 2.377 af
 Outflow = 25.84 cfs @ 12.20 hrs, Volume= 2.377 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

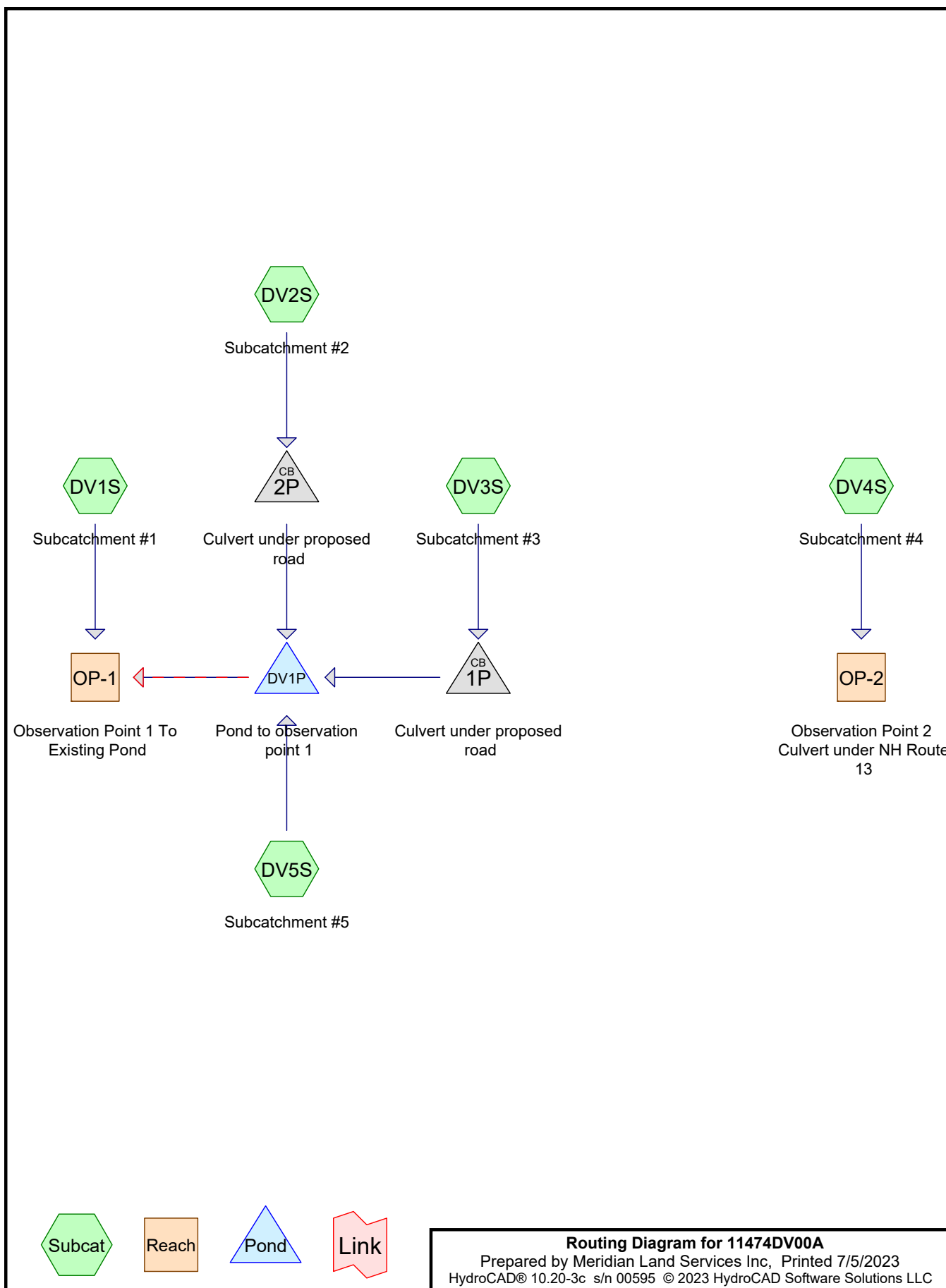
Summary for Reach OP2: Observation Point #2

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

Inflow Area = 13.371 ac, 5.35% Impervious, Inflow Depth = 2.29" for 25YR event
 Inflow = 21.72 cfs @ 12.36 hrs, Volume= 2.549 af
 Outflow = 21.72 cfs @ 12.36 hrs, Volume= 2.549 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Section 2.0: Post-Developed Conditions



11474DV00A

Prepared by Meridian Land Services Inc

Printed 7/5/2023

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.618	39	>75% Grass cover, Good HSG A (DV1S, DV5S)
1.477	61	>75% Grass cover, Good HSG B (DV1S, DV2S, DV3S, DV4S, DV5S)
2.432	80	>75% Grass cover, Good HSG D (DV1S, DV2S, DV3S, DV4S, DV5S)
0.319	85	Gravel roads HSG B (DV2S, DV3S, DV4S, DV5S)
0.127	91	Gravel roads HSG D (DV2S, DV3S, DV4S)
0.323	98	Paved parking HSG A (DV1S, DV4S, DV5S)
0.553	98	Paved parking HSG B (DV2S, DV3S, DV4S, DV5S)
0.492	98	Paved parking HSG D (DV1S, DV2S, DV3S, DV4S)
0.028	98	Roofs HSG A (DV1S)
0.162	98	Roofs HSG B (DV3S, DV4S)
0.367	98	Roofs HSG D (DV1S, DV2S, DV4S)
0.280	30	Woods, Good HSG A (DV1S, DV4S)
6.218	55	Woods, Good HSG B (DV1S, DV3S, DV4S)
10.094	77	Woods, Good HSG D (DV1S, DV2S, DV3S, DV4S)
23.492	71	TOTAL AREA

11474DV00A

Prepared by Meridian Land Services Inc

Printed 7/5/2023

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

Page 3

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.249	HSG A	DV1S, DV4S, DV5S
8.729	HSG B	DV1S, DV2S, DV3S, DV4S, DV5S
0.000	HSG C	
13.513	HSG D	DV1S, DV2S, DV3S, DV4S, DV5S
0.000	Other	
23.492		TOTAL AREA

Section 2.1: Post-Developed Conditions
25-year Storm – Full Summary

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 1

Summary for Subcatchment DV1S: Subcatchment #1

CarlsonPlanXYPos|0.0000|0.0000|

Runoff = 14.98 cfs @ 12.20 hrs, Volume= 1.389 af, Depth= 2.73"
Routed to Reach OP-1 : Observation Point 1 To Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR Rainfall=5.56"

Area (sf)	CN	Description
9,773	30	Woods, Good HSG A
170,584	77	Woods, Good HSG D
3,410	98	Paved parking HSG D
1,123	55	Woods, Good HSG B
1,229	98	Roofs HSG A
6,016	98	Paved parking HSG A
6,327	98	Roofs HSG D
26,778	39	>75% Grass cover, Good HSG A
197	61	>75% Grass cover, Good HSG B
40,868	80	>75% Grass cover, Good HSG D
266,305	73	Weighted Average
249,323		93.62% Pervious Area
16,982		6.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	1,458	0.1361	1.70		Lag/CN Method,

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

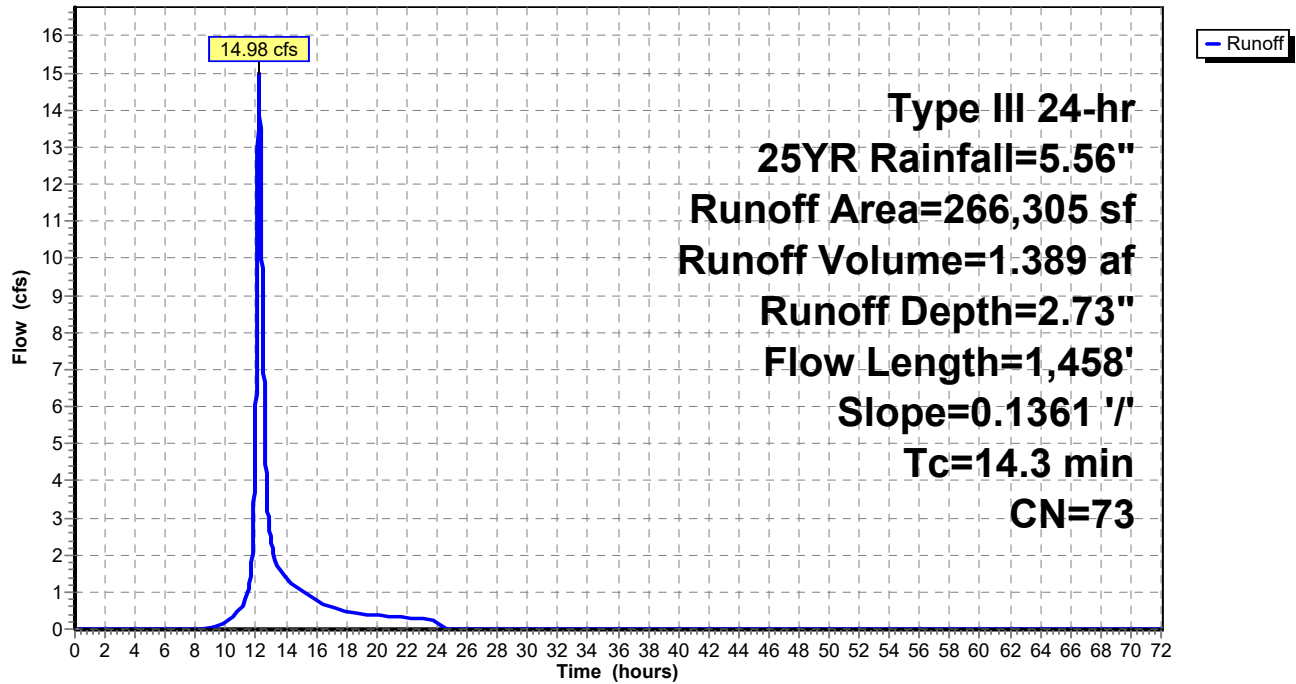
Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 2

Subcatchment DV1S: Subcatchment #1

Hydrograph



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 3

Summary for Subcatchment DV2S: Subcatchment #2

CarlsonPlanXYPos|0.0000|0.0000|

Runoff = 9.33 cfs @ 12.09 hrs, Volume= 0.675 af, Depth= 3.29"
Routed to Pond 2P : Culvert under proposed road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR Rainfall=5.56"

Area (sf)	CN	Description
986	85	Gravel roads HSG B
2,065	91	Gravel roads HSG D
3,389	98	Paved parking HSG B
61,455	77	Woods, Good HSG D
7,924	98	Paved parking HSG D
73	98	Roofs HSG D
10,138	61	>75% Grass cover, Good HSG B
21,318	80	>75% Grass cover, Good HSG D
107,349	79	Weighted Average
95,963		89.39% Pervious Area
11,386		10.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	656	0.1297	1.68		Lag/CN Method,

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

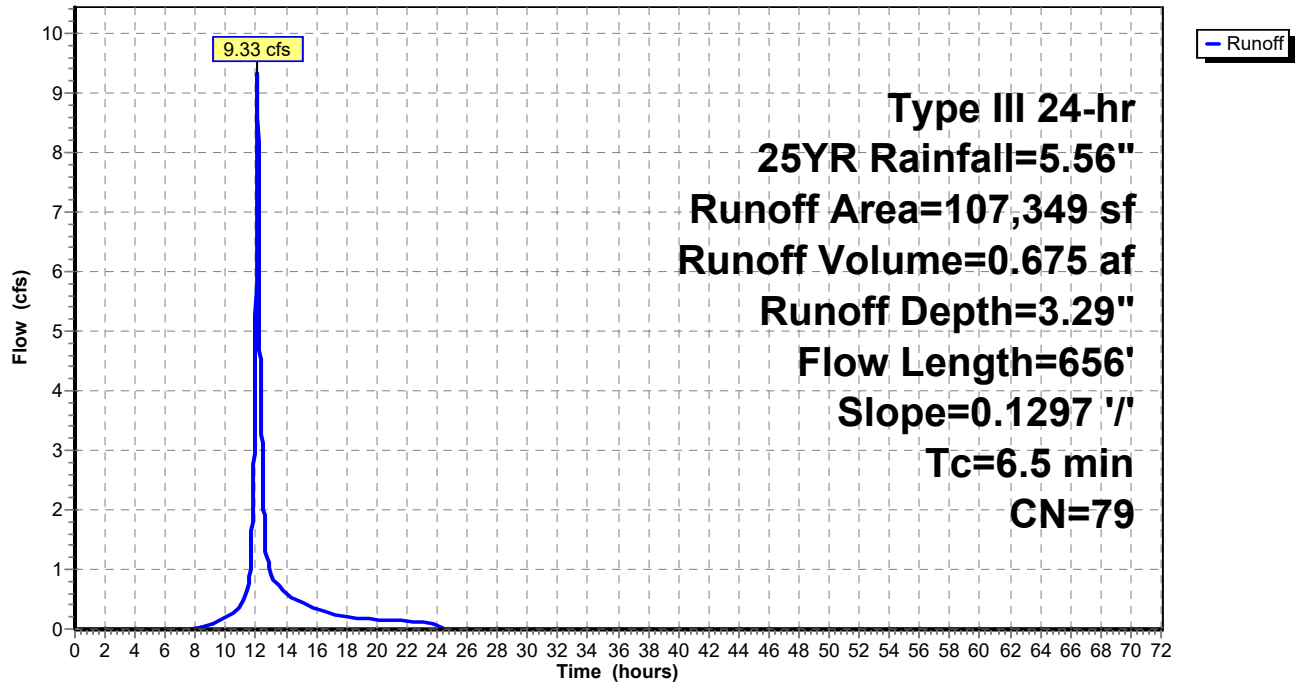
Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 4

Subcatchment DV2S: Subcatchment #2

Hydrograph



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 5

Summary for Subcatchment DV3S: Subcatchment #3

CarlsonPlanXYPos|0.0000|0.0000|

Runoff = 4.48 cfs @ 12.11 hrs, Volume= 0.338 af, Depth= 2.55"
Routed to Pond 1P : Culvert under proposed road

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR Rainfall=5.56"

Area (sf)	CN	Description
1,625	91	Gravel roads HSG D
1,495	85	Gravel roads HSG B
1,989	77	Woods, Good HSG D
16,802	55	Woods, Good HSG B
5,134	98	Paved parking HSG D
9,605	98	Paved parking HSG B
1,465	98	Roofs HSG B
26,100	61	>75% Grass cover, Good HSG B
5,163	80	>75% Grass cover, Good HSG D
69,377	71	Weighted Average
53,173		76.64% Pervious Area
16,204		23.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	739	0.1863	1.64		Lag/CN Method,

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

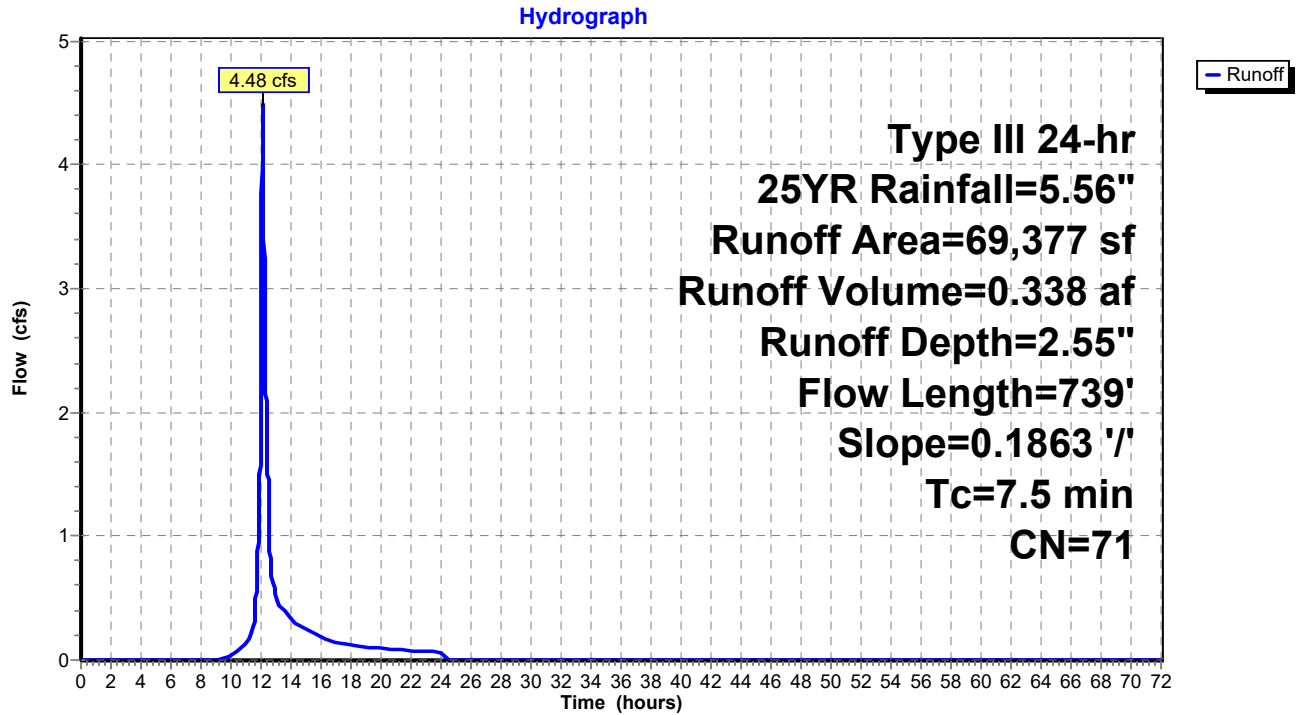
DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 6

Subcatchment DV3S: Subcatchment #3



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 7

Summary for Subcatchment DV4S: Subcatchment #4

CarlsonPlanXYPos|0.0000|0.0000|

Runoff = 21.20 cfs @ 12.34 hrs, Volume= 2.471 af, Depth= 2.29"
 Routed to Reach OP-2 : Observation Point 2 Culvert under NH Route 13

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25YR Rainfall=5.56"

Area (sf)	CN	Description
1,845	91	Gravel roads HSG D
10,881	85	Gravel roads HSG B
4,983	98	Paved parking HSG D
2,407	30	Woods, Good HSG A
205,684	77	Woods, Good HSG D
252,936	55	Woods, Good HSG B
7,990	98	Paved parking HSG A
7,561	98	Paved parking HSG B
9,600	98	Roofs HSG D
5,584	98	Roofs HSG B
20,376	61	>75% Grass cover, Good HSG B
34,724	80	>75% Grass cover, Good HSG D
564,572	68	Weighted Average
528,854		93.67% Pervious Area
35,718		6.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	1,897	0.0950	1.31		Lag/CN Method,

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

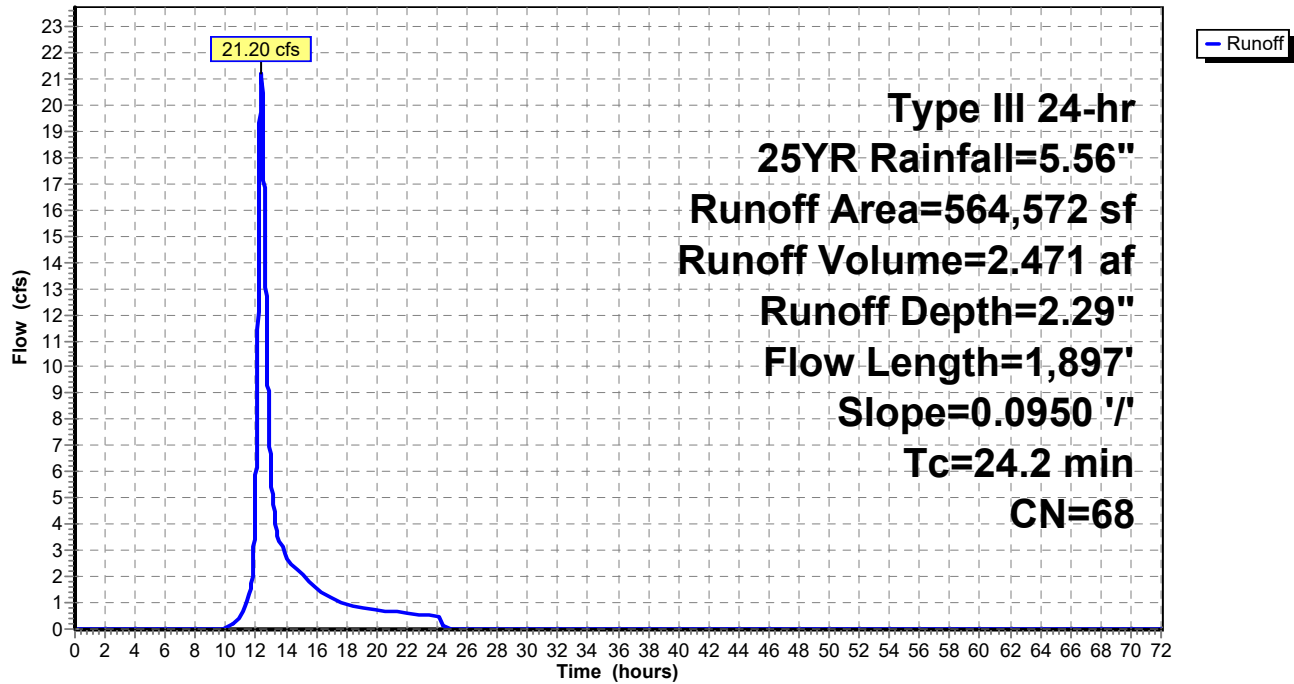
Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 8

Subcatchment DV4S: Subcatchment #4

Hydrograph



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 9

Summary for Subcatchment DV5S: Subcatchment #5

CarlsonPlanXYPos|0.0000|0.0000|

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.51 cfs @ 12.00 hrs, Volume= 0.087 af, Depth= 2.91"
Routed to Pond DV1P : Pond to observation point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR Rainfall=5.56"

Area (sf)	CN	Description
77	98	Paved parking HSG A
530	85	Gravel roads HSG B
3,550	98	Paved parking HSG B
151	39	>75% Grass cover, Good HSG A
7,521	61	>75% Grass cover, Good HSG B
3,872	80	>75% Grass cover, Good HSG D
15,699	75	Weighted Average
12,073		76.90% Pervious Area
3,627		23.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0		0.2131			Lag/CN Method,

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

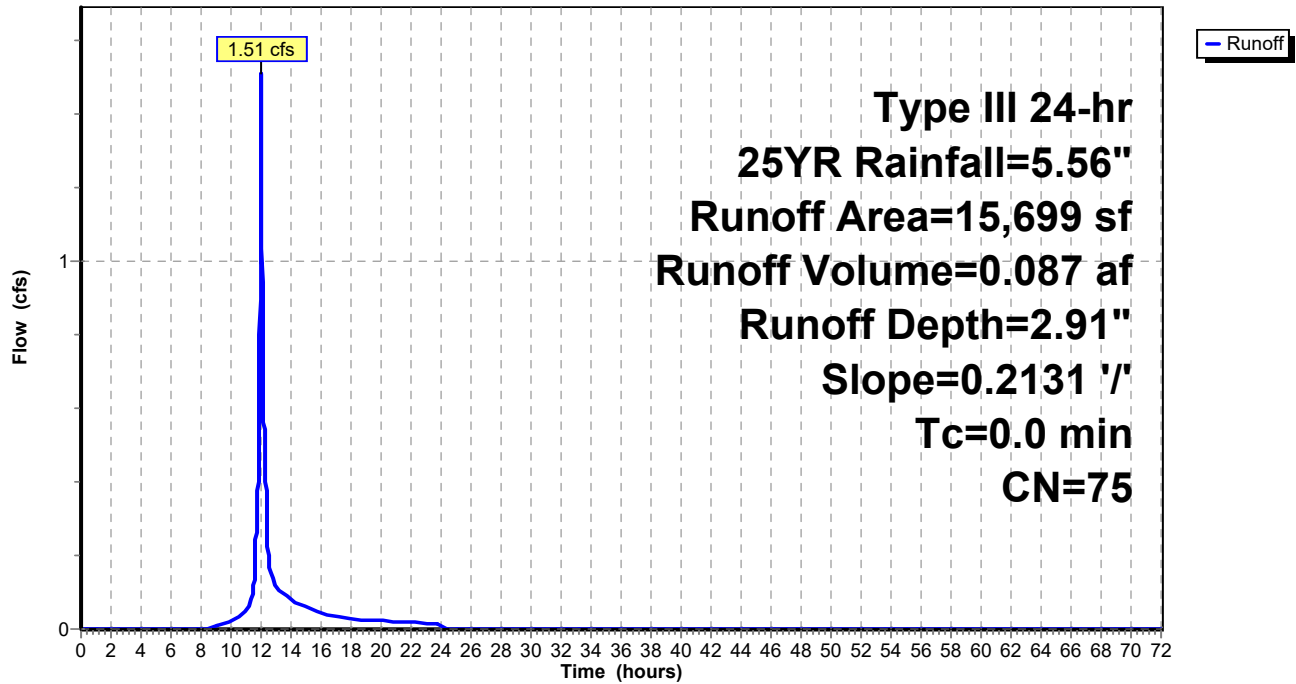
Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 10

Subcatchment DV5S: Subcatchment #5

Hydrograph



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS
Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 11

Summary for Reach OP-1: Observation Point 1 To Existing Pond

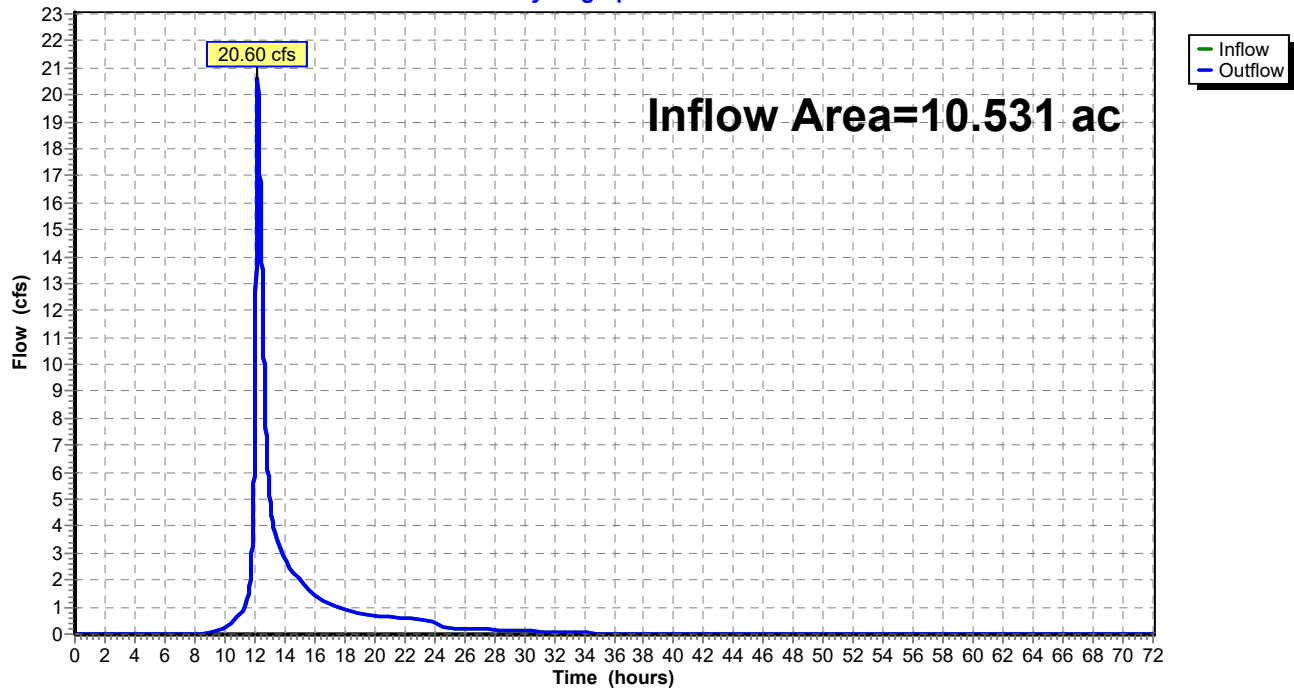
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.531 ac, 10.51% Impervious, Inflow Depth = 2.84" for 25YR event
Inflow = 20.60 cfs @ 12.21 hrs, Volume= 2.489 af
Outflow = 20.60 cfs @ 12.21 hrs, Volume= 2.489 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach OP-1: Observation Point 1 To Existing Pond

Hydrograph



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 12

Summary for Reach OP-2: Observation Point 2 Culvert under NH Route 13

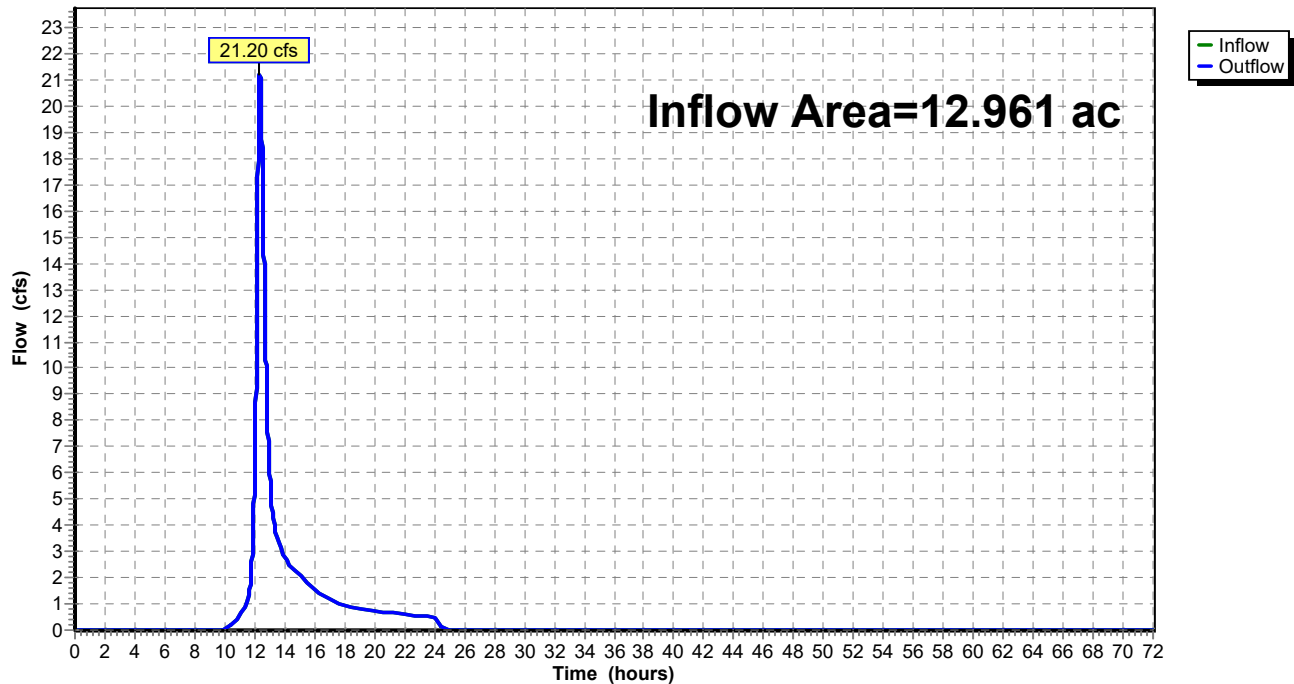
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 12.961 ac, 6.33% Impervious, Inflow Depth = 2.29" for 25YR event
Inflow = 21.20 cfs @ 12.34 hrs, Volume= 2.471 af
Outflow = 21.20 cfs @ 12.34 hrs, Volume= 2.471 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach OP-2: Observation Point 2 Culvert under NH Route 13

Hydrograph



Summary for Pond 1P: Culvert under proposed road

[58] Hint: Peaked 1.05' above defined flood level

Inflow Area = 1.593 ac, 23.36% Impervious, Inflow Depth = 2.55" for 25YR event
 Inflow = 4.48 cfs @ 12.11 hrs, Volume= 0.338 af
 Outflow = 4.48 cfs @ 12.11 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min
 Primary = 4.48 cfs @ 12.11 hrs, Volume= 0.338 af
 Routed to Pond DV1P : Pond to observation point 1

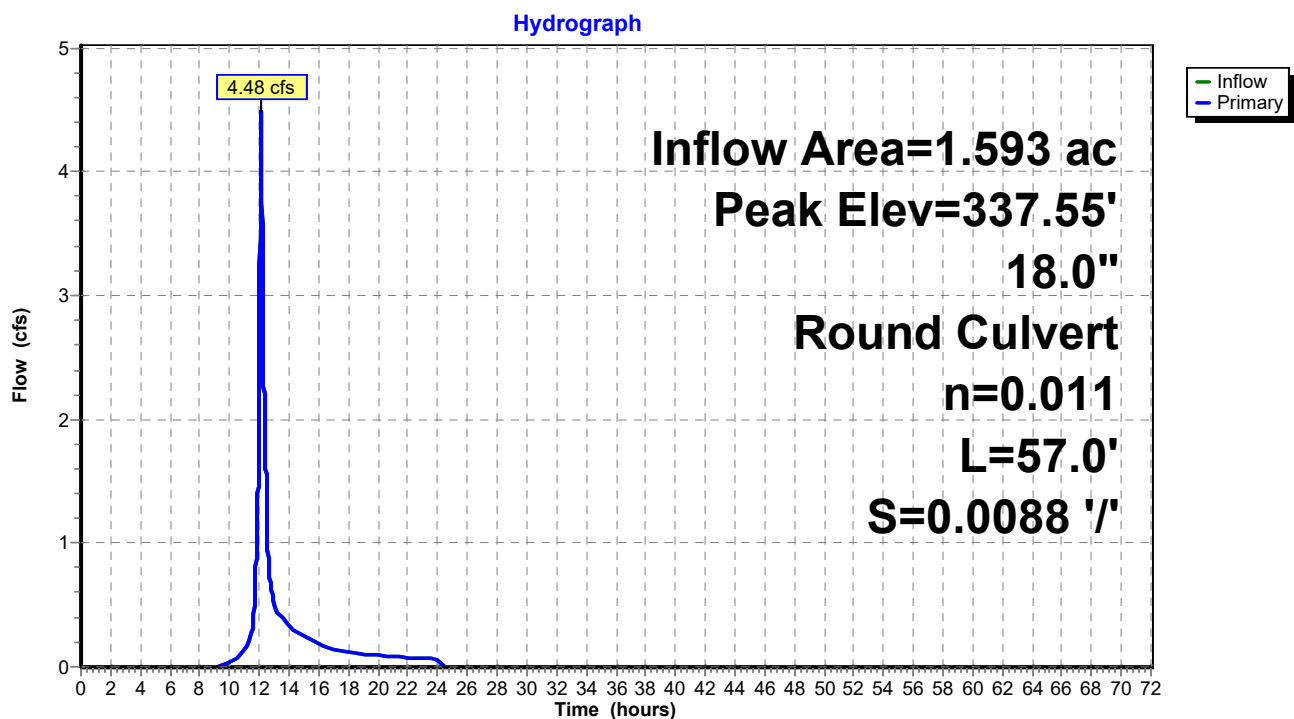
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Peak Elev= 337.55' @ 12.33 hrs

Flood Elev= 336.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	335.00'	18.0" Round Culvert L= 57.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 335.00' / 334.50' S= 0.0088 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=3.95 cfs @ 12.11 hrs HW=337.21' TW=336.99' (Dynamic Tailwater)
 ↑1=Culvert (Inlet Controls 3.95 cfs @ 2.24 fps)

Pond 1P: Culvert under proposed road

Summary for Pond 2P: Culvert under proposed road

[58] Hint: Peaked 5.68' above defined flood level

Inflow Area = 2.464 ac, 10.61% Impervious, Inflow Depth = 3.29" for 25YR event
 Inflow = 9.33 cfs @ 12.09 hrs, Volume= 0.675 af
 Outflow = 9.33 cfs @ 12.09 hrs, Volume= 0.675 af, Atten= 0%, Lag= 0.0 min
 Primary = 9.33 cfs @ 12.09 hrs, Volume= 0.675 af
 Routed to Pond DV1P : Pond to observation point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Peak Elev= 342.12' @ 12.09 hrs

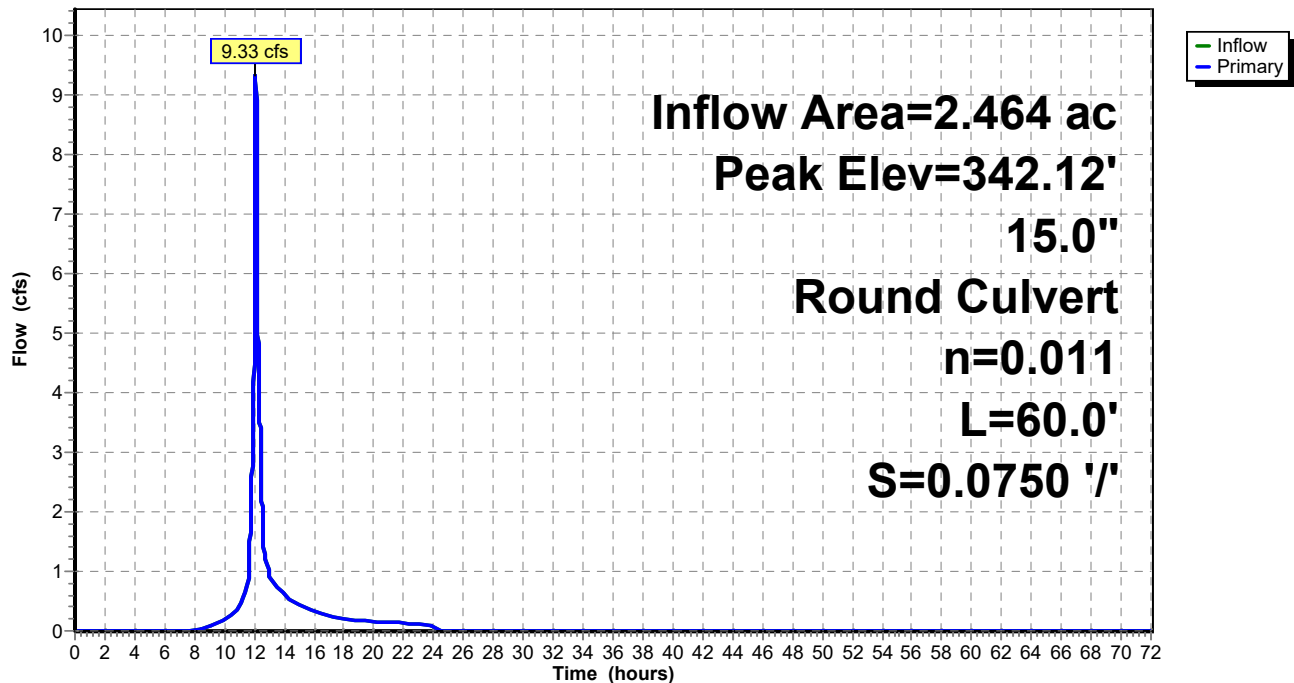
Flood Elev= 336.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	339.00'	15.0" Round Culvert L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 339.00' / 334.50' S= 0.0750 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=9.31 cfs @ 12.09 hrs HW=342.11' TW=336.89' (Dynamic Tailwater)
 ↳ **1=Culvert** (Inlet Controls 9.31 cfs @ 7.59 fps)

Pond 2P: Culvert under proposed road

Hydrograph



11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 15

Summary for Pond DV1P: Pond to observation point 1

[95] Warning: Outlet Device #4 rise exceeded

[80] Warning: Exceeded Pond 1P by 0.70' @ 24.27 hrs (2.26 cfs 0.077 af)

Inflow Area = 4.417 ac, 16.22% Impervious, Inflow Depth = 2.99" for 25YR event
 Inflow = 14.44 cfs @ 12.09 hrs, Volume= 1.101 af
 Outflow = 6.04 cfs @ 12.35 hrs, Volume= 1.100 af, Atten= 58%, Lag= 15.6 min
 Primary = 6.04 cfs @ 12.35 hrs, Volume= 1.100 af
 Routed to Reach OP-1 : Observation Point 1 To Existing Pond
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach OP-1 : Observation Point 1 To Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 337.49' @ 12.35 hrs Surf.Area= 6,618 sf Storage= 15,865 cf
 Flood Elev= 338.00' Surf.Area= 7,106 sf Storage= 19,371 cf

Plug-Flow detention time= 155.5 min calculated for 1.100 af (100% of inflow)
 Center-of-Mass det. time= 155.2 min (982.2 - 827.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	334.50'	19,371 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)
334.50	4,084	254.8	0	0	4,084
336.00	5,295	283.0	7,015	7,015	5,356
338.00	7,106	320.7	12,357	19,371	7,266

Device	Routing	Invert	Outlet Devices
#1	Primary	334.50'	15.0" Round Culvert L= 30.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 334.50' / 333.00' S= 0.0500 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	337.50'	48.0" x 48.0" Horiz. Rim C= 0.600 Limited to weir flow at low heads
#3	Device 1	335.75'	9.0" Vert. 9" ORIFICE C= 0.600 Limited to weir flow at low heads
#4	Device 1	336.50'	CUSTOM HIGH FLOW ORIFICE, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.50 Width (feet) 1.50 1.50
#5	Secondary	337.50'	10.0' long x 7.0' breadth EMERGENCY SPILLWAY Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78
#6	Device 1	334.50'	3.0" Vert. 3" LOW FLOW ORIFICE C= 0.600 Limited to weir flow at low heads

11474DV00A

Prepared by Meridian Land Services Inc

HydroCAD® 10.20-3c s/n 00595 © 2023 HydroCAD Software Solutions LLC

DEVELOPED CONDITIONS

Type III 24-hr 25YR Rainfall=5.56"

Printed 7/5/2023

Page 16

Primary OutFlow Max=6.04 cfs @ 12.35 hrs HW=337.49' TW=0.00' (Dynamic Tailwater)

1=Culvert (Passes 6.04 cfs of 12.39 cfs potential flow)

2=Rim (Controls 0.00 cfs)

3=9" ORIFICE (Orifice Controls 2.48 cfs @ 5.62 fps)

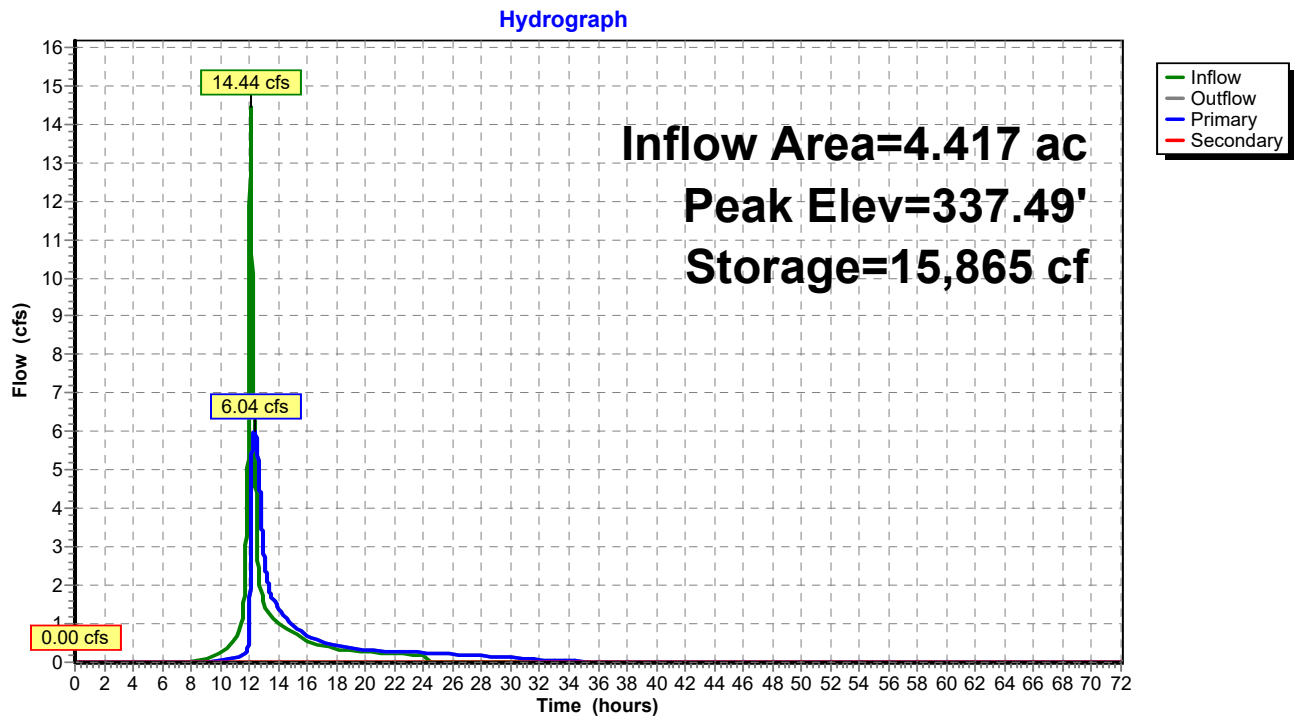
4=CUSTOM HIGH FLOW ORIFICE (Orifice Controls 3.15 cfs @ 4.20 fps)

6=3" LOW FLOW ORIFICE (Orifice Controls 0.40 cfs @ 8.15 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=334.50' TW=0.00' (Dynamic Tailwater)

5=EMERGENCY SPILLWAY (Controls 0.00 cfs)

Pond DV1P: Pond to observation point 1



Section 3.0: Drainage Area Plans

