

# Stormwater Management Report

## Proposed Site Development

**2 Rebel Road, 345 Derry Road & 307 Nashua Road  
Hudson & Londonderry, NH**

*Date:*

**August 11, 2021**

*Rev 1: N/A*

*Prepared for:*

**Bobcat of New Hampshire**

2 Tracy Lane  
Hudson, NH 03051

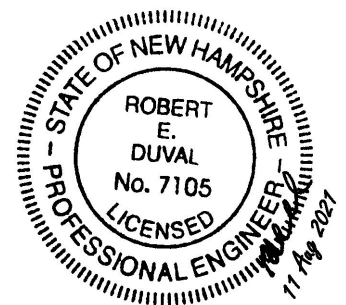
TFM #: 17851.08

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**Bobcat of New Hampshire**  
345 Derry Road / 307 Nashua Road, Hudson & Londonderry, NH

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## Executive Summary

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- This drainage analysis was performed to study the on-site stormwater runoff conditions for the proposed development located at 345 Derry Road in Hudson and 307 Nashua Road in Londonderry, New Hampshire.
- The scope of the proposed site work includes paving and reconfiguring the parking lot/access drives on Lot 101-18 as well as adding outdoor display and storage areas. Site work for Lot 101-19 includes two building additions with associated site improvements and outdoor display areas.
- The purpose of this analysis is to show the proposed drainage design meets the requirement for the post development flow being less than the predevelopment flow. As well as, to ensure proper efforts are taken to relieve existing treatment facilities from increased stormwater flows due to the proposed improvements.
- The drainage study compares pre-existing conditions to post-development conditions. There are two analysis points being analyzed: flow from the site to the Southern Abutter (Discharge Point A) and flow from the site to the Eastern Abutter (Discharge Point B).
- Currently, peak flows in every storm event are matched or reduced at Discharge Points A & B due to the improvements on site and the stormwater management system.

**Table 1 Peak Flow Summary**

Discharge Point	2-Year Storm		10-Year Storm		25-Year Storm		50-Year Storm	
	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)
DP-A	2.06	1.79	4.62	3.90	6.83	5.71	8.98	7.46
DP-B	0.85	0.46	1.95	1.08	2.91	1.62	3.85	3.47

**Table 2 Volumes Summary**

Discharge Point	2-Year Storm		10-Year Storm		25-Year Storm		50-Year Storm	
	Exist (ac-ft)	Prop (ac-ft)	Exist (ac-ft)	Prop (ac-ft)	Exist (ac-ft)	Prop (ac-ft)	Exist (ac-ft)	Prop (ac-ft)
DP-A	0.168	0.143	0.365	0.304	0.539	0.446	0.711	0.586
DP-B	0.069	0.173	0.153	0.308	0.227	0.421	0.301	0.531

## Storm Water Methodology

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In order to minimize the impact of this development, the design of this site was done in a manner to maintain, to the most extent possible, the existing drainage patterns. Based on the proposed configuration and grading of the site, HydroCAD has been implemented to determine post-development runoff rates.

In accordance with the Town of Hudson and Londonderry Development Regulations for stormwater management the 2, 10, and 25-year storm events as well as the 50-year storm event routing for detention facilities have been calculated for pre-development and post-development conditions. The data generated by the HydroCAD model indicates that the intent of the drainage design has been met. The summary tables included in this report illustrate that for each of the watershed areas and their associated design/discharge point, the post-development peak runoff rate is less than the pre-development runoff rate.

Existing and proposed hydrologic conditions were analyzed using HydroCAD, an SCS TR-20 based program, to calculate existing and proposed peak runoff rates. This method takes into account existing and proposed pervious and impervious areas including soil types and hydrologic classifications. The 2, 10, 25, and 50- year, 24-hour storm frequencies were used in the off-site drainage analysis.

Curve Numbers for the subcatchment areas were based on existing surface conditions as well as existing soil conditions. Soil data for these areas was taken from the USDA Web Soil Survey. The area of analysis is shown in the Pre and Post-Development Drainage Plans

### Pre-Development Conditions

Stormwater from the project limits was broken into 2 subcatchments based on surveyed topography and is conveyed into one of two discharge points described as follows and shown in the *Pre-Development Drainage Plan*.

**Discharge Point A** is the flow from the majority of the site to the Southern Abutter.

**Discharge Point B** is the flow from a portion of the site to the Eastern Abutter (Discharge Point B).

The curve numbers for each subcatchment were calculated based on the existing ground cover and hydrologic soil group.

The soils mapping information is based on USDA NRCS soils. The pre-developed ground cover is mixed between woodlands, lawn area, buildings, gravel and pavement. There are no major disparities between soil information.

HydroCAD Version 10.0 was used to model site drainage. The software is based on the SCS TR-20 technique used for modeling the hydrology and hydraulics of storm water runoff.

## Rainfall Intensity

Rainfall data used was obtained from the Northeast Regional Climate Center (NRCC). The rainfall precipitation values for the proposed area are as follows:

24-Hour Rainfall Intensity

	Northeast Regional Climate Center
2-year	2.94 inches
10-year	4.44 inches
25-year	5.62 inches
50-year	6.73 inches

## Post-Development Conditions

The proposed site improvements include paving and reconfiguring the parking lot/access drives on Lot 101-18 as well as adding outdoor display and storage areas. Site work for Lot 101-19 includes two building additions with associated site improvements and outdoor display areas.

The project is classified as a redevelopment project under the Hudson NH Stormwater Ordinance, exceeding 40,000 SF per the ordinance and thus subject to the Basic Stormwater Standards and Redevelopment Standards Section 290-5 (A) and (B)2.

The objective for the Post-Development drainage design is to use best management practices to attenuate the flow, provide treatment to collected stormwater, and promote groundwater recharge in accordance with the requirements of the Town of Hudson and Londonderry Development Regulations for stormwater management. The proposed area of disturbance is approximately 48,000 SF with a vast majority of the disturbance occurring in Hudson. The proposed stormwater treatment facility is located entirely within Hudson, situated at the low point of the development. As such, the stormwater management system has been designed in accordance with Town of Hudson Stormwater Ordinance.

This project has been designed to achieve all of the Basic Standards as well as to Implement LID or stormwater treatment measures on site to provide disconnection or treatment for at least 50% of the entire site area.

The post-development drainage model represents the project drainage areas divided into multiple subcatchments based on the layout of the site.

One filtration pond will collect and detain stormwater generated by the improvements proposed on the site. A sediment forebay will provide pretreatment. Stormwater treatment occurs as runoff pollutants bind to particles that will settle beneath the basin as the water infiltrates through the subsurface filter media. Biological and chemical processes occurring within the soil continue the breakdown of pollutants. Discharge of this stormwater will be directed, as in the pre-development condition, toward each discharge point.

Deep sump catch basins are proposed to collect and route generated stormwater from the development to the stormwater management system.

All pre-development discharge points have been analyzed in post-development conditions.

### **Stormwater Management**

Best Management Practices are proposed to manage the stormwater from the development while proposing treatment and recharge to the site and maintaining existing flow rates leaving the property. As previously stated, a filtration pond will collect and treat stormwater from the development. Within the system, a sediment forebay will provide pretreatment. Primary stormwater treatment occurs as runoff pollutants bind to particles that will settle beneath the systems as the water infiltrates through the subsurface filter media. The filtration basin will include outlets to control peak flows for the analyzed design storms.

### **Groundwater Recharge**

Test pits were performed in the area of the proposed stormwater treatment practice, which is located at the low point in the watershed. The excavation indicates that soils are comprised of imported fill material consisting of building debris to approx. 8 ft below grade. An infiltration test was run, yielding severely limited infiltration rates within the existing soils. As such it was determined that exfiltration is not feasible in this site.

Alternatively, we are providing filtration preceded by pretreatment in accordance with EPA's MS4 Stormwater Permit requirements. As such, the project will not create or contribute to water quality impairment to downstream abutters and/ or receiving waters.

### **Erosion Control Measures**

Erosion Control Measures are found on the Storm Water Management Plans within the plan set. The erosion control notes and construction sequence notes on the respective detail sheets contain specifications for stabilizing disturbed areas and limiting the length of time these areas are exposed.

### **Temporary Erosion Control Measures**

Silt fences are proposed downstream of site work on the subject properties to prevent sediment from leaving. A stabilized construction entrance is not required because both of the entrances to the site are paved and stable.

### **Permanent Erosion Control Measures**

Permanent erosion control measures include the existing open and closed drainage system to capture the runoff as well as riprap aprons at the pipe discharge points to dissipate the flows from the closed system.

### **Flood Protection**

Examination of the Flood Insurance Rate Maps for Hillsborough County, New Hampshire (all jurisdictions), map number 33015C0508E, effective May 17, 2005, and map number 33011C0508D, effective September 25, 2009, indicate that the subject parcels are not located within a flood hazard area.

## **Results**

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### Discharge Point A

The proposed project reduces the peak rates of runoff compared to the existing conditions for 2,10,25 and 50 year- storm events at DP A.

### Discharge Point B

The proposed project reduces the peak rates of runoff compared to the existing conditions for 2,10,25 and 50 year- storm events at DP B.

Table 1 & 2 presents a summary of the pre and post development hydrologic analysis comparing the peak rate runoff generated from the 2, 10, 25, and 50-year storm events.

**Table 1 Peak Flow Summary**

Discharge Point	2-Year Storm		10-Year Storm		25-Year Storm		50-Year Storm	
	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)
DP-A	2.06	1.79	4.62	3.90	6.83	5.71	8.98	7.46
DP-B	0.85	0.46	1.95	1.08	2.91	1.62	3.85	3.47

**Table 2 Volumes Summary**

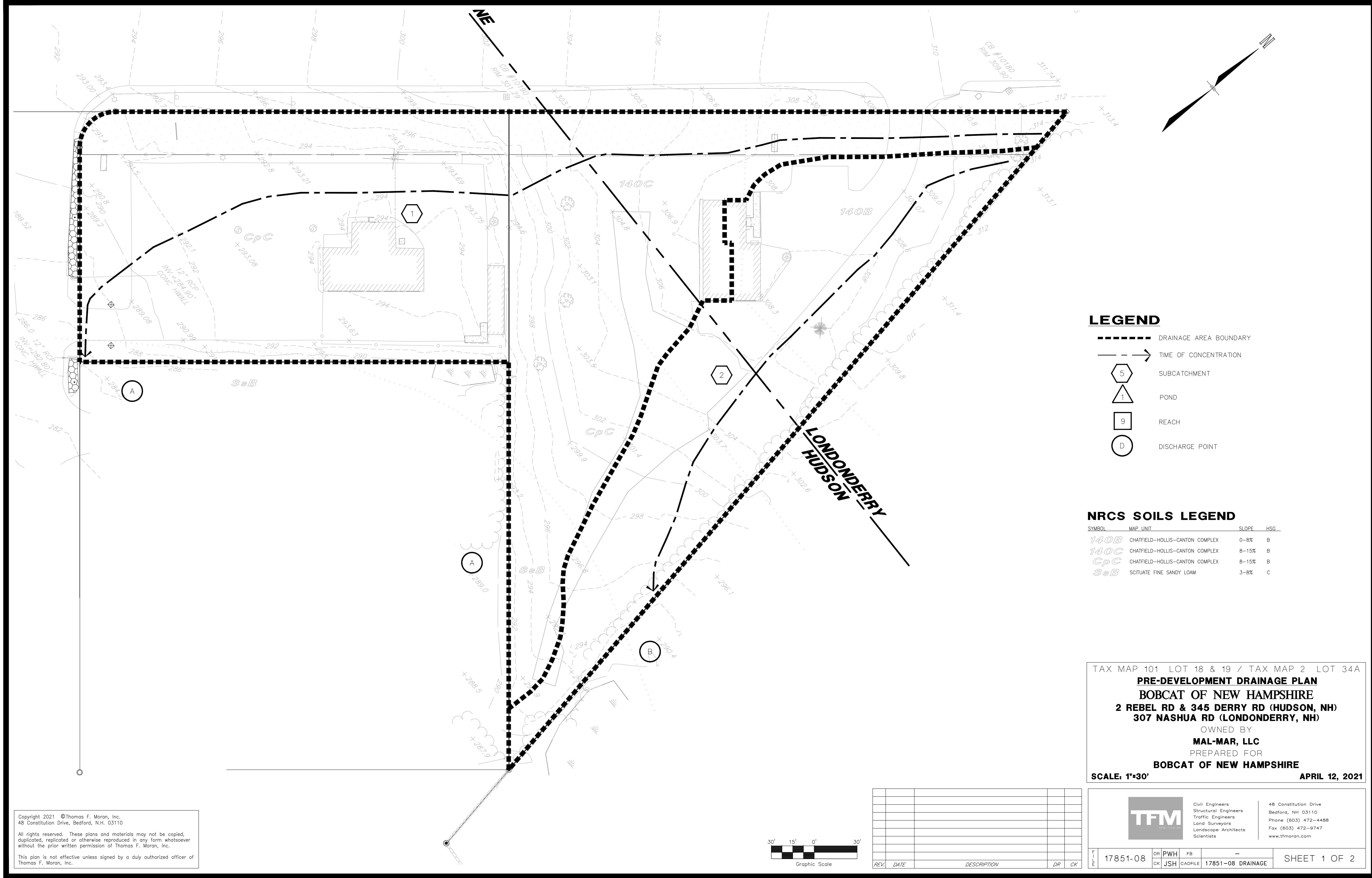
Discharge Point	2-Year Storm		10-Year Storm		25-Year Storm		50-Year Storm	
	Exist (ac-ft)	Prop (ac-ft)	Exist (ac-ft)	Prop (ac-ft)	Exist (ac-ft)	Prop (ac-ft)	Exist (ac-ft)	Prop (ac-ft)
DP-A	0.168	0.143	0.365	0.304	0.539	0.446	0.711	0.586
DP-B	0.069	0.173	0.153	0.308	0.227	0.421	0.301	0.531

### **Conclusion**

The stormwater management system has been designed in accordance with Town of Hudson Stormwater Ordinance.

This project has been designed to achieve all of the Basic Standards as well as to Implement LID or stormwater treatment measures on site to provide disconnection or treatment for at least 50% of the entire site area.

The proposed site improvements associated with the development will meet the Town of Hudson and Londonderry stormwater requirements by maintaining pre-development flows at the project discharge locations. The results shown in Table 1 confirm that post development flows to Discharge Points A and B will experience the same or less stormwater runoff flows as the pre-development condition.



**LEGEND**

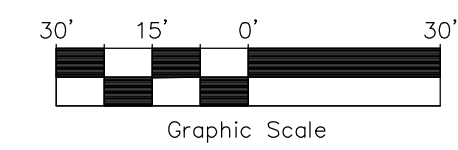
- DRAINAGE AREA BOUNDARY
- - - -> TIME OF CONCENTRATION
- ⑤ SUBCATCHMENT
- ① POND
- ⑨ REACH
- ⓓ DISCHARGE POINT

**NRCS SOILS LEGEND**

SYMBOL	MAP UNIT	SLOPE	HSG
140B	CHATFIELD-HOLLIS-CANTON COMPLEX	0-8%	B
140C	CHATFIELD-HOLLIS-CANTON COMPLEX	8-15%	B
CpC	CHATFIELD-HOLLIS-CANTON COMPLEX	8-15%	B
SsB	SCITUATE FINE SANDY LOAM	3-8%	C

TAX MAP 101 LOT 18 & 19 / TAX MAP 2 LOT 34A  
**PRE-DEVELOPMENT DRAINAGE PLAN**  
**BOBCAT OF NEW HAMPSHIRE**  
**2 REBEL RD & 345 DERRY RD (HUDSON, NH)**  
**307 NASHUA RD (LONDONDERRY, NH)**  
 OWNED BY  
**MAL-MAR, LLC**  
 PREPARED FOR  
**BOBCAT OF NEW HAMPSHIRE**  
**SCALE: 1"=30' APRIL 12, 2021**

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	17851-08 DR PWH FB CK JSH CADFILE	17851-08 DRAINAGE





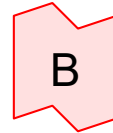
FLOW SOUTH TO  
ABUTTING  
PROPERTY



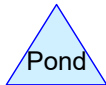
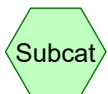
SOUTHERN ABUTTER



FLOW EAST TO  
ABUTTING  
PROPERTY



EASTERN ABUTTER



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## Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.638	61	>75% Grass cover, Good, HSG B (1S, 2S)
0.086	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.332	96	Gravel surface, HSG B (1S, 2S)
0.029	96	Gravel surface, HSG C (1S, 2S)
0.828	98	Paved parking, HSG B (1S, 2S)
0.131	98	Roofs, HSG B (1S, 2S)
0.178	55	Woods, Good, HSG B (2S)
0.043	70	Woods, Good, HSG C (2S)
<b>3.264</b>	<b>76</b>	<b>TOTAL AREA</b>

**17851.08\_PRE-DEVELOPMENT**

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**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.107	HSG B	1S, 2S
0.157	HSG C	1S, 2S
0.000	HSG D	
0.000	Other	
<b>3.264</b>		<b>TOTAL AREA</b>

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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

**Subcatchment 1S: FLOW SOUTH TO**

Runoff Area=99,076 sf 34.63% Impervious Runoff Depth>0.89"  
Flow Length=735' Tc=11.1 min CN=76 Runoff=2.06 cfs 0.168 af

**Subcatchment 2S: FLOW EAST TO**

Runoff Area=43,109 sf 17.33% Impervious Runoff Depth>0.84"  
Flow Length=408' Tc=10.7 min CN=75 Runoff=0.85 cfs 0.069 af

**Link A: SOUTHERN ABUTTER**

Inflow=2.06 cfs 0.168 af  
Primary=2.06 cfs 0.168 af

**Link B: EASTERN ABUTTER**

Inflow=0.85 cfs 0.069 af  
Primary=0.85 cfs 0.069 af

**Total Runoff Area = 3.264 ac Runoff Volume = 0.237 af Average Runoff Depth = 0.87"**  
**70.61% Pervious = 2.305 ac 29.39% Impervious = 0.959 ac**

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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**Summary for Subcatchment 1S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 2.06 cfs @ 12.17 hrs, Volume= 0.168 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
29,856	98	Paved parking, HSG B
5,830	96	Gravel surface, HSG B
4,458	98	Roofs, HSG B
56,561	61	>75% Grass cover, Good, HSG B
1,585	74	>75% Grass cover, Good, HSG C
786	96	Gravel surface, HSG C
99,076	76	Weighted Average
64,762		65.37% Pervious Area
34,314		34.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	310	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.6	340	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
11.1	735	Total			

**Summary for Subcatchment 2S: FLOW EAST TO ABUTTING PROPERTY**

Runoff = 0.85 cfs @ 12.16 hrs, Volume= 0.069 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
6,207	98	Paved parking, HSG B
8,617	96	Gravel surface, HSG B
1,265	98	Roofs, HSG B
7,754	55	Woods, Good, HSG B
14,792	61	>75% Grass cover, Good, HSG B
1,861	70	Woods, Good, HSG C
2,146	74	>75% Grass cover, Good, HSG C
467	96	Gravel surface, HSG C
43,109	75	Weighted Average
35,637		82.67% Pervious Area
7,472		17.33% Impervious Area

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	308	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.7	408	Total			

**Summary for Link A: SOUTHERN ABUTTER**

Inflow Area = 2.274 ac, 34.63% Impervious, Inflow Depth > 0.89" for 2-YEAR event  
 Inflow = 2.06 cfs @ 12.17 hrs, Volume= 0.168 af  
 Primary = 2.06 cfs @ 12.17 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 0.990 ac, 17.33% Impervious, Inflow Depth > 0.84" for 2-YEAR event  
 Inflow = 0.85 cfs @ 12.16 hrs, Volume= 0.069 af  
 Primary = 0.85 cfs @ 12.16 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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

**Subcatchment 1S: FLOW SOUTH TO**

Runoff Area=99,076 sf 34.63% Impervious Runoff Depth>1.92"  
Flow Length=735' Tc=11.1 min CN=76 Runoff=4.62 cfs 0.365 af

**Subcatchment 2S: FLOW EAST TO**

Runoff Area=43,109 sf 17.33% Impervious Runoff Depth>1.85"  
Flow Length=408' Tc=10.7 min CN=75 Runoff=1.95 cfs 0.153 af

**Link A: SOUTHERN ABUTTER**

Inflow=4.62 cfs 0.365 af  
Primary=4.62 cfs 0.365 af

**Link B: EASTERN ABUTTER**

Inflow=1.95 cfs 0.153 af  
Primary=1.95 cfs 0.153 af

**Total Runoff Area = 3.264 ac Runoff Volume = 0.517 af Average Runoff Depth = 1.90"**  
**70.61% Pervious = 2.305 ac 29.39% Impervious = 0.959 ac**

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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**Summary for Subcatchment 1S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 4.62 cfs @ 12.16 hrs, Volume= 0.365 af, Depth&gt; 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

Area (sf)	CN	Description
29,856	98	Paved parking, HSG B
5,830	96	Gravel surface, HSG B
4,458	98	Roofs, HSG B
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
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11.1	735	Total			

**Summary for Subcatchment 2S: FLOW EAST TO ABUTTING PROPERTY**

Runoff = 1.95 cfs @ 12.16 hrs, Volume= 0.153 af, Depth&gt; 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

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2,146	74	>75% Grass cover, Good, HSG C
467	96	Gravel surface, HSG C
43,109	75	Weighted Average
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7,472		17.33% Impervious Area



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Type III 24-hr 10-YEAR Rainfall=4.44"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	308	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.7	408	Total			

**Summary for Link A: SOUTHERN ABUTTER**

Inflow Area = 2.274 ac, 34.63% Impervious, Inflow Depth > 1.92" for 10-YEAR event  
 Inflow = 4.62 cfs @ 12.16 hrs, Volume= 0.365 af  
 Primary = 4.62 cfs @ 12.16 hrs, Volume= 0.365 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 0.990 ac, 17.33% Impervious, Inflow Depth > 1.85" for 10-YEAR event  
 Inflow = 1.95 cfs @ 12.16 hrs, Volume= 0.153 af  
 Primary = 1.95 cfs @ 12.16 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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

**Subcatchment 1S: FLOW SOUTH TO**

Runoff Area=99,076 sf 34.63% Impervious Runoff Depth>2.84"  
Flow Length=735' Tc=11.1 min CN=76 Runoff=6.83 cfs 0.539 af

**Subcatchment 2S: FLOW EAST TO**

Runoff Area=43,109 sf 17.33% Impervious Runoff Depth>2.75"  
Flow Length=408' Tc=10.7 min CN=75 Runoff=2.91 cfs 0.227 af

**Link A: SOUTHERN ABUTTER**

Inflow=6.83 cfs 0.539 af  
Primary=6.83 cfs 0.539 af

**Link B: EASTERN ABUTTER**

Inflow=2.91 cfs 0.227 af  
Primary=2.91 cfs 0.227 af

**Total Runoff Area = 3.264 ac Runoff Volume = 0.765 af Average Runoff Depth = 2.81"**  
**70.61% Pervious = 2.305 ac 29.39% Impervious = 0.959 ac**

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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**Summary for Subcatchment 1S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 6.83 cfs @ 12.16 hrs, Volume= 0.539 af, Depth> 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
29,856	98	Paved parking, HSG B
5,830	96	Gravel surface, HSG B
4,458	98	Roofs, HSG B
56,561	61	>75% Grass cover, Good, HSG B
1,585	74	>75% Grass cover, Good, HSG C
786	96	Gravel surface, HSG C
99,076	76	Weighted Average
64,762		65.37% Pervious Area
34,314		34.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	310	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.6	340	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
11.1	735	Total			

**Summary for Subcatchment 2S: FLOW EAST TO ABUTTING PROPERTY**

Runoff = 2.91 cfs @ 12.15 hrs, Volume= 0.227 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
6,207	98	Paved parking, HSG B
8,617	96	Gravel surface, HSG B
1,265	98	Roofs, HSG B
7,754	55	Woods, Good, HSG B
14,792	61	>75% Grass cover, Good, HSG B
1,861	70	Woods, Good, HSG C
2,146	74	>75% Grass cover, Good, HSG C
467	96	Gravel surface, HSG C
43,109	75	Weighted Average
35,637		82.67% Pervious Area
7,472		17.33% Impervious Area

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	308	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.7	408	Total			

**Summary for Link A: SOUTHERN ABUTTER**

Inflow Area = 2.274 ac, 34.63% Impervious, Inflow Depth > 2.84" for 25-YEAR event  
 Inflow = 6.83 cfs @ 12.16 hrs, Volume= 0.539 af  
 Primary = 6.83 cfs @ 12.16 hrs, Volume= 0.539 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 0.990 ac, 17.33% Impervious, Inflow Depth > 2.75" for 25-YEAR event  
 Inflow = 2.91 cfs @ 12.15 hrs, Volume= 0.227 af  
 Primary = 2.91 cfs @ 12.15 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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

**Subcatchment 1S: FLOW SOUTH TO**

Runoff Area=99,076 sf 34.63% Impervious Runoff Depth>3.75"  
Flow Length=735' Tc=11.1 min CN=76 Runoff=8.98 cfs 0.711 af

**Subcatchment 2S: FLOW EAST TO**

Runoff Area=43,109 sf 17.33% Impervious Runoff Depth>3.65"  
Flow Length=408' Tc=10.7 min CN=75 Runoff=3.85 cfs 0.301 af

**Link A: SOUTHERN ABUTTER**

Inflow=8.98 cfs 0.711 af  
Primary=8.98 cfs 0.711 af

**Link B: EASTERN ABUTTER**

Inflow=3.85 cfs 0.301 af  
Primary=3.85 cfs 0.301 af

**Total Runoff Area = 3.264 ac Runoff Volume = 1.012 af Average Runoff Depth = 3.72"**  
**70.61% Pervious = 2.305 ac 29.39% Impervious = 0.959 ac**

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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**Summary for Subcatchment 1S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 8.98 cfs @ 12.16 hrs, Volume= 0.711 af, Depth&gt; 3.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
29,856	98	Paved parking, HSG B
5,830	96	Gravel surface, HSG B
4,458	98	Roofs, HSG B
56,561	61	>75% Grass cover, Good, HSG B
1,585	74	>75% Grass cover, Good, HSG C
786	96	Gravel surface, HSG C
99,076	76	Weighted Average
64,762		65.37% Pervious Area
34,314		34.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	310	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.6	340	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
11.1	735	Total			

**Summary for Subcatchment 2S: FLOW EAST TO ABUTTING PROPERTY**

Runoff = 3.85 cfs @ 12.15 hrs, Volume= 0.301 af, Depth&gt; 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
6,207	98	Paved parking, HSG B
8,617	96	Gravel surface, HSG B
1,265	98	Roofs, HSG B
7,754	55	Woods, Good, HSG B
14,792	61	>75% Grass cover, Good, HSG B
1,861	70	Woods, Good, HSG C
2,146	74	>75% Grass cover, Good, HSG C
467	96	Gravel surface, HSG C
43,109	75	Weighted Average
35,637		82.67% Pervious Area
7,472		17.33% Impervious Area

**17851.08\_PRE-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
3.3	308	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.7	408	Total			

**Summary for Link A: SOUTHERN ABUTTER**

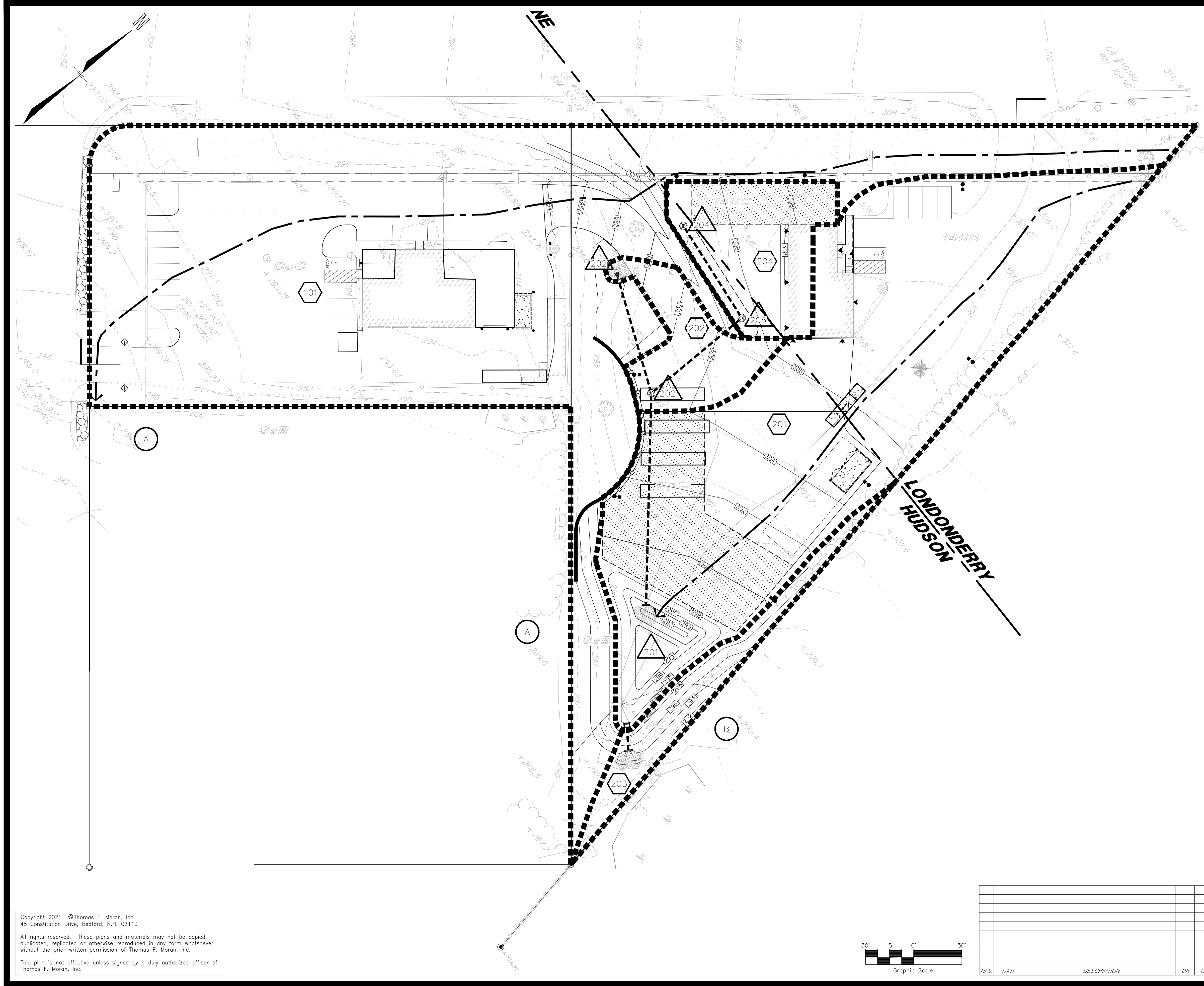
Inflow Area = 2.274 ac, 34.63% Impervious, Inflow Depth > 3.75" for 50-YEAR event  
 Inflow = 8.98 cfs @ 12.16 hrs, Volume= 0.711 af  
 Primary = 8.98 cfs @ 12.16 hrs, Volume= 0.711 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 0.990 ac, 17.33% Impervious, Inflow Depth > 3.65" for 50-YEAR event  
 Inflow = 3.85 cfs @ 12.15 hrs, Volume= 0.301 af  
 Primary = 3.85 cfs @ 12.15 hrs, Volume= 0.301 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



**LEGEND**

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION
- SUBCATCHMENT
- POND
- REACH
- DISCHARGE POINT

**NRCS SOILS LEGEND**

SYMBOL	MAP UNIT	SLOPE	HSG
140B	CHATFIELD-HOLLIS-CANTON COMPLEX	0-8%	B
140C	CHATFIELD-HOLLIS-CANTON COMPLEX	8-15%	B
CpC	CHATFIELD-HOLLIS-CANTON COMPLEX	8-15%	B
SsB	SCITUATE FINE SANDY LOAM	3-8%	C

TAX MAP 101 LOT 18 & 19 / TAX MAP 2 LOT 34A

**POST-DEVELOPMENT DRAINAGE PLAN**  
**BOBCAT OF NEW HAMPSHIRE**  
**2 REBEL RD & 345 DERRY RD (HUDSON, NH)**  
**307 NASHUA RD (LONDONDERRY, NH)**

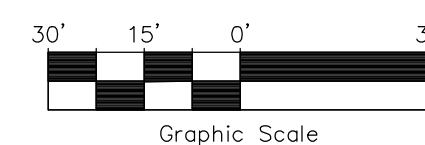
OWNED BY  
**MAL-MAR, LLC**  
 PREPARED FOR

**BOBCAT OF NEW HAMPSHIRE**

SCALE: 1"=30'

AUGUST 11, 2021

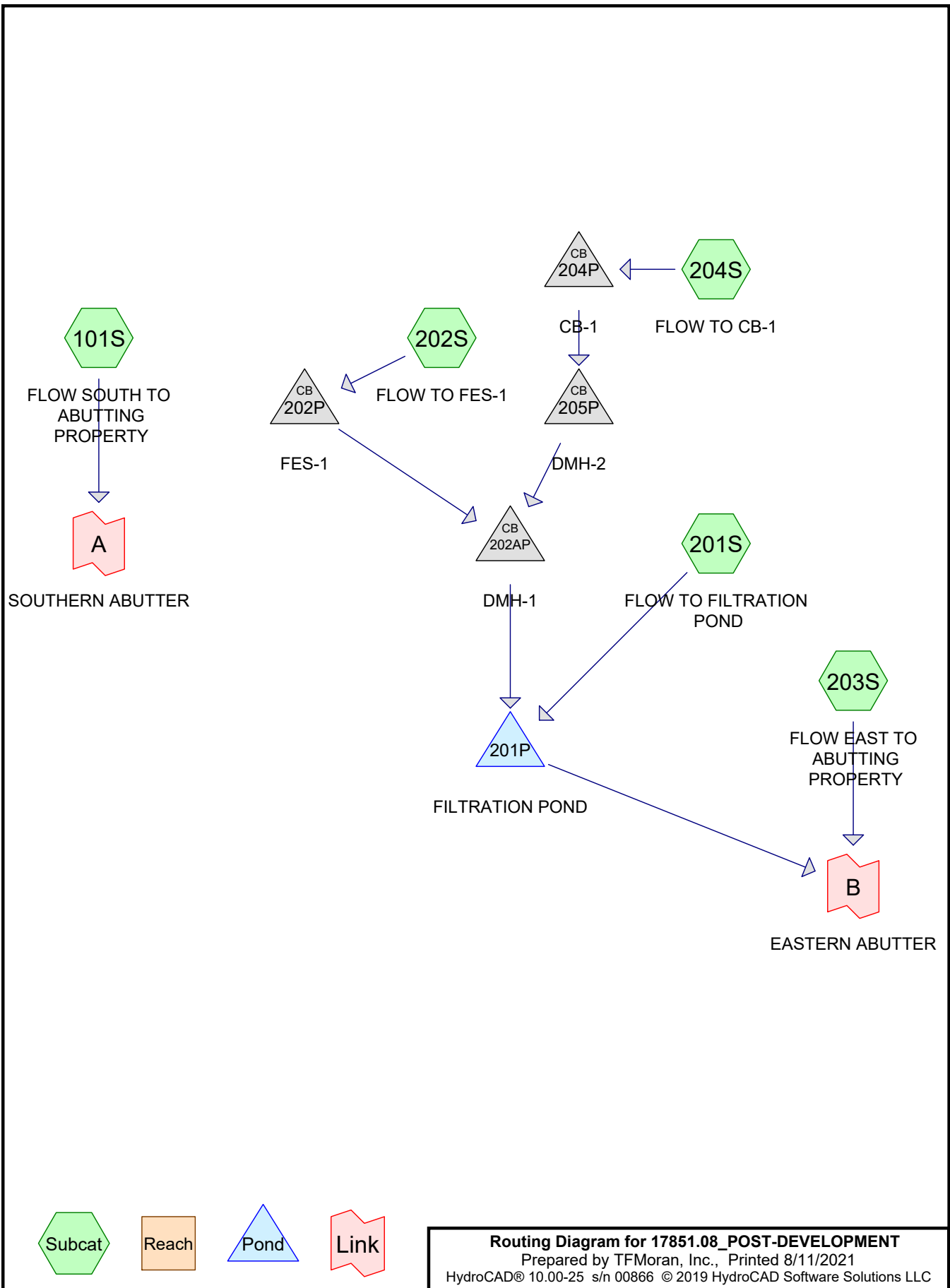
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REV.	DATE	DESCRIPTION	DR	CK

	Civil Engineers	48 Constitution Drive Bedford, NH 03110 Phone (603) 472-4488 Fax (603) 472-9747 www.tfmoran.com
	Structural Engineers Traffic Engineers Land Surveyors Landscape Architects Scientists	
17851-08	DR PWH CK JSH	FB CADFILE
17851-08 DRAINAGE		SHEET 2 OF 2





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## Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.334	61	>75% Grass cover, Good, HSG B (101S, 201S, 202S, 203S, 204S)
0.219	74	>75% Grass cover, Good, HSG C (101S, 201S, 203S)
0.241	96	Gravel surface, HSG B (201S, 204S)
1.266	98	Paved parking, HSG B (101S, 201S, 202S, 204S)
0.163	98	Roofs, HSG B (101S, 201S, 204S)
0.035	55	Woods, Good, HSG B (201S, 203S)
0.005	70	Woods, Good, HSG C (203S)
<b>3.264</b>	<b>81</b>	<b>TOTAL AREA</b>

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## Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.040	HSG B	101S, 201S, 202S, 203S, 204S
0.224	HSG C	101S, 201S, 203S
0.000	HSG D	
0.000	Other	
<b>3.264</b>		<b>TOTAL AREA</b>

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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

**Subcatchment 101S: FLOW SOUTH TO** Runoff Area=79,435 sf 42.42% Impervious Runoff Depth>0.94"  
 Flow Length=734' Tc=10.7 min CN=77 Runoff=1.79 cfs 0.143 af

**Subcatchment 201S: FLOW TO** Runoff Area=45,782 sf 41.67% Impervious Runoff Depth>1.29"  
 Flow Length=409' Tc=10.6 min CN=83 Runoff=1.46 cfs 0.113 af

**Subcatchment 202S: FLOW TO FES-1** Runoff Area=4,933 sf 96.53% Impervious Runoff Depth>2.45"  
 Tc=5.0 min CN=97 Runoff=0.32 cfs 0.023 af

**Subcatchment 203S: FLOW EAST TO** Runoff Area=4,520 sf 0.00% Impervious Runoff Depth>0.49"  
 Tc=5.0 min CN=67 Runoff=0.05 cfs 0.004 af

**Subcatchment 204S: FLOW TO CB-1** Runoff Area=7,498 sf 62.91% Impervious Runoff Depth>2.35"  
 Tc=5.0 min CN=96 Runoff=0.47 cfs 0.034 af

**Pond 201P: FILTRATION POND** Peak Elev=296.83' Storage=2,864 cf Inflow=2.08 cfs 0.170 af  
 Outflow=0.44 cfs 0.169 af

**Pond 202AP: DMH-1** Peak Elev=298.09' Inflow=0.79 cfs 0.057 af  
 15.0" Round Culvert n=0.012 L=130.0' S=0.0200 '/' Outflow=0.79 cfs 0.057 af

**Pond 202P: FES-1** Peak Elev=298.78' Inflow=0.32 cfs 0.023 af  
 15.0" Round Culvert n=0.012 L=73.0' S=0.0100 '/' Outflow=0.32 cfs 0.023 af

**Pond 204P: CB-1** Peak Elev=300.32' Inflow=0.47 cfs 0.034 af  
 15.0" Round Culvert n=0.012 L=64.0' S=0.0100 '/' Outflow=0.47 cfs 0.034 af

**Pond 205P: DMH-2** Peak Elev=299.58' Inflow=0.47 cfs 0.034 af  
 15.0" Round Culvert n=0.012 L=69.0' S=0.0100 '/' Outflow=0.47 cfs 0.034 af

**Link A: SOUTHERN ABUTTER** Inflow=1.79 cfs 0.143 af  
 Primary=1.79 cfs 0.143 af

**Link B: EASTERN ABUTTER** Inflow=0.46 cfs 0.173 af  
 Primary=0.46 cfs 0.173 af

**Total Runoff Area = 3.264 ac Runoff Volume = 0.317 af Average Runoff Depth = 1.17"**  
**56.21% Pervious = 1.834 ac 43.79% Impervious = 1.429 ac**

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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**Summary for Subcatchment 101S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 1.79 cfs @ 12.16 hrs, Volume= 0.143 af, Depth&gt; 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
4,573	98	Roofs, HSG B
41,311	61	>75% Grass cover, Good, HSG B
29,127	98	Paved parking, HSG B
4,424	74	>75% Grass cover, Good, HSG C
79,435	77	Weighted Average
45,735		57.58% Pervious Area
33,700		42.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.8	262	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	49	0.0800	5.74		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.6	338	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
10.7	734	Total			

**Summary for Subcatchment 201S: FLOW TO FILTRATION POND**

Runoff = 1.46 cfs @ 12.15 hrs, Volume= 0.113 af, Depth&gt; 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
17,606	98	Paved parking, HSG B
8,083	96	Gravel surface, HSG B
1,473	98	Roofs, HSG B
1,370	55	Woods, Good, HSG B
14,268	61	>75% Grass cover, Good, HSG B
2,982	74	>75% Grass cover, Good, HSG C
45,782	83	Weighted Average
26,703		58.33% Pervious Area
19,079		41.67% Impervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.4	141	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.8	168	0.0430	3.34		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
10.6	409	Total			

**Summary for Subcatchment 202S: FLOW TO FES-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
4,762	98	Paved parking, HSG B
171	61	>75% Grass cover, Good, HSG B
4,933	97	Weighted Average
171		3.47% Pervious Area
4,762		96.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 203S: FLOW EAST TO ABUTTING PROPERTY**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.05 cfs @ 12.10 hrs, Volume= 0.004 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
150	55	Woods, Good, HSG B
2,019	61	>75% Grass cover, Good, HSG B
200	70	Woods, Good, HSG C
2,151	74	>75% Grass cover, Good, HSG C
4,520	67	Weighted Average
4,520		100.00% Pervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 204S: FLOW TO CB-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YEAR Rainfall=2.94"

Area (sf)	CN	Description
3,664	98	Paved parking, HSG B
2,431	96	Gravel surface, HSG B
1,053	98	Roofs, HSG B
350	61	>75% Grass cover, Good, HSG B
7,498	96	Weighted Average
2,781		37.09% Pervious Area
4,717		62.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Pond 201P: FILTRATION POND**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.336 ac, 49.06% Impervious, Inflow Depth > 1.53" for 2-YEAR event  
 Inflow = 2.08 cfs @ 12.12 hrs, Volume= 0.170 af  
 Outflow = 0.44 cfs @ 12.63 hrs, Volume= 0.169 af, Atten= 79%, Lag= 30.6 min  
 Primary = 0.44 cfs @ 12.63 hrs, Volume= 0.169 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 296.83' @ 12.63 hrs Surf.Area= 2,346 sf Storage= 2,864 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 85.6 min ( 869.9 - 784.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	293.00'	0 cf	<b>FOREBAY (Prismatic)</b> Listed below (Recalc) -Impervious 575 cf Overall x 0.0% Voids
#2	295.00'	8,546 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		8,546 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
293.00	100	0	0
295.00	475	575	575

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
295.00	600	0	0
296.00	1,740	1,170	1,170
298.00	3,200	4,940	6,110
298.70	3,760	2,436	8,546

Device	Routing	Invert	Outlet Devices
#1	Device 3	295.00'	<b>5.000 in/hr Exfiltration over Surface area</b>
#2	Device 3	296.25'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Head (feet) 0.00 2.20 Width (feet) 0.12 0.12
#3	Primary	292.25'	<b>15.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.25' / 292.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#4	Device 3	298.50'	<b>30.0" x 42.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.44 cfs @ 12.63 hrs HW=296.83' TW=0.00' (Dynamic Tailwater)

- ↑ **3=Culvert** (Passes 0.44 cfs of 11.75 cfs potential flow)
  - ↑ **1=Exfiltration** (Exfiltration Controls 0.27 cfs)
  - ↑ **2=Custom Weir/Orifice** (Weir Controls 0.17 cfs @ 2.49 fps)
  - ↑ **4=Orifice/Grate** ( Controls 0.00 cfs)

**Summary for Pond 202AP: DMH-1**

[82] Warning: Early inflow requires earlier time span  
 [57] Hint: Peaked at 298.09' (Flood elevation advised)

Inflow Area = 0.285 ac, 76.25% Impervious, Inflow Depth > 2.39" for 2-YEAR event  
 Inflow = 0.79 cfs @ 12.07 hrs, Volume= 0.057 af  
 Outflow = 0.79 cfs @ 12.07 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.79 cfs @ 12.07 hrs, Volume= 0.057 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.09' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	297.67'	<b>15.0" Round Culvert</b> L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 297.67' / 295.07' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.76 cfs @ 12.07 hrs HW=298.08' TW=296.00' (Dynamic Tailwater)

- ↑ **1=Culvert** (Inlet Controls 0.76 cfs @ 2.18 fps)



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Type III 24-hr 2-YEAR Rainfall=2.94"

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## Summary for Pond 202P: FES-1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.113 ac, 96.53% Impervious, Inflow Depth > 2.45" for 2-YEAR event  
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af  
Outflow = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Peak Elev= 298.78' @ 12.07 hrs  
Flood Elev= 299.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.50'	<b>15.0" Round Culvert</b> L= 73.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 298.50' / 297.77' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.31 cfs @ 12.07 hrs HW=298.77' TW=298.08' (Dynamic Tailwater)  
↑**1=Culvert** (Inlet Controls 0.31 cfs @ 1.56 fps)

## Summary for Pond 204P: CB-1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 2.35" for 2-YEAR event  
Inflow = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af  
Outflow = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Peak Elev= 300.32' @ 12.07 hrs  
Flood Elev= 304.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.00'	<b>15.0" Round Culvert</b> L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.00' / 299.36' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.46 cfs @ 12.07 hrs HW=300.31' TW=299.57' (Dynamic Tailwater)  
↑**1=Culvert** (Inlet Controls 0.46 cfs @ 1.90 fps)

## Summary for Pond 205P: DMH-2

[82] Warning: Early inflow requires earlier time span

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

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Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 2.35" for 2-YEAR event  
 Inflow = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af  
 Outflow = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.47 cfs @ 12.07 hrs, Volume= 0.034 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 299.58' @ 12.07 hrs  
 Flood Elev= 305.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.26'	<b>15.0" Round Culvert</b> L= 69.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.26' / 298.57' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.46 cfs @ 12.07 hrs HW=299.57' TW=298.08' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 0.46 cfs @ 1.90 fps)

**Summary for Link A: SOUTHERN ABUTTER**

Inflow Area = 1.824 ac, 42.42% Impervious, Inflow Depth > 0.94" for 2-YEAR event  
 Inflow = 1.79 cfs @ 12.16 hrs, Volume= 0.143 af  
 Primary = 1.79 cfs @ 12.16 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 1.440 ac, 45.52% Impervious, Inflow Depth > 1.44" for 2-YEAR event  
 Inflow = 0.46 cfs @ 12.61 hrs, Volume= 0.173 af  
 Primary = 0.46 cfs @ 12.61 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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

**Subcatchment 101S: FLOW SOUTH TO** Runoff Area=79,435 sf 42.42% Impervious Runoff Depth>2.00"  
 Flow Length=734' Tc=10.7 min CN=77 Runoff=3.90 cfs 0.304 af

**Subcatchment 201S: FLOW TO** Runoff Area=45,782 sf 41.67% Impervious Runoff Depth>2.50"  
 Flow Length=409' Tc=10.6 min CN=83 Runoff=2.80 cfs 0.219 af

**Subcatchment 202S: FLOW TO FES-1** Runoff Area=4,933 sf 96.53% Impervious Runoff Depth>3.83"  
 Tc=5.0 min CN=97 Runoff=0.49 cfs 0.036 af

**Subcatchment 203S: FLOW EAST TO** Runoff Area=4,520 sf 0.00% Impervious Runoff Depth>1.30"  
 Tc=5.0 min CN=67 Runoff=0.16 cfs 0.011 af

**Subcatchment 204S: FLOW TO CB-1** Runoff Area=7,498 sf 62.91% Impervious Runoff Depth>3.74"  
 Tc=5.0 min CN=96 Runoff=0.74 cfs 0.054 af

**Pond 201P: FILTRATION POND** Peak Elev=297.71' Storage=5,208 cf Inflow=3.75 cfs 0.308 af  
 Outflow=1.04 cfs 0.296 af

**Pond 202AP: DMH-1** Peak Elev=298.20' Inflow=1.23 cfs 0.090 af  
 15.0" Round Culvert n=0.012 L=130.0' S=0.0200 '/' Outflow=1.23 cfs 0.090 af

**Pond 202P: FES-1** Peak Elev=298.85' Inflow=0.49 cfs 0.036 af  
 15.0" Round Culvert n=0.012 L=73.0' S=0.0100 '/' Outflow=0.49 cfs 0.036 af

**Pond 204P: CB-1** Peak Elev=300.40' Inflow=0.74 cfs 0.054 af  
 15.0" Round Culvert n=0.012 L=64.0' S=0.0100 '/' Outflow=0.74 cfs 0.054 af

**Pond 205P: DMH-2** Peak Elev=299.66' Inflow=0.74 cfs 0.054 af  
 15.0" Round Culvert n=0.012 L=69.0' S=0.0100 '/' Outflow=0.74 cfs 0.054 af

**Link A: SOUTHERN ABUTTER** Inflow=3.90 cfs 0.304 af  
 Primary=3.90 cfs 0.304 af

**Link B: EASTERN ABUTTER** Inflow=1.08 cfs 0.308 af  
 Primary=1.08 cfs 0.308 af

**Total Runoff Area = 3.264 ac Runoff Volume = 0.624 af Average Runoff Depth = 2.29"**  
**56.21% Pervious = 1.834 ac 43.79% Impervious = 1.429 ac**

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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**Summary for Subcatchment 101S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 3.90 cfs @ 12.16 hrs, Volume= 0.304 af, Depth&gt; 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

Area (sf)	CN	Description
4,573	98	Roofs, HSG B
41,311	61	>75% Grass cover, Good, HSG B
29,127	98	Paved parking, HSG B
4,424	74	>75% Grass cover, Good, HSG C
79,435	77	Weighted Average
45,735		57.58% Pervious Area
33,700		42.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.8	262	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	49	0.0800	5.74		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.6	338	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
10.7	734	Total			

**Summary for Subcatchment 201S: FLOW TO FILTRATION POND**

Runoff = 2.80 cfs @ 12.15 hrs, Volume= 0.219 af, Depth&gt; 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

Area (sf)	CN	Description
17,606	98	Paved parking, HSG B
8,083	96	Gravel surface, HSG B
1,473	98	Roofs, HSG B
1,370	55	Woods, Good, HSG B
14,268	61	>75% Grass cover, Good, HSG B
2,982	74	>75% Grass cover, Good, HSG C
45,782	83	Weighted Average
26,703		58.33% Pervious Area
19,079		41.67% Impervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.4	141	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.8	168	0.0430	3.34		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
10.6	409	Total			

**Summary for Subcatchment 202S: FLOW TO FES-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.49 cfs @ 12.07 hrs, Volume= 0.036 af, Depth> 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

Area (sf)	CN	Description
4,762	98	Paved parking, HSG B
171	61	>75% Grass cover, Good, HSG B
4,933	97	Weighted Average
171		3.47% Pervious Area
4,762		96.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 203S: FLOW EAST TO ABUTTING PROPERTY**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

Area (sf)	CN	Description
150	55	Woods, Good, HSG B
2,019	61	>75% Grass cover, Good, HSG B
200	70	Woods, Good, HSG C
2,151	74	>75% Grass cover, Good, HSG C
4,520	67	Weighted Average
4,520		100.00% Pervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 204S: FLOW TO CB-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af, Depth> 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-YEAR Rainfall=4.44"

Area (sf)	CN	Description
3,664	98	Paved parking, HSG B
2,431	96	Gravel surface, HSG B
1,053	98	Roofs, HSG B
350	61	>75% Grass cover, Good, HSG B
7,498	96	Weighted Average
2,781		37.09% Pervious Area
4,717		62.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Pond 201P: FILTRATION POND**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.336 ac, 49.06% Impervious, Inflow Depth > 2.77" for 10-YEAR event  
 Inflow = 3.75 cfs @ 12.12 hrs, Volume= 0.308 af  
 Outflow = 1.04 cfs @ 12.55 hrs, Volume= 0.296 af, Atten= 72%, Lag= 25.7 min  
 Primary = 1.04 cfs @ 12.55 hrs, Volume= 0.296 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 297.71' @ 12.55 hrs Surf.Area= 2,987 sf Storage= 5,208 cf

Plug-Flow detention time= 88.3 min calculated for 0.296 af (96% of inflow)  
 Center-of-Mass det. time= 73.2 min ( 847.3 - 774.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	293.00'	0 cf	<b>FOREBAY (Prismatic)</b> Listed below (Recalc) -Impervious 575 cf Overall x 0.0% Voids
#2	295.00'	8,546 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		8,546 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
293.00	100	0	0
295.00	475	575	575

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
295.00	600	0	0
296.00	1,740	1,170	1,170
298.00	3,200	4,940	6,110
298.70	3,760	2,436	8,546

Device	Routing	Invert	Outlet Devices
#1	Device 3	295.00'	<b>5.000 in/hr Exfiltration over Surface area</b>
#2	Device 3	296.25'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Head (feet) 0.00 2.20 Width (feet) 0.12 0.12
#3	Primary	292.25'	<b>15.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.25' / 292.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#4	Device 3	298.50'	<b>30.0" x 42.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=1.04 cfs @ 12.55 hrs HW=297.71' TW=0.00' (Dynamic Tailwater)

- ↑ **3=Culvert** (Passes 1.04 cfs of 12.99 cfs potential flow)
  - ↑ **1=Exfiltration** (Exfiltration Controls 0.35 cfs)
  - ↑ **2=Custom Weir/Orifice** (Weir Controls 0.69 cfs @ 3.95 fps)
  - ↑ **4=Orifice/Grate** ( Controls 0.00 cfs)

**Summary for Pond 202AP: DMH-1**

[82] Warning: Early inflow requires earlier time span  
 [57] Hint: Peaked at 298.20' (Flood elevation advised)

Inflow Area = 0.285 ac, 76.25% Impervious, Inflow Depth > 3.77" for 10-YEAR event  
 Inflow = 1.23 cfs @ 12.07 hrs, Volume= 0.090 af  
 Outflow = 1.23 cfs @ 12.07 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.0 min  
 Primary = 1.23 cfs @ 12.07 hrs, Volume= 0.090 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.20' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	297.67'	<b>15.0" Round Culvert</b> L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 297.67' / 295.07' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.18 cfs @ 12.07 hrs HW=298.19' TW=296.72' (Dynamic Tailwater)

- ↑ **1=Culvert** (Inlet Controls 1.18 cfs @ 2.45 fps)

**17851.08\_POST-DEVELOPMENT**

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**Summary for Pond 202P: FES-1**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.113 ac, 96.53% Impervious, Inflow Depth > 3.83" for 10-YEAR event  
 Inflow = 0.49 cfs @ 12.07 hrs, Volume= 0.036 af  
 Outflow = 0.49 cfs @ 12.07 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.49 cfs @ 12.07 hrs, Volume= 0.036 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.85' @ 12.07 hrs  
 Flood Elev= 299.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.50'	<b>15.0" Round Culvert</b> L= 73.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 298.50' / 297.77' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.47 cfs @ 12.07 hrs HW=298.84' TW=298.19' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 0.47 cfs @ 1.75 fps)

**Summary for Pond 204P: CB-1**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 3.74" for 10-YEAR event  
 Inflow = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af  
 Outflow = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 300.40' @ 12.07 hrs  
 Flood Elev= 304.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.00'	<b>15.0" Round Culvert</b> L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.00' / 299.36' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.71 cfs @ 12.07 hrs HW=300.39' TW=299.65' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 0.71 cfs @ 2.14 fps)

**Summary for Pond 205P: DMH-2**

[82] Warning: Early inflow requires earlier time span



**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 10-YEAR Rainfall=4.44"

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Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 3.74" for 10-YEAR event  
 Inflow = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af  
 Outflow = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.74 cfs @ 12.07 hrs, Volume= 0.054 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 299.66' @ 12.07 hrs  
 Flood Elev= 305.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.26'	<b>15.0" Round Culvert</b> L= 69.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.26' / 298.57' S= 0.0100 1' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.71 cfs @ 12.07 hrs HW=299.65' TW=298.19' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.71 cfs @ 2.14 fps)

**Summary for Link A: SOUTHERN ABUTTER**

Inflow Area = 1.824 ac, 42.42% Impervious, Inflow Depth > 2.00" for 10-YEAR event  
 Inflow = 3.90 cfs @ 12.16 hrs, Volume= 0.304 af  
 Primary = 3.90 cfs @ 12.16 hrs, Volume= 0.304 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 1.440 ac, 45.52% Impervious, Inflow Depth > 2.56" for 10-YEAR event  
 Inflow = 1.08 cfs @ 12.50 hrs, Volume= 0.308 af  
 Primary = 1.08 cfs @ 12.50 hrs, Volume= 0.308 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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

**Subcatchment 101S: FLOW SOUTH TO** Runoff Area=79,435 sf 42.42% Impervious Runoff Depth>2.93"  
 Flow Length=734' Tc=10.7 min CN=77 Runoff=5.71 cfs 0.446 af

**Subcatchment 201S: FLOW TO** Runoff Area=45,782 sf 41.67% Impervious Runoff Depth>3.51"  
 Flow Length=409' Tc=10.6 min CN=83 Runoff=3.89 cfs 0.307 af

**Subcatchment 202S: FLOW TO FES-1** Runoff Area=4,933 sf 96.53% Impervious Runoff Depth>4.91"  
 Tc=5.0 min CN=97 Runoff=0.62 cfs 0.046 af

**Subcatchment 203S: FLOW EAST TO** Runoff Area=4,520 sf 0.00% Impervious Runoff Depth>2.07"  
 Tc=5.0 min CN=67 Runoff=0.27 cfs 0.018 af

**Subcatchment 204S: FLOW TO CB-1** Runoff Area=7,498 sf 62.91% Impervious Runoff Depth>4.82"  
 Tc=5.0 min CN=96 Runoff=0.94 cfs 0.069 af

**Pond 201P: FILTRATION POND** Peak Elev=298.30' Storage=7,097 cf Inflow=5.11 cfs 0.423 af  
 Outflow=1.55 cfs 0.403 af

**Pond 202AP: DMH-1** Peak Elev=298.32' Inflow=1.56 cfs 0.116 af  
 15.0" Round Culvert n=0.012 L=130.0' S=0.0200 '/' Outflow=1.56 cfs 0.116 af

**Pond 202P: FES-1** Peak Elev=298.89' Inflow=0.62 cfs 0.046 af  
 15.0" Round Culvert n=0.012 L=73.0' S=0.0100 '/' Outflow=0.62 cfs 0.046 af

**Pond 204P: CB-1** Peak Elev=300.46' Inflow=0.94 cfs 0.069 af  
 15.0" Round Culvert n=0.012 L=64.0' S=0.0100 '/' Outflow=0.94 cfs 0.069 af

**Pond 205P: DMH-2** Peak Elev=299.72' Inflow=0.94 cfs 0.069 af  
 15.0" Round Culvert n=0.012 L=69.0' S=0.0100 '/' Outflow=0.94 cfs 0.069 af

**Link A: SOUTHERN ABUTTER** Inflow=5.71 cfs 0.446 af  
 Primary=5.71 cfs 0.446 af

**Link B: EASTERN ABUTTER** Inflow=1.62 cfs 0.421 af  
 Primary=1.62 cfs 0.421 af

**Total Runoff Area = 3.264 ac Runoff Volume = 0.887 af Average Runoff Depth = 3.26"**  
**56.21% Pervious = 1.834 ac 43.79% Impervious = 1.429 ac**

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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**Summary for Subcatchment 101S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 5.71 cfs @ 12.15 hrs, Volume= 0.446 af, Depth&gt; 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
4,573	98	Roofs, HSG B
41,311	61	>75% Grass cover, Good, HSG B
29,127	98	Paved parking, HSG B
4,424	74	>75% Grass cover, Good, HSG C
79,435	77	Weighted Average
45,735		57.58% Pervious Area
33,700		42.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.8	262	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	49	0.0800	5.74		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.6	338	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
10.7	734	Total			

**Summary for Subcatchment 201S: FLOW TO FILTRATION POND**

Runoff = 3.89 cfs @ 12.15 hrs, Volume= 0.307 af, Depth&gt; 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
17,606	98	Paved parking, HSG B
8,083	96	Gravel surface, HSG B
1,473	98	Roofs, HSG B
1,370	55	Woods, Good, HSG B
14,268	61	>75% Grass cover, Good, HSG B
2,982	74	>75% Grass cover, Good, HSG C
45,782	83	Weighted Average
26,703		58.33% Pervious Area
19,079		41.67% Impervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.4	141	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.8	168	0.0430	3.34		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
10.6	409	Total			

**Summary for Subcatchment 202S: FLOW TO FES-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.62 cfs @ 12.07 hrs, Volume= 0.046 af, Depth> 4.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
4,762	98	Paved parking, HSG B
171	61	>75% Grass cover, Good, HSG B
4,933	97	Weighted Average
171		3.47% Pervious Area
4,762		96.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 203S: FLOW EAST TO ABUTTING PROPERTY**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.27 cfs @ 12.08 hrs, Volume= 0.018 af, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
150	55	Woods, Good, HSG B
2,019	61	>75% Grass cover, Good, HSG B
200	70	Woods, Good, HSG C
2,151	74	>75% Grass cover, Good, HSG C
4,520	67	Weighted Average
4,520		100.00% Pervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 204S: FLOW TO CB-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-YEAR Rainfall=5.62"

Area (sf)	CN	Description
3,664	98	Paved parking, HSG B
2,431	96	Gravel surface, HSG B
1,053	98	Roofs, HSG B
350	61	>75% Grass cover, Good, HSG B
7,498	96	Weighted Average
2,781		37.09% Pervious Area
4,717		62.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Pond 201P: FILTRATION POND**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.336 ac, 49.06% Impervious, Inflow Depth > 3.80" for 25-YEAR event  
 Inflow = 5.11 cfs @ 12.12 hrs, Volume= 0.423 af  
 Outflow = 1.55 cfs @ 12.52 hrs, Volume= 0.403 af, Atten= 70%, Lag= 23.8 min  
 Primary = 1.55 cfs @ 12.52 hrs, Volume= 0.403 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.30' @ 12.52 hrs Surf.Area= 3,438 sf Storage= 7,097 cf

Plug-Flow detention time= 84.6 min calculated for 0.403 af (95% of inflow)  
 Center-of-Mass det. time= 66.7 min ( 835.1 - 768.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	293.00'	0 cf	<b>FOREBAY (Prismatic)</b> Listed below (Recalc) -Impervious 575 cf Overall x 0.0% Voids
#2	295.00'	8,546 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		8,546 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
293.00	100	0	0
295.00	475	575	575

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 25-YEAR Rainfall=5.62"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
295.00	600	0	0
296.00	1,740	1,170	1,170
298.00	3,200	4,940	6,110
298.70	3,760	2,436	8,546

Device	Routing	Invert	Outlet Devices
#1	Device 3	295.00'	<b>5.000 in/hr Exfiltration over Surface area</b>
#2	Device 3	296.25'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Head (feet) 0.00 2.20 Width (feet) 0.12 0.12
#3	Primary	292.25'	<b>15.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.25' / 292.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#4	Device 3	298.50'	<b>30.0" x 42.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=1.55 cfs @ 12.52 hrs HW=298.30' TW=0.00' (Dynamic Tailwater)

- ↑ **3=Culvert** (Passes 1.55 cfs of 13.76 cfs potential flow)
  - ↑ **1=Exfiltration** (Exfiltration Controls 0.40 cfs)
  - ↑ **2=Custom Weir/Orifice** (Weir Controls 1.15 cfs @ 4.68 fps)
  - ↑ **4=Orifice/Grate** ( Controls 0.00 cfs)

**Summary for Pond 202AP: DMH-1**

[82] Warning: Early inflow requires earlier time span  
 [57] Hint: Peaked at 298.32' (Flood elevation advised)

Inflow Area = 0.285 ac, 76.25% Impervious, Inflow Depth > 4.86" for 25-YEAR event  
 Inflow = 1.56 cfs @ 12.07 hrs, Volume= 0.116 af  
 Outflow = 1.56 cfs @ 12.07 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min  
 Primary = 1.56 cfs @ 12.07 hrs, Volume= 0.116 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.32' @ 12.53 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	297.67'	<b>15.0" Round Culvert</b> L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 297.67' / 295.07' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.43 cfs @ 12.07 hrs HW=298.27' TW=297.23' (Dynamic Tailwater)

- ↑ **1=Culvert** (Outlet Controls 1.43 cfs @ 3.63 fps)

# 17851.08\_POST-DEVELOPMENT

Type III 24-hr 25-YEAR Rainfall=5.62"

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## Summary for Pond 202P: FES-1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.113 ac, 96.53% Impervious, Inflow Depth > 4.91" for 25-YEAR event  
Inflow = 0.62 cfs @ 12.07 hrs, Volume= 0.046 af  
Outflow = 0.62 cfs @ 12.07 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.62 cfs @ 12.07 hrs, Volume= 0.046 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Peak Elev= 298.89' @ 12.07 hrs  
Flood Elev= 299.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.50'	<b>15.0" Round Culvert</b> L= 73.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 298.50' / 297.77' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.60 cfs @ 12.07 hrs HW=298.89' TW=298.27' (Dynamic Tailwater)  
↑**1=Culvert** (Inlet Controls 0.60 cfs @ 1.87 fps)

## Summary for Pond 204P: CB-1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 4.82" for 25-YEAR event  
Inflow = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af  
Outflow = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Peak Elev= 300.46' @ 12.07 hrs  
Flood Elev= 304.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.00'	<b>15.0" Round Culvert</b> L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.00' / 299.36' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.91 cfs @ 12.07 hrs HW=300.45' TW=299.71' (Dynamic Tailwater)  
↑**1=Culvert** (Inlet Controls 0.91 cfs @ 2.28 fps)

## Summary for Pond 205P: DMH-2

[82] Warning: Early inflow requires earlier time span

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Type III 24-hr 25-YEAR Rainfall=5.62"

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Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 4.82" for 25-YEAR event  
Inflow = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af  
Outflow = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.94 cfs @ 12.07 hrs, Volume= 0.069 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Peak Elev= 299.72' @ 12.07 hrs  
Flood Elev= 305.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.26'	<b>15.0" Round Culvert</b> L= 69.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.26' / 298.57' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.91 cfs @ 12.07 hrs HW=299.71' TW=298.27' (Dynamic Tailwater)  
↑**1=Culvert** (Inlet Controls 0.91 cfs @ 2.28 fps)

## Summary for Link A: SOUTHERN ABUTTER

Inflow Area = 1.824 ac, 42.42% Impervious, Inflow Depth > 2.93" for 25-YEAR event  
Inflow = 5.71 cfs @ 12.15 hrs, Volume= 0.446 af  
Primary = 5.71 cfs @ 12.15 hrs, Volume= 0.446 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

## Summary for Link B: EASTERN ABUTTER

Inflow Area = 1.440 ac, 45.52% Impervious, Inflow Depth > 3.51" for 25-YEAR event  
Inflow = 1.62 cfs @ 12.47 hrs, Volume= 0.421 af  
Primary = 1.62 cfs @ 12.47 hrs, Volume= 0.421 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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

**Subcatchment 101S: FLOW SOUTH TO** Runoff Area=79,435 sf 42.42% Impervious Runoff Depth>3.86"  
 Flow Length=734' Tc=10.7 min CN=77 Runoff=7.46 cfs 0.586 af

**Subcatchment 201S: FLOW TO** Runoff Area=45,782 sf 41.67% Impervious Runoff Depth>4.49"  
 Flow Length=409' Tc=10.6 min CN=83 Runoff=4.92 cfs 0.393 af

**Subcatchment 202S: FLOW TO FES-1** Runoff Area=4,933 sf 96.53% Impervious Runoff Depth>5.92"  
 Tc=5.0 min CN=97 Runoff=0.75 cfs 0.056 af

**Subcatchment 203S: FLOW EAST TO** Runoff Area=4,520 sf 0.00% Impervious Runoff Depth>2.86"  
 Tc=5.0 min CN=67 Runoff=0.37 cfs 0.025 af

**Subcatchment 204S: FLOW TO CB-1** Runoff Area=7,498 sf 62.91% Impervious Runoff Depth>5.84"  
 Tc=5.0 min CN=96 Runoff=1.13 cfs 0.084 af

**Pond 201P: FILTRATION POND** Peak Elev=298.61' Storage=8,223 cf Inflow=6.40 cfs 0.533 af  
 Outflow=3.32 cfs 0.507 af

**Pond 202AP: DMH-1** Peak Elev=298.64' Inflow=1.88 cfs 0.140 af  
 15.0" Round Culvert n=0.012 L=130.0' S=0.0200 '/' Outflow=1.88 cfs 0.140 af

**Pond 202P: FES-1** Peak Elev=298.94' Inflow=0.75 cfs 0.056 af  
 15.0" Round Culvert n=0.012 L=73.0' S=0.0100 '/' Outflow=0.75 cfs 0.056 af

**Pond 204P: CB-1** Peak Elev=300.51' Inflow=1.13 cfs 0.084 af  
 15.0" Round Culvert n=0.012 L=64.0' S=0.0100 '/' Outflow=1.13 cfs 0.084 af

**Pond 205P: DMH-2** Peak Elev=299.77' Inflow=1.13 cfs 0.084 af  
 15.0" Round Culvert n=0.012 L=69.0' S=0.0100 '/' Outflow=1.13 cfs 0.084 af

**Link A: SOUTHERN ABUTTER** Inflow=7.46 cfs 0.586 af  
 Primary=7.46 cfs 0.586 af

**Link B: EASTERN ABUTTER** Inflow=3.47 cfs 0.531 af  
 Primary=3.47 cfs 0.531 af

**Total Runoff Area = 3.264 ac Runoff Volume = 1.144 af Average Runoff Depth = 4.21"**  
**56.21% Pervious = 1.834 ac 43.79% Impervious = 1.429 ac**

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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**Summary for Subcatchment 101S: FLOW SOUTH TO ABUTTING PROPERTY**

Runoff = 7.46 cfs @ 12.15 hrs, Volume= 0.586 af, Depth> 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
4,573	98	Roofs, HSG B
41,311	61	>75% Grass cover, Good, HSG B
29,127	98	Paved parking, HSG B
4,424	74	>75% Grass cover, Good, HSG C
79,435	77	Weighted Average
45,735		57.58% Pervious Area
33,700		42.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.0500	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.8	262	0.0500	1.57		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	49	0.0800	5.74		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
1.6	338	0.0300	3.52		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
10.7	734	Total			

**Summary for Subcatchment 201S: FLOW TO FILTRATION POND**

Runoff = 4.92 cfs @ 12.15 hrs, Volume= 0.393 af, Depth> 4.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
17,606	98	Paved parking, HSG B
8,083	96	Gravel surface, HSG B
1,473	98	Roofs, HSG B
1,370	55	Woods, Good, HSG B
14,268	61	>75% Grass cover, Good, HSG B
2,982	74	>75% Grass cover, Good, HSG C
45,782	83	Weighted Average
26,703		58.33% Pervious Area
19,079		41.67% Impervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0450	0.23		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 2.94"
2.4	141	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.8	168	0.0430	3.34		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
10.6	409	Total			

**Summary for Subcatchment 202S: FLOW TO FES-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.75 cfs @ 12.07 hrs, Volume= 0.056 af, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
4,762	98	Paved parking, HSG B
171	61	>75% Grass cover, Good, HSG B
4,933	97	Weighted Average
171		3.47% Pervious Area
4,762		96.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 203S: FLOW EAST TO ABUTTING PROPERTY**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 0.025 af, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
150	55	Woods, Good, HSG B
2,019	61	>75% Grass cover, Good, HSG B
200	70	Woods, Good, HSG C
2,151	74	>75% Grass cover, Good, HSG C
4,520	67	Weighted Average
4,520		100.00% Pervious Area

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Subcatchment 204S: FLOW TO CB-1**

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af, Depth> 5.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-YEAR Rainfall=6.73"

Area (sf)	CN	Description
3,664	98	Paved parking, HSG B
2,431	96	Gravel surface, HSG B
1,053	98	Roofs, HSG B
350	61	>75% Grass cover, Good, HSG B
7,498	96	Weighted Average
2,781		37.09% Pervious Area
4,717		62.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

**Summary for Pond 201P: FILTRATION POND**

[82] Warning: Early inflow requires earlier time span

[95] Warning: Outlet Device #2 rise exceeded

[80] Warning: Exceeded Pond 202AP by 0.04' @ 12.25 hrs (0.49 cfs 0.004 af)

Inflow Area = 1.336 ac, 49.06% Impervious, Inflow Depth > 4.79" for 50-YEAR event  
 Inflow = 6.40 cfs @ 12.12 hrs, Volume= 0.533 af  
 Outflow = 3.32 cfs @ 12.36 hrs, Volume= 0.507 af, Atten= 48%, Lag= 14.2 min  
 Primary = 3.32 cfs @ 12.36 hrs, Volume= 0.507 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.61' @ 12.36 hrs Surf.Area= 3,691 sf Storage= 8,223 cf

Plug-Flow detention time= 78.8 min calculated for 0.507 af (95% of inflow)  
 Center-of-Mass det. time= 60.0 min ( 824.1 - 764.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	293.00'	0 cf	<b>FOREBAY (Prismatic)</b> Listed below (Recalc) -Impervious 575 cf Overall x 0.0% Voids
#2	295.00'	8,546 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		8,546 cf	Total Available Storage

**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 50-YEAR Rainfall=6.73"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
293.00	100	0	0
295.00	475	575	575

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
295.00	600	0	0
296.00	1,740	1,170	1,170
298.00	3,200	4,940	6,110
298.70	3,760	2,436	8,546

Device	Routing	Invert	Outlet Devices
#1	Device 3	295.00'	<b>5.000 in/hr Exfiltration over Surface area</b>
#2	Device 3	296.25'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Head (feet) 0.00 2.20 Width (feet) 0.12 0.12
#3	Primary	292.25'	<b>15.0" Round Culvert</b> L= 15.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 292.25' / 292.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#4	Device 3	298.50'	<b>30.0" x 42.0" Horiz. Orifice/Grate C= 0.600</b> Limited to weir flow at low heads

**Primary OutFlow** Max=3.28 cfs @ 12.36 hrs HW=298.61' TW=0.00' (Dynamic Tailwater)

- ↑ **3=Culvert** (Passes 3.28 cfs of 14.15 cfs potential flow)
  - ↑ **1=Exfiltration** (Exfiltration Controls 0.43 cfs)
  - ↑ **2=Custom Weir/Orifice** (Orifice Controls 1.40 cfs @ 5.31 fps)
  - ↑ **4=Orifice/Grate** (Weir Controls 1.46 cfs @ 1.09 fps)

**Summary for Pond 202AP: DMH-1**

[82] Warning: Early inflow requires earlier time span  
 [57] Hint: Peaked at 298.64' (Flood elevation advised)

Inflow Area = 0.285 ac, 76.25% Impervious, Inflow Depth > 5.88" for 50-YEAR event  
 Inflow = 1.88 cfs @ 12.07 hrs, Volume= 0.140 af  
 Outflow = 1.88 cfs @ 12.07 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min  
 Primary = 1.88 cfs @ 12.07 hrs, Volume= 0.140 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.64' @ 12.39 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	297.67'	<b>15.0" Round Culvert</b> L= 130.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 297.67' / 295.07' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.56 cfs @ 12.07 hrs HW=298.37' TW=297.66' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Outlet Controls 1.56 cfs @ 3.18 fps)

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**Summary for Pond 202P: FES-1**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.113 ac, 96.53% Impervious, Inflow Depth > 5.92" for 50-YEAR event  
 Inflow = 0.75 cfs @ 12.07 hrs, Volume= 0.056 af  
 Outflow = 0.75 cfs @ 12.07 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.75 cfs @ 12.07 hrs, Volume= 0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 298.94' @ 12.08 hrs  
 Flood Elev= 299.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	298.50'	<b>15.0" Round Culvert</b> L= 73.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 298.50' / 297.77' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=0.70 cfs @ 12.07 hrs HW=298.93' TW=298.37' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 0.70 cfs @ 2.81 fps)

**Summary for Pond 204P: CB-1**

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 5.84" for 50-YEAR event  
 Inflow = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af  
 Outflow = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min  
 Primary = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 300.51' @ 12.07 hrs  
 Flood Elev= 304.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.00'	<b>15.0" Round Culvert</b> L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.00' / 299.36' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.09 cfs @ 12.07 hrs HW=300.50' TW=299.76' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.09 cfs @ 2.40 fps)

**Summary for Pond 205P: DMH-2**

[82] Warning: Early inflow requires earlier time span

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Inflow Area = 0.172 ac, 62.91% Impervious, Inflow Depth > 5.84" for 50-YEAR event  
 Inflow = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af  
 Outflow = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min  
 Primary = 1.13 cfs @ 12.07 hrs, Volume= 0.084 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 299.77' @ 12.07 hrs  
 Flood Elev= 305.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.26'	<b>15.0" Round Culvert</b> L= 69.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.26' / 298.57' S= 0.0100 1' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.09 cfs @ 12.07 hrs HW=299.76' TW=298.37' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 1.09 cfs @ 2.40 fps)

**Summary for Link A: SOUTHERN ABUTTER**

Inflow Area = 1.824 ac, 42.42% Impervious, Inflow Depth > 3.86" for 50-YEAR event  
 Inflow = 7.46 cfs @ 12.15 hrs, Volume= 0.586 af  
 Primary = 7.46 cfs @ 12.15 hrs, Volume= 0.586 af, Atten= 0%, Lag= 0.0 min

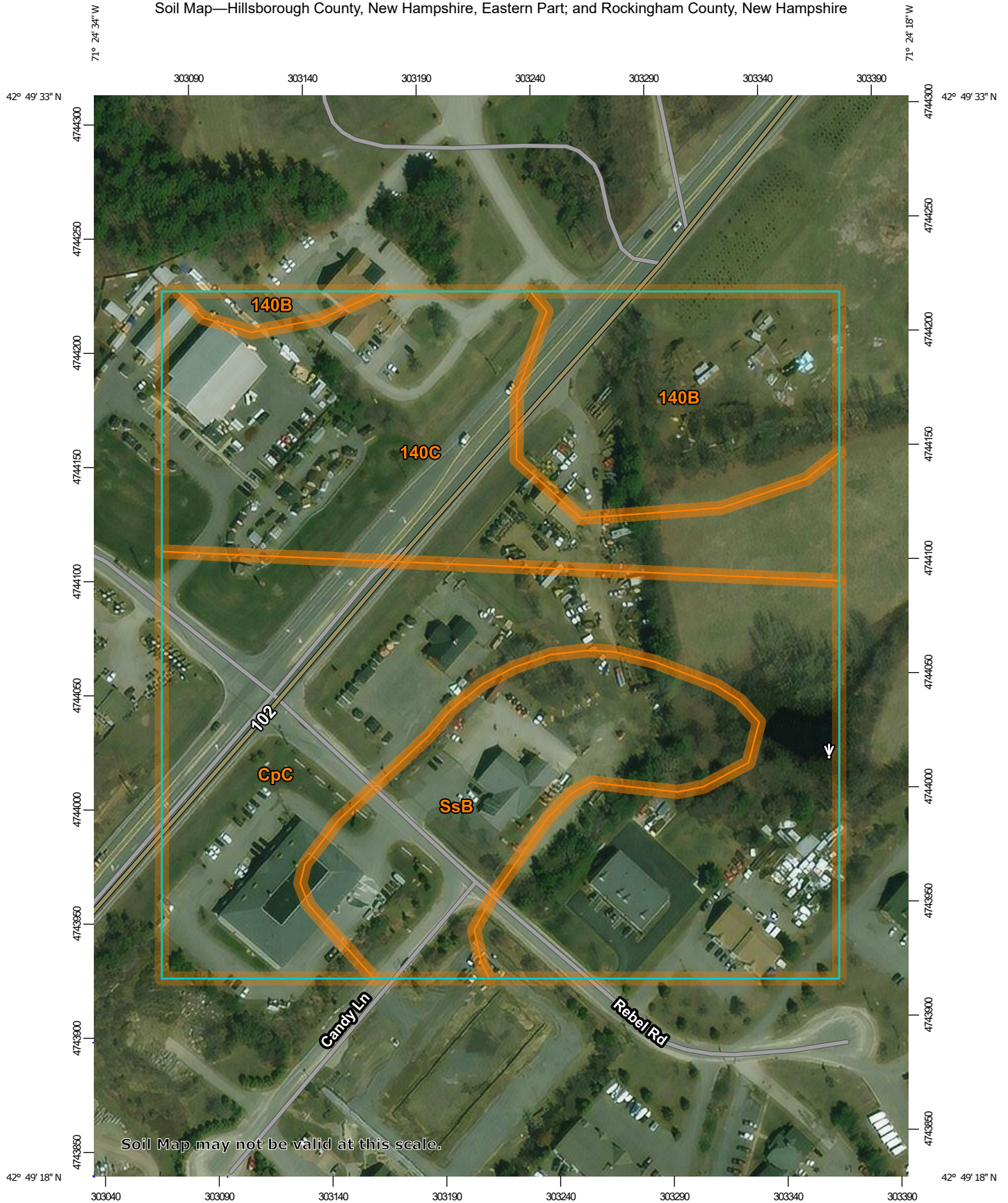
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link B: EASTERN ABUTTER**

Inflow Area = 1.440 ac, 45.52% Impervious, Inflow Depth > 4.43" for 50-YEAR event  
 Inflow = 3.47 cfs @ 12.36 hrs, Volume= 0.531 af  
 Primary = 3.47 cfs @ 12.36 hrs, Volume= 0.531 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Soil Map—Hillsborough County, New Hampshire, Eastern Part; and Rockingham County, New Hampshire



Map Scale: 1:2,310 if printed on A portrait (8.5" x 11") sheet.



0 30 60 120 180 Meters

0 100 200 400 600 Feet

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



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

4/12/2021  
Page 1 of 4





## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

**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 22, May 29, 2020

Soil Survey Area: Rockingham County, New Hampshire

Survey Area Data: Version 22, May 29, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Jun 1, 2014—Jun 26, 2016

## MAP LEGEND

## MAP INFORMATION

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CpC	Chatfield-Hollis-Canton complex, 8 to 15 percent slopes	9.9	44.6%
SsB	Scituate fine sandy loam, 3 to 8 percent slopes	3.4	15.4%
<b>Subtotals for Soil Survey Area</b>		<b>13.3</b>	<b>60.0%</b>
<b>Totals for Area of Interest</b>		<b>22.2</b>	<b>100.0%</b>

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
140B	Chatfield-Hollis-Canton complex, 0 to 8 percent slopes, rocky	3.4	15.1%
140C	Chatfield-Hollis-Canton complex, 8 to 15 percent slopes, rocky	5.5	24.9%
<b>Subtotals for Soil Survey Area</b>		<b>8.9</b>	<b>40.0%</b>
<b>Totals for Area of Interest</b>		<b>22.2</b>	<b>100.0%</b>

# Extreme Precipitation Tables

## Northeast Regional Climate Center

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

<b>Smoothing</b>	Yes
<b>State</b>	New Hampshire
<b>Location</b>	
<b>Longitude</b>	71.408 degrees West
<b>Latitude</b>	42.824 degrees North
<b>Elevation</b>	0 feet
<b>Date/Time</b>	Tue, 13 Apr 2021 09:26:40 -0400

### Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
<b>1yr</b>	0.27	0.42	0.52	0.68	0.84	1.06	<b>1yr</b>	0.73	1.01	1.23	1.55	1.95	2.46	2.69	<b>1yr</b>	2.18	2.59	3.01	3.68	4.29	<b>1yr</b>
<b>2yr</b>	0.33	0.51	0.63	0.83	1.05	1.31	<b>2yr</b>	0.90	1.20	1.52	1.89	2.36	2.94	3.26	<b>2yr</b>	2.60	3.13	3.64	4.34	4.94	<b>2yr</b>
<b>5yr</b>	0.39	0.61	0.76	1.02	1.30	1.65	<b>5yr</b>	1.13	1.51	1.92	2.40	2.99	3.71	4.15	<b>5yr</b>	3.29	3.99	4.61	5.46	6.17	<b>5yr</b>
<b>10yr</b>	0.44	0.69	0.87	1.19	1.54	1.98	<b>10yr</b>	1.33	1.78	2.30	2.88	3.59	4.44	4.98	<b>10yr</b>	3.93	4.79	5.53	6.49	7.31	<b>10yr</b>
<b>25yr</b>	0.52	0.83	1.05	1.45	1.93	2.49	<b>25yr</b>	1.66	2.23	2.91	3.66	4.55	5.62	6.36	<b>25yr</b>	4.98	6.12	7.02	8.15	9.14	<b>25yr</b>
<b>50yr</b>	0.58	0.94	1.20	1.69	2.28	2.98	<b>50yr</b>	1.97	2.64	3.50	4.40	5.47	6.73	7.65	<b>50yr</b>	5.95	7.35	8.42	9.70	10.83	<b>50yr</b>
<b>100yr</b>	0.67	1.09	1.40	1.99	2.71	3.56	<b>100yr</b>	2.34	3.13	4.18	5.27	6.55	8.05	9.20	<b>100yr</b>	7.13	8.85	10.10	11.54	12.84	<b>100yr</b>
<b>200yr</b>	0.77	1.25	1.62	2.32	3.21	4.25	<b>200yr</b>	2.77	3.72	5.00	6.32	7.85	9.64	11.08	<b>200yr</b>	8.53	10.66	12.12	13.73	15.22	<b>200yr</b>
<b>500yr</b>	0.92	1.51	1.98	2.87	4.03	5.37	<b>500yr</b>	3.48	4.67	6.35	8.03	9.98	12.24	14.17	<b>500yr</b>	10.83	13.63	15.43	17.30	19.08	<b>500yr</b>

### Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
<b>1yr</b>	0.23	0.35	0.43	0.57	0.70	0.81	<b>1yr</b>	0.61	0.79	1.07	1.30	1.66	2.26	2.54	<b>1yr</b>	2.00	2.44	2.73	3.25	3.92	<b>1yr</b>
<b>2yr</b>	0.31	0.48	0.59	0.81	0.99	1.19	<b>2yr</b>	0.86	1.16	1.36	1.78	2.29	2.83	3.15	<b>2yr</b>	2.50	3.03	3.52	4.21	4.79	<b>2yr</b>
<b>5yr</b>	0.36	0.55	0.68	0.93	1.19	1.41	<b>5yr</b>	1.03	1.38	1.61	2.09	2.67	3.47	3.80	<b>5yr</b>	3.07	3.66	4.25	5.04	5.71	<b>5yr</b>
<b>10yr</b>	0.39	0.60	0.74	1.04	1.34	1.60	<b>10yr</b>	1.16	1.56	1.82	2.36	3.01	4.00	4.36	<b>10yr</b>	3.54	4.19	4.90	5.79	6.49	<b>10yr</b>
<b>25yr</b>	0.44	0.68	0.84	1.20	1.58	1.88	<b>25yr</b>	1.36	1.83	2.15	2.78	3.50	4.83	5.20	<b>25yr</b>	4.27	5.00	5.92	6.97	7.59	<b>25yr</b>
<b>50yr</b>	0.48	0.74	0.92	1.32	1.77	2.13	<b>50yr</b>	1.53	2.09	2.44	3.15	3.93	5.58	5.96	<b>50yr</b>	4.94	5.73	6.86	8.02	8.54	<b>50yr</b>
<b>100yr</b>	0.53	0.80	1.01	1.45	1.99	2.41	<b>100yr</b>	1.72	2.36	2.77	3.59	4.41	5.90	6.82	<b>100yr</b>	5.22	6.56	7.95	9.24	9.61	<b>100yr</b>
<b>200yr</b>	0.59	0.88	1.12	1.62	2.25	2.74	<b>200yr</b>	1.94	2.68	3.13	4.09	5.00	6.68	7.81	<b>200yr</b>	5.91	7.51	9.24	10.67	10.78	<b>200yr</b>
<b>500yr</b>	0.67	0.99	1.28	1.85	2.64	3.26	<b>500yr</b>	2.28	3.18	3.71	4.87	5.90	7.85	9.38	<b>500yr</b>	6.94	9.02	11.30	12.94	12.54	<b>500yr</b>

### Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
<b>1yr</b>	0.31	0.47	0.58	0.77	0.95	1.11	<b>1yr</b>	0.82	1.08	1.25	1.63	2.07	2.67	2.85	<b>1yr</b>	2.37	2.74	3.31	4.06	4.68	<b>1yr</b>
<b>2yr</b>	0.35	0.54	0.66	0.90	1.11	1.30	<b>2yr</b>	0.95	1.27	1.47	1.90	2.45	3.07	3.42	<b>2yr</b>	2.71	3.29	3.78	4.50	5.18	<b>2yr</b>
<b>5yr</b>	0.43	0.67	0.83	1.14	1.45	1.65	<b>5yr</b>	1.25	1.61	1.88	2.41	3.02	4.01	4.53	<b>5yr</b>	3.55	4.35	4.98	5.87	6.62	<b>5yr</b>
<b>10yr</b>	0.52	0.81	1.00	1.40	1.80	2.01	<b>10yr</b>	1.56	1.96	2.26	2.87	3.59	4.98	5.63	<b>10yr</b>	4.41	5.42	6.16	7.20	8.07	<b>10yr</b>
<b>25yr</b>	0.68	1.03	1.29	1.84	2.42	2.59	<b>25yr</b>	2.08	2.54	2.91	3.64	4.46	6.62	7.53	<b>25yr</b>	5.86	7.24	8.15	9.42	10.52	<b>25yr</b>
<b>50yr</b>	0.82	1.25	1.56	2.25	3.02	3.16	<b>50yr</b>	2.61	3.09	3.52	4.35	5.27	8.22	9.39	<b>50yr</b>	7.28	9.03	10.07	11.51	12.87	<b>50yr</b>
<b>100yr</b>	1.01	1.52	1.91	2.76	3.78	3.85	<b>100yr</b>	3.26	3.76	4.27	5.20	6.23	10.68	11.71	<b>100yr</b>	9.45	11.26	12.42	14.09	15.76	<b>100yr</b>
<b>200yr</b>	1.23	1.85	2.35	3.40	4.74	4.68	<b>200yr</b>	4.09	4.58	5.16	6.21	7.38	13.36	14.60	<b>200yr</b>	11.83	14.04	15.32	17.25	19.31	<b>200yr</b>
<b>500yr</b>	1.61	2.40	3.09	4.49	6.38	6.06	<b>500yr</b>	5.51	5.93	6.65	7.86	9.21	18.01	19.55	<b>500yr</b>	15.94	18.80	20.21	22.54	25.29	<b>500yr</b>



# **Inspection & Maintenance Manual**

## **Proposed Development – Bobcat of New Hampshire**

2 Rebel Road / 345 Derry Road / 307 Nashua Road, Hudson & Londonderry, NH  
July 21, 2021

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## Description of Project

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- This drainage analysis was performed to study the on-site stormwater runoff conditions for the proposed development located at 345 Derry Road in Hudson and 307 Nashua Road in Londonderry, New Hampshire.
- The scope of the proposed site work includes paving and reconfiguring the parking lot/access drives on Lot 101-18 as well as adding outdoor display and storage areas. Site work for Lot 101-19 includes two building additions with associated site improvements and outdoor display areas.
- The purpose of this analysis is to show the proposed drainage design meets the requirement for the post development flow being less than the predevelopment flow. As well as, to ensure proper efforts are taken to relieve existing treatment facilities from increased stormwater flows due to the proposed improvements.
- The drainage study compares pre-existing conditions to post-development conditions. There are two analysis points being analyzed: flow from the site to the Southern Abutter (Discharge Point A) and flow from the site to the Eastern Abutter (Discharge Point B).
- Currently, peak flows in every storm event are matched or reduced at Discharge Points A & B due to the improvements on site and the stormwater management system.

## **Responsible Party**

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Owner/Applicant: Bobcat of New Hampshire

Address: 2 Tracy Lane  
Hudson, NH 03051

## **Stormwater Practices – Schedule of Maintenance**

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The following practices shall be inspected twice annually; once following snow-melt (spring) and once following leaf-drop (fall):

- Filtration Basin
- Sediment Forebay
- Catch Basins/Drainage Manholes

The following practices shall be inspected annually following snow-melt (spring):

- Riprap Apron
- Grass Swale

An Inspection Checklist is provided on the following pages which outlines the critical components of the Facility Stormwater Management System. The Inspection Checklist shall be submitted to the Town of Hudson & Town of Londonderry for record annually.



## Stormwater Practices – Maintenance Guidelines

---

### **Treatment Practices**

(Inspected twice a year)

#### Filtration Basins

Maintenance Requirements:

- Inspection of infiltration components at least twice a year (spring and fall), and following any rainfall event exceeding 2.5 inches in a 24-hour period. If erosion has occurred, then measures shall be taken to stabilize and protect the affected area of the basin.
- Accumulated debris shall be removed from inlet and outlet structures and disposed of properly.
- Accumulated sediment and debris shall be removed from the basin and disposed of properly.
- Embankment shall be mowed periodically.
- Remove of woody vegetation from embankments.
- Inspect and repair embankments and basin with appropriate grass cover.
- If an infiltration system does not drain within 72-hours following a rainfall event, then a qualified professional should assess the condition of the facility to determine measures required to restore infiltration function, including but not limiting to removal of accumulated sediments or reconstruction of the infiltration trench.

### **Pretreatment Practices**

(Inspected twice a year)

#### Sediment Forebay

Maintenance Requirements:

- To be inspected at least twice annually, once following snow-melt and once following leaf-drop and cleaned as indicated by inspection.
- Conduct periodic mowing of embankments (two times per year) to control growth of woody vegetation on embankments.
- Remove debris from outlet structure.
- Remove and dispose of accumulated sediment.
- Install and maintain a staff gage or other measuring device to indicate depth of sediment accumulation and level at which clean-out is required. It shall be cleaned out when sediment fills half the sump depth. (minimum sump depth is 2 feet when clear)

### **Conveyance Practices**

(Inspected once a year)

#### Catch Basins

Maintenance Requirements:

- To be inspected at least twice annually, once following snow-melt and once following leaf-drop and cleaned as indicated by inspection.
- Sediment should be removed annually and when it approaches half the sump depth.
- Clean debris from grate.

- If floating hydrocarbons are observed during an inspection, the material should be removed immediately by skimming, absorbent materials, or other method and disposed in conformance with applicable state and federal regulations.

#### Drain Manhole

##### Maintenance Requirements:

- To be inspection a least twice annually, once following snow-melt and once following leaf-drop and cleaned as indicated by inspection.
- Sediment should be removed annually and when it approaches half the sump depth.
- If floating hydrocarbons are observed during an inspection, the material should be removed immediately by skimming, absorbent materials, or other method and disposed in conformance with applicable state and federal regulations.

#### Riprap Apron

##### Maintenance Requirements:

- Inspect annually for sediment accumulation, erosion and condition of surface lining.
- Inspect a least once annually for damage and deterioration.
- Repair damages immediately.

#### Grass Conveyance Swale

##### Maintenance Requirements:

- Grassed channels should be inspected annually for sediment accumulation, erosion and condition of surface lining.
- Repairs, including vegetation replacement, should be made based on inspection.
- Remove sediment and debris annually, or more frequently as warranted by inspection.
- Mow vegetated channels at least once a year to control establishment of woody vegetation. It is recommended to cut grass no shorter than 4 inches.







## Invasive Species Management

Actions shall be taken if any invasive species begin to grow in the stormwater management practices in accordance with Env-Wq 1507.08. An Invasive Species Management Plan (ISMP) will be required

If the presence of invasive species is noted, a management plan will be prepared to address the problem and will likely require the use of several techniques. Action will be taken immediately when an invasive species is noted. Delay will only make the problem more difficult to address properly. Monitoring for invasive species will be conducted throughout the construction period as part of the regular construction environmental monitoring and will continue after completion of construction

Monitoring and management measures for invasive species will also be part of the regular ongoing operations and management activities for the components of the stormwater management system.

Invasive plant species most likely to be a problem in the constructed in stormwater facilities may include Japanese barberry, purple loosestrife, common reed and European buckthorn. Each species will be addressed according to methods most likely to be effective in control of the species. Invasive species are broadly grouped as herbaceous and woody. Each will be address in accordance with the most effective methods.

# TEST PIT REPORT

for  
**SMT Rebel Road, LLC**  
Rebel Road  
Hudson, NH

## PREPARED FOR

Bobcat of NH  
17851.08

## PREPARED BY

TFMoran, Inc.  
48 Constitution Drive  
Bedford, NH 03110

July 14, 2021

**Test Pit #1          7/14/2021**

- 0-26"          Fill-2.5Y 5/1 Gray, Sandy Loam  
Subangular, Blocky, Friable mixed with  
2.5Y 4/3 Olive Brown Sandy Loam Weak  
Granular, Friable, 5% gravels
- 26-44"          Fill 2.5Y 4/2 Dark Grayish Brown, Sandy Loam  
5% gravels-angular, Weak, Subangular, Blocky  
Friable, angular and rounded cobbles, stones
- 44-96\*\*          Fill 2.5Y 5/2 Grayish Brown, Sandy Loam, Weak  
Subangular Blocky, Friable, firm in place
- 96-108"          Ab 10YR 5/4 Yellowish Brown, Sandy Loam,  
5% gravels-angular, Strong, Subangular, Blocky,  
Friable, firm in place.

ESHWT: None Obs @ 108"

Seeps: Observed at 72"

Roots: obs to 30"

No Refusal @ 108"

\*Note: Fill contained artifacts including building debris such as brick, lumber, plastics, and wire to a depth of 8 feet below grade





Civil Engineers  
Structural Engineers  
Traffic Engineers  
Land Surveyors  
Landscape Architects  
Scientists

## Field Observation Report

**Date:** July 14, 2021  
**To:** Jason Hill, P.E.  
**From:** Chris Danforth, CWS  
**Re:** Lot 101-19 Rebel Road, Hudson

---

As requested, three test pits were dug at the above referenced site to determine the composition of fills/subgrade in the paved areas of the existing lot. The included map indicates the test pit locations and excavations were made to a depth of approximately 3 feet. Soils observed were not select grade sand and gravel within three feet of the surface.

### TP#1

0-2" Asphalt

2-8" Gravelly Sandy Loam weak subangular blocky friable

8-32" Sandy Loam, Subangular, Blocky, Friable <5% gravels

### TP#2

0-2" Asphalt

2-36" Sandy Loam, subangular, Blocky, Slightly Firm,  
5% gravels, Large rocks and boulders observed

### TP#3

0-2" Asphalt

2-34" Sandy Loam, Subangular, Blocky, Friable,  
Firm in place. Seeps observed at 24" (likely the result of  
heavy recent rains and proximity to a drainage swale)



Civil Engineers  
Structural Engineers  
Traffic Engineers  
Land Surveyors  
Landscape Architects  
Scientists

### Amoozometer Field Data Sheet

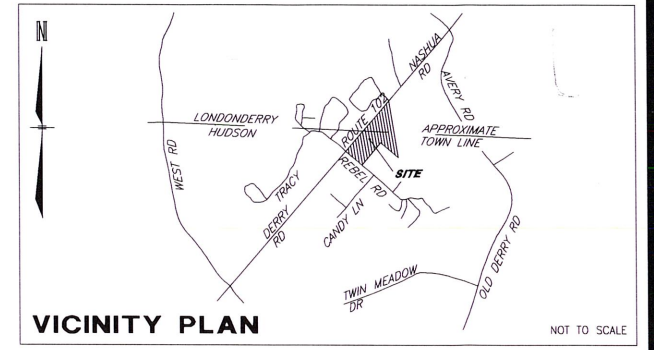
DATE: July 14, 2021		Project: 17851.08 Bobcat of NH	
LOCATION: Rebel Road, Hudson, NH		AIR TEMPERATURE:	75F
TEST BY: Chris Danforth			
SOIL MAP UNIT: Scituate Fine Sandy Loam 3-8% slopes (SsB)		NOTES: Test conducted in fill place at site. Approximate depth of fill is 8 feet.	
HORIZON: Filled Site			
DISTURBED SITE: Developed Commercial Property			
SOIL LOG RECORDED: <b>Test Pit #1</b>			
<b>SETUP CALCULATIONS</b>	Sample Round 1	Sample Round 2	Sample Round 3
D- Bottom of Hole to Ref line	40cm	39	39
H - DEPTH OF H2O IN HOLE	17.0cm	17.0cm	21.5cm
Coefficient A	0.000965	0.000965	0.000674
Test Depth Below Grade	24"	60"	60"

Amoozometer Data Calculation Sheet				Bobcat of NH 17851.08			7/14/2021	
TP#1							Ksat	Ksat
Drop in Water	Time	Min./hr.	Outflow C.F.	Outflow Q			(cm/hr)	(in/hr)
<b>Sample Set 1 Coefficient A = 0.000965 @24" BG</b>								
0.100	1	0.016667	20	120			0.11580	0.04559055
0.100	1	0.016667	20	120			0.11580	0.04559055
0.100	1	0.016667	20	120			0.11580	0.04559055
0.000	1	0.016667	20	0			0.00000	0
0.100	1	0.016667	20	120			0.11580	0.04559055
0.000	1	0.016667	20	0			0.00000	0
						Average	<b>0.07720</b>	<b>0.0303937</b>
						Stand Dev	0.059799	0.02038871
<b>Sample Set 2 Coefficient A = 0.000965 @ 60" BG</b>								
0.50	1	0.016667	20	600			0.57900	0.22795276
0.10	1	0.016667	20	120			0.11580	0.04559055
0.30	1	0.016667	20	360			0.34740	0.13677165
0.20	1	0.016667	20	240			0.23160	0.0911811
0.30	1	0.016667	20	360			0.34740	0.13677165
0.30	1	0.016667	20	360			0.34740	0.13677165
						Average	<b>0.32810</b>	<b>0.12917323</b>
						Stand Dev	0.15392	0.06059714
<b>Sample Set 3 Coefficient A = 0.000674 @ 60" BG</b>								
0.200	1	0.016667	20	240			0.16176	0.06368504
0.200	1	0.016667	20	240			0.16176	0.06368504
0.000	1	0.016667	20	0			0.00000	0
0.100	1	0.016667	20	120			0.08088	0.03184252
0.100	1	0.016667	20	120			0.08088	0.03184252
0.000	1	0.016667	20	0			0.00000	0
						Average	<b>0.08088</b>	<b>0.03184252</b>
						Stand Dev	0.072341	0.02848082
<b>NOTE: TESTS CONDUCTED IN PLACED FILL</b>								



### LEGEND

- CONCRETE BOUND FOUND
- GRANITE BOUND FOUND
- IRON PIPE
- IRON PIN
- DRILL HOLE
- EDGE OF PAVEMENT
- EDGE OF GRAVEL
- CHAIN LINK FENCE
- POST & RAIL PVC FENCE
- SIGN
- LIGHT POLE
- SEWER MANHOLE
- CATCH BASIN
- UTILITY POLE
- WELL
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- EDGE OF WETLAND
- STONEWALL
- TREELINE
- TREES
- DELINEATOR POST
- ELECTRIC METER
- MAILBOX
- BENCHMARK
- GUY WIRE
- SPOT GRADE



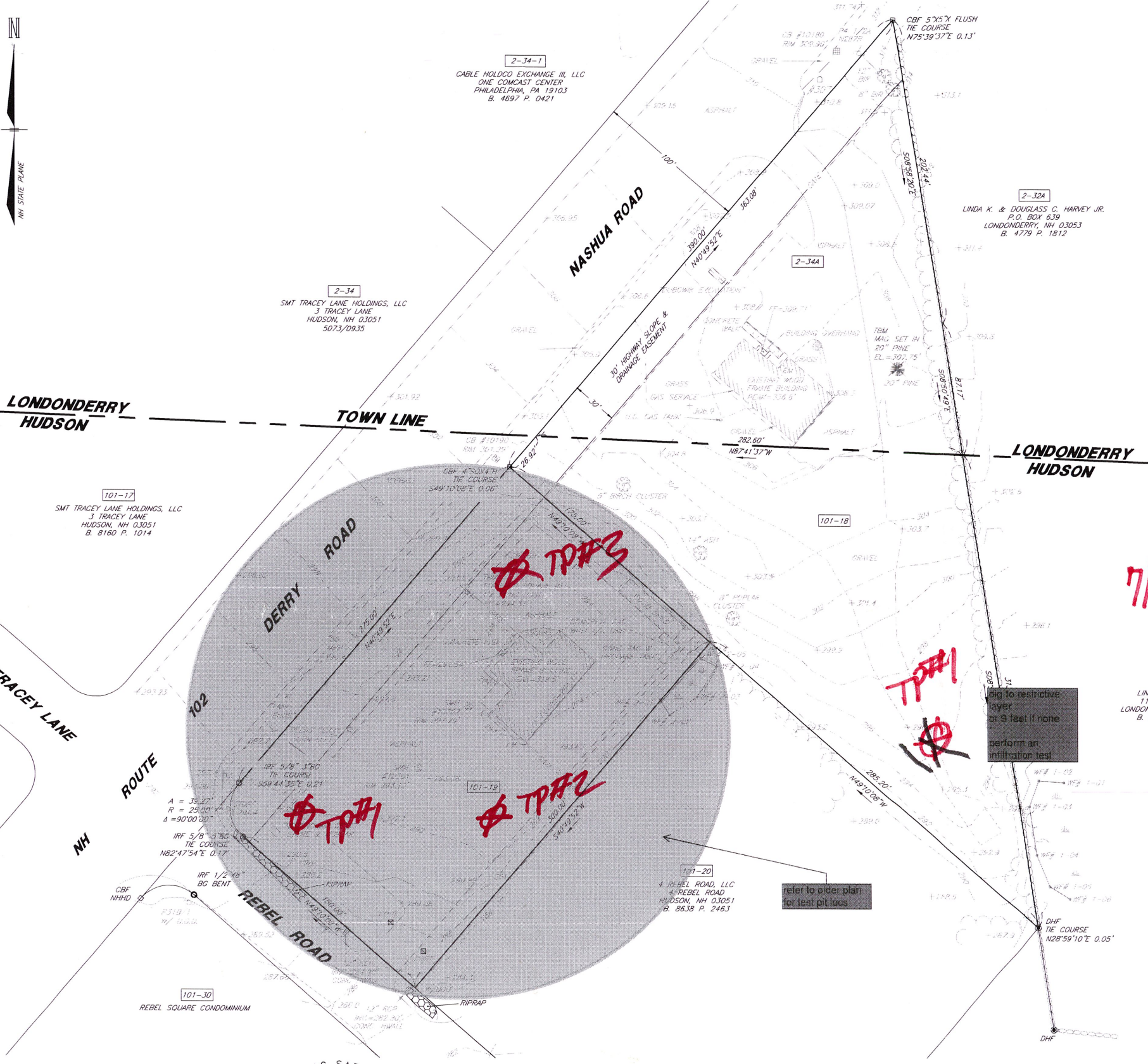
### REFERENCE PLAN

SUBDIVISION PLAN: MAP 42 LOT 7 LEE J. ALLARD ET. UX, NH ROUTE 102 HUDSON & LONDONDERRY, NH, 23 MARCH 1984 BY GEORGE F. KELLER INC. H.C.R.D. PLAN # 18102

### NOTES

1. OWNER OF RECORD OF MAP 2 LOT 34-A, MAP 101 LOT 18, MAP 101 LOT 19: SMT REBEL ROAD, LLC, 3 TRACEY LANE, HUDSON, NH 03051. DEED REFERENCE TO PARCELS IS BK. 6211 PG. 989 (R.C.R.D.), BK. 9399 PG. 972 (H.C.R.D.), BK. 8812 PG. 1401 (H.C.R.D.).
2. AREA OF LOT 2-34-A = 40,156 S.F.± OR 0.9219 ACRES±. AREA OF LOT 101-18 = 49,672 S.F.± OR 1.1403 ACRES±. AREA OF LOT 101-19 = 52,366 S.F.± OR 1.2022 ACRES±.
- 2-34-A INDICATES TAX MAP AND LOT NUMBER.
3. THE PURPOSE OF THIS PLAN IS TO SHOW EXISTING CONDITIONS OF LOTS 2-34-A, 101-18, 101-19.
4. CURRENT ZONING IS LONDONDERRY: COMMERCIAL 2 WITH ROUTE 102 PERFORMANCE DISTRICT OVERLAY. HUDSON: BUSINESS DISTRICT.
5. EXAMINATION OF THE FLOOD INSURANCE RATE MAP FOR HILLSBOROUGH AND ROCKINGHAM COUNTY, NEW HAMPSHIRE (ALL JURISDICTIONS), MAP NUMBER 330110050RD, EFFECTIVE DATE 9/25/2009 AND MAP NUMBER 330150050RE EFFECTIVE DATE 5/17/2005, INDICATES THAT THE SUBJECT PARCELS ARE NOT LOCATED WITHIN A SPECIAL FLOOD HAZARD AREA.
6. HORIZONTAL DATUM IS NEW HAMPSHIRE STATE PLANE, NAD 83/86. VERTICAL DATUM IS NAVD1988. BENCHMARKS SET AS NOTED.
7. EASEMENTS, RIGHTS, AND RESTRICTIONS SHOWN OR IDENTIFIED ARE THOSE WHICH WERE FOUND DURING RESEARCH PERFORMED AT THE HILLSBOROUGH AND ROCKINGHAM COUNTY REGISTRY OF DEEDS. OTHER RIGHTS, EASEMENTS, OR RESTRICTIONS MAY EXIST WHICH A TITLE EXAMINATION OF SUBJECT PARCEL(S) WOULD DETERMINE. BK. 3384 PG. 899 (H.C.R.D.), BK. 3476 PG. 336 (H.C.R.D.) NET&T CO. AND PSNH EASEMENT, BK. 5626 PG. 45 (H.C.R.D.) DEVELOPMENT AGREEMENT.
8. THE LOCATION OF ANY UNDERGROUND UTILITY INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE. IF MORAN INC. MAKES NO CLAIM TO THE ACCURACY OR COMPLETENESS OF UNDERGROUND UTILITIES SHOWN. PRIOR TO ANY EXCAVATION ON SITE THE CONTRACTOR SHALL CONTACT DIG SAFE AT 811.
9. TOWN LINE PER REFERENCE PLAN.

7/14/2024



### ADDITIONAL ABUTTERS:

- 101-21: MATTHEW E. MASON TRUST, LYNN A. MASON TRUSTEE, 13 CUTLER ROAD, LITCHFIELD, NH 03052, B. 8923 P. 2849
- 2-35: CABLE HOLDCO EXCHANGE III, LLC, ONE COMCAST CENTER, PHILADELPHIA, PA 19103, B. 4697 P. 1077

### CERTIFICATION

I HEREBY CERTIFY THAT THIS SURVEY AND PLAN WERE PREPARED BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND IS THE RESULT OF AN ACTUAL FIELD SURVEY MADE ON THE GROUND AND HAS AN ERROR OF CLOSURE OF GREATER ACCURACY THAN ONE PART IN TEN THOUSAND (1:10,000).

I CERTIFY THAT THIS SURVEY PLAN IS NOT A SUBDIVISION PURSUANT TO THIS TITLE AND THAT THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW WAYS ARE SHOWN. (RSA 676:18-10)

TAX MAP 2 LOT 34-A (LONDONDERRY)  
 TAX MAP 101 LOTS 17&18 (HUDSON)  
**EXISTING CONDITIONS PLAN**  
 NH ROUTE 102  
 HUDSON / LONDONDERRY, NH  
 OWNED BY  
**SMT REBEL ROAD, LLC**  
 PREPARED FOR  
**BOBCAT OF NH**      **JUNE 9, 2021**  
 SCALE: 1"=40'

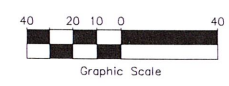
### WETLAND CERTIFICATION

JURISDICTIONAL WETLANDS SHOWN ON THIS PLAN WERE DELINEATED ON 2/9/21 BY CHRISTOPHER K. DANFORTH CWS #077. THE WETLANDS WERE DELINEATED ACCORDING TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL (1987) AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTH-CENTRAL AND NORTH-EAST REGION, VERSION 2, JANUARY 2012. DOMINANT HYDRIC SOILS WITHIN THE WETLAND(S) WERE IDENTIFIED USING "FIELD INDICATORS OF HYDRIC SOILS OF THE UNITED STATES" A GUIDE FOR IDENTIFYING AND DELINEATING HYDRIC SOILS, NRCS, VERSION 8.1, 2017. DOMINANCE OF HYDROPHYTIC VEGETATION WAS DETERMINED USING THE USACE NATIONAL WETLAND PLANT LIST, NWPL 2016 VERSION 3.3 HTTP://WETLAND\_PLANTS.USACE.ARMY.MIL.



CONTACT DIG SAFE 72 BUSINESS HOURS PRIOR TO CONSTRUCTION

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 This plan is not effective unless signed by a duly authorized officer of Thomas F. Moran, Inc.

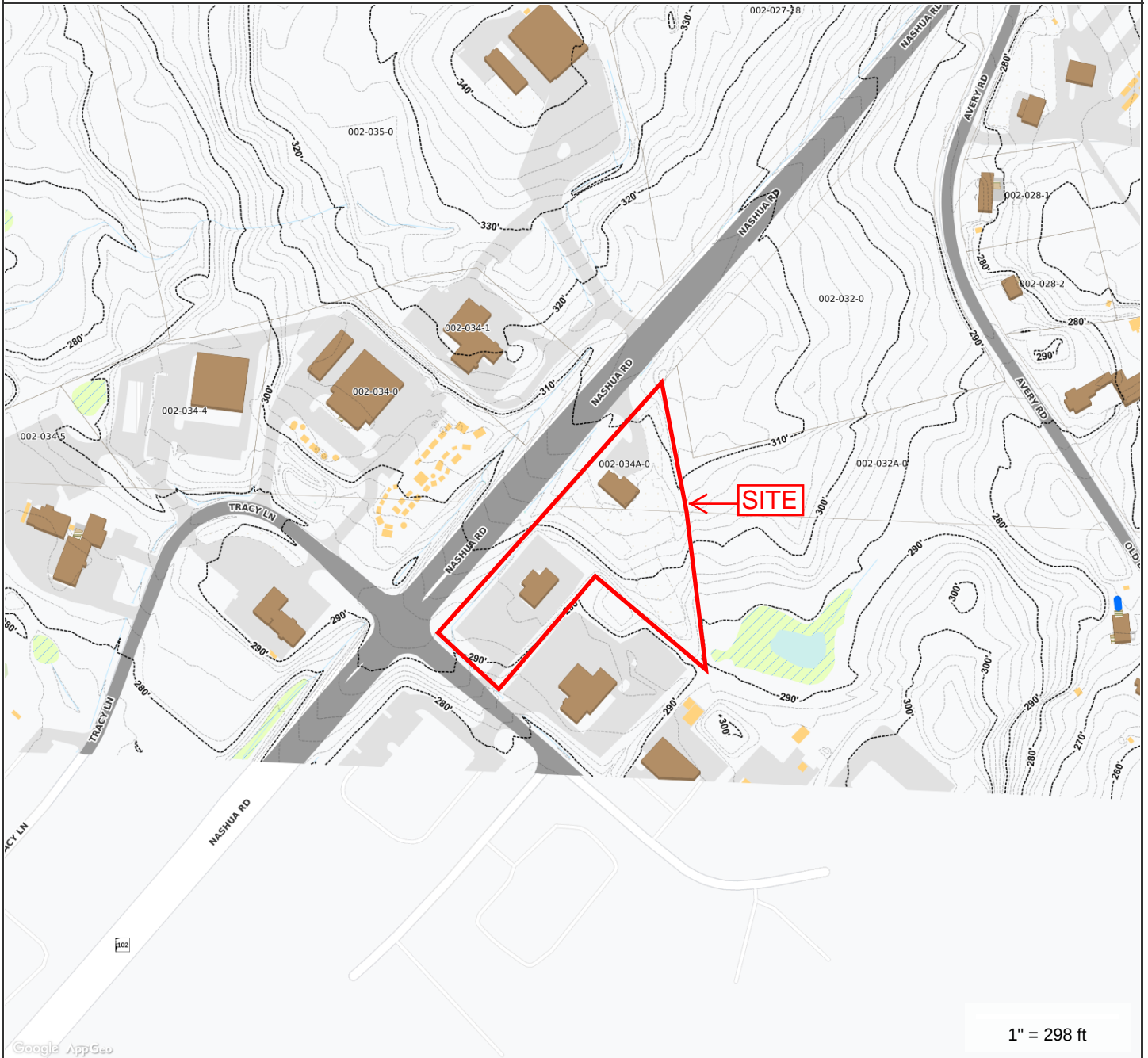


REV	DATE	DESCRIPTION	DR	CK

	Civil Engineers	48 CONSTITUTION DRIVE
	Structural Engineers	BEDFORD, NH 03110
	Traffic Engineers	PHONE (603) 472-4488
	Land Surveyors	FAX (603) 472-9747
	Landscape Architects	WWW.TFMORAN.COM
	Scientists	

FILE	17851.08	DR	AGL	FB	2177, 2178	SHEET 1 OF 1
CK	HGM	CADFILE	17851-08 SURVEY			

# USGS MAP - LONDONDERRY



## MAP FOR REFERENCE ONLY NOT A LEGAL DOCUMENT

Town of Londonderry, NH makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated 06/05/2020  
Data updated 06/05/2020

**RIPRAP CALCULATIONS**  
 Bobcat of New Hampshire  
 2 Rebel Road & 345 Derry Road / 307 Nashua Road  
 Hudson & Londonderry, NH  
 DATE: 8/11/2021

JN: 17851.08

OUTLET	Do (ft.)	Q25 (cfs)	Tw (ft.)	LENGTH (ft.)	WIDTH up (ft.)	WIDTH dn (ft.)	d50 (in.)*
HW-1	1.25	1.6	0.6	12.1	3.8	8.6	0.6

\*Note:6"min.

**Notes:**

- 1 Use NHDOT Class C Stone
- 2 Depth of Stone to be 12" min. or 1.5 times d50 - which ever is larger
- 3 Design storm: 25-year storm

Calculations

1. 'When  $Tw < 0.5Do$  at pipe outlet:  
 $La = 1.8Q/Do^{3/2} + 7Do$   
 $Wup = 3Do$   
 $Wdn = 3Do + La$   
 $d50 = (0.02Q^{4/3})/(TwDo)$

Where:  
 Tw is the tailwater depth at the outlet of the pipe or channel  
 Do is the diameter of the pipe or the width of channel  
 Q is the discharge from the pipe of channel  
 La is the length of apron  
 Wup is the upstream width of apron  
 Wdn is the downstream width of apron

2. When  $T_w \geq 0.5D_o$  at pipe outlet:  $d_{50}$  is the median stone diameter

$$L_a = \frac{3Q}{D_o^{3/2}} + 7D_o$$

$$W_{up} = 3D_o$$

$$W_{dn} = 3D_o + 0.4L_a$$

$$d_{50} = (0.02Q^{4/3}) / (T_w D_o)$$



## FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: \_\_\_\_\_

**Filtration Pond (Node 201P)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
1.34	ac	A = Area draining to the practice	
0.65	ac	$A_i$ = Impervious area draining to the practice	
0.49	decimal	l = Percent impervious area draining to the practice, in decimal form	
0.49	unitless	$R_v$ = Runoff coefficient = $0.05 + (0.9 \times l)$	
0.65	ac-in	WQV = 1" x $R_v$ x A	
2,366	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
592	cf	25% x WQV (check calc for sediment forebay volume)	
1,775	cf	75% x WQV (check calc for surface sand filter volume)	
Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
600	cf	$V_{SED}$ = Sediment forebay volume, if used for pretreatment	<b>≥ 25%WQV</b>
Calculate time to drain if system IS NOT underdrained:			
600	sf	$A_{SA}$ = Surface area of the practice	
5.00	iph	$K_{SAT_{DESIGN}}$ = Design infiltration rate <sup>1</sup>	
Yes	Yes/No	If $K_{SAT}$ (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
9.5	hours	$T_{DRAIN}$ = Drain time = $V / (A_{SA} * I_{DESIGN})$	<b>≤ 72-hrs</b>
Calculate time to drain if system IS underdrained:			
296.62	ft	$E_{WQV}$ = Elevation of WQV (attach stage-storage table)	
0.34	cfs	$Q_{WQV}$ = Discharge at the $E_{WQV}$ (attach stage-discharge table)	
3.87	hours	$T_{DRAIN}$ = Drain time = $2WQV/Q_{WQV}$	<b>≤ 72-hrs</b>
293.50	feet	$E_{FC}$ = Elevation of the bottom of the filter course material <sup>2</sup>	
292.25	feet	$E_{UD}$ = Invert elevation of the underdrain (UD), if applicable	
287.00	feet	$E_{SHWT}$ = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
287.00	feet	$E_{ROCK}$ = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.25	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	<b>≥ 1'</b>
6.50	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	<b>≥ 1'</b>
6.50	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	<b>≥ 1'</b>
298.61	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
298.70	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	<b>← yes</b>
<b>If a surface sand filter or underground sand filter is proposed:</b>			
YES	ac	Drainage Area check.	<b>&lt; 10 ac</b>
	cf	V = Volume of storage <sup>3</sup> (attach a stage-storage table)	<b>≥ 75%WQV</b>
	inches	$D_{FC}$ = Filter course thickness	<b>18", or 24" if within GPA</b>
Sheet		Note what sheet in the plan set contains the filter course specification.	
Yes/No		Access grate provided?	<b>← yes</b>

**If a bioretention area is proposed:**

YES	ac	Drainage Area no larger than 5 ac?	← yes
3,147	cf	V = Volume of storage <sup>3</sup> (attach a stage-storage table)	≥ WQV
18.0	inches	D <sub>FC</sub> = Filter course thickness	18", or 24" if within GPA
Sheet	C-11	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	> 3:1
Sheet	C-11	Note what sheet in the plan set contains the planting plans and surface cover	

**If porous pavement is proposed:**

		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A <sub>SA</sub> = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	≤ 5:1
	inches	D <sub>FC</sub> = Filter course thickness	12", or 18" if within GPA
Sheet		Note what sheet in the plan set contains the filter course spec.	mod. 304.1 (see spec)

1. Rate of the limiting layer (either the filter course or the underlying soil). K<sub>sat,design</sub> includes factor of safety. See Env-Wq 1504.14 for guidance on determining the infiltration rate.
2. See lines 34, 40 and 48 for required depths of filter media.
3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet structure, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes: \_\_\_\_\_

Volume of Storage Calculations: \_\_\_\_\_

Storage Above Filter (but below the invert of the outlet structure) = 1,647 cf

Filter Media Storage = 600 Sf (surface area of bottom of pond) x 18" (filter media thickness) = 900 cf

Pretreatment Area Storage (Forebay) = 600 cf

Total Volume = 1,647 cf + 900 cf + 600 cf = 3,147 cf

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**17851.08\_POST-DEVELOPMENT**

Type III 24-hr 2-YEAR Rainfall=2.94"

Prepared by TFMoran, Inc.

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**Stage-Area-Storage for Pond 201P: FILTRATION POND**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
293.00	0	0	298.30	3,440	7,106
293.10	0	0	298.40	3,520	7,454
293.20	0	0	298.50	3,600	7,810
293.30	0	0	298.60	3,680	8,174
293.40	0	0	298.70	<b>3,760</b>	<b>8,546</b>
293.50	0	0			
293.60	0	0			
293.70	0	0			
293.80	0	0			
293.90	0	0			
294.00	0	0			
294.10	0	0			
294.20	0	0			
294.30	0	0			
294.40	0	0			
294.50	0	0			
294.60	0	0			
294.70	0	0			
294.80	0	0			
294.90	0	0			
295.00	600	0			
295.10	714	66			
295.20	828	143			
295.30	942	231			
295.40	1,056	331			
295.50	1,170	443			
295.60	1,284	565			
295.70	1,398	699			
295.80	1,512	845			
295.90	1,626	1,002			
296.00	1,740	1,170			
296.10	1,813	1,348			
296.20	1,886	1,533			
<b>296.30</b>	<b>1,959</b>	<b>1,725</b>			
296.40	2,032	1,924			
296.50	2,105	2,131			
296.60	2,178	2,345			
296.70	2,251	2,567			
296.80	2,324	2,796			
296.90	2,397	3,032			
297.00	2,470	3,275			
297.10	2,543	3,526			
297.20	2,616	3,784			
297.30	2,689	4,049			
297.40	2,762	4,321			
297.50	2,835	4,601			
297.60	2,908	4,888			
297.70	2,981	5,183			
297.80	3,054	5,485			
297.90	3,127	5,794			
298.00	3,200	6,110			
298.10	3,280	6,434			
298.20	3,360	6,766			