ENGINEER'S REPORT

FOR

RURAL OUTREACH CENTER

730 OLEAN ROAD
EAST AURORA, NY 14052

Prepared for:
Fontanese Folts Aubrecht Ernst Architects PC
6395 West Quaker Street
Orchard Park, NY 14127

Prepared by:
C&S ENGINEERS, INC.
141 Elm Street, Suite 100
Buffalo, NY 14203

May 14, 2021

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A. GENERAL

1. Existing Site Conditions:

The project site is located at 730 Olean Road, in the Town of Aurora, New York. The site is situated on a 7.20+/- acre parcel and consists of an existing metal clad trailer/building, a storage shed, an asphalt paved parking lot for 6 vehicles, a gravel drive and lawn areas along the front of the parcel. The remainder of the site is heavily wooded. The site generally slopes in a southwesterly direction and consists of three drainage areas, a northern drainage area, a central drainage area and a southern drainage area. The northern drainage area consists mostly of wooded areas (trees and light underbrush). Stormwater runoff from the northern drainage area flows toward the existing property to the north/west. The central drainage area consists of the majority of the wooded area, along with the existing metal clad trailer/building, storage shed, asphalt parking lot and gravel drive. Stormwater runoff from the central drainage area flows overland to the existing ditch along Olean Road. The southern drainage area consists mostly of wooded areas. Stormwater runoff from the southern drainage area flows onto the adjacent property to the south.

The soils on the site, according to the United State Department of Agriculture's National Resources Conservation Service are Orpark silt loam (OrC) and Rhinebeck gravelly loam (RkB), which are both listed as Hydrologic Soil HSG "C/D". For dual hydrologic group soils, the first letter is for drained areas and the second is for undrained areas. Only soils that in their natural condition are in group D are assigned to dual classes.

2. Proposed Site Conditions:

Development will consist of removal of the existing metal clad trailer/building and storage shed and demolition of the existing asphalt paved parking lot and gravel drive to accommodate the construction of a single-story, 9,738 s.f. building along with site improvements. Site improvements include two asphalt paved parking lots to accommodate 60 parking spaces including 3 handicap accessible parking spaces, at concrete sidewalks, a stormwater detention basin, two bio-retention basins, a new septic system, new domestic and fire protection water services and site landscaping.

Upon completion, the proposed project will add 0.78 acres of new impervious cover and 0.43 acres of reconstructed impervious area. The total anticipated ground disturbance during construction of this project will be approximately 3.90 acres. Due to the increase in impervious areas, stormwater detention is required. Additionally, since the construction of this site will disturb more than one acre, a Storm Water Pollution Prevention Plan (SWPPP), in accordance with the New York State Department of Environmental Conservation (NYSDEC) standards will be prepared and a NOI (Notice of Intent) will be filed prior to beginning construction.

B. PROPOSED FACILITIES

1. Stormwater Management

a. Stormwater Conveyance

Under proposed conditions, stormwater runoff will continue to follow the existing drainage patterns. Stormwater runoff from the new building will be collected and treated within a bioretention basin and then piped to the stormwater detention basin. Stormwater runoff from the asphalt paved parking lots will be collected and treated within a bioretention basin located between the two parking lots and then piped to the stormwater detention basin. Stormwater runoff from the access drive and lawn areas will be collected and conveyed to the stormwater detention basin. Discharge from the stormwater detention basin will be conveyed to the existing roadside drainage ditch along Olean Road. Stormwater runoff from the upstream, undisturbed areas of the site will be routed around the site, within drainage swales, and conveyed to the existing roadside drainage ditch along Olean Road.

b. Quantity Control

New York State Department of Environmental Conservation regulations require design of stormwater detention facilities to limit the peak discharge produced by the 10-year and 100-year storm events to the pre-developed runoff rates, as well as provide extended detention of the 1-YR, 24-HR storm event (channel protection volume).

As mentioned above, stormwater runoff from the new building as well as the two parking lots will be conveyed to a stormwater detention basin. The stormwater detention basin has been sized for future site improvements that includes a 4,480 s.f. stand-alone building. Stormwater discharge from the detention basin is limited by a control structure that consists of a 12-inch diameter HDPE inlet pipe, a 7.4-inch orifice, a 4-foot long sharp crested weir and an 18-inch diameter HDPE outlet pipe.

The channel protection volume (CPv) requirement is relaxed for redevelopment projects with an increase in impervious area. The post development 1-YR storm event discharge rate will be less than the pre-development 1-YR storm event discharge rate.

The stormwater detention calculations were completed using HYDROCAD, version 10 software. Following is a summary of the pre and post development discharge rates and associated detention volumes and water surface elevations:

Discharge to Olean Road Drainage Ditch:

Storm Event	Pre-Development Discharge (cfs)	Post-Development Discharge (cfs)	Detention Volume (cf)	Water Surface Elevation (feet)
1-YR	2.65	2.63	1,181	885.79
10-YR	8.55	8.41	4,564	886.73
100-YR	20.37	20.25	8,164	887.36

Discharge to South:

Storm Event	Pre-Development Discharge (cfs)	Post-Development Discharge (cfs)
1-YR	0.13	0.12
10-YR	0.52	0.49
100-YR	1.36	1.29

Quality Control:

Chapters 3-5 of the NYSDEC Stormwater Management Design Manual (SMDM) provides a green infrastructure approach to stormwater management to reduce a site's impact on the aquatic ecosystem through the use of site planning techniques, runoff reduction techniques, and standard SMP's. Runoff Reduction Volume (RRv) is the reduction of the total Water Quality Volume (WQv) by application of green infrastructure techniques and SMP's to replicate pre-development hydrology.

The NYSDEC SMDM's intent is for projects to meet 100% of runoff reduction volume through the use of green infrastructure techniques. Projects that do not achieve runoff reduction to pre-construction condition must, at a minimum, provide the minimum RRv as well as provide the remaining WQv in standard SMPs.

Two (2) bio-retention facilities will be used to treat impervious areas on-site to offset the WQv and RRv required by the new impervious area and reconstructed impervious area from the total site disturbance area.

The minimum RRv requirement has been attained through the use of the bio-retention facilities. Additionally, the required water quality treatment volume will be provided in the bio-retention facilities. This project is considered a redevelopment project with an increase in impervious area. Therefore, per Chapter 9.2.1.B.II, a standard SMP will be used to treat 100% of the WQv from new impervious areas and 25% of the WQv from reconstructed impervious areas.

Below is a summary of the water quality volume and runoff reduction volumes attained on site:

Total Water Quality Volume Required (WQv): 3,061 cf
100% WQv req'd from new impervious area: 2,690 cf

25% WQv req'd from reconstructed impervious using standard SMP:	0.25(1,483 cf) = 371 cf
Minimum Runoff Reduction Volume Required (RRv, min)	**538 cf**

East Bioretention Basin:

WQ_v Required	2,000 cf
WQ_v Provided	1,200 cf
RR_v Provided	800 cf

(Standard SMP with Runoff Reduction Volume)
– due to HSG D soils, RRv = 40% WQv for bioretention basins

North Bioretention Basin:

WQ_v Required	1,228 cf
WQ_v Provided	737 cf
RR_v Provided	491 cf

(Standard SMP with Runoff Reduction Volume)
– due to HSG D soils, RRv = 40% WQv for bioretention basins

Total RRv Provided:	**1,291 cf**
Total WQv Provided (WQv provided + RRv provided):	**3,228 cf**

Stormwater calculations are included in Appendix B.

2. Sanitary Sewer

Public sewer is not available in the vicinity of the site. Currently, the existing metal clad trailer/building discharges to an existing holding tank which gets emptied periodically and when necessary.

A new sand filter and downstream absorption trench septic system has been designed for the site. As per Erie County Health Department and NYSDEC requirements, a 6-foot deep hole test was performed. The deep hole test confirmed that bedrock is greater than 30-inches below existing grade at the location of the proposed sand filter. (no bedrock was encountered at the depth of the deep hole tests, which terminated at 12 feet below existing grade). In conducting the percolation tests, one of the three perc tests failed (water elevation did not drop from presoak, after 24 hours). Accordingly, a sand filter system with downstream absorption trenches have been designed. Refer to Appendix C for the reports. The septic system will consist of a 1,500 gallon, septic tank and effluent pump to an intermittent sand filter with (8) 40 lf distribution lines followed by (6) 57 lf long downstream "modified" shallow absorption trenches. A design flow of 960 gal/day has been calculated based on the worst case sewer loading scenario. See septic calculations in Appendix C. The new septic system design will be submitted to the Erie County Health Department for their review and approval.

<u>Design Parameters –</u>

1) Hydraulic Loading Rate per "Design Standards for Intermediate Sized Wastewater Treatment Systems", 2014, NYSDEC.
2) Loading Rates:
   Church/multi-purpose = 2.4 gpd/seat (3 gpd/seat reduced by 20% w/using water saving plumbing fixtures)
   Office = 12 gpd/employee (15 gpd/employee reduced by 20% w/using water saving plumbing fixtures)
   Classroom = 8 gpd/seat (10 gpd/seat reduced by 20% w/using water saving plumbing fixtures)
   Kitchen/Banquet = 8 gpd/seat (10 gpd/seat reduced by 20% w/using water saving plumbing fixtures)
3) Facilities/employees:
   Offices = 14 full-time staff and 8 full-time visitors = 22 people
   Classrooms = 2 classrooms w/ 10 people/room = 20 people
   Church = 120 people total (including staff)
   Banquet = 120 people total (including staff)

4) Design Flow Scenarios:
   Scenario #1: continuation of existing counseling services (office and classrooms)
      Average daily flow = 100 gpd (per existing ECWA consumption records

   Scenario #2: Church Service
      Average daily flow = (120 people)(2.4 gpd/person) = 288 gpd

   Scenario #3: Banquet Event
      Average daily flow = (120 people)(8 gpd/person) = 960 gpd

   Use Average Daily Flow = 960 gpd

5) Peak Factor = 4.22
6) Peak Hourly Flow = (Average Daily Flow)(Peak Factor)
   = (960 gpd)(4.22) = 4,051 gpd = 5.6 gpm

3. Water System

The existing 8-inch watermain along Olean Road will be tapped off of with a 6-inch tapping sleeve and valve. The 6-inch water service will be split at the property line into a 6-inch CL52 ductile iron private fire service and a 3 inch CL52 ductile iron domestic water service. Both services will enter into a Hotbox Enclosure located near the northwest corner of the site to provide backflow protection requirements. The 6-inch private fire service will be backflow protected with a 4-inch Watts LF757 DCDA. The 3-inch domestic service will have a 2-inch Neptune T-10 meter and be backflow protected with a 2 ½-inch Watts LF957

RPZ. Both services will exit out of the Hotbox Enclosure and transition from ductile iron to AWWA C900 PVC (for private fire service) and AWWA C901 PE pipe (for domestic water service) and continue along the northern portion of the property, then enter into the building.

Design Criteria (Appendix D):

1)	Domestic Peak Operating Demand: (use 80 gpm per plumbing engineer's fixture unit calculations)	5.6 gpm
2)	Static Pressure in 8-inch watermain on Olean Road:	64 psi
3)	Residual Flow in 8-inch watermain on Olean Road:	1,138 gpm w/ 56 psi residual
4)	Friction Loss through 3-inch domestic service:	2.4 psi
5)	Friction Loss through fittings	1 psi
6)	Friction Loss due to elevation:	8.2 psi
7)	Friction Loss through 2-inch Neptune T-10 meter:	2.5 psi
8)	Friction Loss through 2 ½ -inch Watts LF957 RPZ:	10 psi
9)	Residual Pressure @ building for domestic service:	31.8 psi
Assuming 500 gpm fire flow required (per plumbing engineer):		
10)	Friction Loss through 6" fire service:	2.5 psi
11)	Friction Loss through fittings	1 psi
12)	Friction Loss due to elevation:	8.2 psi
13)	Friction Loss through 4-inch Watts LF757 DCDA	8 psi
14)	Residual Pressure @ bldg. for fire service with 500 gpm fire flow:	36.3 psi

(Static pressure, residual pressure and flow within the 8-inch watermain was provided by the Erie County Water Authority. Hydrant Flow Test was performed on 11/10/2009.)

Disinfection of water services following construction will be continuous feed, in accordance with AWWA C-651, latest revision requirements. Water demand calculations are included in Appendix D.

4. 100-YR Floodplain Information

The site is not located in a 100-year flood plain.

Respectfully Submitted,

C&S ENGINEERS, INC.

Jason Utzig, P.E.
Senior Project Engineer

APPENDIX A

SITE LOCATION MAP

Erie County On-Line Mapping Application

Legend

- Parcels
- Streets and Highways
  - Interstate
  - Primary State Road
  - Secondary State Road
  - County Road
  - Local Road

0 0.07 0.1 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
THIS MAP IS NOT TO BE USED FOR NAVIGATION

ERIE COUNTY
DEPARTMENT OF ENVIRONMENT & PLANNING
OFFICE OF GIS

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

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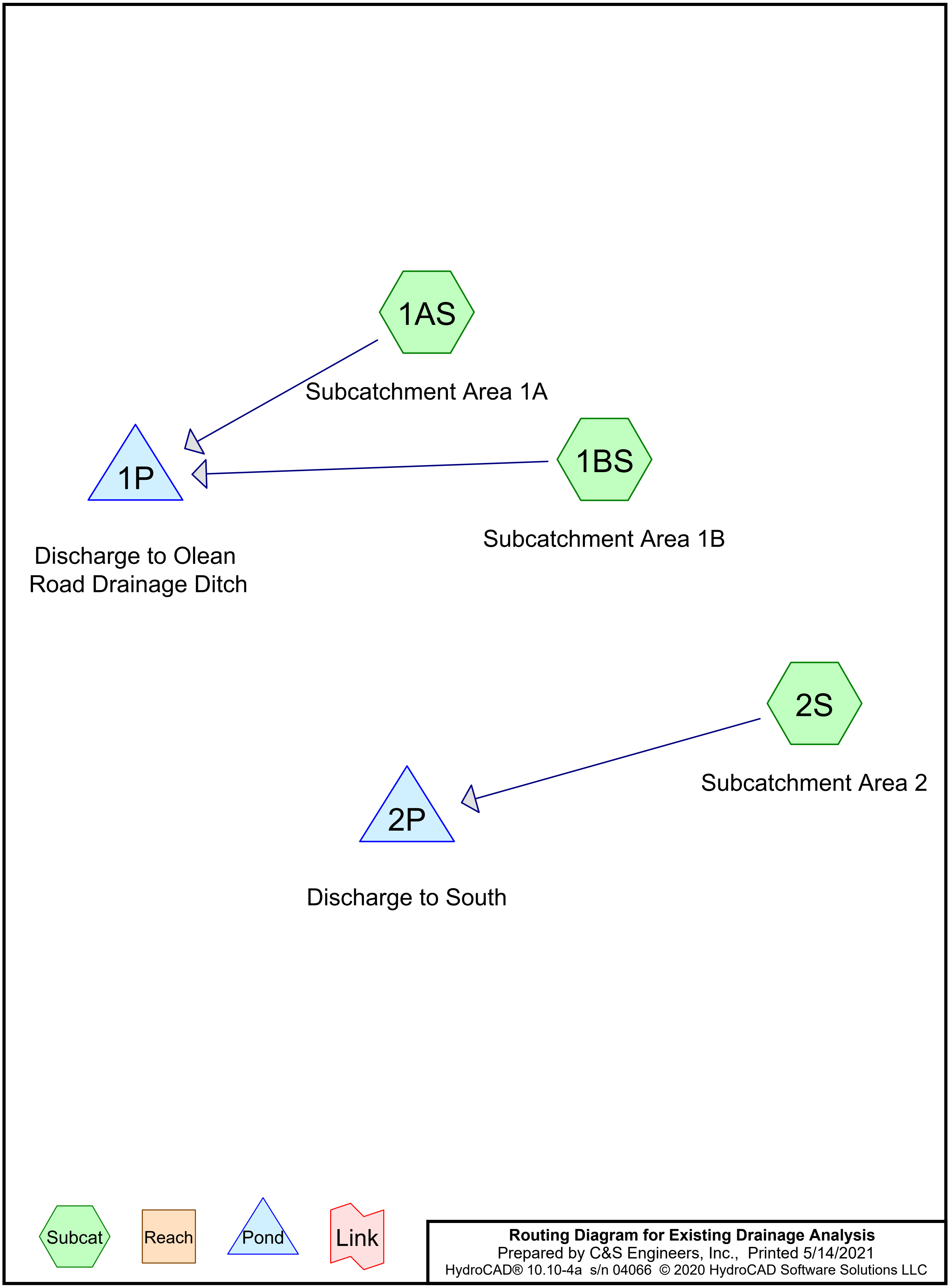
APPENDIX B

STORMWATER CALCULATIONS



Routing Diagram for Existing Drainage Analysis
Prepared by C&S Engineers, Inc., Printed 5/14/2021
HydroCAD® 10.10-4a s/n 04066 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1yr	Type II 24-hr		Default	24.00	1	1.88	2
2	10yr	Type II 24-hr		Default	24.00	1	3.15	2
3	100yr	Type II 24-hr		Default	24.00	1	5.25	2

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1BS	0.00	0.00	163.0	0.0500	0.025	12.0	0.0	0.0

Summary for Subcatchment 1AS: Subcatchment Area 1A

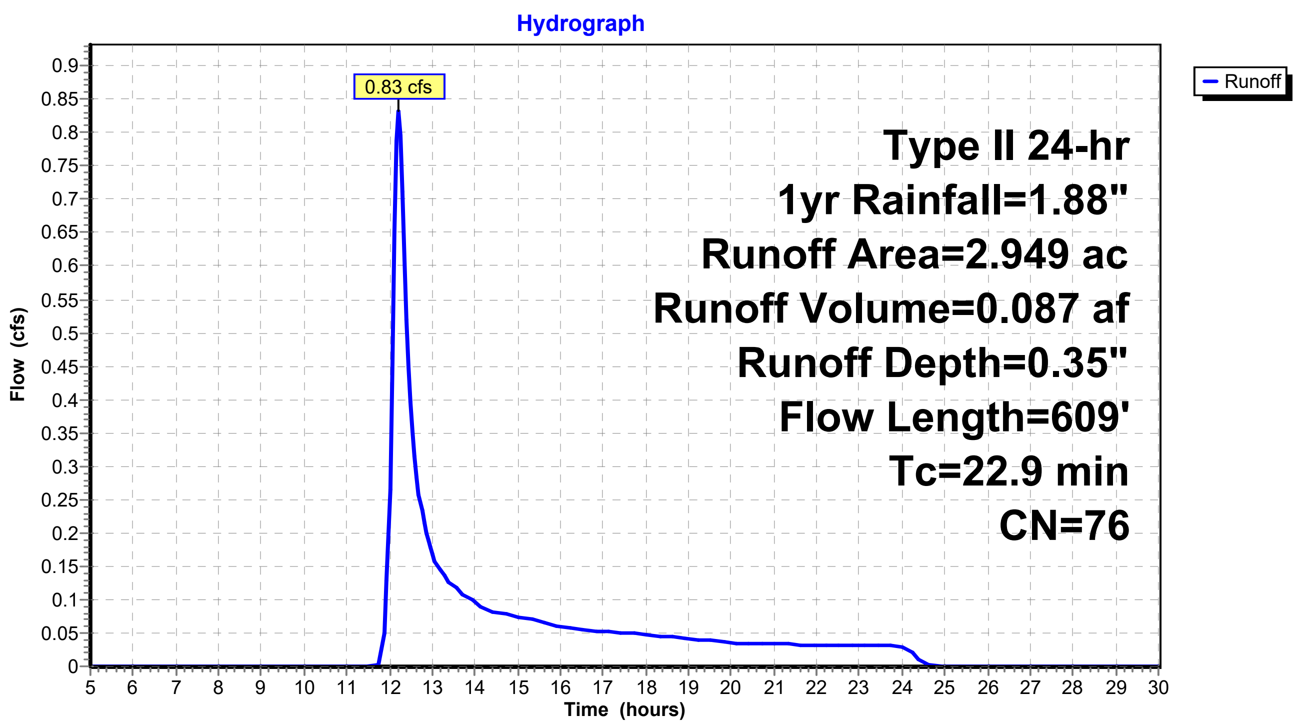
Runoff = 0.83 cfs @ 12.20 hrs, Volume= 0.087 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
2.042	77	Woods, Good, HSG D
0.907	73	Brush, Good, HSG D
2.949	76	Weighted Average
2.949		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	42	0.1607	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
9.3	58	0.0870	0.10		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 2.20"
3.4	232	0.0518	1.14		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
4.6	277	0.0405	1.01		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
22.9	609	Total			

Subcatchment 1AS: Subcatchment Area 1A



Summary for Subcatchment 1BS: Subcatchment Area 1B

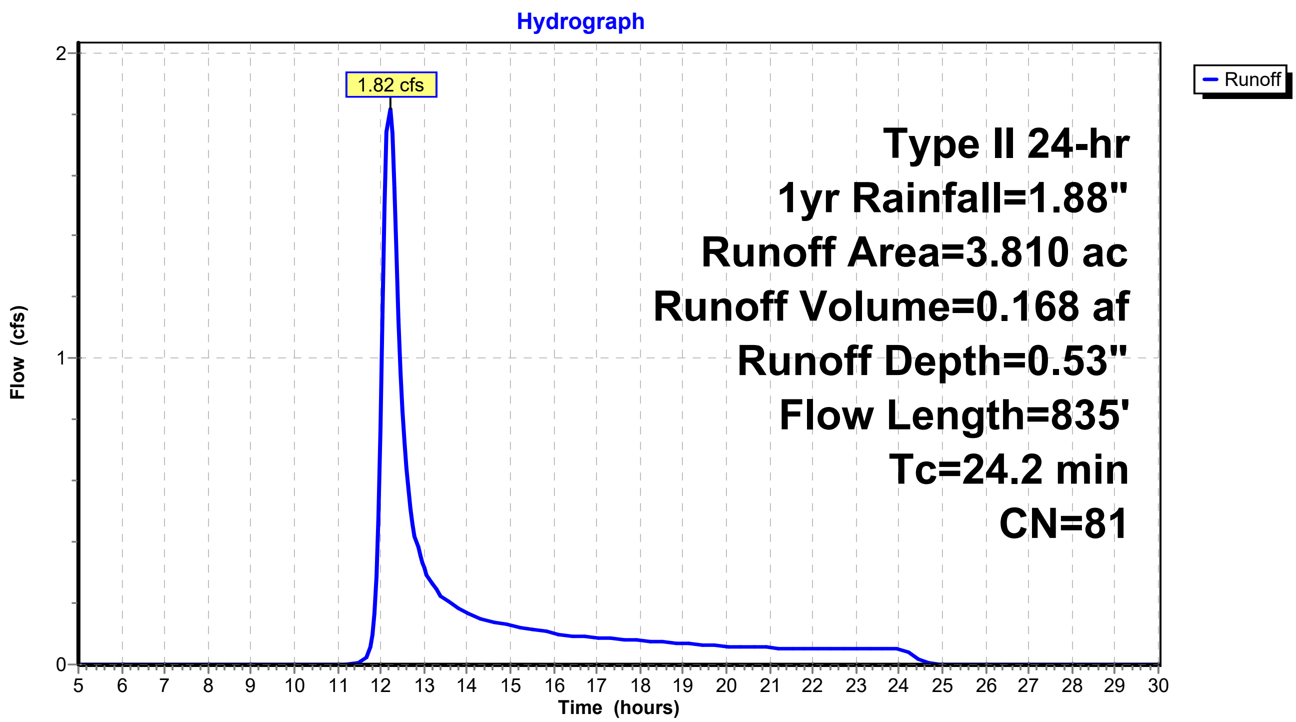
Runoff = 1.82 cfs @ 12.20 hrs, Volume= 0.168 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
1.880	77	Woods, Good, HSG D
0.429	98	Paved parking, HSG D
1.501	80	>75% Grass cover, Good, HSG D
3.810	81	Weighted Average
3.381		88.74% Pervious Area
0.429		11.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	100	0.0824	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
9.0	572	0.0448	1.06		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	163	0.0500	5.27	4.14	**Pipe Channel, CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
24.2	835	Total			

Subcatchment 1BS: Subcatchment Area 1B



Summary for Subcatchment 2S: Subcatchment Area 2

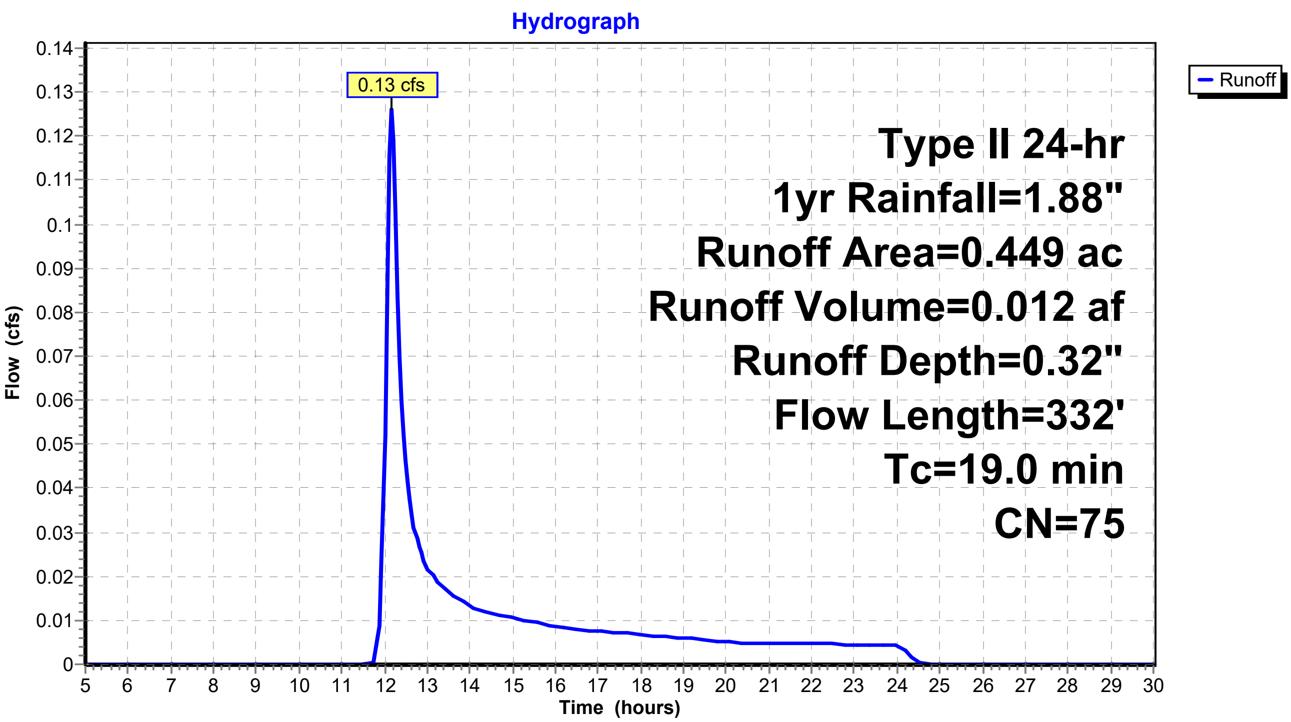
Runoff = 0.13 cfs @ 12.16 hrs, Volume= 0.012 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
0.234	77	Woods, Good, HSG D
0.215	73	Brush, Good, HSG D
0.449	75	Weighted Average
0.449		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0780	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
4.0	232	0.0377	0.97		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
19.0	332	Total			

Subcatchment 2S: Subcatchment Area 2



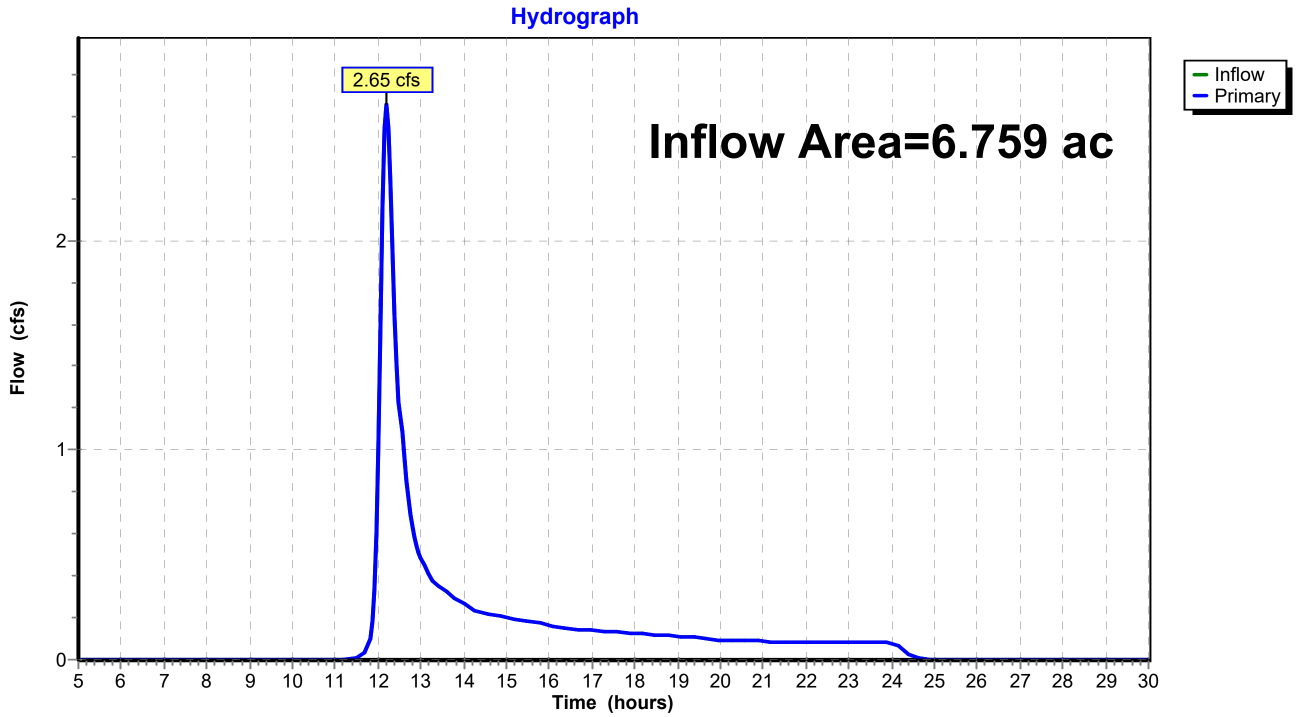
Summary for Pond 1P: Discharge to Olean Road Drainage Ditch

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

Inflow Area =	6.759 ac,	6.35% Impervious,	Inflow Depth = 0.45"	for 1yr event	
Inflow =	2.65 cfs @	12.20 hrs,	Volume=	0.255 af	
Primary =	2.65 cfs @	12.20 hrs,	Volume=	0.255 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Pond 1P: Discharge to Olean Road Drainage Ditch

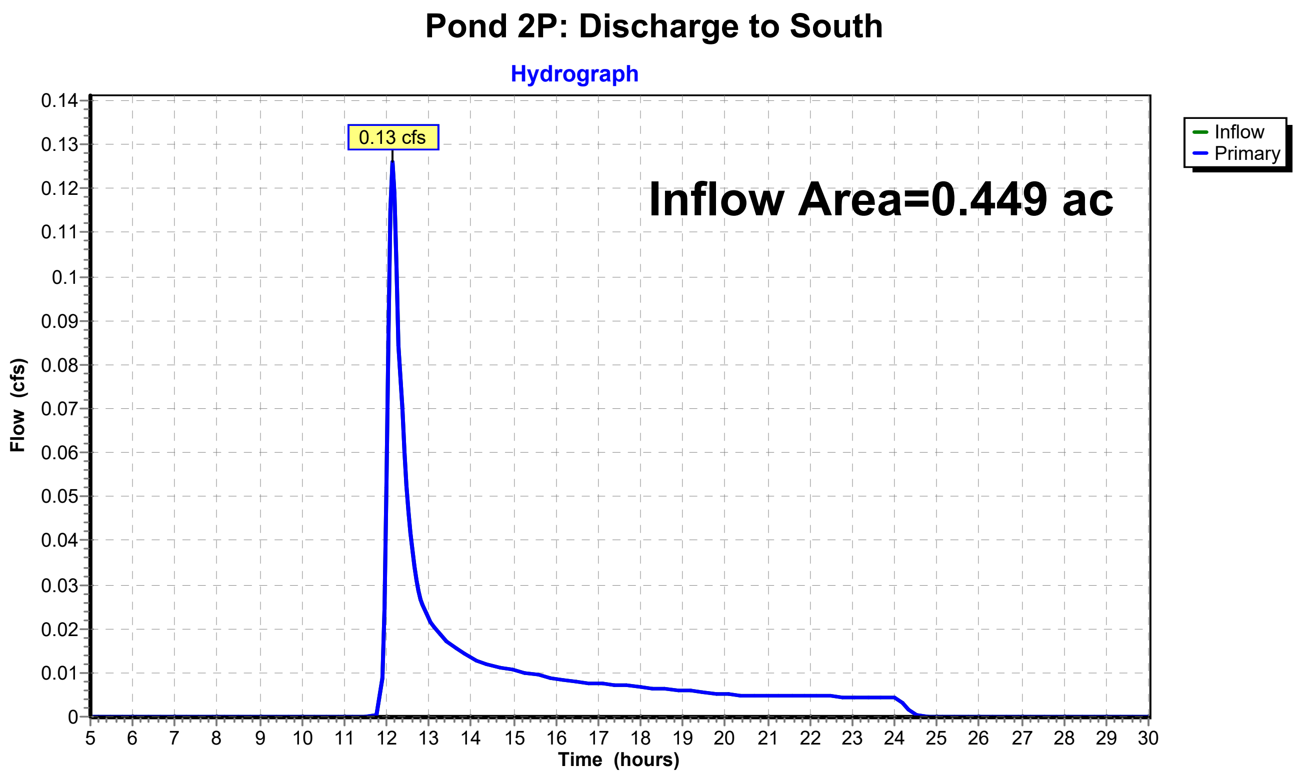


Summary for Pond 2P: Discharge to South

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

Inflow Area = 0.449 ac, 0.00% Impervious, Inflow Depth = 0.32" for 1yr event
Inflow = 0.13 cfs @ 12.16 hrs, Volume= 0.012 af
Primary = 0.13 cfs @ 12.16 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs



Summary for Subcatchment 1AS: Subcatchment Area 1A

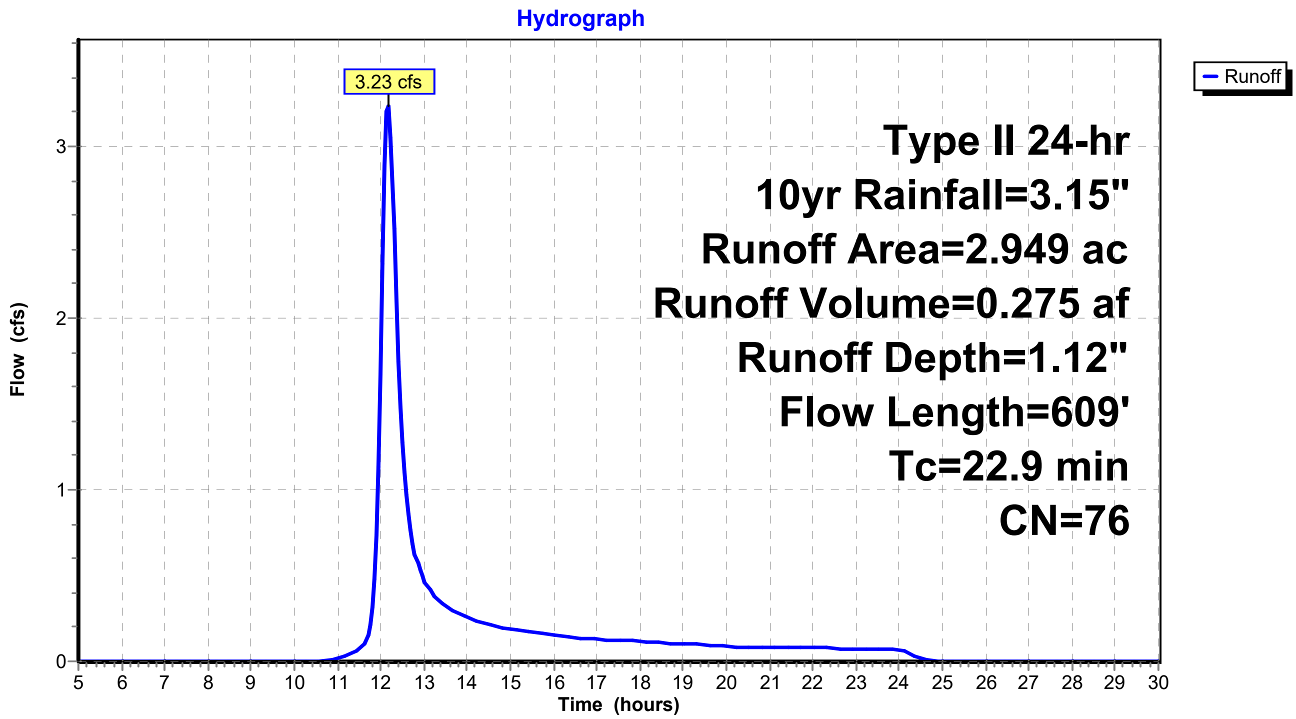
Runoff = 3.23 cfs @ 12.17 hrs, Volume= 0.275 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
2.042	77	Woods, Good, HSG D
0.907	73	Brush, Good, HSG D
2.949	76	Weighted Average
2.949		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	42	0.1607	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
9.3	58	0.0870	0.10		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 2.20"
3.4	232	0.0518	1.14		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
4.6	277	0.0405	1.01		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
22.9	609	Total			

Subcatchment 1AS: Subcatchment Area 1A



Summary for Subcatchment 1BS: Subcatchment Area 1B

[47] Hint: Peak is 129% of capacity of segment #3

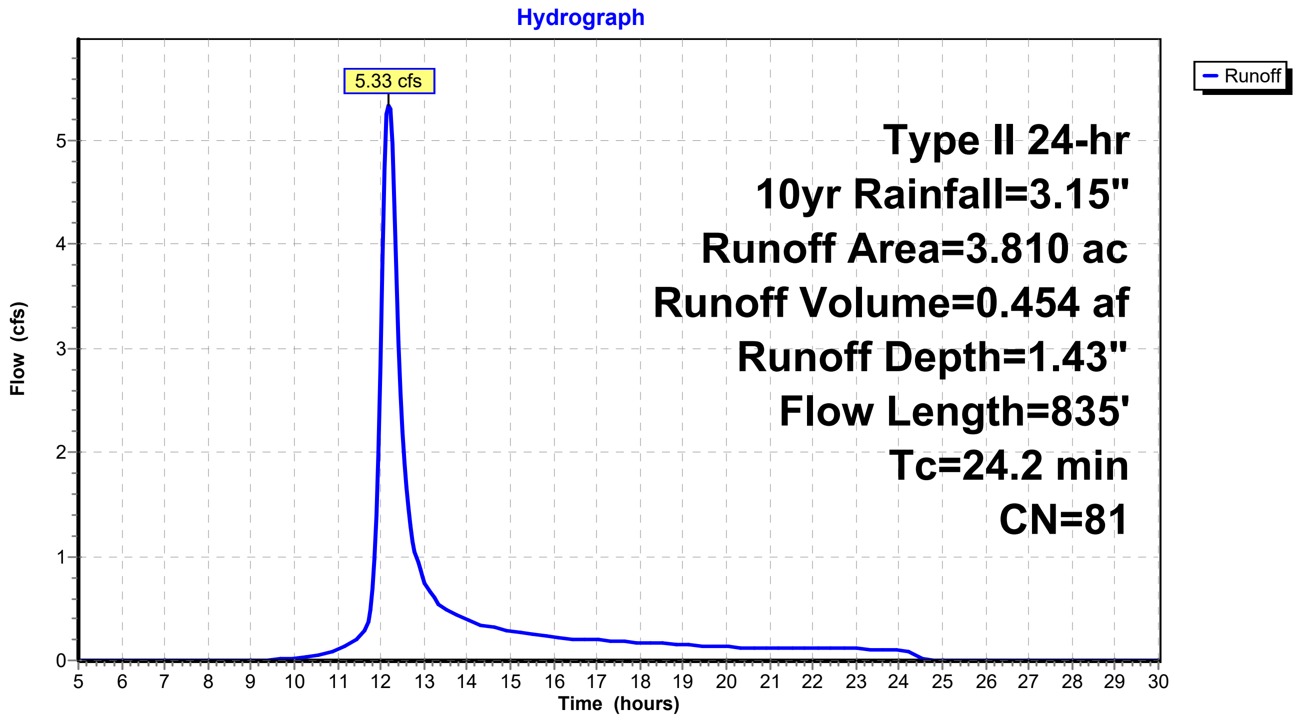
Runoff = 5.33 cfs @ 12.18 hrs, Volume= 0.454 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
1.880	77	Woods, Good, HSG D
0.429	98	Paved parking, HSG D
1.501	80	>75% Grass cover, Good, HSG D
3.810	81	Weighted Average
3.381		88.74% Pervious Area
0.429		11.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	100	0.0824	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
9.0	572	0.0448	1.06		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	163	0.0500	5.27	4.14	**Pipe Channel, CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
24.2	835	Total			

Subcatchment 1BS: Subcatchment Area 1B



Summary for Subcatchment 2S: Subcatchment Area 2

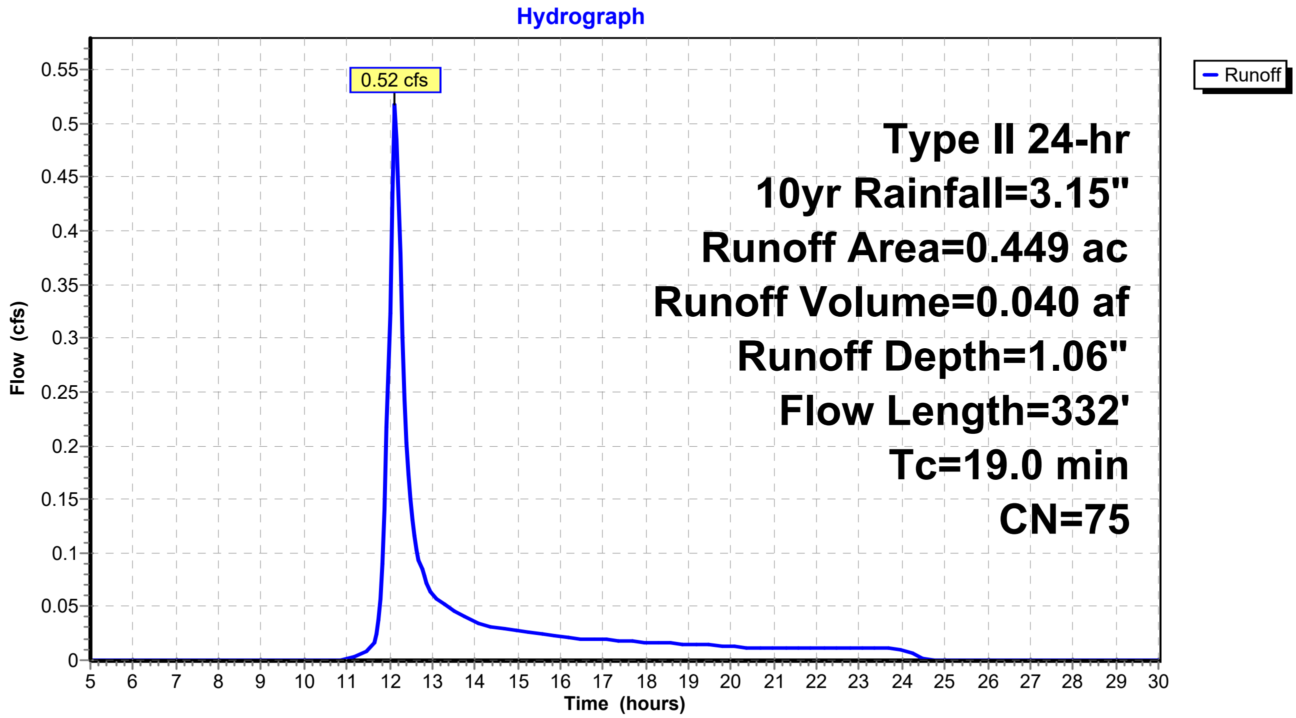
Runoff = 0.52 cfs @ 12.13 hrs, Volume= 0.040 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
0.234	77	Woods, Good, HSG D
0.215	73	Brush, Good, HSG D
0.449	75	Weighted Average
0.449		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0780	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
4.0	232	0.0377	0.97		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
19.0	332	Total			

Subcatchment 2S: Subcatchment Area 2



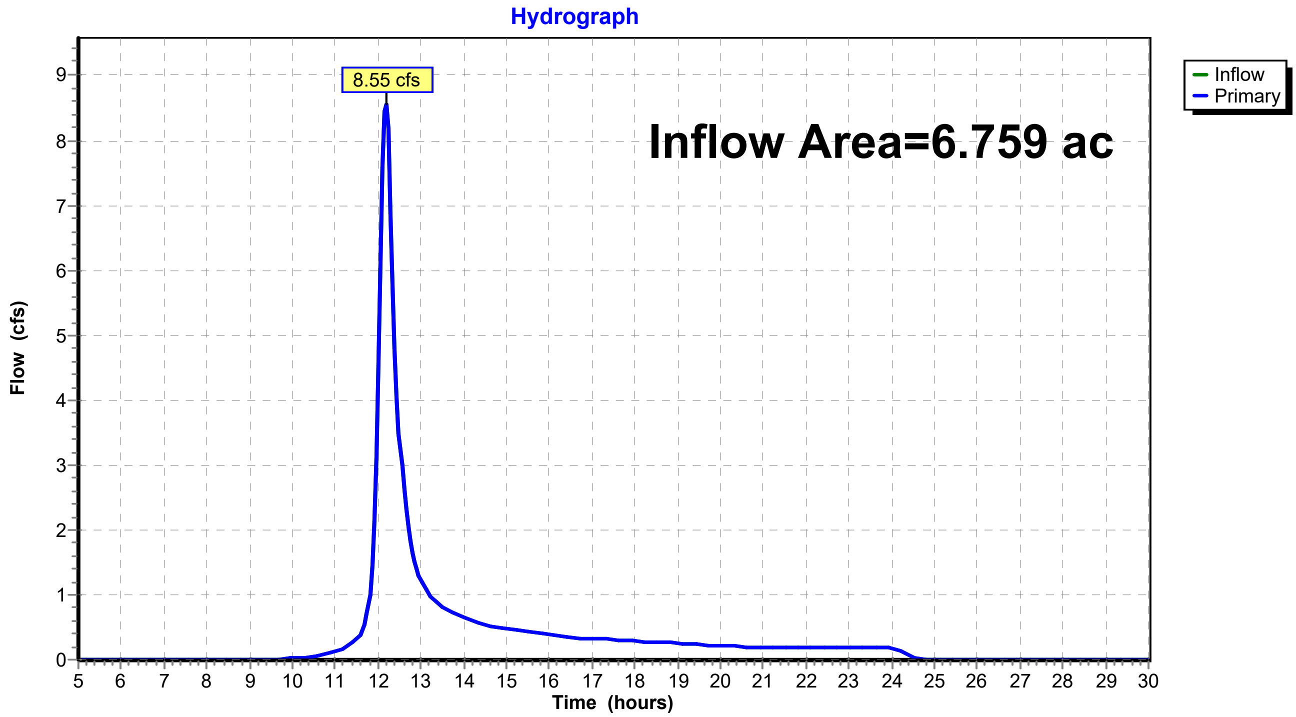
Summary for Pond 1P: Discharge to Olean Road Drainage Ditch

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

Inflow Area =	6.759 ac,	6.35% Impervious,	Inflow Depth = 1.29"	for 10yr event
Inflow =	8.55 cfs @	12.18 hrs,	Volume=	0.729 af
Primary =	8.55 cfs @	12.18 hrs,	Volume=	0.729 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Pond 1P: Discharge to Olean Road Drainage Ditch

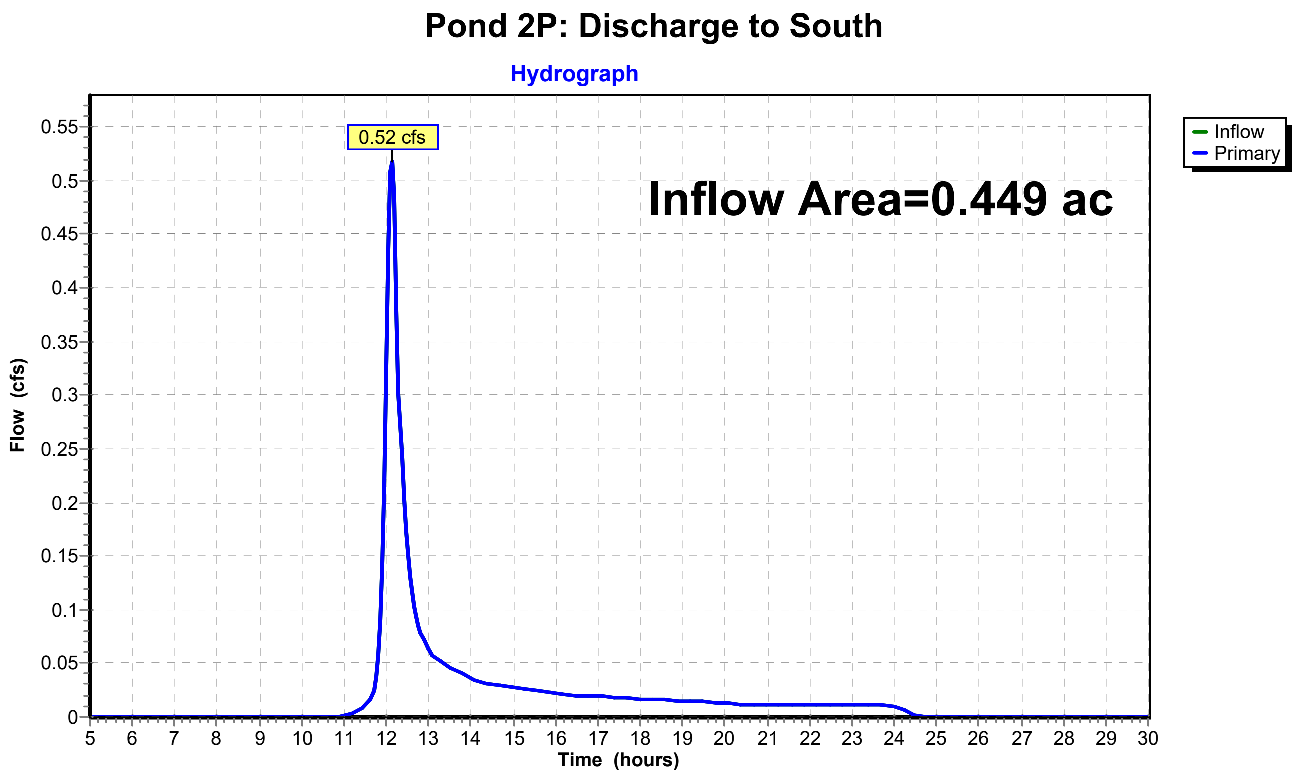


Summary for Pond 2P: Discharge to South

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

Inflow Area =	0.449 ac,	0.00% Impervious,	Inflow Depth = 1.06"	for 10yr event	
Inflow =	0.52 cfs @	12.13 hrs,	Volume=	0.040 af	
Primary =	0.52 cfs @	12.13 hrs,	Volume=	0.040 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs



Summary for Subcatchment 1AS: Subcatchment Area 1A

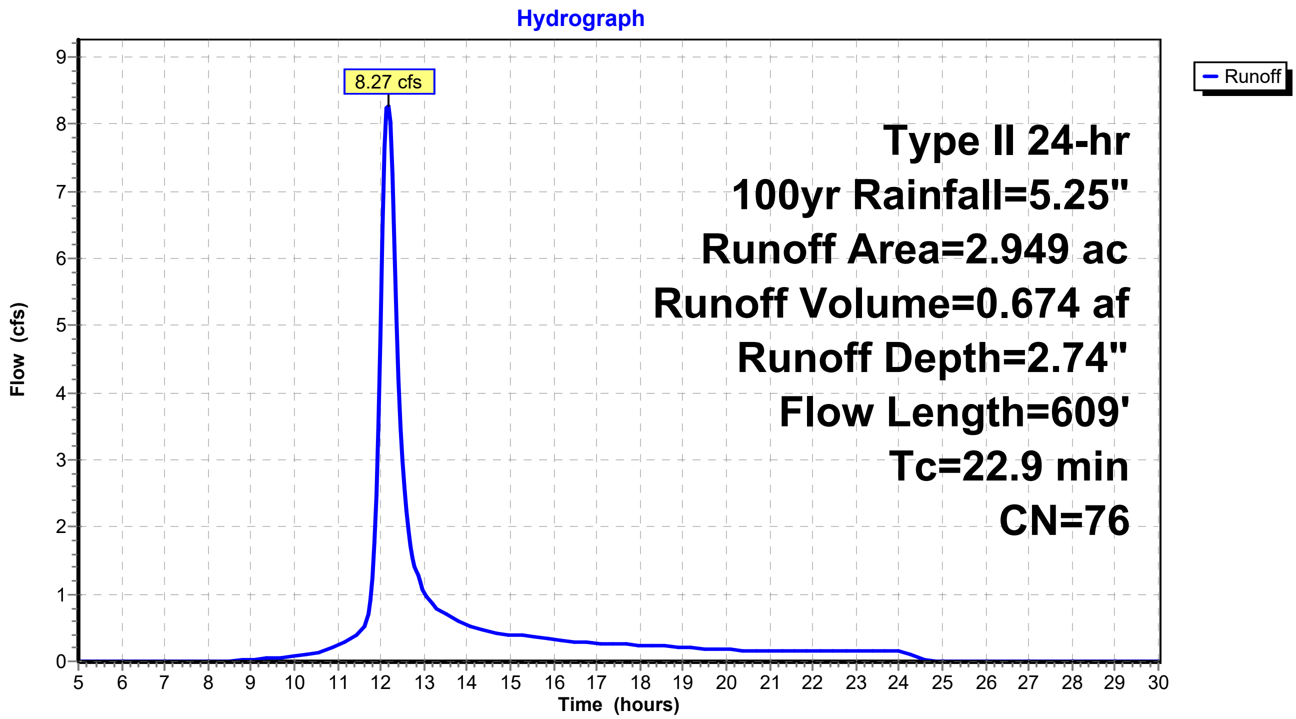
Runoff = 8.27 cfs @ 12.16 hrs, Volume= 0.674 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
2.042	77	Woods, Good, HSG D
0.907	73	Brush, Good, HSG D
2.949	76	Weighted Average
2.949		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	42	0.1607	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
9.3	58	0.0870	0.10		**Sheet Flow, BC** Woods: Light underbrush n= 0.400 P2= 2.20"
3.4	232	0.0518	1.14		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
4.6	277	0.0405	1.01		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
22.9	609	Total			

Subcatchment 1AS: Subcatchment Area 1A



Summary for Subcatchment 1BS: Subcatchment Area 1B

[47] Hint: Peak is 292% of capacity of segment #3

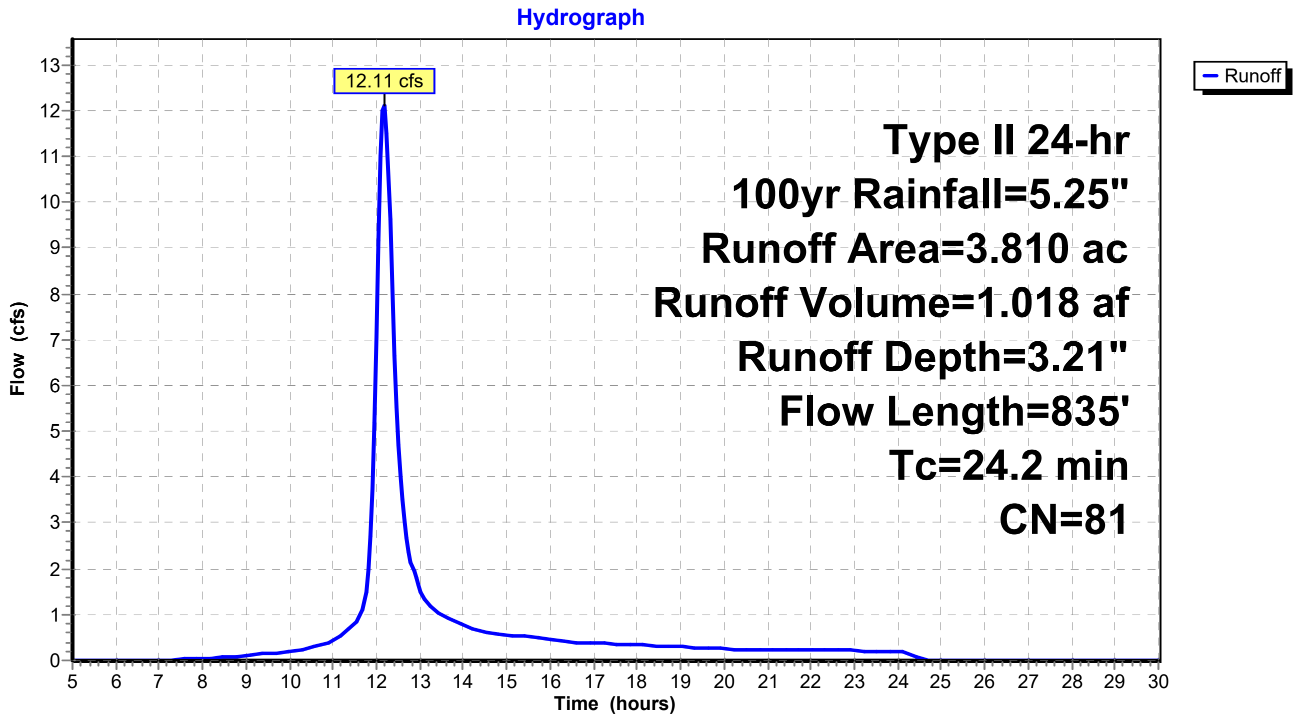
Runoff = 12.11 cfs @ 12.17 hrs, Volume= 1.018 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
1.880	77	Woods, Good, HSG D
0.429	98	Paved parking, HSG D
1.501	80	>75% Grass cover, Good, HSG D
3.810	81	Weighted Average
3.381		88.74% Pervious Area
0.429		11.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	100	0.0824	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
9.0	572	0.0448	1.06		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	163	0.0500	5.27	4.14	**Pipe Channel, CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
24.2	835	Total			

Subcatchment 1BS: Subcatchment Area 1B



Summary for Subcatchment 2S: Subcatchment Area 2

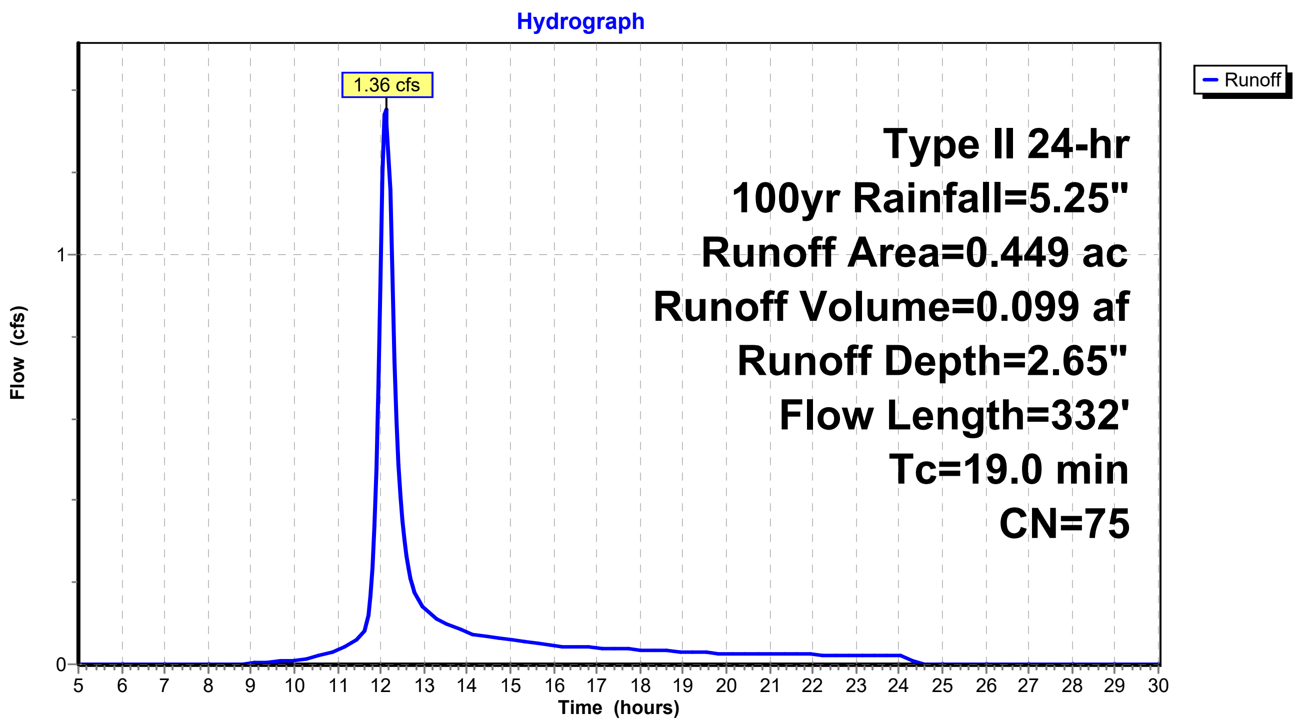
Runoff = 1.36 cfs @ 12.12 hrs, Volume= 0.099 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
0.234	77	Woods, Good, HSG D
0.215	73	Brush, Good, HSG D
0.449	75	Weighted Average
0.449		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0780	0.11		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 2.20"
4.0	232	0.0377	0.97		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
19.0	332	Total			

Subcatchment 2S: Subcatchment Area 2

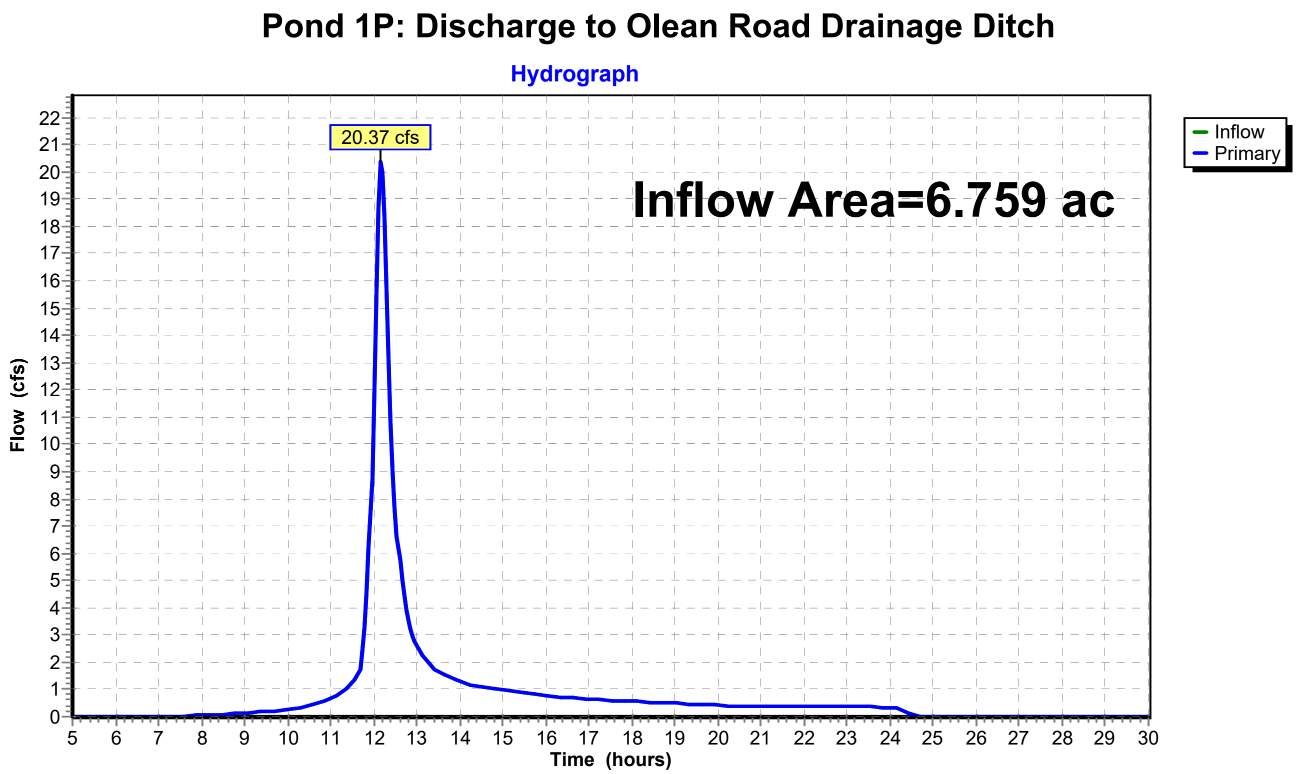


Summary for Pond 1P: Discharge to Olean Road Drainage Ditch

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

Inflow Area =	6.759 ac,	6.35% Impervious,	Inflow Depth = 3.00"	for 100yr event	
Inflow =	20.37 cfs @	12.17 hrs,	Volume=	1.692 af	
Primary =	20.37 cfs @	12.17 hrs,	Volume=	1.692 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs



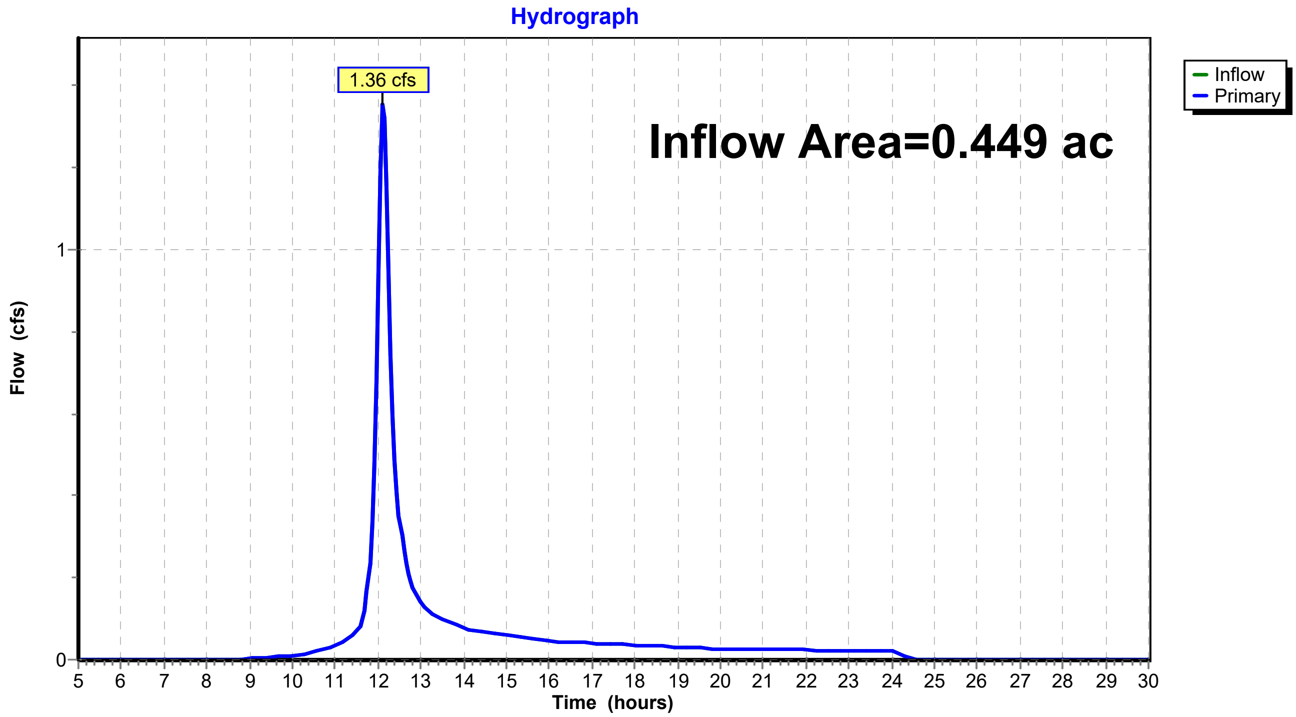
Summary for Pond 2P: Discharge to South

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

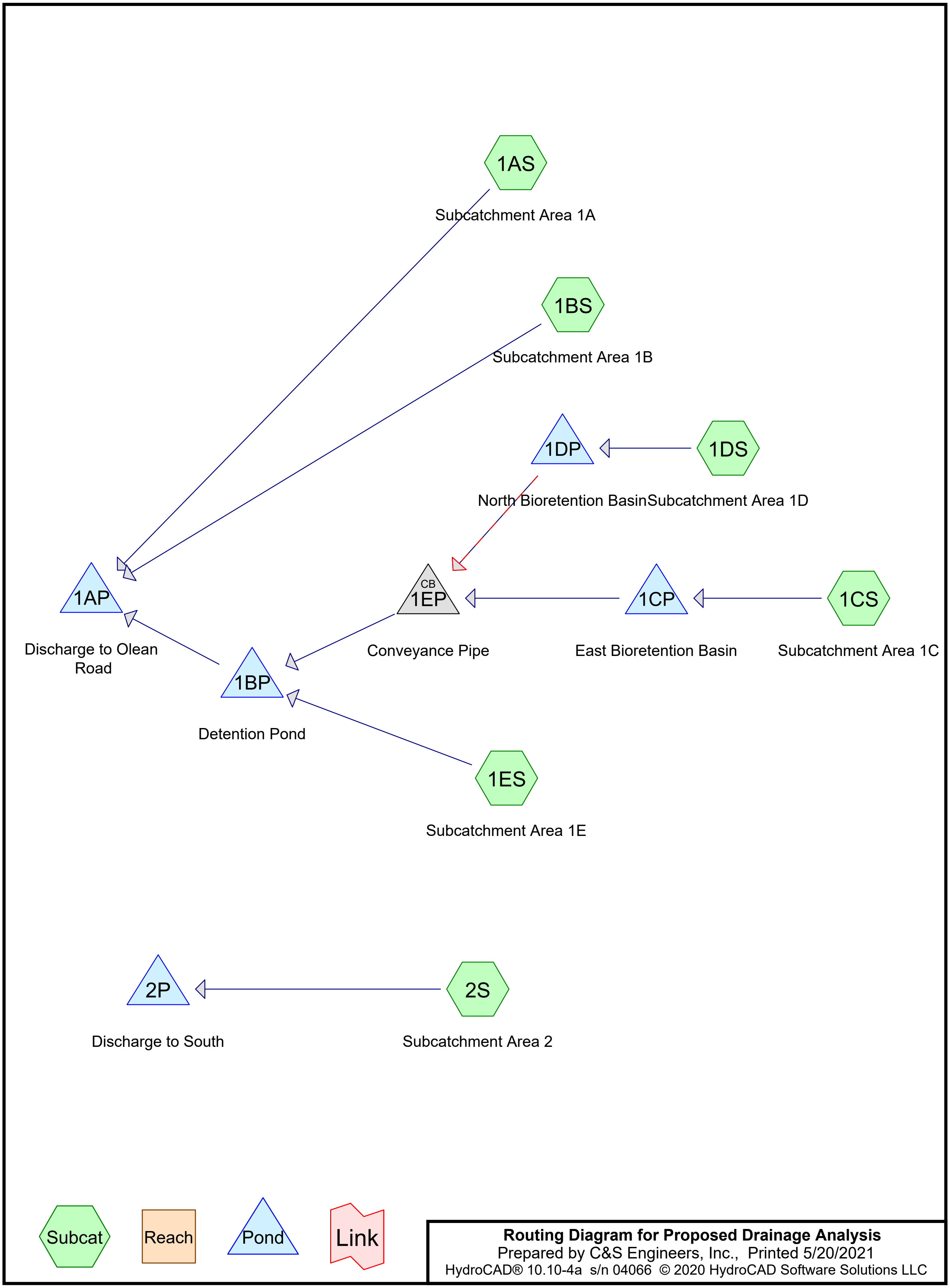
Inflow Area =	0.449 ac,	0.00% Impervious,	Inflow Depth = 2.65"		for 100yr event
Inflow =	1.36 cfs @	12.12 hrs,	Volume=	0.099 af	
Primary =	1.36 cfs @	12.12 hrs,	Volume=	0.099 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Pond 2P: Discharge to South




EXISTING DRAINAGE ANALYSIS MAP
DRAINAGE AREA
IMPERVIOUS AREA
TIME OF CONCENTRATION
80 0 80 160 Ft.
80'
PLAN NORTH
SUBCATCHMENT AREA 1A
SUBCATCHMENT AREA 1B
SUBCATCHMENT AREA 2
TREES & BRUSH
453.50' DEED AND MEASURED
313.41' DEED AND MEASURED
241.80' DEED AND MEASURED
266.80' DEED AND MEASURED
856.38' DEED AND MEASURED
446.00' DEED AND MEASURED
OLEAN ROAD
(WIDTH VARIES)
EDGE OF PAVEMENT
NORFOLK SOUTHERN RAILROAD
WEST LINE OF LANDS FORMERLY OWNED BY THE PENNSYLVANIA RAILROAD COMPANY
FOUND IRON AXLE 0.7' N ONLINE
FOUND IRON PIPE 1.6' E 0.2' N
FOUND 2" IRON ROD 1.1' E ONLINE
FOUND IRON PIPE 3.7' E ONLINE
FOUND REBAR AND CAP 0.4'W
FOUND REBAR ONLINE
SOUTH LINE LANDS OF CLARKE L. 8349, P. 149
EAST LINE LANDS OF CLARKE L. 8349, P. 149
SOUTH LINE OF LOT 14
NORTH LINE OF LOT 13
98'24' DEED 99'35'30" MEAS
20' EASEMENT TO THE NEW YORK TELEPHONE COMPANY
POINT OF BEGINNING SOUTHWEST CORNER OF LANDS CONVEYED TO CLARKE AND WIFE R 8349, PAGE 149
RURAL OUTREACH CENTER BUILDING R.O.C.
STONE DRIVEWAY
STONE PARKING AREA
SHED
TANK
TELEPHONE MARKER
ASPHALT DRIVE
BENCHMARK PK NAIL ELEVATION = 885.75'
30" BOX CULVERT INVERT = 883.50'



Routing Diagram for Proposed Drainage Analysis
Prepared by C&S Engineers, Inc., Printed 5/20/2021
HydroCAD® 10.10-4a s/n 04066 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1yr	Type II 24-hr		Default	24.00	1	1.88	2
2	10yr	Type II 24-hr		Default	24.00	1	3.15	2
3	100yr	Type II 24-hr		Default	24.00	1	5.25	2

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1BP	884.50	884.00	26.0	0.0192	0.013	18.0	0.0	0.0
2	1BP	884.50	884.50	21.0	0.0000	0.013	12.0	0.0	0.0
3	1CP	898.00	896.81	134.0	0.0089	0.013	12.0	0.0	0.0
4	1CP	898.00	898.00	120.0	0.0000	0.013	6.0	0.0	0.0
5	1DP	898.00	898.00	38.0	0.0000	0.013	6.0	0.0	0.0
6	1EP	893.50	885.00	109.0	0.0780	0.013	18.0	0.0	0.0
7	1EP	896.81	893.50	196.0	0.0169	0.013	18.0	0.0	0.0

Summary for Subcatchment 1AS: Subcatchment Area 1A

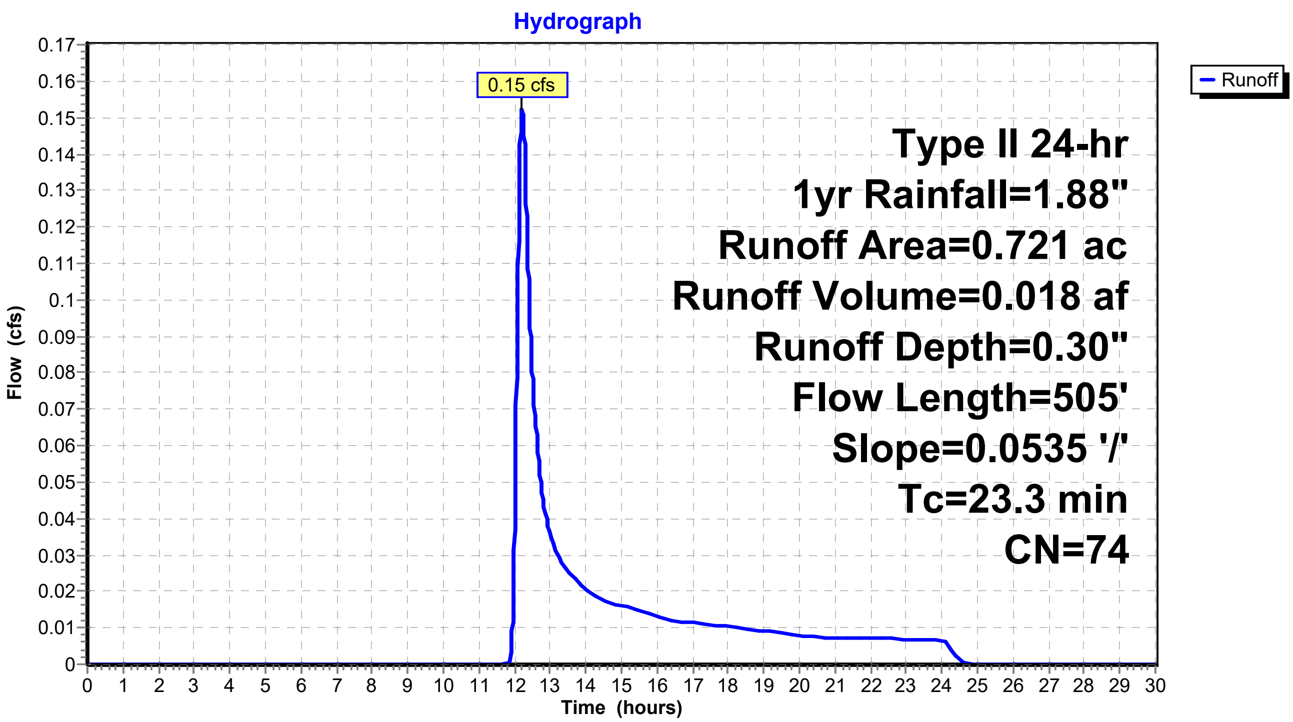
Runoff = 0.15 cfs @ 12.22 hrs, Volume= 0.018 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
0.173	77	Woods, Good, HSG D
0.548	73	Brush, Good, HSG D
0.721	74	Weighted Average
0.721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0535	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
5.8	405	0.0535	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
23.3	505	Total			

Subcatchment 1AS: Subcatchment Area 1A



Summary for Subcatchment 1BS: Subcatchment Area 1B

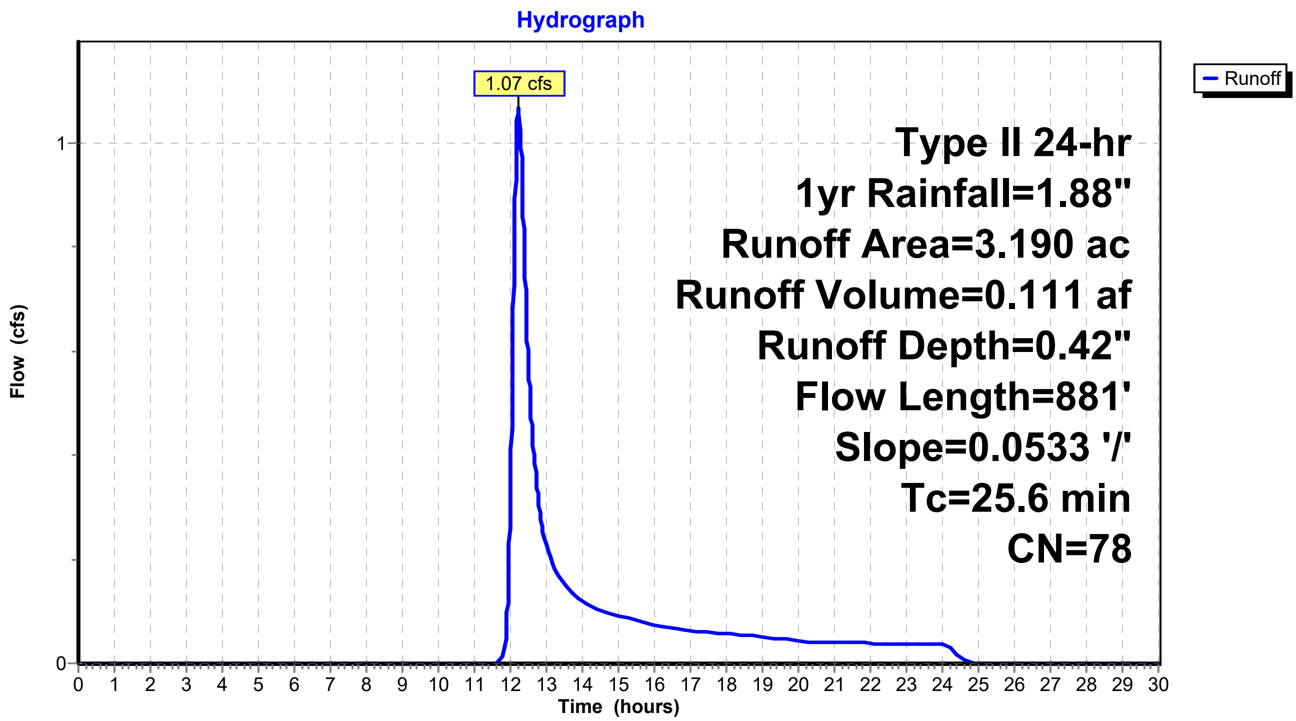
Runoff = 1.07 cfs @ 12.23 hrs, Volume= 0.111 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
1.534	77	Woods, Good, HSG D
0.352	73	Brush, Good, HSG D
1.200	80	>75% Grass cover, Good, HSG D
0.104	98	Paved parking, HSG D
3.190	78	Weighted Average
3.086		96.74% Pervious Area
0.104		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0533	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
8.1	781	0.0533	1.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.6	881	Total			

Subcatchment 1BS: Subcatchment Area 1B



Summary for Subcatchment 1CS: Subcatchment Area 1C

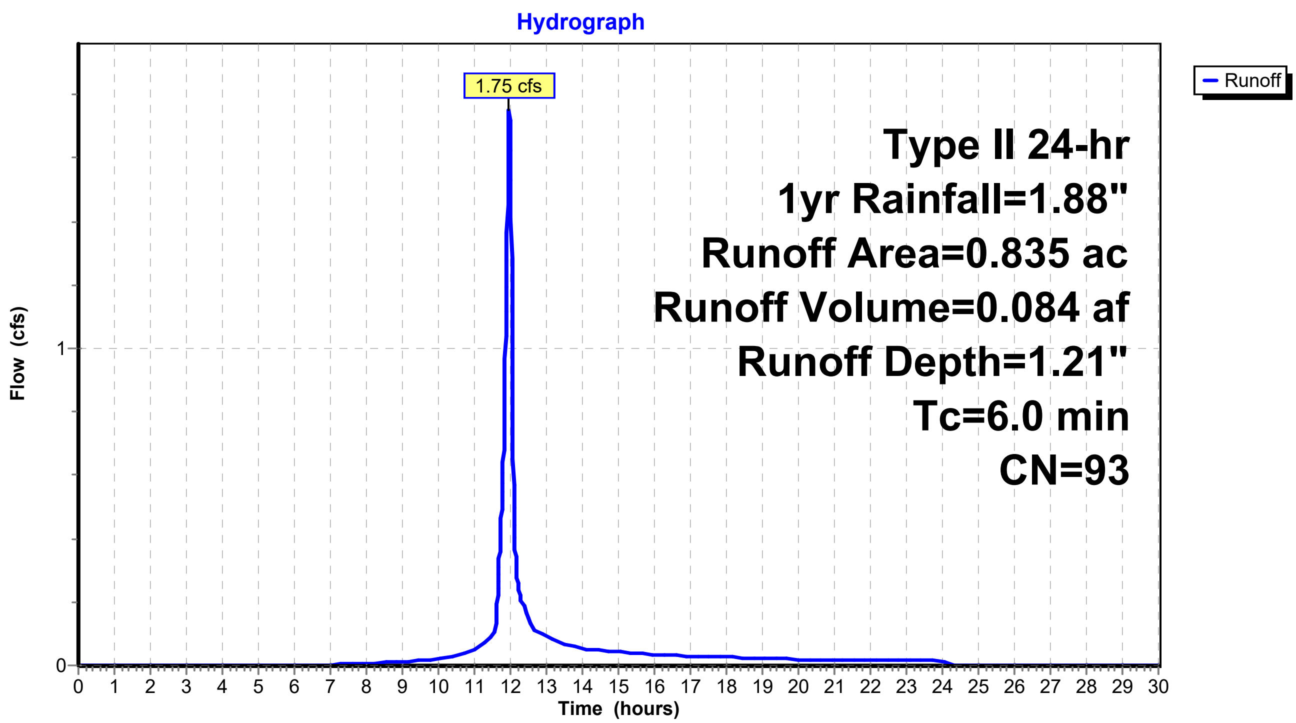
Runoff = 1.75 cfs @ 11.97 hrs, Volume= 0.084 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
0.585	98	Paved parking, HSG D
0.250	80	>75% Grass cover, Good, HSG D
0.835	93	Weighted Average
0.250		29.94% Pervious Area
0.585		70.06% Impervious Area

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

Subcatchment 1CS: Subcatchment Area 1C



Summary for Subcatchment 1DS: Subcatchment Area 1D

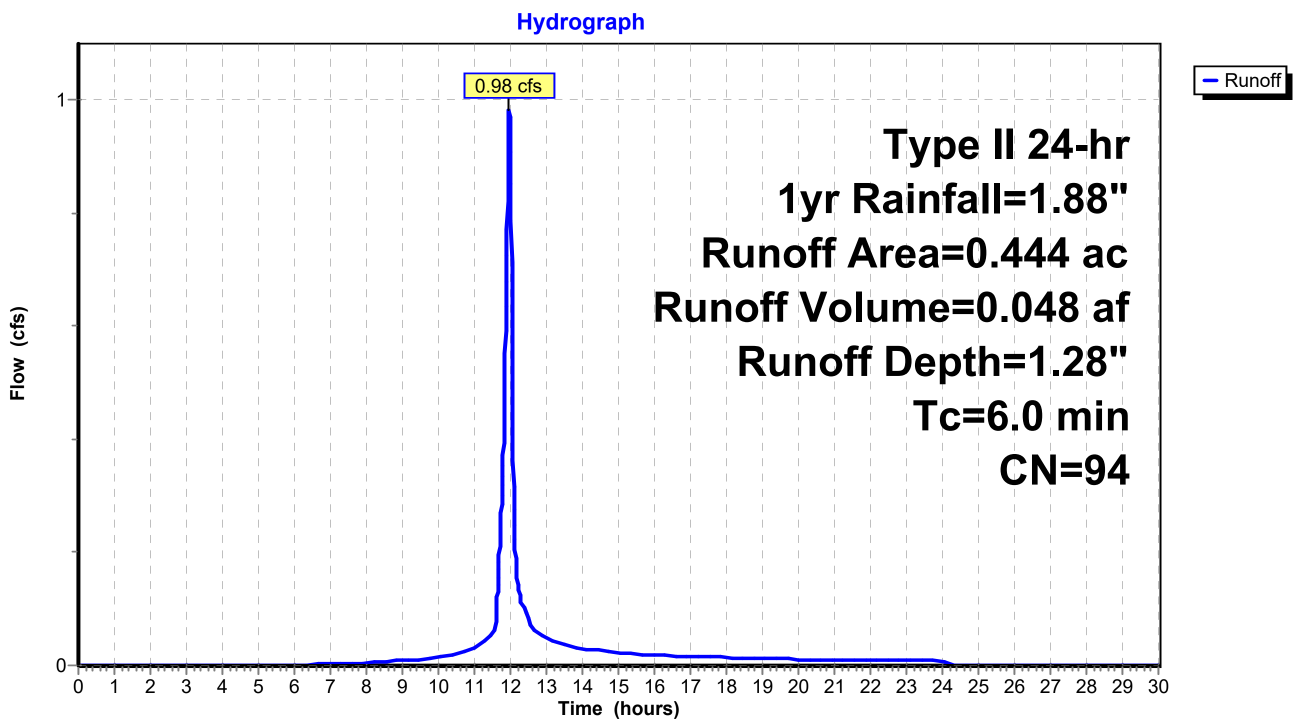
Runoff = 0.98 cfs @ 11.97 hrs, Volume= 0.048 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
0.357	98	Paved parking, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.444	94	Weighted Average
0.087		19.59% Pervious Area
0.357		80.41% Impervious Area

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

Subcatchment 1DS: Subcatchment Area 1D



Summary for Subcatchment 1ES: Subcatchment Area 1E

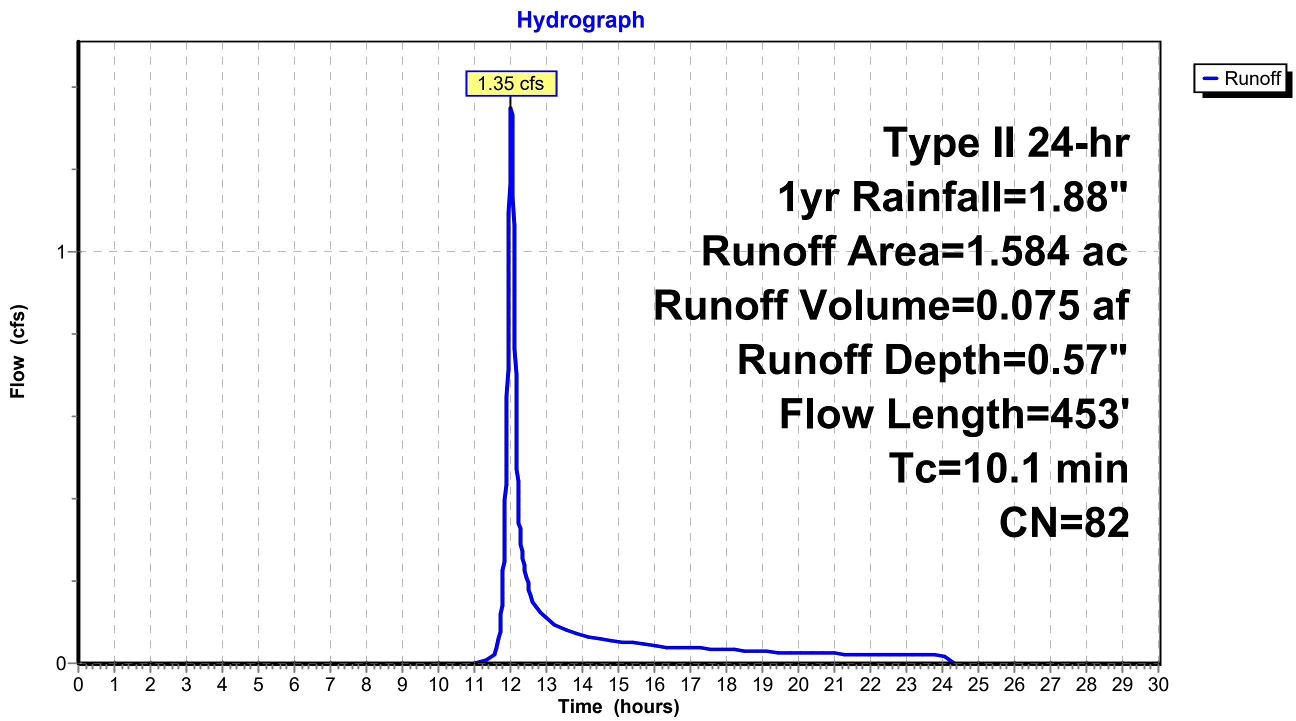
Runoff = 1.35 cfs @ 12.03 hrs, Volume= 0.075 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
1.395	80	>75% Grass cover, Good, HSG D
0.189	98	Paved parking, HSG D
1.584	82	Weighted Average
1.395		88.07% Pervious Area
0.189		11.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	65	0.0310	1.25		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.20"
5.3	35	0.0460	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
3.9	353	0.0460	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.1	453	Total			

Subcatchment 1ES: Subcatchment Area 1E



Summary for Subcatchment 2S: Subcatchment Area 2

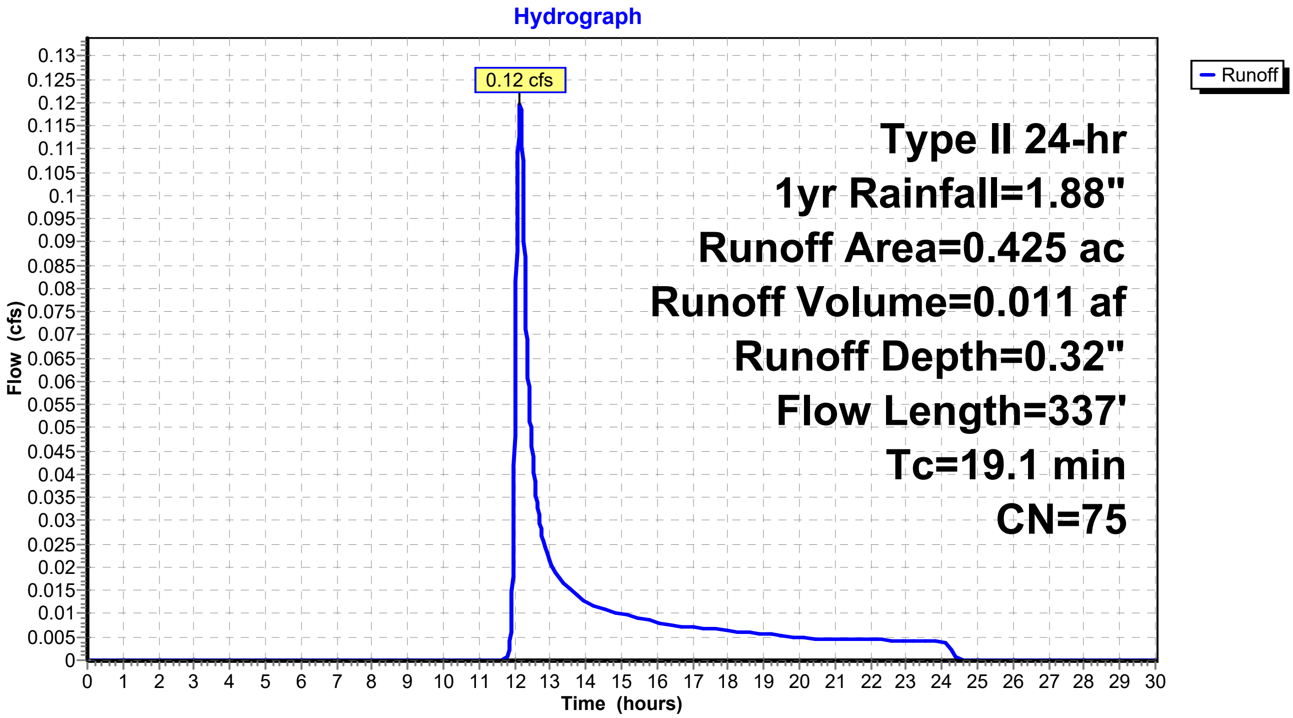
Runoff = 0.12 cfs @ 12.16 hrs, Volume= 0.011 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr Rainfall=1.88"

Area (ac)	CN	Description
0.220	77	Woods, Good, HSG D
0.205	73	Brush, Good, HSG D
0.425	75	Weighted Average
0.425		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0780	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
4.1	237	0.0377	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.1	337	Total			

Subcatchment 2S: Subcatchment Area 2



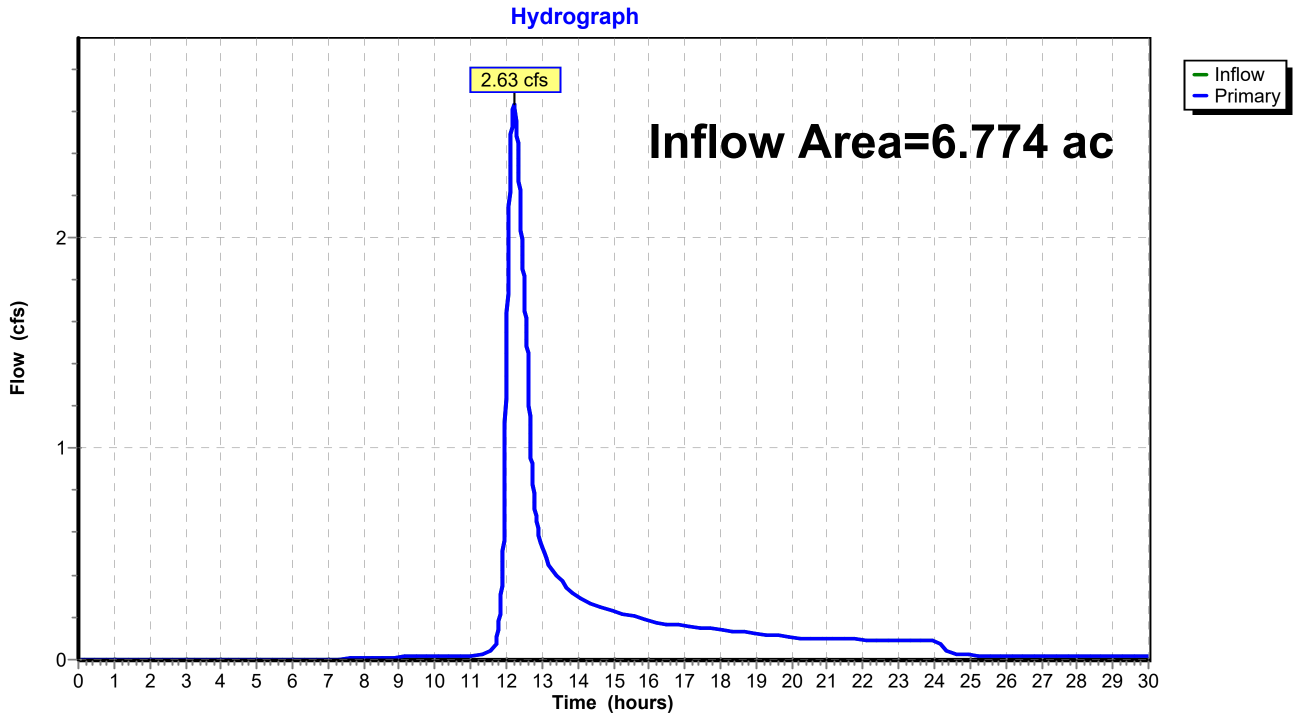
Summary for Pond 1AP: Discharge to Olean Road

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

Inflow Area =	6.774 ac,	18.23% Impervious,	Inflow Depth > 0.55"	for 1yr event	
Inflow =	2.63 cfs @	12.21 hrs,	Volume=	0.309 af	
Primary =	2.63 cfs @	12.21 hrs,	Volume=	0.309 af,	Atten= 0%, Lag= 0.0 min

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

Pond 1AP: Discharge to Olean Road



Summary for Pond 1BP: Detention Pond

[79] Warning: Submerged Pond 1EP Primary device # 1 OUTLET by 0.79'

Inflow Area = 2.863 ac, 39.50% Impervious, Inflow Depth > 0.76" for 1yr event
Inflow = 3.47 cfs @ 12.02 hrs, Volume= 0.180 af
Outflow = 1.43 cfs @ 12.16 hrs, Volume= 0.180 af, Atten= 59%, Lag= 8.0 min
Primary = 1.43 cfs @ 12.16 hrs, Volume= 0.180 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 885.79' @ 12.16 hrs Surf.Area= 2,337 sf Storage= 1,181 cf

Plug-Flow detention time= 5.1 min calculated for 0.180 af (100% of inflow)
Center-of-Mass det. time= 4.9 min (906.6 - 901.7)

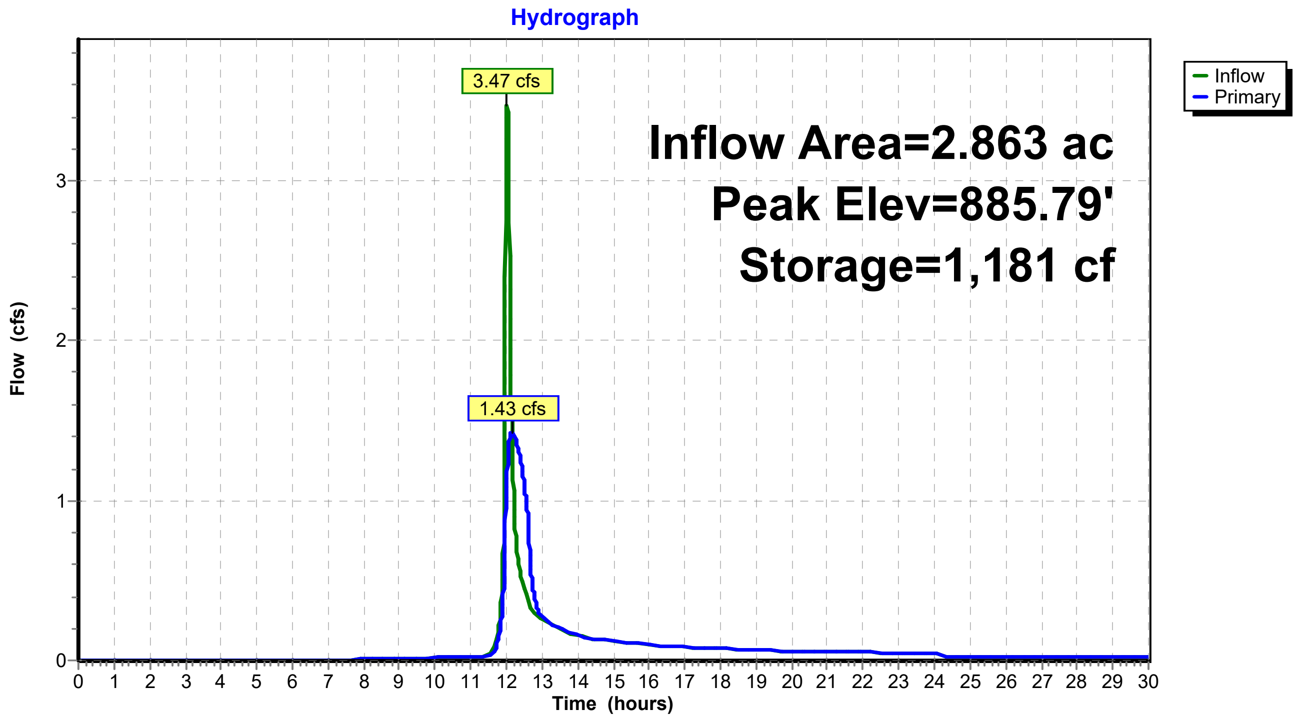
Volume	Invert	Avail.Storage	Storage Description
#1	884.50'	12,606 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
884.50	0	0.0	0	0	0
885.00	592	119.0	99	99	1,127
886.00	2,992	335.0	1,638	1,737	8,934
887.00	5,687	455.0	4,268	6,005	16,489
888.00	7,559	480.0	6,601	12,606	18,407

Device	Routing	Invert	Outlet Devices
#1	Primary	884.50'	**18.0" Round 18" Outlet Pipe** L= 26.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 884.50' / 884.00' S= 0.0192 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	884.50'	**7.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	884.50'	**12.0" Round 12" Inlet Pipe** L= 21.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 884.50' / 884.50' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 1	886.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.43 cfs @ 12.16 hrs HW=885.79' (Free Discharge)
└─**1=18" Outlet Pipe** (Passes 1.43 cfs of 4.94 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.43 cfs @ 4.77 fps)
  │ └─**3=12" Inlet Pipe** (Passes 1.43 cfs of 2.35 cfs potential flow)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1BP: Detention Pond



Summary for Pond 1CP: East Bioretention Basin

Inflow Area = 0.835 ac, 70.06% Impervious, Inflow Depth = 1.21" for 1yr event
Inflow = 1.75 cfs @ 11.97 hrs, Volume= 0.084 af
Outflow = 1.31 cfs @ 12.03 hrs, Volume= 0.067 af, Atten= 25%, Lag= 3.4 min
Primary = 1.31 cfs @ 12.03 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 902.14' @ 12.03 hrs Surf.Area= 2,412 sf Storage= 1,287 cf

Plug-Flow detention time= 197.8 min calculated for 0.067 af (80% of inflow)
Center-of-Mass det. time= 117.2 min (926.6 - 809.4)

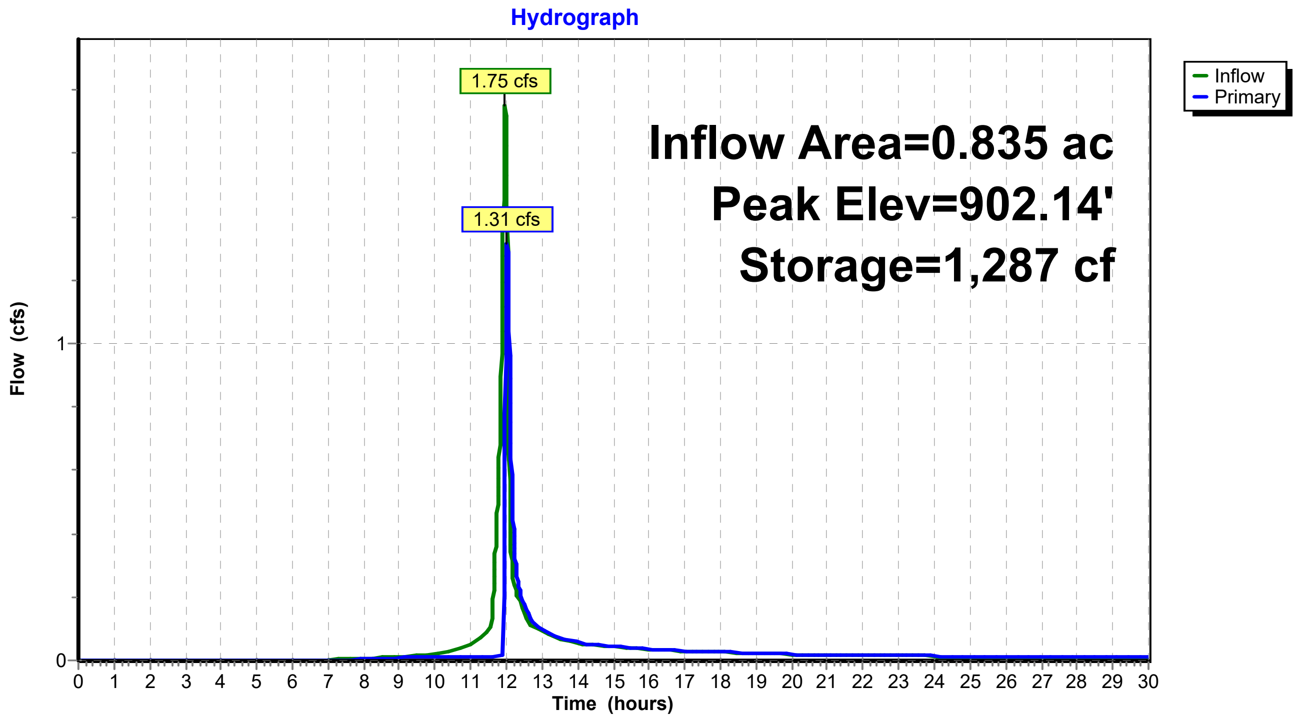
Volume	Invert	Avail.Storage	Storage Description
#1	901.50'	4,064 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
901.50	1,722	271.0	0	0	1,722
902.00	2,191	290.0	976	976	2,582
903.00	4,082	370.0	3,088	4,064	6,796

Device	Routing	Invert	Outlet Devices
#1	Primary	898.00'	**12.0" Round Culvert** L= 134.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 896.81' S= 0.0089 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	898.00'	**6.0" Round Underdrain** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 898.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#3	Device 2	901.50'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 800.00'
#4	Device 1	902.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.31 cfs @ 12.03 hrs HW=902.13' (Free Discharge)
└─**1=Culvert** (Passes 1.31 cfs of 5.30 cfs potential flow)
  ├─**2=Underdrain** (Passes 0.01 cfs of 0.89 cfs potential flow)
  │ └─**3=Exfiltration** (Controls 0.01 cfs)
  └─**4=Orifice/Grate** (Weir Controls 1.30 cfs @ 1.20 fps)

Pond 1CP: East Bioretention Basin



Summary for Pond 1DP: North Bioretention Basin

Inflow Area = 0.444 ac, 80.41% Impervious, Inflow Depth = 1.28" for 1yr event
Inflow = 0.98 cfs @ 11.97 hrs, Volume= 0.048 af
Outflow = 0.81 cfs @ 12.02 hrs, Volume= 0.037 af, Atten= 17%, Lag= 2.8 min
Primary = 0.01 cfs @ 12.02 hrs, Volume= 0.014 af
Secondary = 0.80 cfs @ 12.02 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 902.10' @ 12.02 hrs Surf.Area= 1,360 sf Storage= 729 cf

Plug-Flow detention time= 208.4 min calculated for 0.037 af (79% of inflow)
Center-of-Mass det. time= 124.7 min (927.7 - 802.9)

Volume	Invert	Avail.Storage	Storage Description
#1	901.50'	2,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

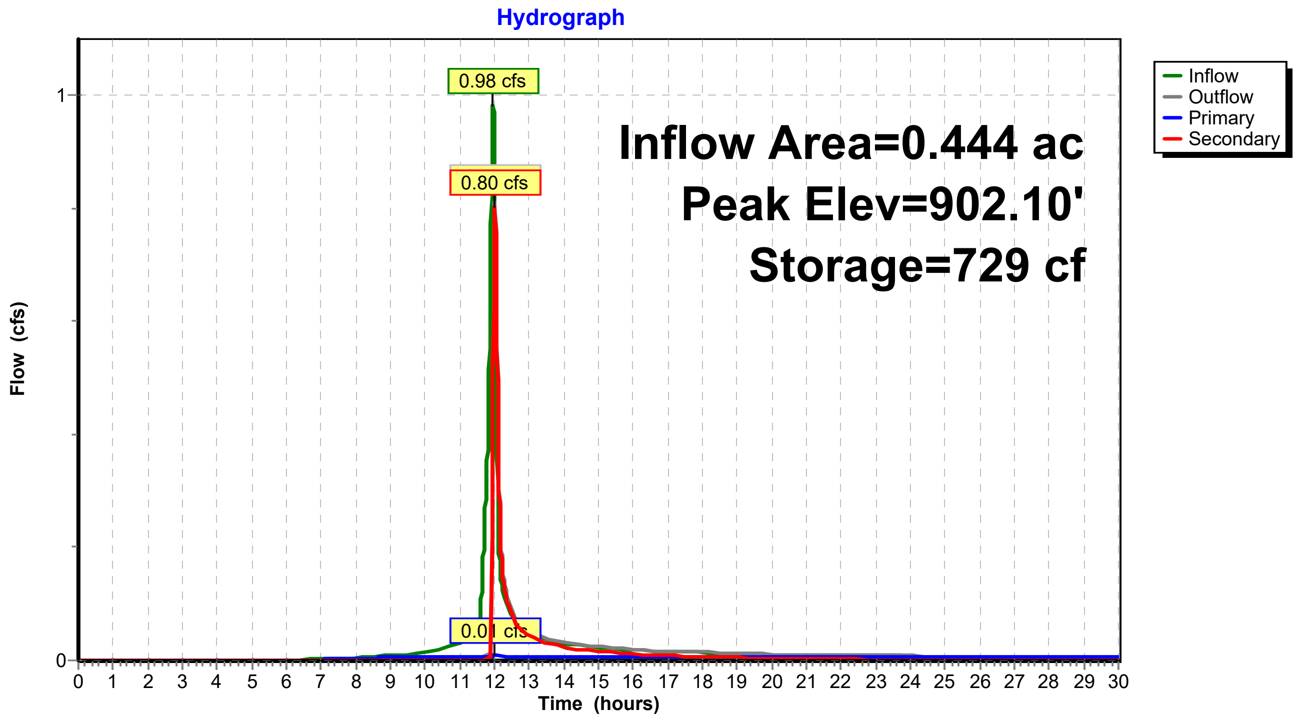
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
901.50	1,080	152.0	0	0	1,080
902.00	1,314	161.0	598	598	1,317
903.00	1,822	180.0	1,561	2,159	1,860

Device	Routing	Invert	Outlet Devices
#1	Primary	898.00'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 898.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	901.50'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 800.00'
#3	Secondary	902.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 12.02 hrs HW=902.10' (Free Discharge)
└─**1=Culvert** (Passes 0.01 cfs of 1.35 cfs potential flow)
  └─**2=Exfiltration** (Controls 0.01 cfs)

Secondary OutFlow Max=0.80 cfs @ 12.02 hrs HW=902.10' (Free Discharge)
└─**3=Orifice/Grate** (Weir Controls 0.80 cfs @ 1.02 fps)

Pond 1DP: North Bioretention Basin



Summary for Pond 1EP: Conveyance Pipe

[79] Warning: Submerged Pond 1CP Primary device # 1 OUTLET by 0.76'

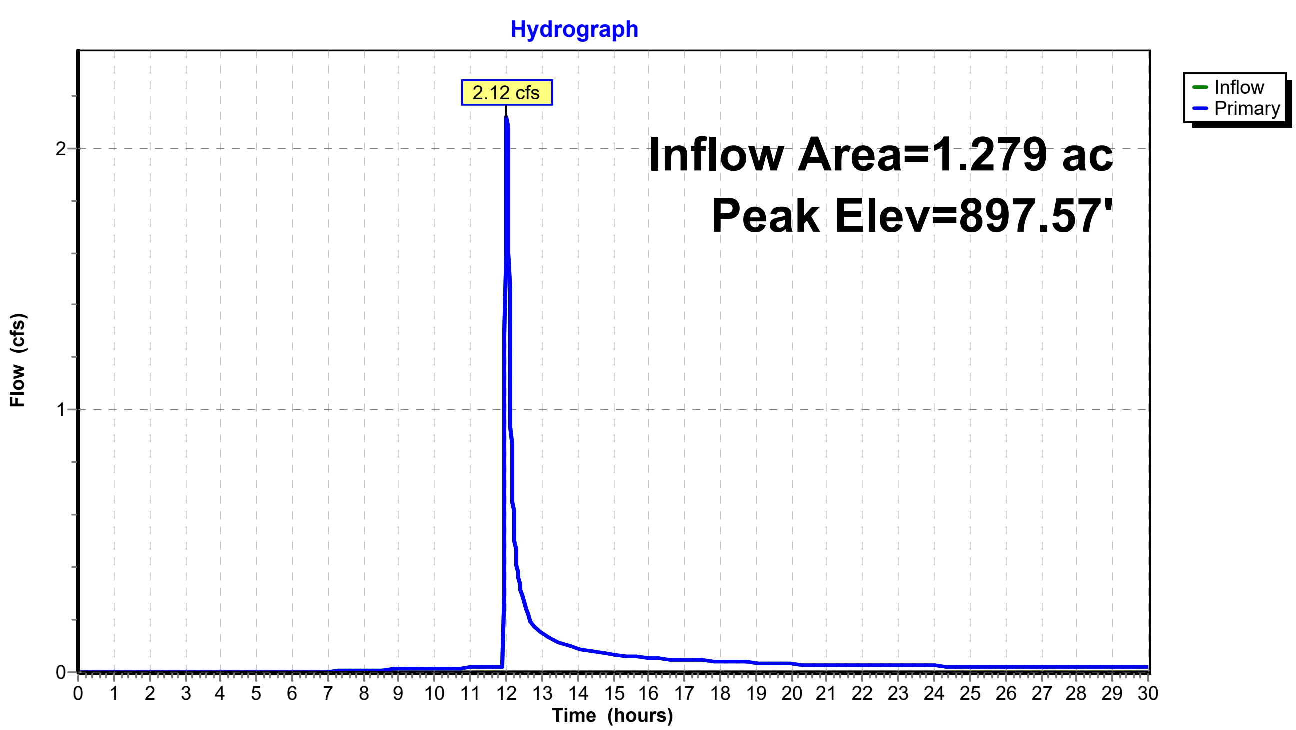
Inflow Area =	1.279 ac, 73.65% Impervious,	Inflow Depth > 0.98"	for 1yr event	
Inflow =	2.12 cfs @	12.02 hrs, Volume=	0.105 af	
Outflow =	2.12 cfs @	12.02 hrs, Volume=	0.105 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.12 cfs @	12.02 hrs, Volume=	0.105 af	

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 897.57' @ 12.02 hrs
Flood Elev= 902.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	893.50'	**18.0" Round Culvert** L= 109.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 893.50' / 885.00' S= 0.0780 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	896.81'	**18.0" Round Culvert** L= 196.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 896.81' / 893.50' S= 0.0169 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.11 cfs @ 12.02 hrs HW=897.57' (Free Discharge)
└─**1=Culvert** (Passes 2.11 cfs of 12.24 cfs potential flow)
  └─**2=Culvert** (Inlet Controls 2.11 cfs @ 2.34 fps)

Pond 1EP: Conveyance Pipe

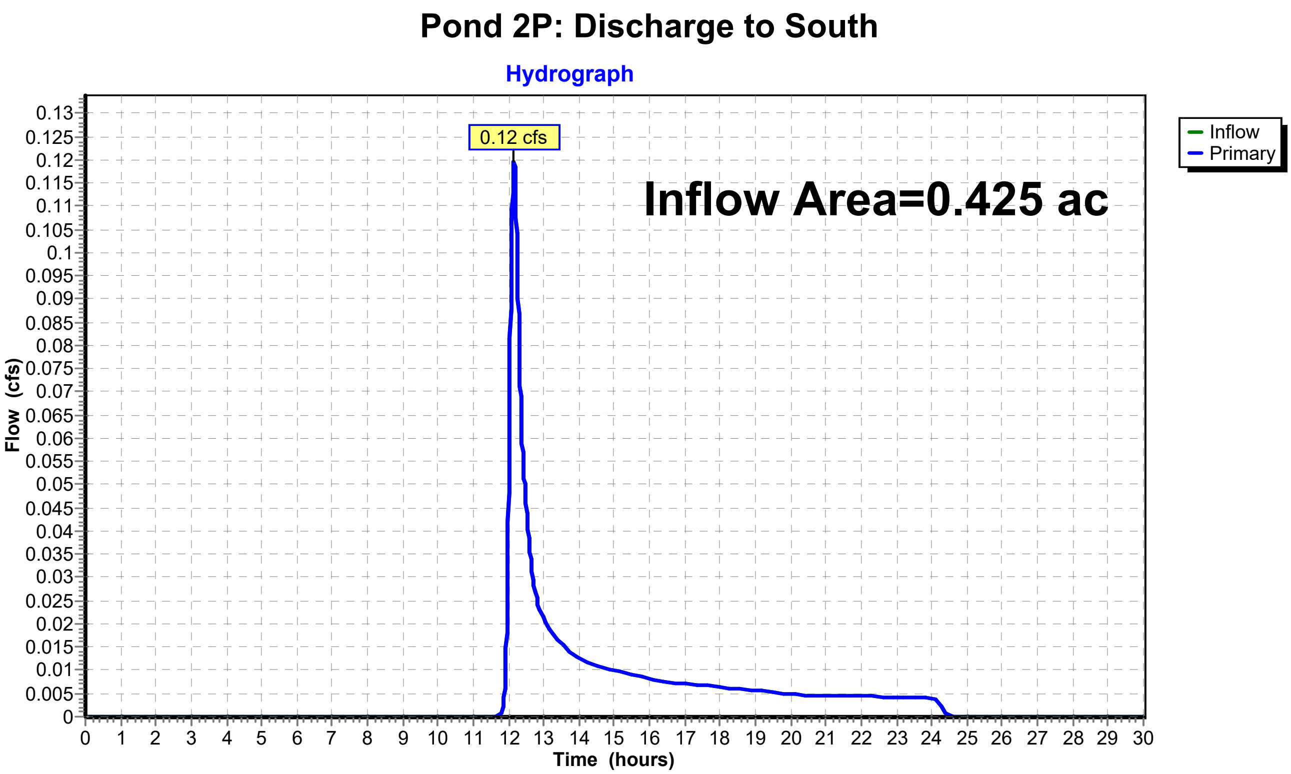


Summary for Pond 2P: Discharge to South

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

Inflow Area = 0.425 ac, 0.00% Impervious, Inflow Depth = 0.32" for 1yr event
Inflow = 0.12 cfs @ 12.16 hrs, Volume= 0.011 af
Primary = 0.12 cfs @ 12.16 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

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



Summary for Subcatchment 1AS: Subcatchment Area 1A

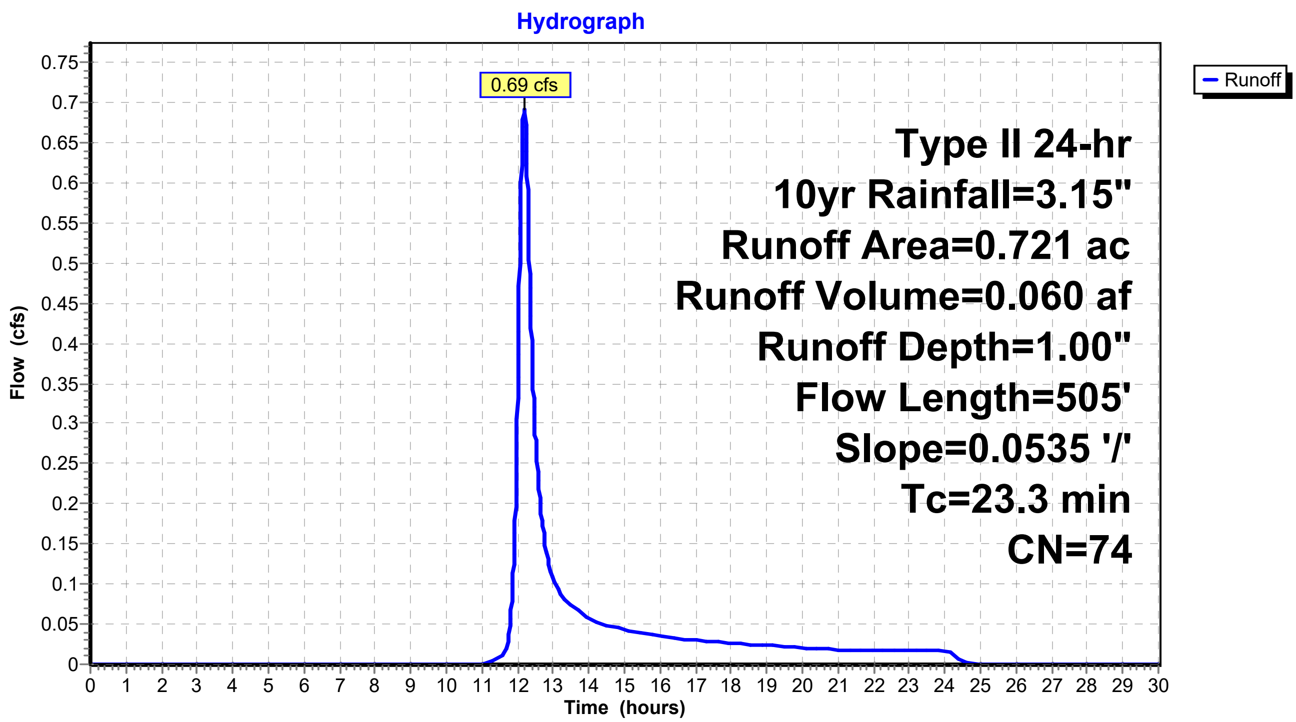
Runoff = 0.69 cfs @ 12.19 hrs, Volume= 0.060 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
0.173	77	Woods, Good, HSG D
0.548	73	Brush, Good, HSG D
0.721	74	Weighted Average
0.721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0535	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
5.8	405	0.0535	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
23.3	505	Total			

Subcatchment 1AS: Subcatchment Area 1A



Summary for Subcatchment 1BS: Subcatchment Area 1B

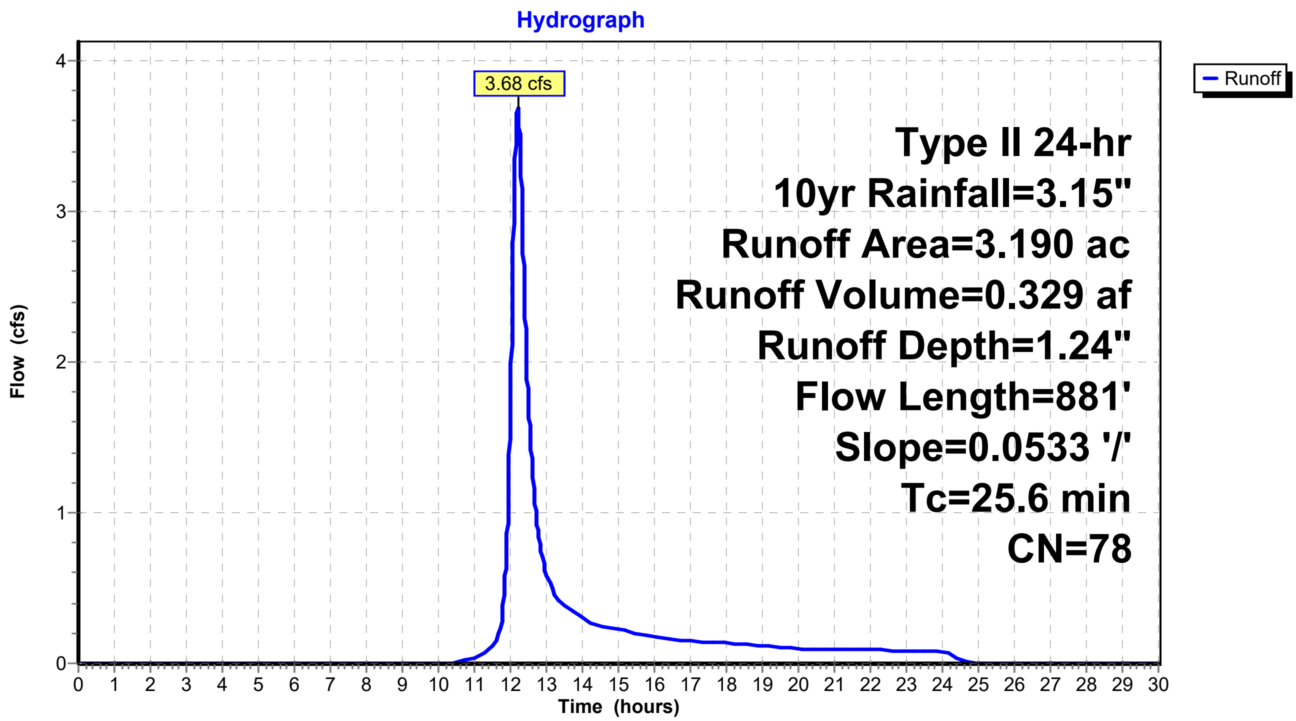
Runoff = 3.68 cfs @ 12.20 hrs, Volume= 0.329 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
1.534	77	Woods, Good, HSG D
0.352	73	Brush, Good, HSG D
1.200	80	>75% Grass cover, Good, HSG D
0.104	98	Paved parking, HSG D
3.190	78	Weighted Average
3.086		96.74% Pervious Area
0.104		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0533	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
8.1	781	0.0533	1.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.6	881	Total			

Subcatchment 1BS: Subcatchment Area 1B



Summary for Subcatchment 1CS: Subcatchment Area 1C

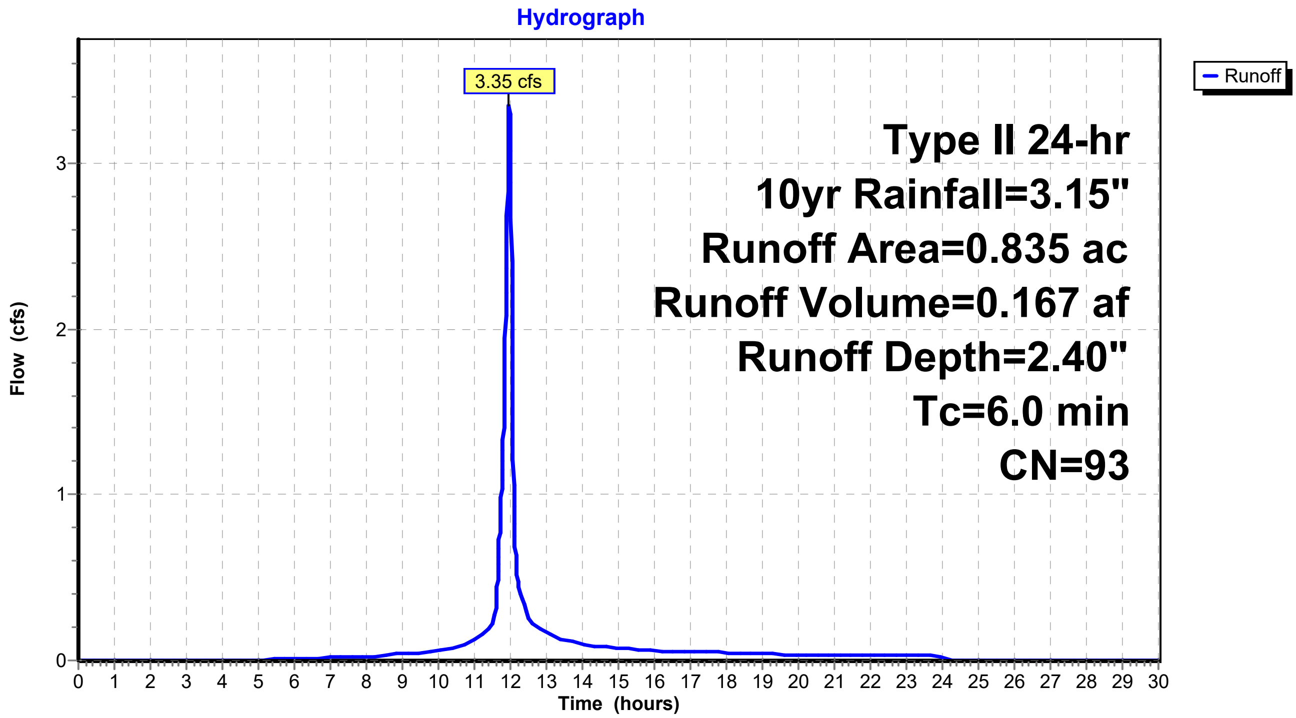
Runoff = 3.35 cfs @ 11.97 hrs, Volume= 0.167 af, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
0.585	98	Paved parking, HSG D
0.250	80	>75% Grass cover, Good, HSG D
0.835	93	Weighted Average
0.250		29.94% Pervious Area
0.585		70.06% Impervious Area

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

Subcatchment 1CS: Subcatchment Area 1C



Summary for Subcatchment 1DS: Subcatchment Area 1D

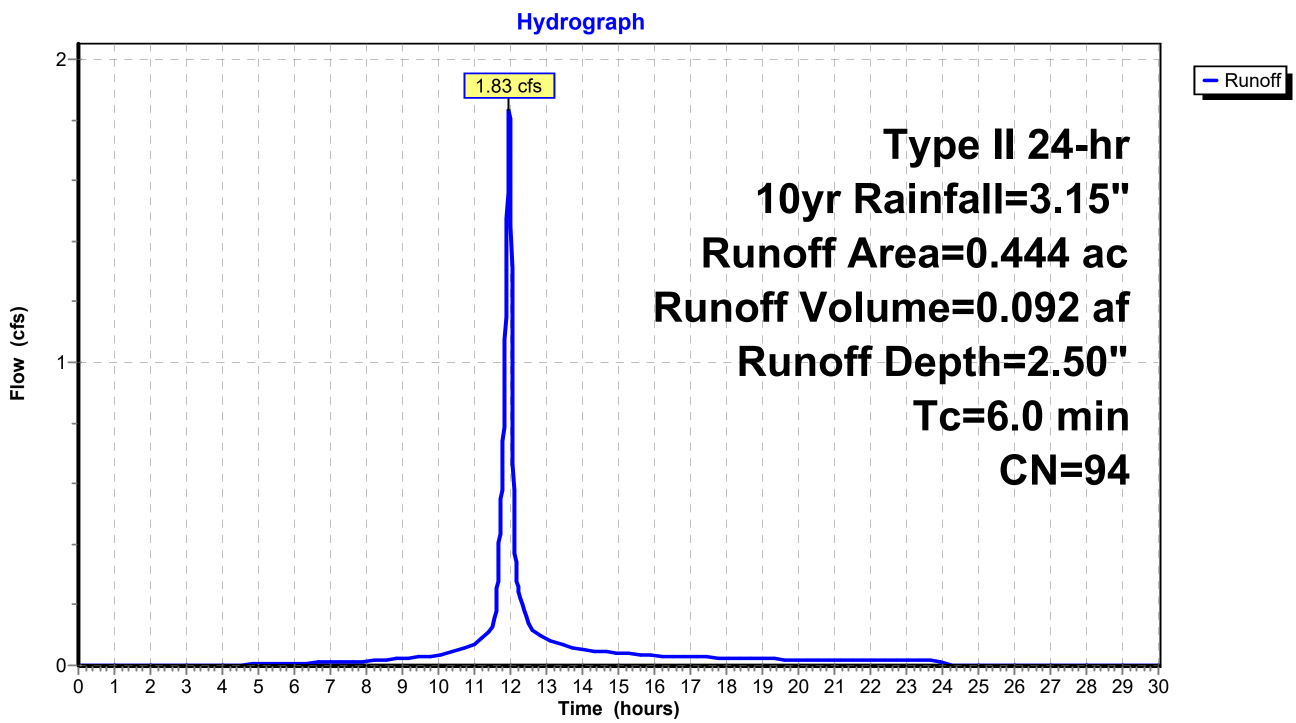
Runoff = 1.83 cfs @ 11.97 hrs, Volume= 0.092 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
0.357	98	Paved parking, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.444	94	Weighted Average
0.087		19.59% Pervious Area
0.357		80.41% Impervious Area

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

Subcatchment 1DS: Subcatchment Area 1D



Summary for Subcatchment 1ES: Subcatchment Area 1E

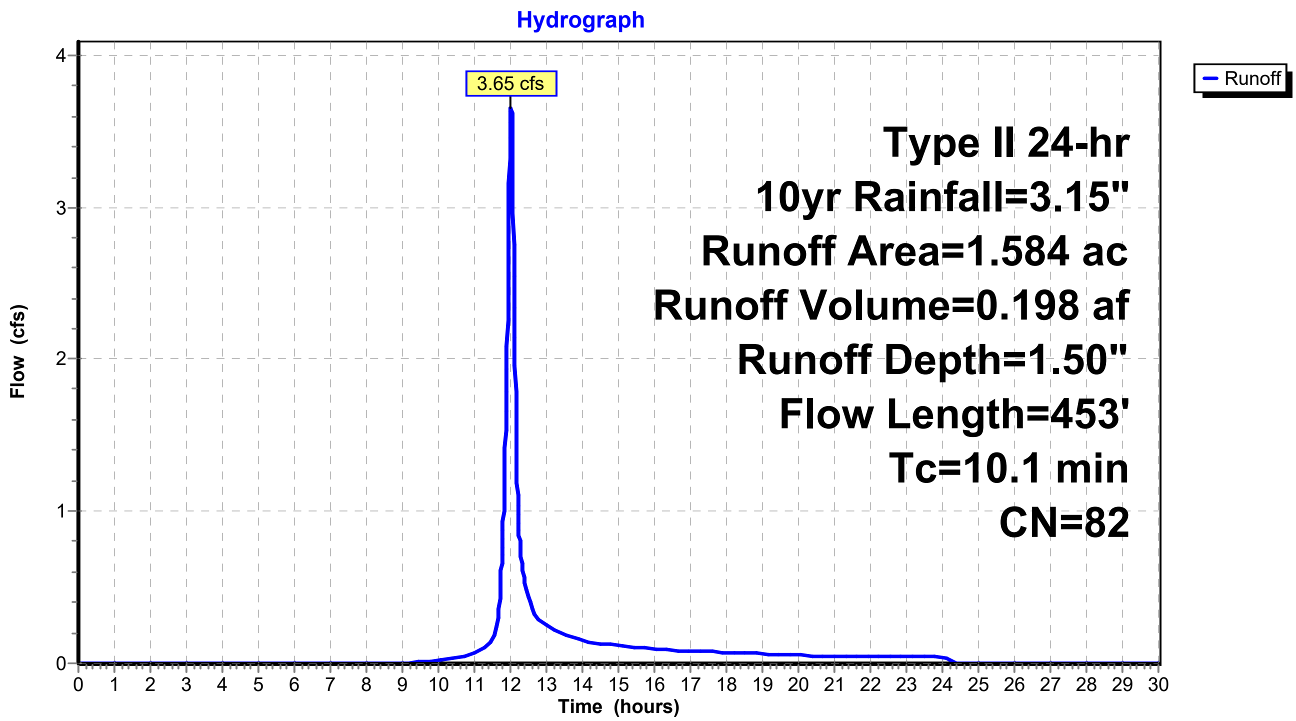
Runoff = 3.65 cfs @ 12.02 hrs, Volume= 0.198 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
1.395	80	>75% Grass cover, Good, HSG D
0.189	98	Paved parking, HSG D
1.584	82	Weighted Average
1.395		88.07% Pervious Area
0.189		11.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	65	0.0310	1.25		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.20"
5.3	35	0.0460	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
3.9	353	0.0460	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.1	453	Total			

Subcatchment 1ES: Subcatchment Area 1E



Summary for Subcatchment 2S: Subcatchment Area 2

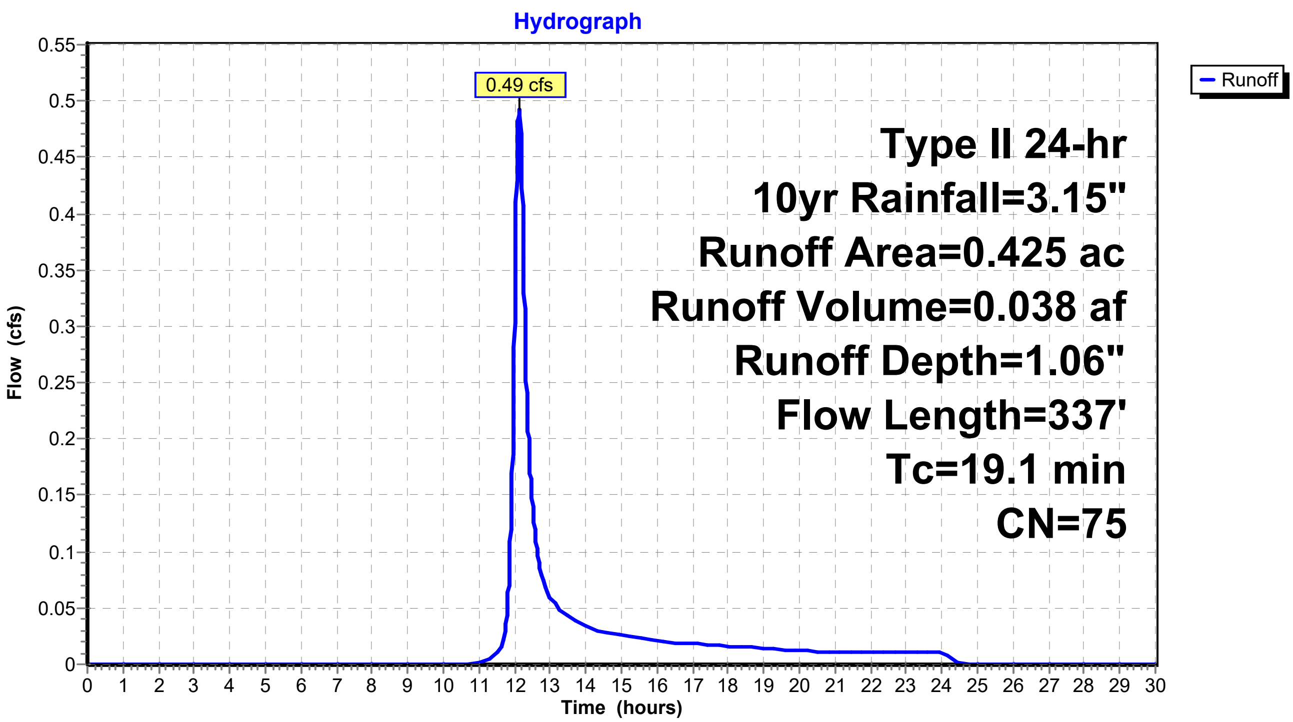
Runoff = 0.49 cfs @ 12.12 hrs, Volume= 0.038 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr Rainfall=3.15"

Area (ac)	CN	Description
0.220	77	Woods, Good, HSG D
0.205	73	Brush, Good, HSG D
0.425	75	Weighted Average
0.425		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0780	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
4.1	237	0.0377	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.1	337	Total			

Subcatchment 2S: Subcatchment Area 2



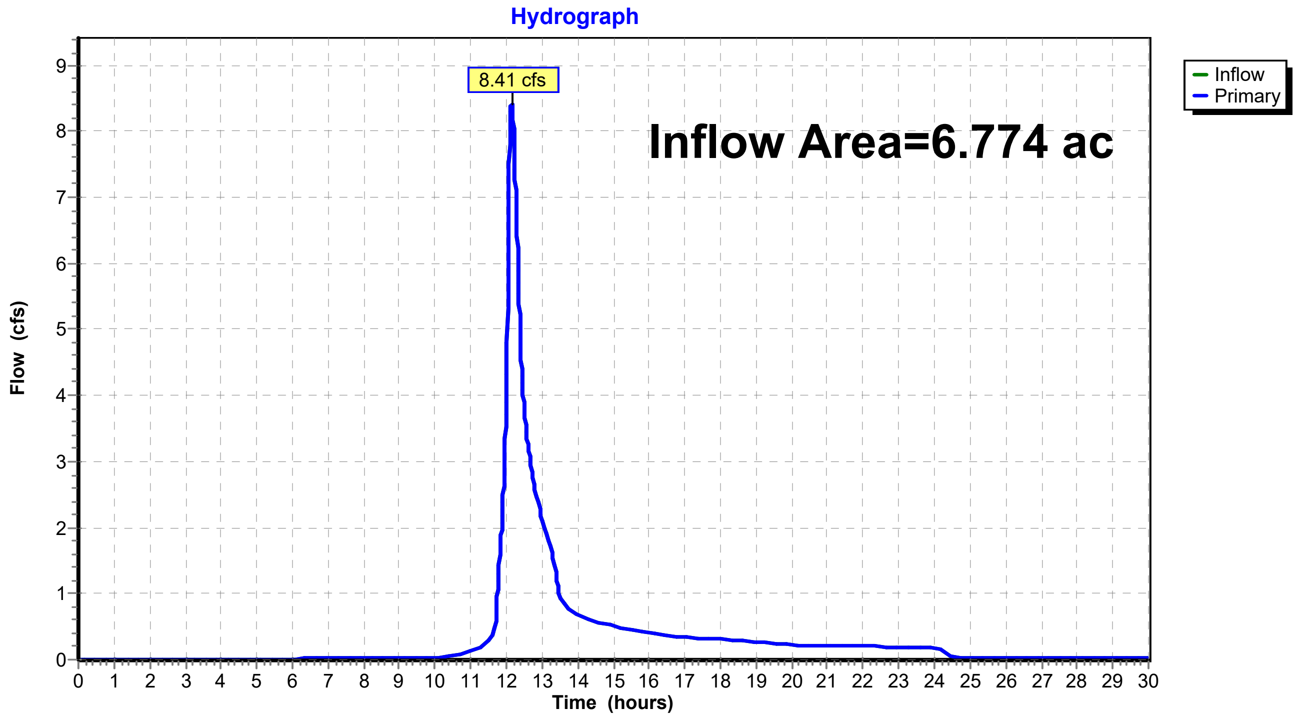
Summary for Pond 1AP: Discharge to Olean Road

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

Inflow Area = 6.774 ac, 18.23% Impervious, Inflow Depth > 1.45" for 10yr event
Inflow = 8.41 cfs @ 12.14 hrs, Volume= 0.819 af
Primary = 8.41 cfs @ 12.14 hrs, Volume= 0.819 af, Atten= 0%, Lag= 0.0 min

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

Pond 1AP: Discharge to Olean Road



Summary for Pond 1BP: Detention Pond

[79] Warning: Submerged Pond 1EP Primary device # 1 OUTLET by 1.73'

Inflow Area = 2.863 ac, 39.50% Impervious, Inflow Depth > 1.80" for 10yr event
Inflow = 8.42 cfs @ 12.00 hrs, Volume= 0.430 af
Outflow = 4.40 cfs @ 12.11 hrs, Volume= 0.430 af, Atten= 48%, Lag= 6.5 min
Primary = 4.40 cfs @ 12.11 hrs, Volume= 0.430 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 886.73' @ 12.11 hrs Surf.Area= 4,865 sf Storage= 4,564 cf

Plug-Flow detention time= 12.3 min calculated for 0.430 af (100% of inflow)
Center-of-Mass det. time= 12.2 min (857.8 - 845.6)

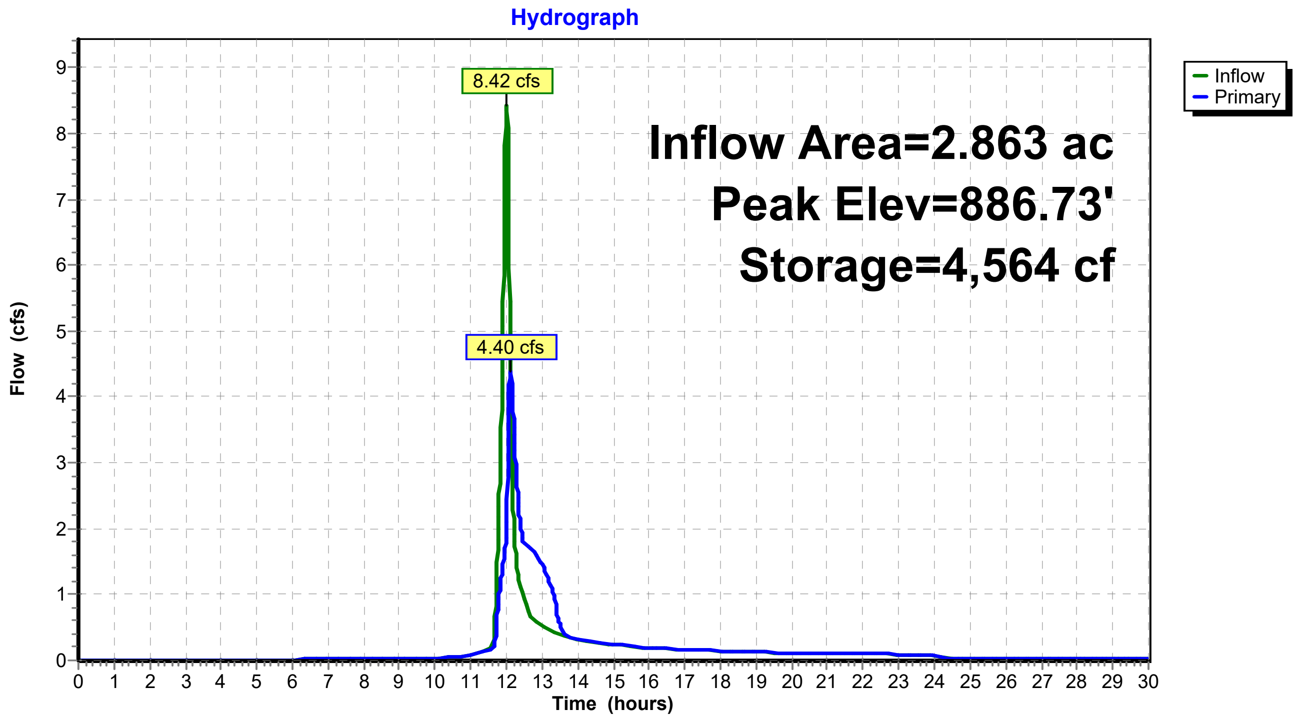
Volume	Invert	Avail.Storage	Storage Description
#1	884.50'	12,606 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
884.50	0	0.0	0	0	0
885.00	592	119.0	99	99	1,127
886.00	2,992	335.0	1,638	1,737	8,934
887.00	5,687	455.0	4,268	6,005	16,489
888.00	7,559	480.0	6,601	12,606	18,407

Device	Routing	Invert	Outlet Devices
#1	Primary	884.50'	**18.0" Round 18" Outlet Pipe** L= 26.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 884.50' / 884.00' S= 0.0192 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	884.50'	**7.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	884.50'	**12.0" Round 12" Inlet Pipe** L= 21.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 884.50' / 884.50' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 1	886.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.39 cfs @ 12.11 hrs HW=886.73' (Free Discharge)
└─**1=18" Outlet Pipe** (Passes 4.39 cfs of 8.16 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.99 cfs @ 6.67 fps)
  │ └─**3=12" Inlet Pipe** (Passes 1.99 cfs of 4.38 cfs potential flow)
  └─**4=Sharp-Crested Rectangular Weir** (Weir Controls 2.40 cfs @ 1.87 fps)

Pond 1BP: Detention Pond



Summary for Pond 1CP: East Bioretention Basin

Inflow Area = 0.835 ac, 70.06% Impervious, Inflow Depth = 2.40" for 10yr event
Inflow = 3.35 cfs @ 11.97 hrs, Volume= 0.167 af
Outflow = 3.11 cfs @ 12.00 hrs, Volume= 0.150 af, Atten= 7%, Lag= 1.7 min
Primary = 3.11 cfs @ 12.00 hrs, Volume= 0.150 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 902.24' @ 12.00 hrs Surf.Area= 2,593 sf Storage= 1,551 cf

Plug-Flow detention time= 113.7 min calculated for 0.150 af (90% of inflow)
Center-of-Mass det. time= 62.8 min (852.8 - 790.0)

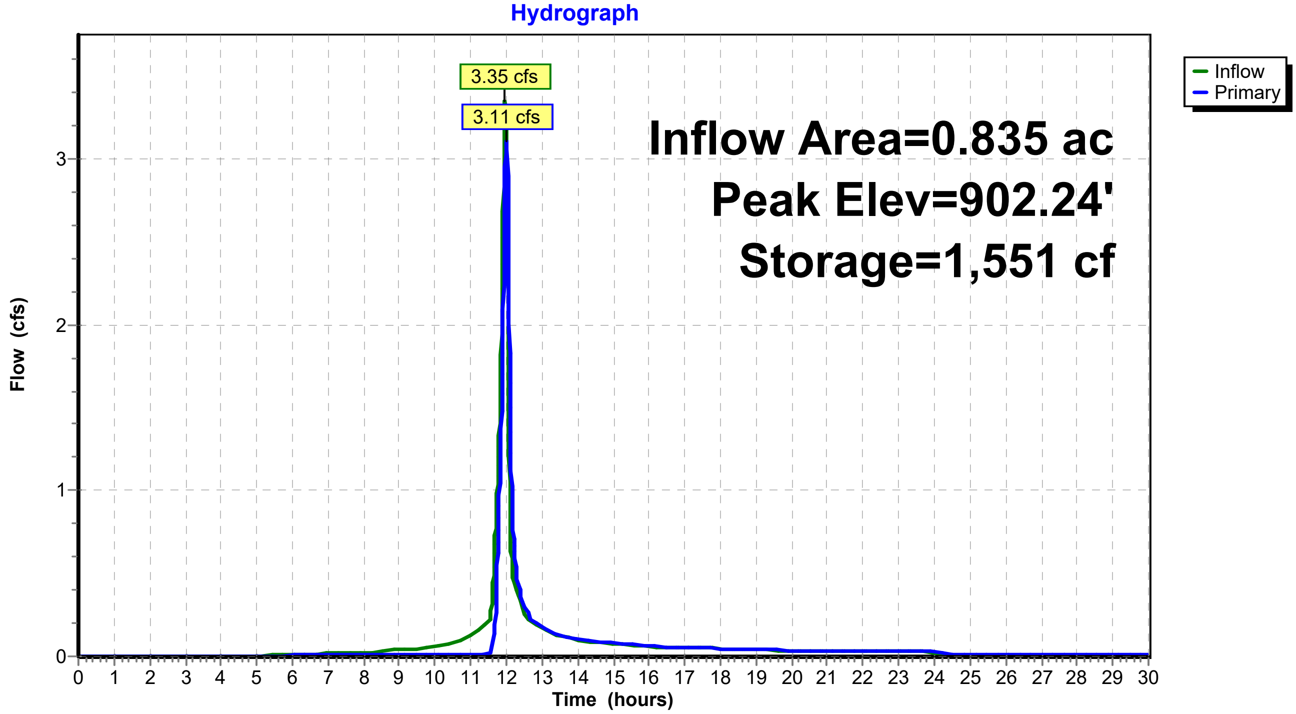
Volume	Invert	Avail.Storage	Storage Description
#1	901.50'	4,064 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
901.50	1,722	271.0	0	0	1,722
902.00	2,191	290.0	976	976	2,582
903.00	4,082	370.0	3,088	4,064	6,796

Device	Routing	Invert	Outlet Devices
#1	Primary	898.00'	**12.0" Round Culvert** L= 134.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 896.81' S= 0.0089 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	898.00'	**6.0" Round Underdrain** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 898.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#3	Device 2	901.50'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 800.00'
#4	Device 1	902.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.10 cfs @ 12.00 hrs HW=902.24' (Free Discharge)
└─**1=Culvert** (Passes 3.10 cfs of 5.37 cfs potential flow)
  ├─**2=Underdrain** (Passes 0.02 cfs of 0.90 cfs potential flow)
  │ └─**3=Exfiltration** (Controls 0.02 cfs)
  └─**4=Orifice/Grate** (Weir Controls 3.09 cfs @ 1.60 fps)

Pond 1CP: East Bioretention Basin



Summary for Pond 1DP: North Bioretention Basin

Inflow Area = 0.444 ac, 80.41% Impervious, Inflow Depth = 2.50" for 10yr event
Inflow = 1.83 cfs @ 11.97 hrs, Volume= 0.092 af
Outflow = 1.76 cfs @ 11.99 hrs, Volume= 0.082 af, Atten= 4%, Lag= 1.2 min
Primary = 0.01 cfs @ 11.99 hrs, Volume= 0.015 af
Secondary = 1.75 cfs @ 11.99 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 902.16' @ 11.99 hrs Surf.Area= 1,392 sf Storage= 821 cf

Plug-Flow detention time= 122.3 min calculated for 0.082 af (89% of inflow)
Center-of-Mass det. time= 67.4 min (851.7 - 784.4)

Volume	Invert	Avail.Storage	Storage Description
#1	901.50'	2,159 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

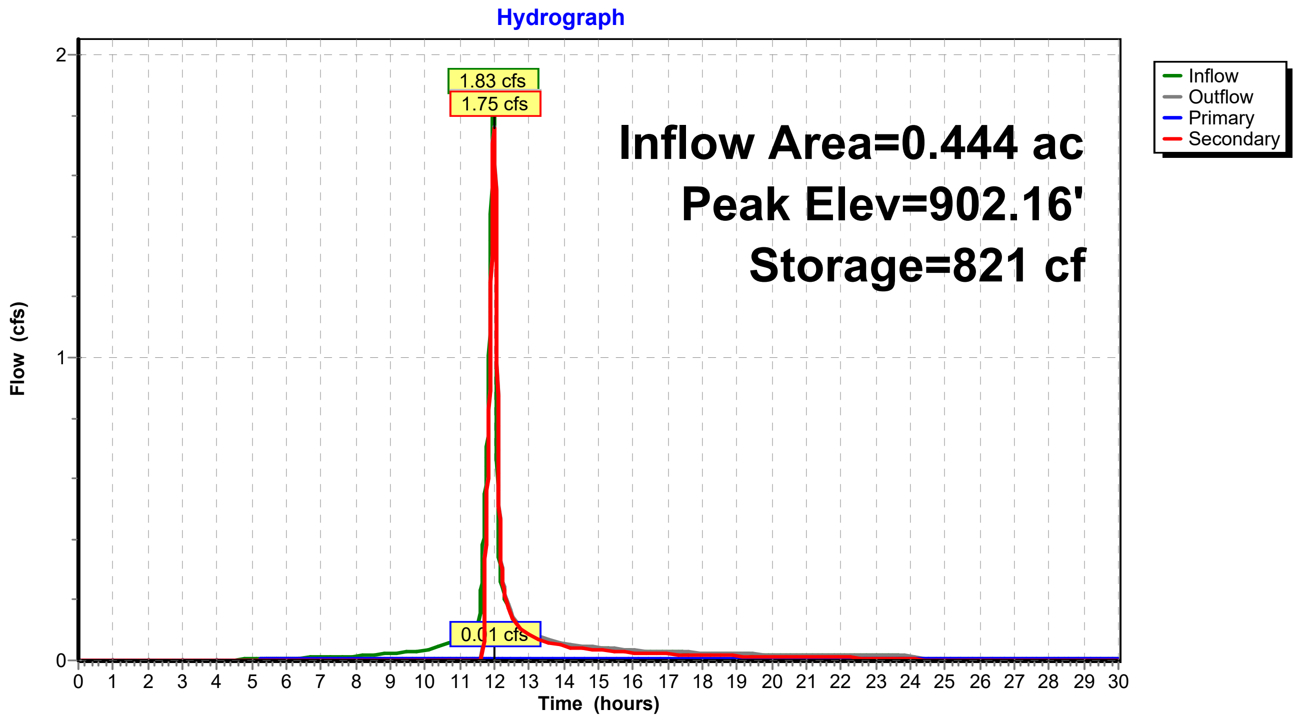
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
901.50	1,080	152.0	0	0	1,080
902.00	1,314	161.0	598	598	1,317
903.00	1,822	180.0	1,561	2,159	1,860

Device	Routing	Invert	Outlet Devices
#1	Primary	898.00'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 898.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	901.50'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 800.00'
#3	Secondary	902.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 11.99 hrs HW=902.16' (Free Discharge)
└─**1=Culvert** (Passes 0.01 cfs of 1.36 cfs potential flow)
  └─**2=Exfiltration** (Controls 0.01 cfs)

Secondary OutFlow Max=1.75 cfs @ 11.99 hrs HW=902.16' (Free Discharge)
└─**3=Orifice/Grate** (Weir Controls 1.75 cfs @ 1.33 fps)

Pond 1DP: North Bioretention Basin



Summary for Pond 1EP: Conveyance Pipe

[79] Warning: Submerged Pond 1CP Primary device # 1 INLET by 0.08'
[79] Warning: Submerged Pond 1DP Primary device # 1 by 0.08'

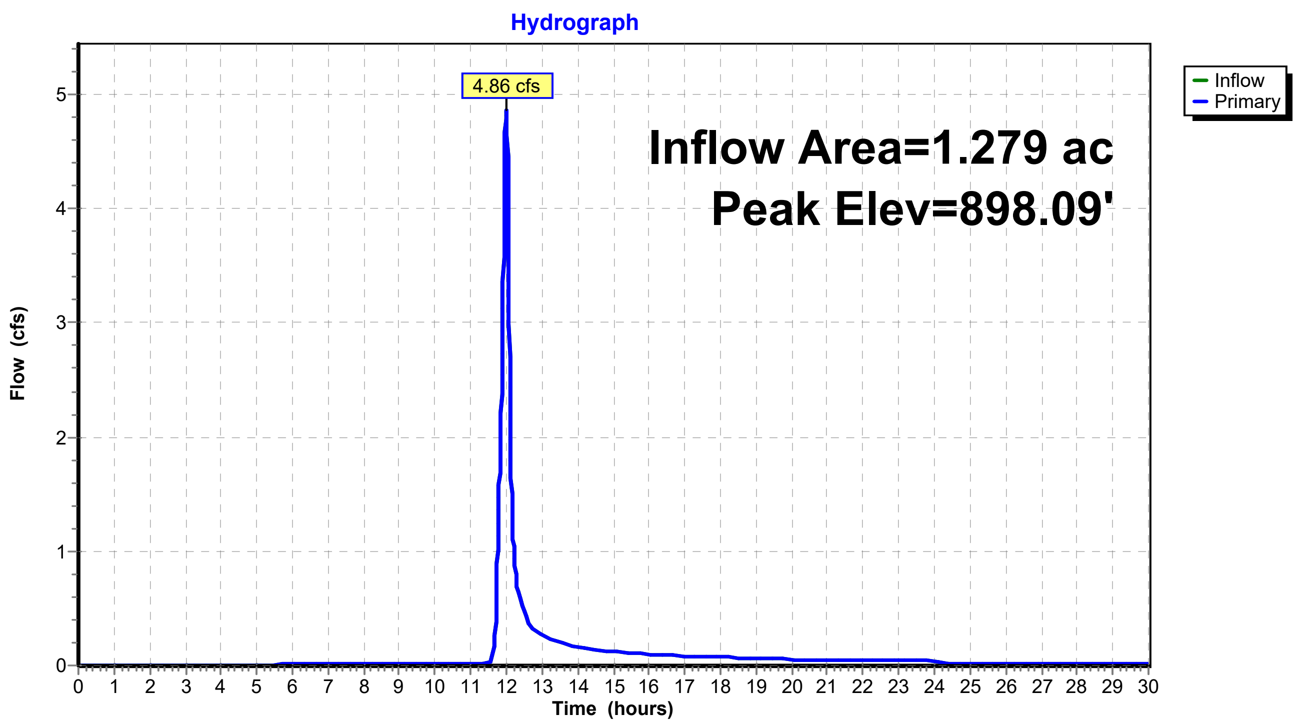
Inflow Area = 1.279 ac, 73.65% Impervious, Inflow Depth > 2.18" for 10yr event
Inflow = 4.86 cfs @ 11.99 hrs, Volume= 0.232 af
Outflow = 4.86 cfs @ 11.99 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min
Primary = 4.86 cfs @ 11.99 hrs, Volume= 0.232 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 898.09' @ 11.99 hrs
Flood Elev= 902.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	893.50'	**18.0" Round Culvert** L= 109.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 893.50' / 885.00' S= 0.0780 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	896.81'	**18.0" Round Culvert** L= 196.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 896.81' / 893.50' S= 0.0169 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.85 cfs @ 11.99 hrs HW=898.08' (Free Discharge)
└─**1=Culvert** (Passes 4.85 cfs of 13.15 cfs potential flow)
└─**2=Culvert** (Inlet Controls 4.85 cfs @ 3.03 fps)

Pond 1EP: Conveyance Pipe



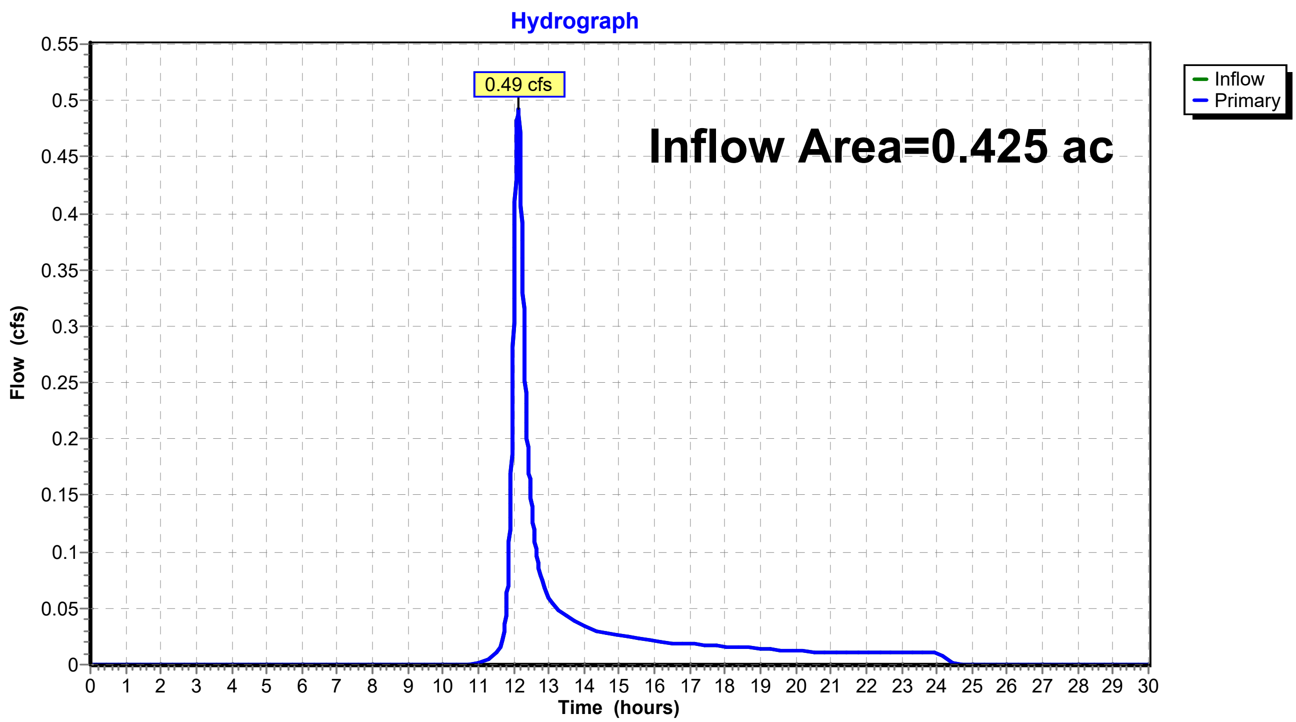
Summary for Pond 2P: Discharge to South

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

Inflow Area = 0.425 ac, 0.00% Impervious, Inflow Depth = 1.06" for 10yr event
Inflow = 0.49 cfs @ 12.12 hrs, Volume= 0.038 af
Primary = 0.49 cfs @ 12.12 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

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

Pond 2P: Discharge to South



Summary for Subcatchment 1AS: Subcatchment Area 1A

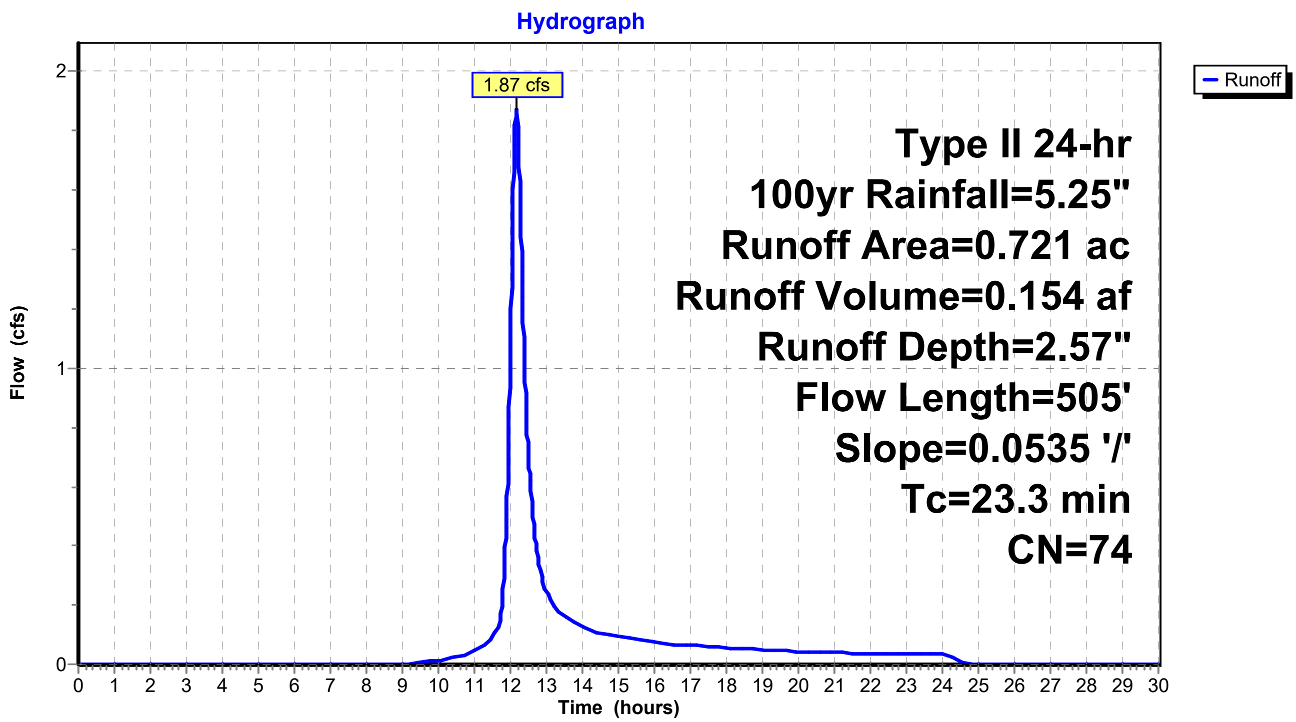
Runoff = 1.87 cfs @ 12.17 hrs, Volume= 0.154 af, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
0.173	77	Woods, Good, HSG D
0.548	73	Brush, Good, HSG D
0.721	74	Weighted Average
0.721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0535	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
5.8	405	0.0535	1.16		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
23.3	505	Total			

Subcatchment 1AS: Subcatchment Area 1A



Summary for Subcatchment 1BS: Subcatchment Area 1B

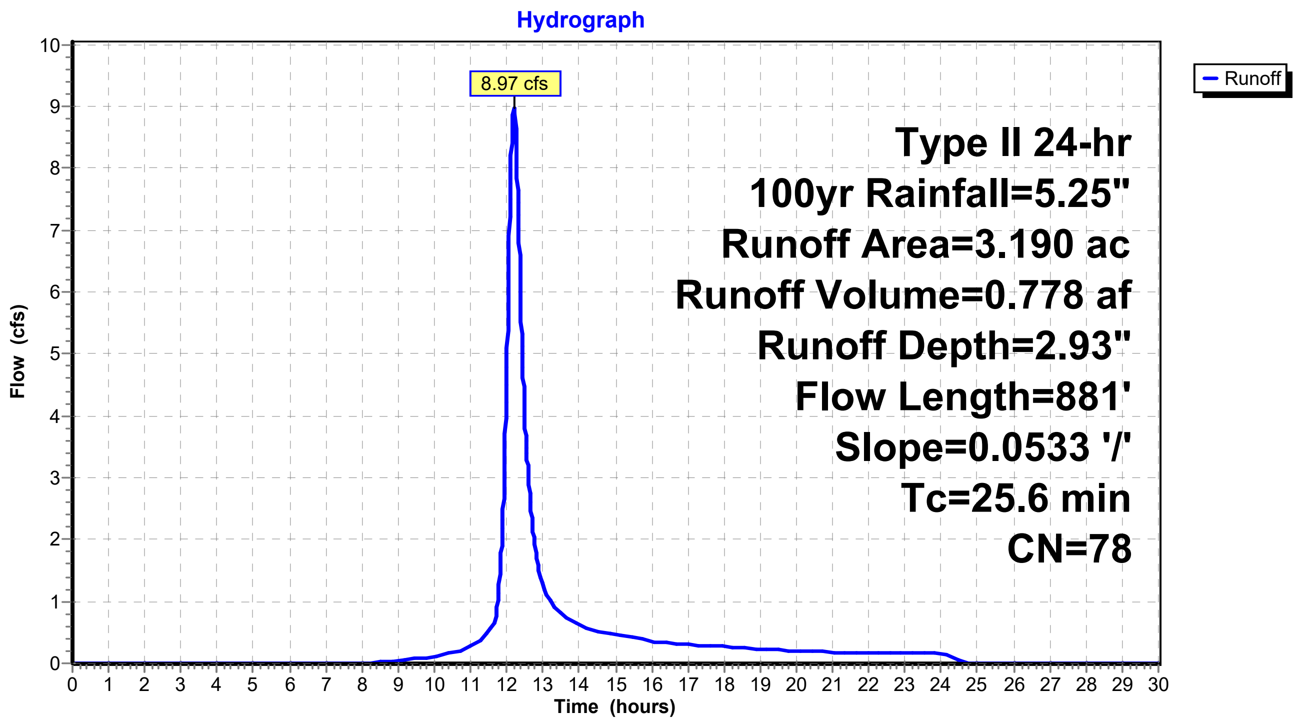
Runoff = 8.97 cfs @ 12.20 hrs, Volume= 0.778 af, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
1.534	77	Woods, Good, HSG D
0.352	73	Brush, Good, HSG D
1.200	80	>75% Grass cover, Good, HSG D
0.104	98	Paved parking, HSG D
3.190	78	Weighted Average
3.086		96.74% Pervious Area
0.104		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	100	0.0533	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
8.1	781	0.0533	1.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.6	881	Total			

Subcatchment 1BS: Subcatchment Area 1B



Summary for Subcatchment 1CS: Subcatchment Area 1C

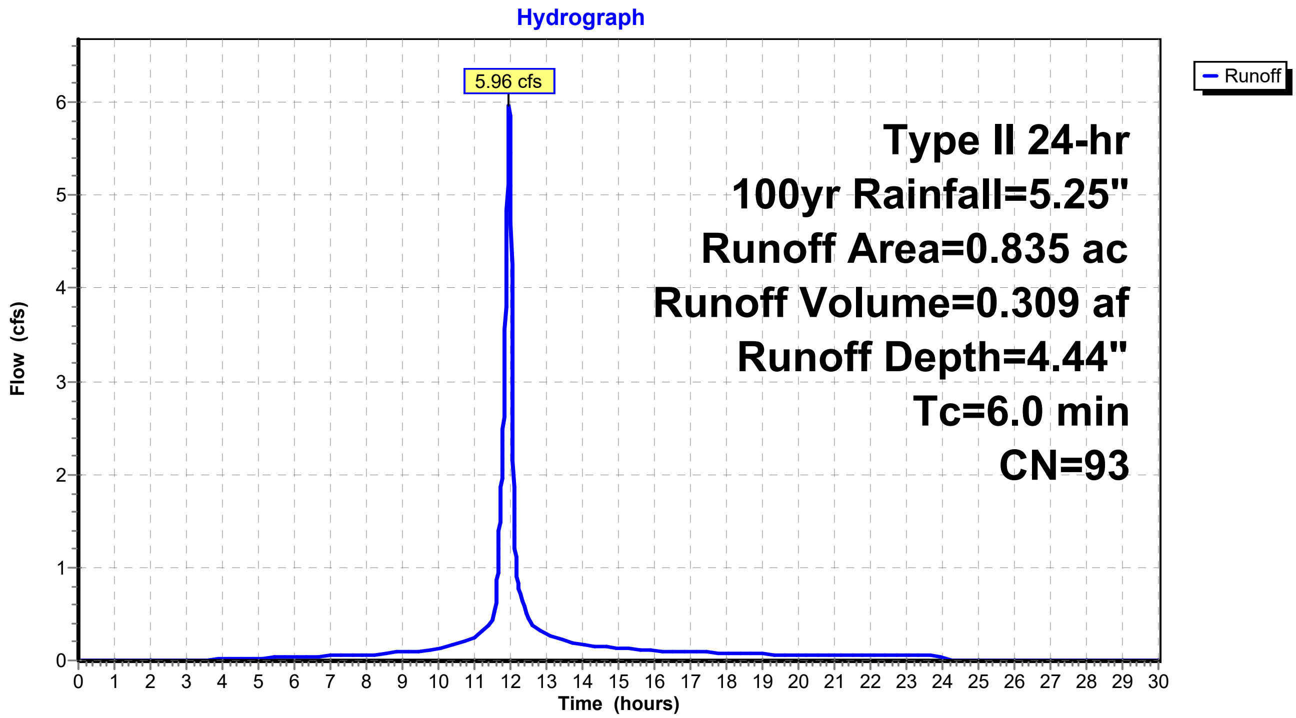
Runoff = 5.96 cfs @ 11.97 hrs, Volume= 0.309 af, Depth= 4.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
0.585	98	Paved parking, HSG D
0.250	80	>75% Grass cover, Good, HSG D
0.835	93	Weighted Average
0.250		29.94% Pervious Area
0.585		70.06% Impervious Area

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

Subcatchment 1CS: Subcatchment Area 1C



Summary for Subcatchment 1DS: Subcatchment Area 1D

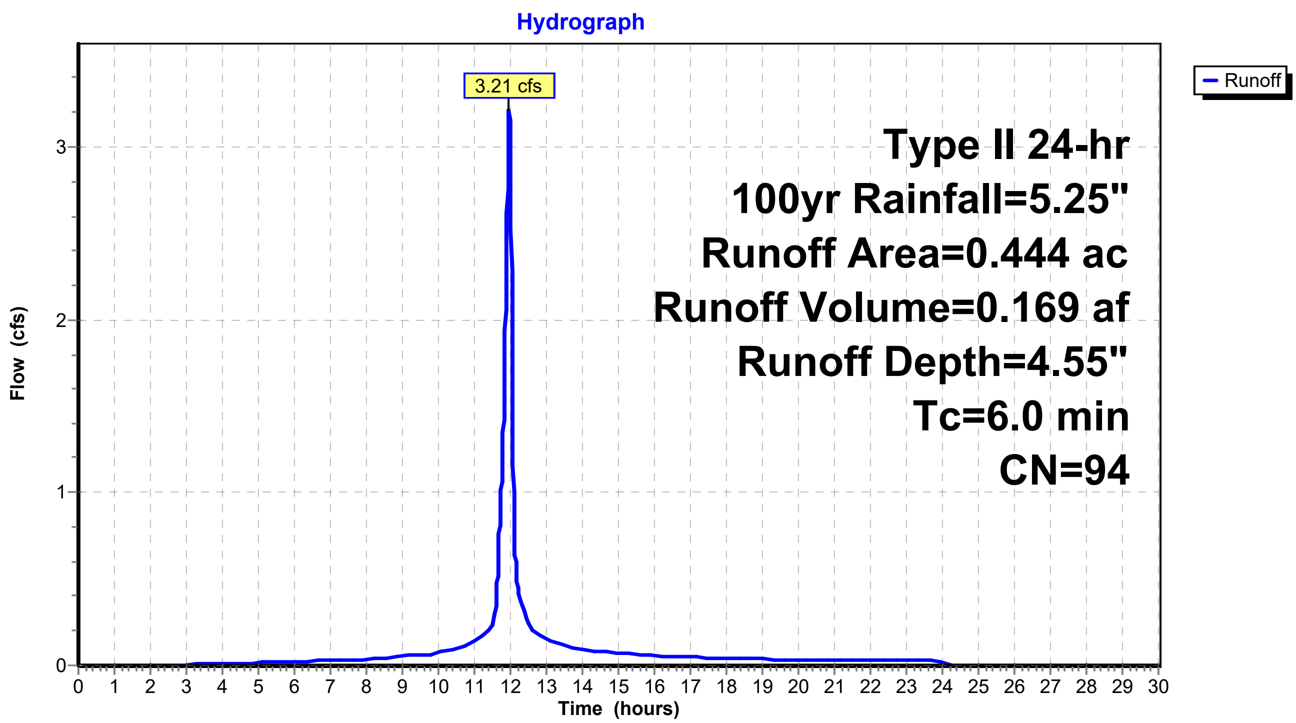
Runoff = 3.21 cfs @ 11.97 hrs, Volume= 0.169 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
0.357	98	Paved parking, HSG D
0.087	80	>75% Grass cover, Good, HSG D
0.444	94	Weighted Average
0.087		19.59% Pervious Area
0.357		80.41% Impervious Area

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

Subcatchment 1DS: Subcatchment Area 1D



Summary for Subcatchment 1ES: Subcatchment Area 1E

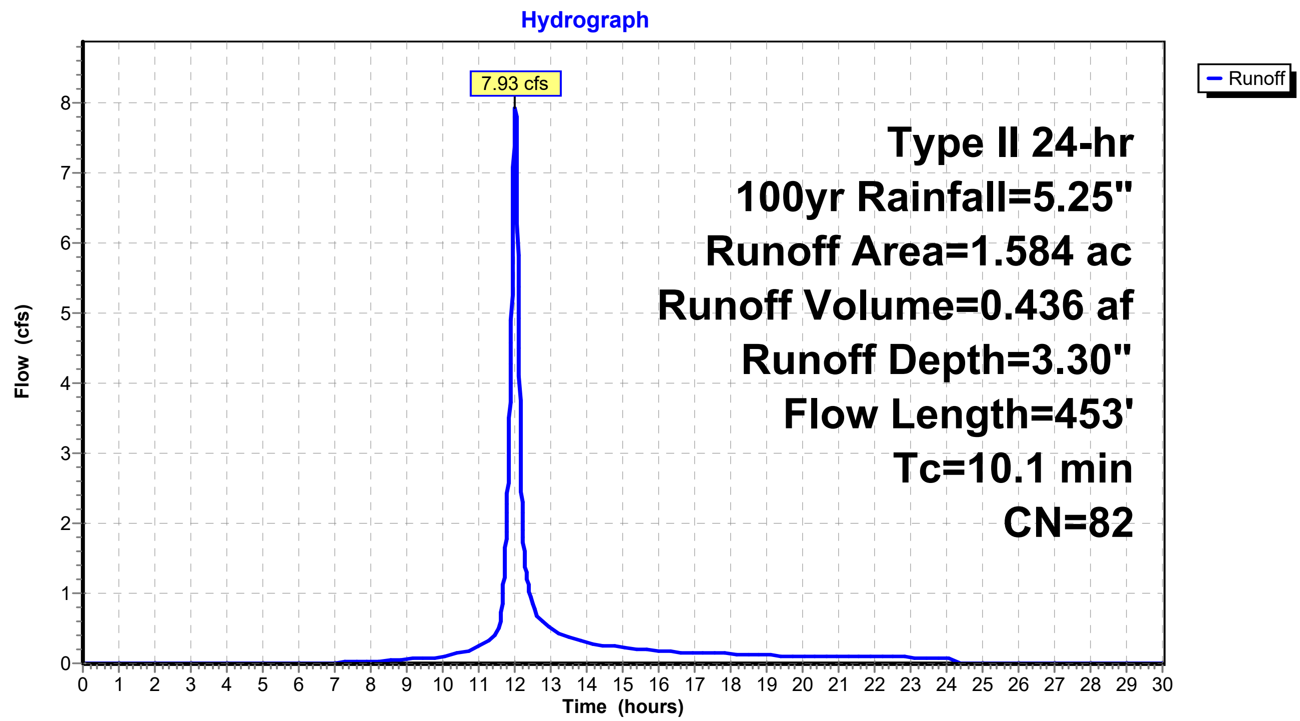
Runoff = 7.93 cfs @ 12.02 hrs, Volume= 0.436 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
1.395	80	>75% Grass cover, Good, HSG D
0.189	98	Paved parking, HSG D
1.584	82	Weighted Average
1.395		88.07% Pervious Area
0.189		11.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	65	0.0310	1.25		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.20"
5.3	35	0.0460	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
3.9	353	0.0460	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.1	453	Total			

Subcatchment 1ES: Subcatchment Area 1E



Summary for Subcatchment 2S: Subcatchment Area 2

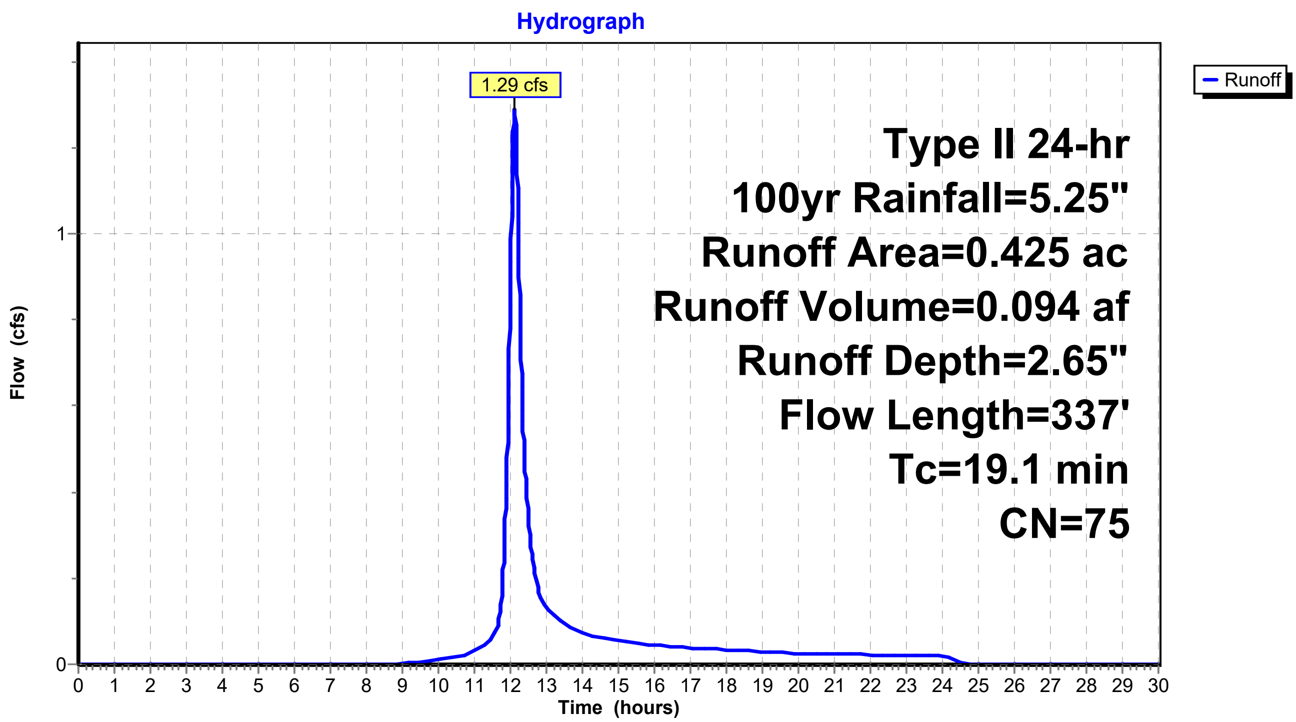
Runoff = 1.29 cfs @ 12.12 hrs, Volume= 0.094 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr Rainfall=5.25"

Area (ac)	CN	Description
0.220	77	Woods, Good, HSG D
0.205	73	Brush, Good, HSG D
0.425	75	Weighted Average
0.425		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0780	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
4.1	237	0.0377	0.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.1	337	Total			

Subcatchment 2S: Subcatchment Area 2



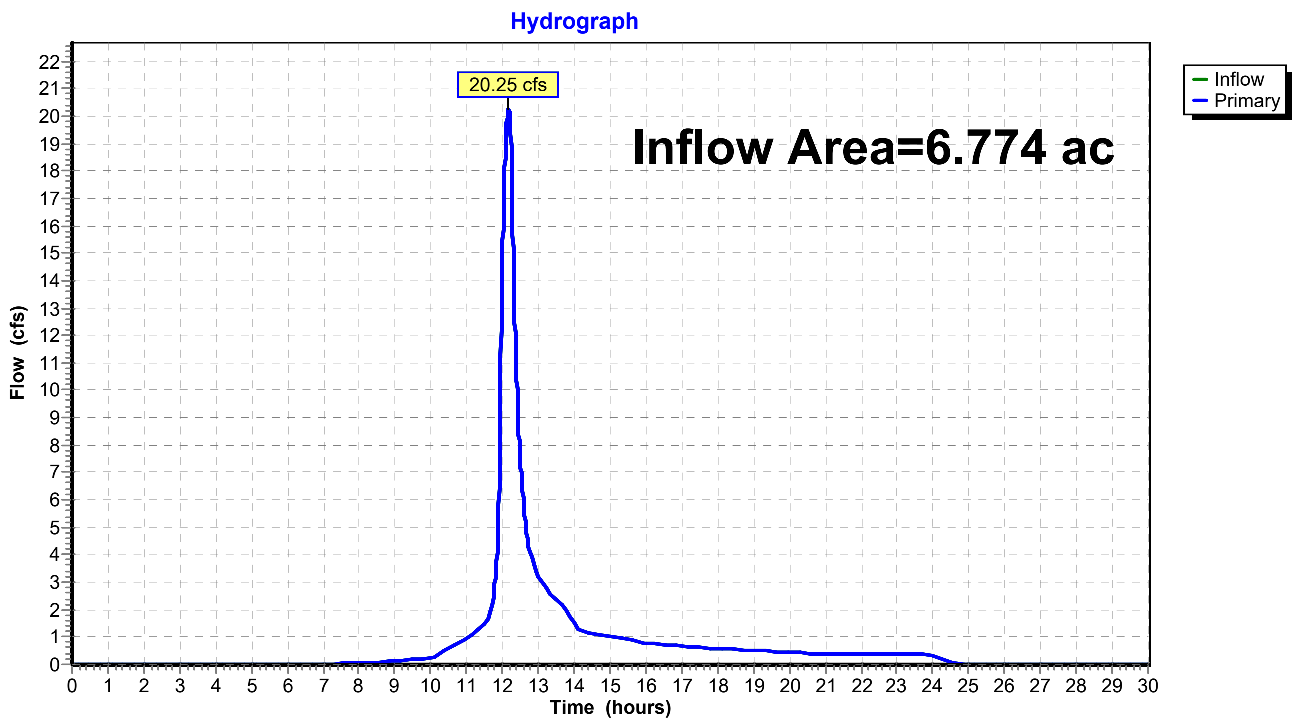
Summary for Pond 1AP: Discharge to Olean Road

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

Inflow Area = 6.774 ac, 18.23% Impervious, Inflow Depth > 3.22" for 100yr event
Inflow = 20.25 cfs @ 12.17 hrs, Volume= 1.819 af
Primary = 20.25 cfs @ 12.17 hrs, Volume= 1.819 af, Atten= 0%, Lag= 0.0 min

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

Pond 1AP: Discharge to Olean Road



Summary for Pond 1BP: Detention Pond

[79] Warning: Submerged Pond 1EP Primary device # 1 OUTLET by 2.36'

Inflow Area = 2.863 ac, 39.50% Impervious, Inflow Depth > 3.72" for 100yr event
Inflow = 16.34 cfs @ 12.01 hrs, Volume= 0.887 af
Outflow = 9.76 cfs @ 12.10 hrs, Volume= 0.887 af, Atten= 40%, Lag= 5.5 min
Primary = 9.76 cfs @ 12.10 hrs, Volume= 0.887 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 887.36' @ 12.10 hrs Surf.Area= 6,329 sf Storage= 8,164 cf

Plug-Flow detention time= 11.4 min calculated for 0.887 af (100% of inflow)
Center-of-Mass det. time= 11.4 min (827.2 - 815.9)

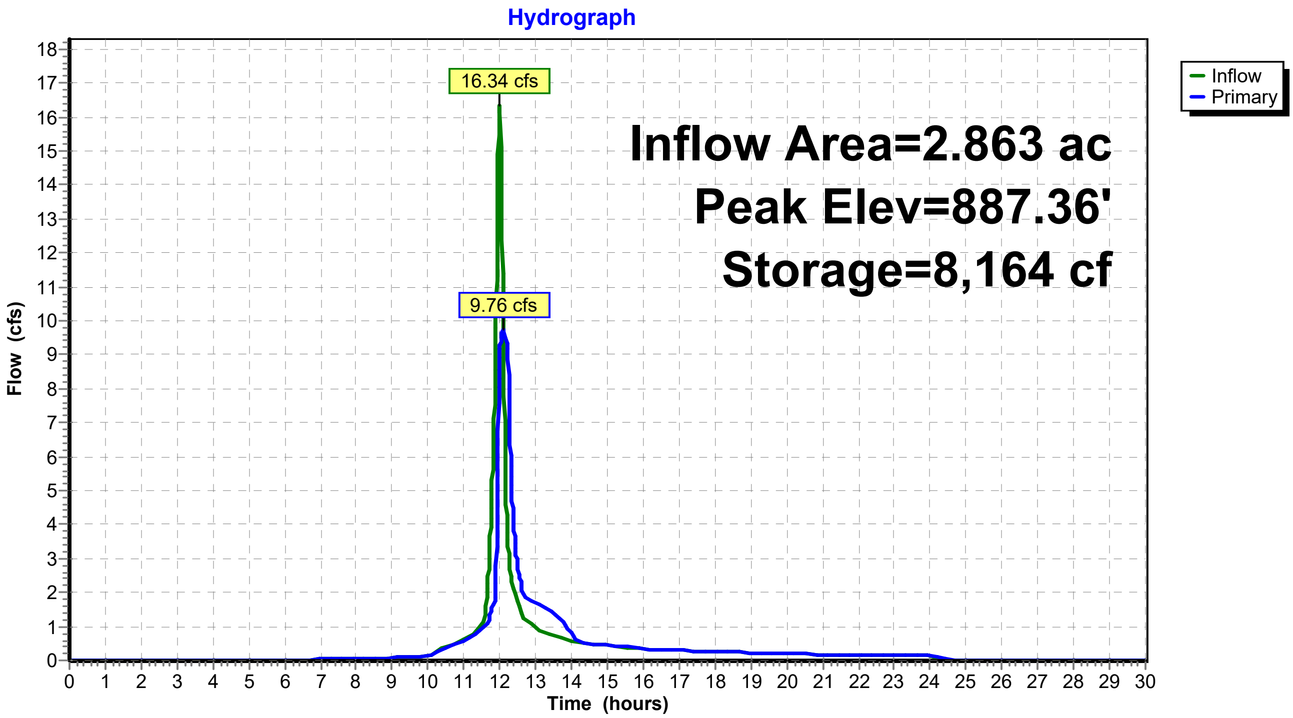
Volume	Invert	Avail.Storage	Storage Description
#1	884.50'	12,606 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
884.50	0	0.0	0	0	0
885.00	592	119.0	99	99	1,127
886.00	2,992	335.0	1,638	1,737	8,934
887.00	5,687	455.0	4,268	6,005	16,489
888.00	7,559	480.0	6,601	12,606	18,407

Device	Routing	Invert	Outlet Devices
#1	Primary	884.50'	**18.0" Round 18" Outlet Pipe** L= 26.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 884.50' / 884.00' S= 0.0192 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	884.50'	**7.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	884.50'	**12.0" Round 12" Inlet Pipe** L= 21.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 884.50' / 884.50' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 1	886.40'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=9.76 cfs @ 12.10 hrs HW=887.36' (Free Discharge)
└─**1=18" Outlet Pipe** (Inlet Controls 9.76 cfs @ 5.52 fps)
  ├─**2=Orifice/Grate** (Passes < 2.30 cfs potential flow)
  │ └─**3=12" Inlet Pipe** (Passes < 5.12 cfs potential flow)
  └─**4=Sharp-Crested Rectangular Weir** (Passes < 11.69 cfs potential flow)

Pond 1BP: Detention Pond



Summary for Pond 1CP: East Bioretention Basin

Inflow Area = 0.835 ac, 70.06% Impervious, Inflow Depth = 4.44" for 100yr event
Inflow = 5.96 cfs @ 11.97 hrs, Volume= 0.309 af
Outflow = 5.44 cfs @ 12.00 hrs, Volume= 0.293 af, Atten= 9%, Lag= 1.9 min
Primary = 5.44 cfs @ 12.00 hrs, Volume= 0.293 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 902.36' @ 12.00 hrs Surf.Area= 2,809 sf Storage= 1,880 cf

Plug-Flow detention time= 75.1 min calculated for 0.292 af (95% of inflow)
Center-of-Mass det. time= 43.8 min (817.2 - 773.4)

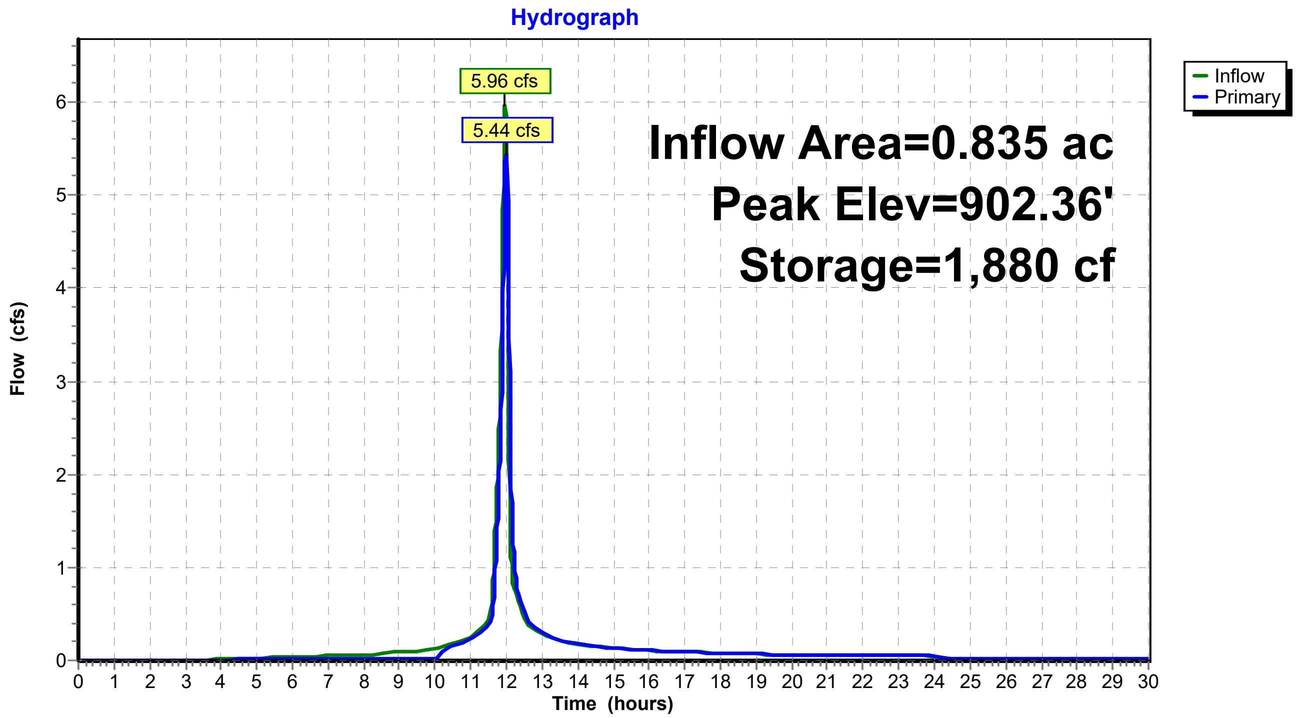
Volume	Invert	Avail.Storage	Storage Description
#1	901.50'	4,064 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
901.50	1,722	271.0	0	0	1,722
902.00	2,191	290.0	976	976	2,582
903.00	4,082	370.0	3,088	4,064	6,796

Device	Routing	Invert	Outlet Devices
#1	Primary	898.00'	**12.0" Round Culvert** L= 134.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 896.81' S= 0.0089 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	898.00'	**6.0" Round Underdrain** L= 120.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 898.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#3	Device 2	901.50'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 800.00'
#4	Device 1	902.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.44 cfs @ 12.00 hrs HW=902.36' (Free Discharge)
└─**1=Culvert** (Barrel Controls 5.44 cfs @ 6.93 fps)
  ├─**2=Underdrain** (Passes < 0.92 cfs potential flow)
  │ └─**3=Exfiltration** (Passes < 0.02 cfs potential flow)
  └─**4=Orifice/Grate** (Passes < 5.71 cfs potential flow)

Pond 1CP: East Bioretention Basin



Summary for Pond 1DP: North Bioretention Basin

Inflow Area = 0.444 ac, 80.41% Impervious, Inflow Depth = 4.55" for 100yr event
Inflow = 3.21 cfs @ 11.97 hrs, Volume= 0.169 af
Outflow = 3.12 cfs @ 11.99 hrs, Volume= 0.158 af, Atten= 3%, Lag= 1.1 min
Primary = 0.01 cfs @ 11.99 hrs, Volume= 0.016 af
Secondary = 3.11 cfs @ 11.99 hrs, Volume= 0.142 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 902.24' @ 11.99 hrs Surf.Area= 1,429 sf Storage= 929 cf

Plug-Flow detention time= 82.1 min calculated for 0.158 af (94% of inflow)
Center-of-Mass det. time= 47.2 min (815.8 - 768.6)

Volume	Invert	Avail.Storage	Storage Description
#1	901.50'	2,159 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

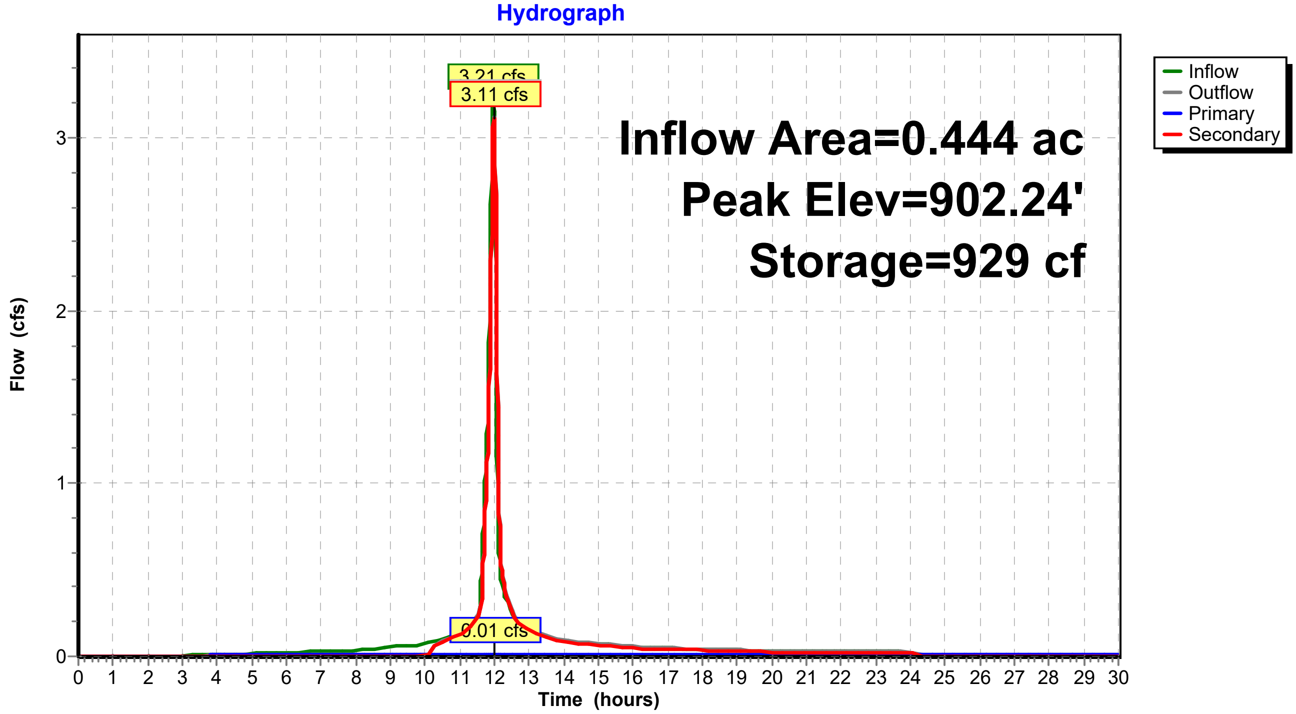
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
901.50	1,080	152.0	0	0	1,080
902.00	1,314	161.0	598	598	1,317
903.00	1,822	180.0	1,561	2,159	1,860

Device	Routing	Invert	Outlet Devices
#1	Primary	898.00'	**6.0" Round Culvert** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 898.00' / 898.00' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	901.50'	**0.250 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 800.00'
#3	Secondary	902.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.01 cfs @ 11.99 hrs HW=902.24' (Free Discharge)
└─**1=Culvert** (Passes 0.01 cfs of 1.38 cfs potential flow)
  └─**2=Exfiltration** (Controls 0.01 cfs)

Secondary OutFlow Max=3.10 cfs @ 11.99 hrs HW=902.24' (Free Discharge)
└─**3=Orifice/Grate** (Weir Controls 3.10 cfs @ 1.61 fps)

Pond 1DP: North Bioretention Basin



Summary for Pond 1EP: Conveyance Pipe

[79] Warning: Submerged Pond 1CP Primary device # 1 INLET by 1.18'
[79] Warning: Submerged Pond 1DP Primary device # 1 by 1.18'

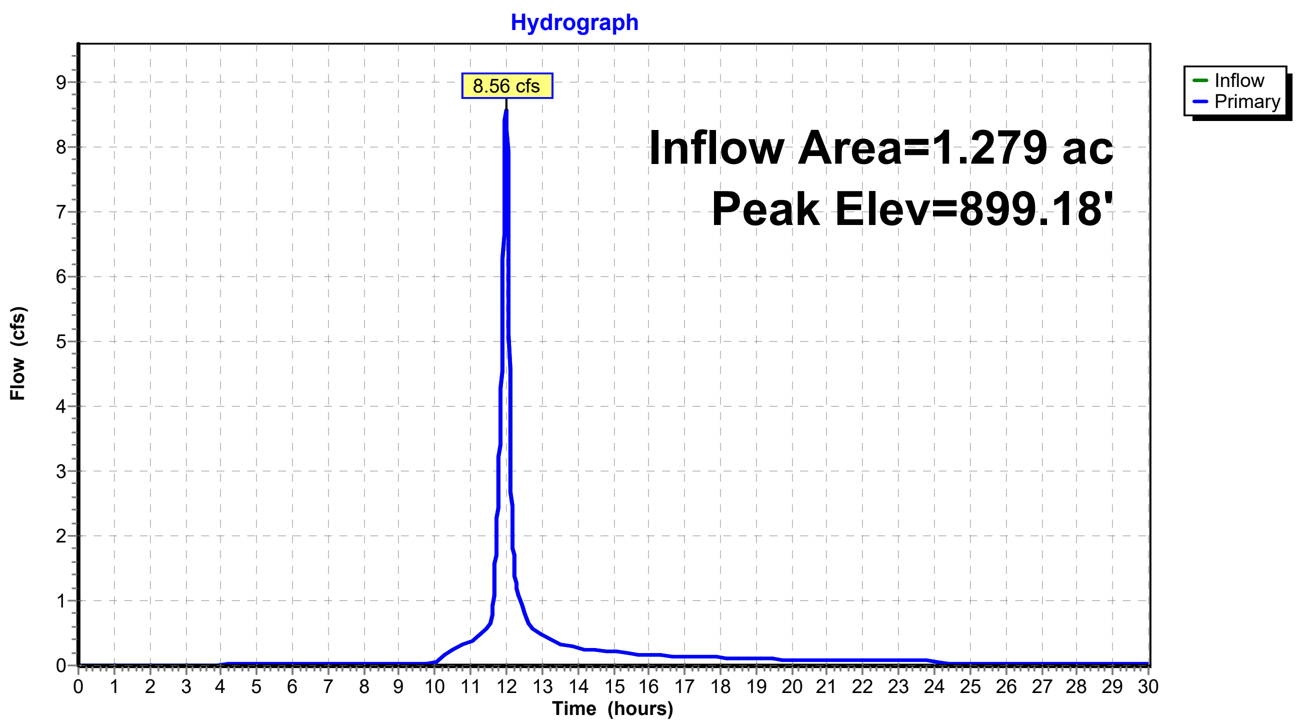
Inflow Area = 1.279 ac, 73.65% Impervious, Inflow Depth > 4.23" for 100yr event
Inflow = 8.56 cfs @ 11.99 hrs, Volume= 0.451 af
Outflow = 8.56 cfs @ 11.99 hrs, Volume= 0.451 af, Atten= 0%, Lag= 0.0 min
Primary = 8.56 cfs @ 11.99 hrs, Volume= 0.451 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 899.18' @ 11.99 hrs
Flood Elev= 902.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	893.50'	**18.0" Round Culvert** L= 109.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 893.50' / 885.00' S= 0.0780 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	896.81'	**18.0" Round Culvert** L= 196.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 896.81' / 893.50' S= 0.0169 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=8.55 cfs @ 11.99 hrs HW=899.18' (Free Discharge)
└─**1=Culvert** (Passes 8.55 cfs of 14.92 cfs potential flow)
  └─**2=Culvert** (Inlet Controls 8.55 cfs @ 4.84 fps)

Pond 1EP: Conveyance Pipe



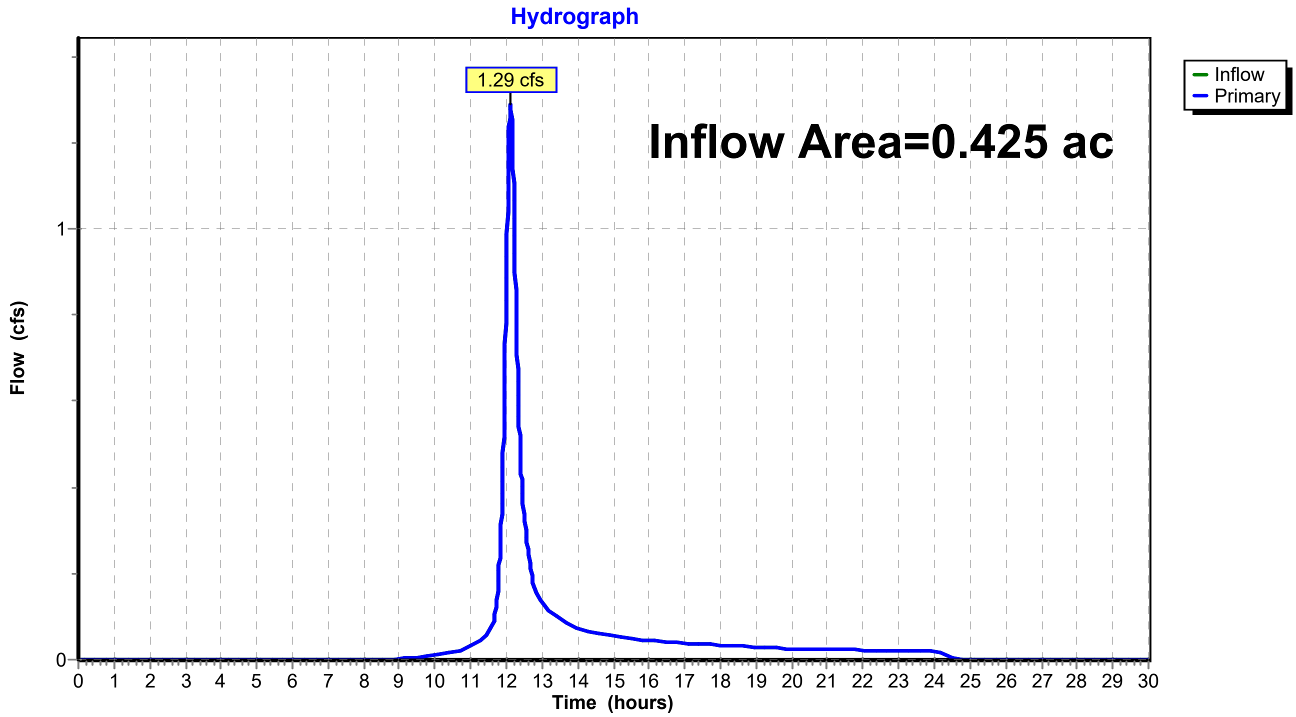
Summary for Pond 2P: Discharge to South

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

Inflow Area = 0.425 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100yr event
Inflow = 1.29 cfs @ 12.12 hrs, Volume= 0.094 af
Primary = 1.29 cfs @ 12.12 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

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

Pond 2P: Discharge to South



PROPOSED DRAINAGE ANALYSIS MAP
DRAINAGE AREA
IMPERVIOUS AREA
TIME OF CONCENTRATION
80 0 80 160 Ft.
80'
PLAN NORTH
SUBCATCHMENT AREA 1A
SUBCATCHMENT AREA 1B
SUBCATCHMENT AREA 1C
SUBCATCHMENT AREA 1D
SUBCATCHMENT AREA E
SUBCATCHMENT AREA 2
TREES & BRUSH
453.50' DEED AND MEASURED
313.41' DEED AND MEASURED
241.80' DEED AND MEASURED
266.80' DEED AND MEASURED
856.38' DEED AND MEASURED
446.00' DEED AND MEASURED
98°24' DEED
99°35'30" MEAS.
SOUTH LINE LANDS OF CLARKE L. 8349, P. 149
EAST LINE LANDS OF CLARKE L. 8349, P. 149
SOUTH LINE OF LOT 14
NORTH LINE OF LOT 13
NORFOLK SOUTHERN RAILROAD
WEST LINE OF LANDS FORMERLY OWNED BY THE PENNSYLVANIA RAILROAD COMPANY
FOUND IRON AXLE 0.7' N ONLINE
FOUND IRON PIPE 1.6' E 0.2' N
FOUND 2" IRON ROD 1.1' E ONLINE
FOUND REBAR AND CAP 0.4'W
FOUND REBAR ONLINE
OLEAN ROAD
(WIDTH VARIES)
EDGE OF PAVEMENT
ASPHALT DRIVE
BENCHMARK PK NAIL ELEVATION = 885.75'
TELEPHONE MARKER
30" BOX CULVERT INVERT = 883.50'
POINT OF BEGINNING
NORTHWEST CORNER OF LANDS CONVEYED TO CLARKE AND WIFE
LIBER 8349, PAGE 149
DOMESTIC AND PRIVATE FIRE SERVICES SHALL BE DUCTILE IRON FROM TAP LOCATION THROUGH HOTBOX ENCLOSURE, TRANSITION FROM DUCTILE IRON TO PVC AND PE PIPING 10-FEET DOWNSTREAM OF ENCLOSURE.
HOTBOX ENCLOSURE (SEE DETAIL)
8x6 TS&V (BY ECWA)
6" GATE VALVE (BY ECWA)
3" GATE VALVE (BY ECWA)
APPROXIMATE LOCATION OF EXISTING 8" ECWA WATERMAIN (PER ECWA RECORDS)
6" CL 52 DUCTILE IRON PRIVATE FIRE SERVICE
3" CL 52 DUCTILE IRON DOMESTIC WATER SERVICE
EXISTING FIRE HYDRANT
LIGHT STONE FILL RIP RAP
1,500 GALLON TWO-COMPARTMENT SEPTIC TANK RIM 903.75
DETENTION BASIN

DATE: MAY 2021
PROJECT NAME: RURAL OUTREACH CENTER

Stormwater Quality Calculations

Impervious Areas (refer to Existing & Proposed Drainage Analysis Maps)

$I_{Existing} := 0.43$ — $I_{Existing}$ = Existing Impervious Area (acres) per Existing Drainage Analysis Map

$I_{Proposed} := 1.21$ — $I_{Proposed}$ = Proposed Impervious Area (acres) per Proposed Drainage Analysis Map

$I_{New} := I_{Proposed} - I_{Existing}$ — I_{New} = New Impervious Area (acres)

$I_{New} = 0.780$

$I_{Reconstructed} := I_{Proposed} - I_{New}$ — $I_{Reconstructed}$ = Reconstructed Impervious Area (acres)

$I_{Reconstructed} = 0.430$

Minimum Runoff Reduction Volume (RR_v Min)

The minimum RRv is calculated by applying a reduction factor (S) (based on the HSG on site) to the area of new impervious coverage.

$P := 1.0$ — ***90% Rainfall Event (inches)***

$Rv := 0.95$ — **0.05 + 0.009(I) where I is 100% impervious**

$Aic := 0.78$ — ***Total Area of new impervious area (acres)***

$S := 0.20$ — ***Hydrologic Soil Group (HSG) Specific Reduction Factor (S)***
The site is 100% HSG D. Therefore, S = 0.20

$RR_{vmin} := \frac{P \cdot Rv \cdot Aic \cdot S}{12} = 0.012$ — ***Runoff Reduction Volume Minimum (acre-feet)***

$RR_{vmin} \cdot 43560 = 538$ — ***Runoff Reduction Volume Minimum (cubic-feet)***

Water Quality Volume Required (WQ_v Required)

New Impervious Area

$P = 1.000$ — *90% Rainfall Event (inches)*

$A_n := 0.78$ — *Total Area of New Impervious area (acres)*

$I := 100$ — *Percent impervious cover (100%)*

$R_v := 0.05 + 0.009 \cdot I$ — **0.05 + 0.009(I) where I is 100% impervious**

$R_v = 0.950$

$$WQ_{vNew} := \frac{P \cdot R_v \cdot A_n}{12}$$

$WQ_{vNew} = 0.062$ — *Water Quality Volume Required from New Impervious Areas (acre-feet)*

$WQ_{vNew} \cdot 43560 = 2690$ — *Water Quality Volume Required from New Impervious Areas (cubic feet)*

Reconstructed Impervious Area

$P = 1.000$ — *90% Rainfall Event (inches)*

$A_r := 0.43$ — *Total Area of new impervious area (acres)*

$I := 100$ — *Percent impervious cover (100%)*

$R_v := 0.05 + 0.009 \cdot I$ — **0.05 + 0.009(I) where I is 100% impervious**

$R_v = 0.950$

$$WQ_{vRecon} := \frac{P \cdot R_v \cdot A_r}{12}$$

$WQ_{vRecon} = 0.034$ — *Water Quality Volume Required from Reconstructed Impervious Areas (acre-feet)*

$WQ_{vRecon} \cdot 43560 = 1483$ — *Water Quality Volume Required from Reconstructed Impervious Areas (cubic feet)*

Total Water Quality Volume Required

In accordance with Chapters 4 and 9 of the NYSDEC SMDM, treat 100% of the new impervious area and 25% of the reconstructed impervious area with a standard practice.

$$WQ_{vRequired} := \left(1.0 \cdot WQ_{vNew} + 0.25 \cdot WQ_{vRecon}\right)$$

$WQ_{vRequired} = 0.070$ ***Total Water Quality Volume Required (acre-feet)***

$WQ_{vRequired} \cdot 43560 = 3061$ ***Total Water Quality Volume Required (cubic feet)***

Water Quality Volume Provided (WQ$_v$ Provided)

East Bioretention Basin

$P = 1.000$ ***90% Rainfall Event (inches)***

$A_1 := 0.58$ ***Area draining to BMP = Parking Lot + small portion of access drive = 26,070 sf 0.60 acres***

$I := 100$ ***Percent impervious cover (100%)***

$R_v := 0.05 + 0.009 \cdot I$ **0.05 + 0.009(I) where I is 100% impervious**

$R_v = 0.950$

$$WQ_{v1} := \frac{P \cdot R_v \cdot A_1}{12}$$

$WQ_{v1} = 0.046$ ***Water Quality Volume Provided in BMP (acre-feet)***

$WQ_{v1} \cdot 43560 = 2000$ ***Water Quality Volume Provided in BMP (cubic feet)***

For Bioretention Basins in Type 'D' soils, 40% of the water quality volume can count towards the Runoff Reduction Volume.

$RR_{v1} := 0.40 \cdot WQ_{v1}$

$RR_{v1} = 0.018$ **Runoff Reduction Volume Provided in BMP (acre-feet)**

$RR_{v1} \cdot 43560 = 800$ **Runoff Reduction Volume Provided in BMP (cubic-feet)**

$WQ_{vProvided1} := WQ_{v1} - RR_{v1}$

$WQ_{vProvided1} = 0.028$ **Water Quality Volume Provided in BMP (acre-feet)**

$WQ_{vProvided1} \cdot 43560 = 1200$ **Water Quality Volume Provided in BMP (cubic-feet)**

C&S COMPANIES®

Size Filter Area of East Bioretention Basin

$WQ_{v1} \cdot 43560 = 2000$ — ***Water Quality Volume Provided in BMP (cubic feet)***

$d_f := 2.5$ — **Filter Bed Depth = 2.5 feet**

$k := 0.50$ — **Coefficient of permeability of filter media = 0.50 ft/day (for bioretention soil)**

$h_f := 0.50$ — **Average height of water above filter bed (feet)**

$t_f := 2$ — **Design filter bed drain time = 2 day for bioretention**

$$A_{f1} := \frac{WQ_{v1} \cdot 43560 \cdot d_f}{k \cdot (h_f + d_f) \cdot t_f}$$

$A_{f1} = 1667$ — Required Surface Area of filter bed (square feet)

A_f provided is 1,722 square feet

North Bioretention Basin

$P = 1.000$ — ***90% Rainfall Event (inches)***

$A_2 := .356$ — ***Area draining to BMP = New Bldg, Sdwlks+ Future Bldg = 15,523 sf = 0.356 acres***

$I := 100$ — ***Percent impervious cover (100%)***

$R_v := 0.05 + 0.009 \cdot I$ — **0.05 + 0.009(I) where I is 100% impervious**

$R_v = 0.950$

$$WQ_{v2} := \frac{P \cdot R_v \cdot A_2}{12}$$

$WQ_{v2} = 0.028$ — ***Water Quality Volume Provided in BMP (acre-feet)***

$WQ_{v2} \cdot 43560 = 1228$ — ***Water Quality Volume Provided in BMP (cubic feet)***

For Bioretention Basins in Type 'D' soils, 40% of the water quality volume can count towards the Runoff Reduction Volume.

$RR_{v2} := 0.40 \cdot WQ_{v2}$

$RR_{v2} = 0.011$ — **Runoff Reduction Volume Provided in BMP (acre-feet)**

$RR_{v2} \cdot 43560 = 491$ — **Runoff Reduction Volume Provided in BMP (cubic-feet)**

$WQ_{vProvided2} := WQ_{v2} - RR_{v2}$

$WQ_{vProvided2} = 0.017$ **Water Quality Volume Provided in BMP (acre-feet)**

$WQ_{vProvided2} \cdot 43560 = 737$ **Water Quality Volume Provided in BMP (cubic-feet)**

Size Filter Area of North Bioretention Basin

$WQ_{v2} \cdot 43560 = 1228$ ***Water Quality Volume Provided in BMP (cubic feet)***

$d_f := 2.5$ **Filter Bed Depth = 2.5 feet**

$k := 0.50$ **Coefficient of permeability of filter media = 0.50 ft/day (for bioretention soil)**

$h_f := 0.50$ **Average height of water above filter bed (feet)**

$t_f := 2$ **Design filter bed drain time = 2 day for bioretention**

$$A_{f2} := \frac{WQ_{v2} \cdot 43560 \cdot d_f}{k \cdot (h_f + d_f) \cdot t_f}$$

$A_{f2} = 1023$ Required Surface Area of filter bed (square feet)

A_f provided is 1,080 square feet

Hydrologic Soil Group—Erie County, New York
(Rural Outreach Center - 730 Olean Rd., Aurora, NY)

Map Scale: 1:1,930 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Erie County, New York
Survey Area Data: Version 20, Jun 11, 2020

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

Date(s) aerial images were photographed: Aug 6, 2018—Sep 27, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
OrC	Orpark silt loam, 8 to 15 percent slopes	C/D	1.2	17.5%
RkB	Rhinebeck gravelly loam, 3 to 8 percent slopes	C/D	5.4	82.5%
Totals for Area of Interest			**6.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C

SANITARY SEWER & SEPTIC SYSTEM CALCULATIONS

DATE: April 1, 2021
PROJECT NAME: Rural Outreach Center

Sanitary Calculations

Loading Rates taken from NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems (2014) - Table B-3: Typical Per-Unit Hydraulic Loading Rates

Church/Multi-Purpose Space = 2.4 gpd/seat (3 gpd/seat reduced by 20% with using water saving reducing plumbing fixtures
Offices = 12 gpd/employee (15 gpd/employee reduced by 20% with using water saving reducing plumbing fixtures
Classroom = 8 gpd/seat (10 gpd/seat reduced by 20% with using water saving reducing plumbing fixtures
Kitchen/Banquet = 8 gpd/seat (10 gpd/seat reduced by 20% with using water saving reducing plumbing fixtures

$LR_{office} := 12 \cdot \frac{gal}{day}$ ***Hydraulic Loading Rate (gal/day per employee)***

$LR_{class} := 8 \cdot \frac{gal}{day}$ ***Hydraulic Loading Rate (gal/day per seat)***

$LR_{Church} := 2.4 \cdot \frac{gal}{day}$ ***Hydraulic Loading Rate (gal/day per seat)***

$LR_{Banquet} := 8 \cdot \frac{gal}{day}$ ***Hydraulic Loading Rate (gal/day per seat)***

Building Uses/Matrix

$N_{Offices} := 22$ **14 full time staff + 8 full time visitors**

$N_{Class} := 20$ **2 classrooms with 10 people per room**

$N_{Church} := 120$ ***Number of people attending church services***

$N_{Banquet} := 120$ ***Number of people attending banquet***

Average Daily Design Flow

Scenario # 1: Counseling Services include office and classroom used on a daily basis

Per Erie County Water Authority water records, the existing facility uses 9,000 gallons quarterly = 3,000 gallons/month = 100 gpd

$$Q_1 := 100 \cdot \frac{gal}{day}$$

Scenario #2: Church Service

$$Q_2 := N_{Church} \cdot LR_{Church}$$

$$Q_2 = 288 \cdot \frac{gal}{day}$$

Scenario #3: Banquet Event

$$Q_3 := N_{Banquet} \cdot LR_{Banquet}$$

$$Q_3 = 960 \cdot \frac{gal}{day}$$

Scenario #3 is the worst case scenario. Accordingly, use 960 gal/day for design.

$$Q := 960 \frac{gal}{day}$$ ***Design flow (gal/day)***

Sand Filter

Design Per "Residential Onsite Wastewater Treatment System Design Handbook," NYS Department of Health (2012)

$Q = 960\cdot\frac{gal}{day}$ — ***Design Flow (gal/day)***

$q := 1.0\frac{\frac{gal}{day}}{ft^2}$ — ***Application Rate (gal/day/s.f.)***

$SA := \frac{Q}{q}$ — $SA = 960\cdot ft^2$ — ***Surface Area required of sand filter (s.f)***

$w_{db} := 3ft$ — **Width of Distribution Bed (feet)**

$L := \frac{SA}{w_{db}}$ — $L = 320\cdot ft$ — ***Total Length of Distribution Lines (ft)***

$N := \frac{L}{40}$ — $N = 8.0\cdot ft$ — ***Number of Distribution Lines 3' o.c., 40' long***

Use N = 8

The distribution system shall be designed to dose the filter at least 2 times daily based upon the design flow rate. The volume of each dose shall be approximately 75% of the volume of the distribution lines when dosing is used.

$N_d := 8$ — ***Number of Distribution Lines***

$L_d := 40ft$ — ***Length of Distribution Lines (ft)***

$d_d := 4in$ — ***Diameter of Distribution Lines (in)***

$A_d := \frac{3.14}{4}\cdot\left[\frac{d_d}{\left(\frac{12in}{1ft}\right)}\right]^2$ — $A_d = 0.087\cdot ft^2$ — ***Area of Distribution Lines (ft^2)***

$V_d := N_d\cdot A_d\cdot L_d$ — $V_d = 27.91\cdot ft^3$ — ***Volume of Distribution Lines (ft^3)***

$V_{dgal} := V_d\cdot\frac{7.48gal}{1ft^3}$ — $V_{dgal} = 208.8\cdot gal$ — ***Convert cubic feet to gallons (1ft^3=7.48gallons)***

$V_{dose} := 0.75\cdot V_{dgal}$ — $V_{dose} = 156.6\cdot gal$ — ***Dosing volume (gallons)***

$V_{daily} := 960gal$ — ***Average Daily Design Volume (gal)***

$$N_{doses} := \frac{V_{daily}}{V_{dose}} \qquad N_{doses} = 6.131$$

Number of doses per day (2 min)

The dosing requirement is met by the design flow.

Downstream Modified Shallow Trench

Design Per "Residential Onsite Wastewater Treatment System Design Handbook," NYS Department of Health (2012)

$$Q = 960.000 \cdot \frac{gal}{day}$$

Design Flow (gal/day)

$$Q_d := 0.85 \cdot Q = 816 \cdot \frac{gal}{day}$$

Downstream Design Flow (gal/day); 85% of the design flow

$$q := 1.2 \frac{\frac{gal}{day}}{ft^2}$$

Application Rate (gal/day/s.f.)

$$SA := \frac{Q_d}{q} \qquad SA = 680 \cdot ft^2$$

Surface Area required of trenches (s.f)

$$w_{at} := 2ft$$

Width of Absorption Trench = 2 feet

$$L := \frac{SA}{w_{at}} \qquad L = 340 \cdot ft$$

Total Length of Distribution Lines (ft)

$$N := \frac{L}{57} \qquad N = 6.0 \cdot ft$$

Number of Distribution Lines 2' wide, 57' long

Use N = 6

Septic Tank

Design Per "Residential Onsite Wastewater Treatment System Design Handbook," NYS Department of Health (2012)

$$Q = 960 \cdot \frac{gal}{day}$$

Design Flow (gal/day)

$$V := 1.5 \cdot Q$$

$$V = 1440.000 \cdot \frac{gal}{day}$$

Tank Size (gal)

Use tank size = 1,500 gallon

PUMP STATION

$Q_{Design} := 960 \frac{gal}{day}$ **Average Daily Design Flow (gal/day)**

$Q_{Design.gpm} := Q_{Design} \cdot \frac{1 day}{12 hr} \cdot \frac{1 hr}{60 min}$

$Q_{Design.gpm} = 1.33 \cdot \frac{gal}{min}$ **Average Daily Design Flow (gal/min)**

Per Recommended Standards for Wastewater Facilities (Ten States Standards, 2014 Edition), Figure 1:

$$\frac{Q\ Peak\ Hourly}{Q\ Design\ Average} = \frac{18 + P^{1/2}}{4 + P^{1/2}} = Peak\ Factor$$

where P = population in thousands

$P := \frac{120}{1000} = 0.120$

$$PeakFactor := \frac{18 + P^{\frac{1}{2}}}{4 + P^{\frac{1}{2}}} = 4.221$$

$PeakFactor = 4.221$

$Q_{PeakHourly} := Q_{Design.gpm} \cdot PeakFactor$

$Q_{PeakHourly} = 5.63 \cdot \frac{gal}{min}$ **Peak Hourly Flow (gal/min)**

Per Ten States Standards (2014 Edition), forcemain shall have a minimum velocity of 2 ft/sec

Determine pumping rate to maintain 2 ft/sec velocity with using 1 1/2 inch, SCH 80 PVC forcemain:

$D_{fm} := 1.5 in \cdot \frac{1 ft}{12 in}$

$D_{fm} = 0.125 \cdot ft$ **Diameter of forcemain (feet)**

$$A_{fm} := \frac{\pi \cdot D_{fm}^{2}}{4}$$

$A_{fm} = 0.012 \cdot ft^2$ **Area of forcemain (square feet)**

$V_{fm} := \frac{2\,ft}{sec}$ **Minimum Velocity in forcemain (ft/sec)**

$Q_{fm} = (V_{fm})(A_{fm})$

$Q_{fm} := V_{fm} \cdot A_{fm}$

$Q_{fm} = 0.025 \cdot \frac{ft^3}{sec}$ **Flow in forcemain (cfs)**

$Q_{fm.gpm} := Q_{fm} \cdot \frac{7.48\,gal}{ft^3} \cdot \frac{60\,sec}{1\,min}$

$Q_{fm.gpm} = 11.015 \cdot \frac{gal}{min}$ **Flow in forcemain (gal/min)**

The pumping rate is to be the larger of either the peak flowrate or the required flowrate to maintain the minimum velocity of 2 ft/sec.

The required flowrate to maintain min. velocity of 2 ft/sec governs.

Therefore use a pumping rate of 11 gal/min

Headloss Calcs

Inlet to pump station = 897.09

Elevation of forcemain @ Distribution Box = 900.00

Using a 6-foot diameter lift station:

$D_{LS} := 6\,ft$

$A_{LS} := \frac{\pi \cdot D_{LS}^2}{4}$

$A_{LS} = 28.27 \cdot ft^2$ **Area of Lift Station**

$V_{LS} := A_{LS} \cdot \frac{7.48\,gal}{ft^2}$

$V_{LS} = 211.5 \cdot gal$ **Volume in Lift Station (gal/foot depth)**

Dosing Volume Required = V_{dose}

$V_{dose} = 156.6 \cdot gal$ **Dosing Volume in gallons**

Storage Required:

$$Storage := \frac{V_{dose}}{V_{LS}}$$

$Storage = 0.740$ **Storage Required in feet**

Top of Pump Station = 903.50
6" Inlet Elevation = 900.09
Alarm = 899.16
2 Pumps "On" = 898.66
1 Pump "On" = 898.16
Pumps "Off" = 897.42
Bottom of Pump Station = 897.00
Total Depth = 6.50 feet

Static Lift = Elevation of forcemain @ Distribuition Box - Pumps "Off" Elevation
= 903.17 - 897.42
Static Lift = 5.75 feet

Forcemain is 6 linear feet, and assume 10% for minor losses:
Effective Length = 6 + (0.10)6 = 6.6 = 7 feet

Calculate Friction Losses in Forcemain for multiple flowrates to develop system curve:

$$h_L = \frac{10.44\ (L)\ (Q^{1.85})}{C^{1.85}\ d^{4.87}}$$

Where:

h_L = headloss in feet

L = forcemain length = 7 feet

Q = flow in gpm

C = coefficient of friction for PVC pipe = 120

d = forcemain diameter (in inches) = 1.5 inches

for Q = 5 gpm:

$Q_{5gpm} := 5$ $C := 120$ $d := 1.5$ $L := 7$

$$h_{L1} := \frac{10.44 \cdot 7 \cdot Q_{5gpm}^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

$h_{L1} = 0.028$ ft

for Q = 10 gpm:

$Q_{10gpm} := 10 \quad C := 120 \quad d := 1.5 \quad L := 7$

$$h_{L2} := \frac{10.44 \cdot 7 \cdot Q_{10gpm}^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

$h_{L2} = 0.102$ ft

for Q = 11 gpm:

$Q_{11gpm} := 11 \quad C := 120 \quad d := 1.5 \quad L := 7$

$$h_{L3} := \frac{10.44 \cdot 7 \cdot Q_{11gpm}^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

$h_{L3} = 0.122$ ft

for Q = 15 gpm:

$Q_{15gpm} := 15 \quad C := 120 \quad d := 1.5 \quad L := 7$

$$h_{L4} := \frac{10.44 \cdot 7 \cdot Q_{15gpm}^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

$h_{L4} = 0.217$ ft

for Q = 20 gpm:

$Q_{20gpm} := 20 \quad C := 120 \quad d := 1.5 \quad L := 7$

$$h_{L5} := \frac{10.44 \cdot 7 \cdot Q_{20gpm}^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

$h_{L5} = 0.369$ ft

for Q = 25 gpm:

$Q_{25gpm} := 25$ $C := 120$ $d := 1.5$ $L := 7$

$$h_{L6} := \frac{10.44 \cdot 7 \cdot Q_{25gpm}{}^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

$h_{L6} = 0.557$ ft

Flowrate		Velocity in forcemain	h_L in pipe	Static Lift	TDH
gpm	cfs	ft/sec	feet	feet	(h_L in pipe + Static Lift) in feet
0	0	0.00	0	5.75	5.75
5	0.011	0.93	0.028	5.75	5.78
10	0.022	1.86	0.102	5.75	5.85
11	0.025	2.04	0.122	5.75	5.87
15	0.033	2.79	0.217	5.75	5.97
20	0.045	3.71	0.369	5.75	6.12
25	0.056	4.64	0.557	5.75	6.31

Choose a pump capable of 11 gpm @ 5.87 feet TDH

Use (2) Liberty Pumps Model FL-30-Series, 1/3 HP submersible effluent pumps with 1 1/2" discharge.

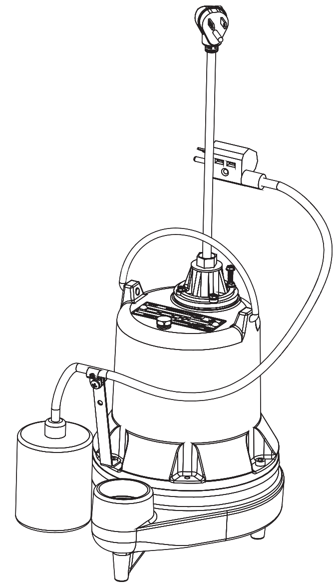
Pump will operate at around 52 gpm

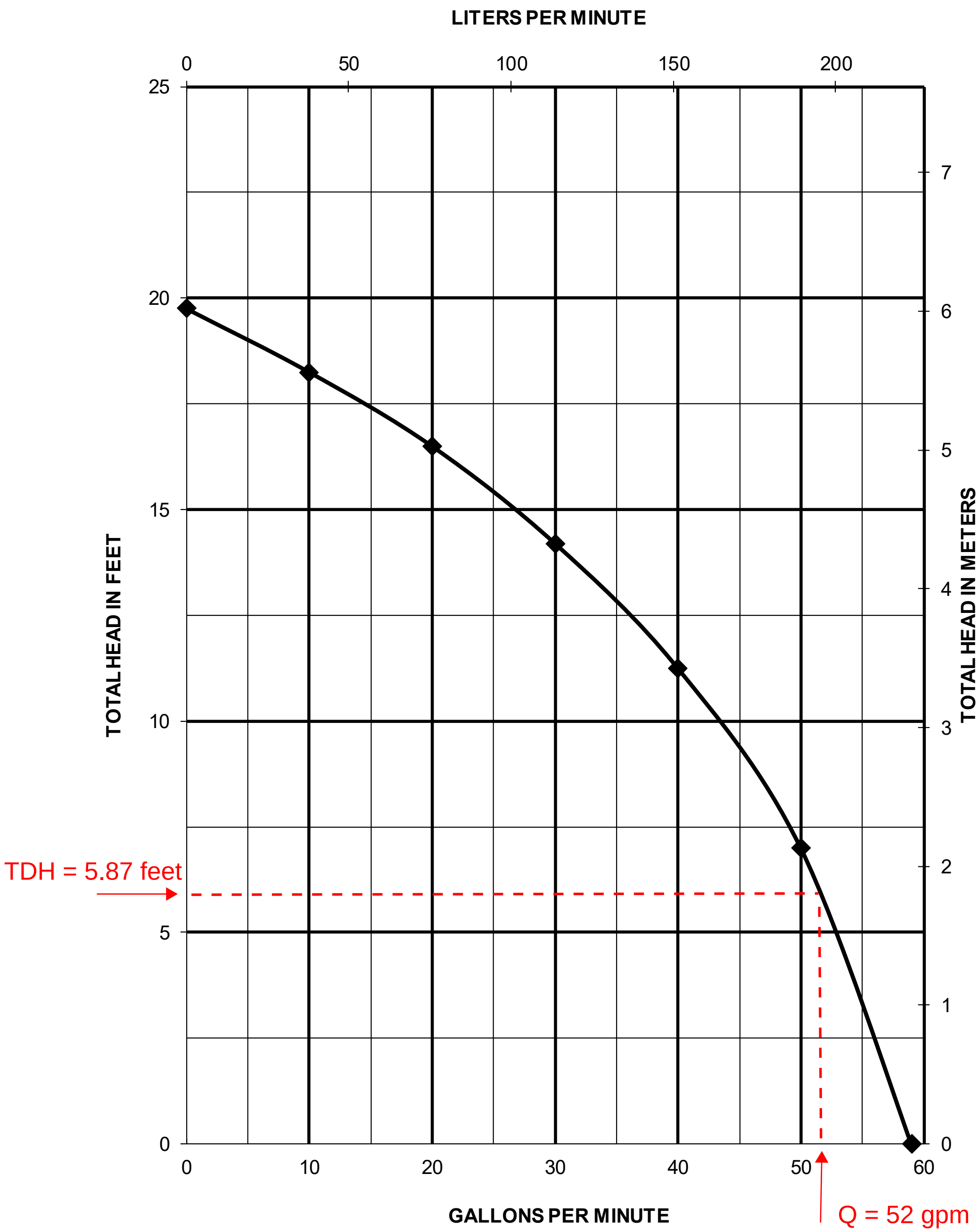
Liberty Pumps®
A Family and Employee Owned Company

Pump Specification

FL30-Series

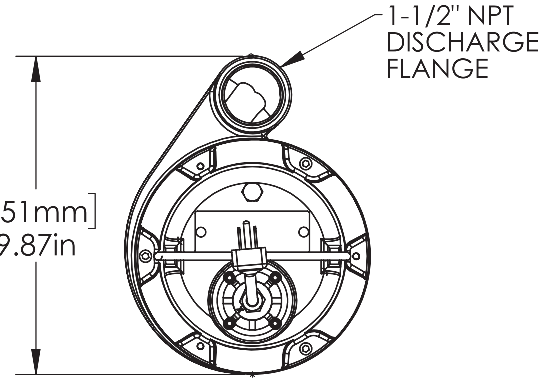
1/3 HP Submersible Effluent Pumps

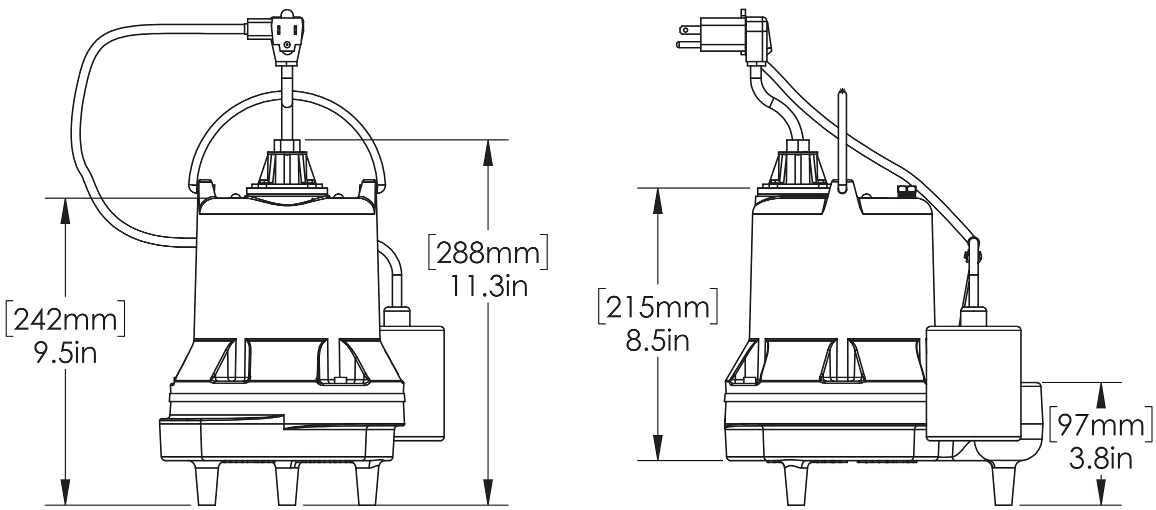




 FL30-Series_P1 R9/27/2019

7000 Apple Tree Avenue Bergen NY 14416 ■ ***Phone** 800-543-2550* ■ ***Fax** 585-494-1839* ■ ***Email** Liberty@LibertyPumps.com* ■ ***Web** www.LibertyPumps.com*





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DWG. NO. FL30 SERIES DIMENSIONAL			
SIZE A	DATE:		REV. A
SCALE:1:4	WEIGHT: ___ LBS	SHEET 1 OF 1	

FL30-Series Electrical Data

MODEL	HP	VOLTAGE	PHASE	FULL LOAD AMPS	LOCKED ROTOR AMPS	THERMAL OVERLOAD TEMP	STATOR WINDING CLASS	CORD LENGTH	PUMP DISCHARGE	AUTOMATIC
FL31A	1/3	115	1	10.5	26	105˚C / 221˚F	B	10′	1-1/2″ NPT	YES
FL31A-2	1/3	115	1	10.5	26	105˚C / 221˚F	B	25′	1-1/2″ NPT	YES
FL31A-3	1/3	115	1	10.5	26	105˚C / 221˚F	B	35′	1-1/2″ NPT	YES
FL31M	1/3	115	1	10.5	26	105˚C / 221˚F	B	10′	1-1/2″ NPT	NO
FL31M-2	1/3	115	1	10.5	26	105˚C / 221˚F	B	25′	1-1/2″ NPT	NO
FL31M-3	1/3	115	1	10.5	26	105˚C / 221˚F	B	35′	1-1/2″ NPT	NO
FL31M-5	1/3	115	1	10.5	26	105˚C / 221˚F	B	50′	1-1/2″ NPT	NO
FL32A	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	10′	1-1/2″ NPT	YES
FL32A-2	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	25′	1-1/2″ NPT	YES
FL32A-3	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	35′	1-1/2″ NPT	YES
FL32M	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	10′	1-1/2″ NPT	NO
FL32M-2	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	25′	1-1/2″ NPT	NO
FL32M-3	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	35′	1-1/2″ NPT	NO
FL32M-5	1/3	208–230	1	5.5	12	105˚C / 221˚F	B	50′	1-1/2″ NPT	NO

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FL30-Series Technical Data

IMPELLER	MULTI-VANE ENGINEERED POLYMER
PAINT	POWDER COATING
MAX LIQUID TEMP	60˚C / 140˚F
MAX STATOR TEMP (1-PHASE)	130˚C / 250˚F
THERMAL OVERLOAD	105˚C / 221˚F
POWER CORD TYPE	SJTW
MOTOR HOUSING	CLASS 25 CAST IRON
VOLUTE	CLASS 25 CAST IRON
SHAFT	STAINLESS
HARDWARE	STAINLESS
O-RINGS	BUNA-N
MECHANICAL SEAL	UNITIZED CERAMIC CARBON
WEIGHT	37 LBS / 16.8 KG

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FL30-Series Specifications

1.01 GENERAL

The contractor shall provide labor, material, equipment, and incidentals required to provide ________ (QTY) centrifugal pumps as specified herein. The pump models covered in this specification are FL30-Series single-phase pumps. The pump furnished for this application shall be model ______________________________ as manufactured by Liberty Pumps.

2.01 OPERATING CONDITIONS

Each submersible pump shall be rated at 1/3 hp, _______________ volts, single-phase, 60 Hz, 1725 RPM. The unit shall produce ___________ GPM at __________ feet of total dynamic head.

The submersible pump shall be capable of handling effluent with 3/4" solids handling capability. The submersible pump shall have a shut-off head of 19.8 feet and a maximum flow of 58 GPM @ 5 feet of total dynamic head.

The pump shall be controlled with:

______ Piggyback style ON/OFF float switch

______ NEMA 4X outdoor simplex control panel with three float switches and a high water alarm

______ NEMA 1 indoor simplex control panel with three float switches and a high water alarm

______ NEMA 4X outdoor simplex control panel with four float switches and a high water alarm

______ NEMA 1 indoor simplex control panel with four float switches and a high water alarm

______ NEMA 4X outdoor duplex control panel with three float switches and a high water alarm

______ NEMA 1 indoor duplex control panel with three float switches and a high water alarm

______ NEMA 4X outdoor duplex control panel with four float switches and a high water alarm

______ NEMA 1 indoor duplex control panel with four float switches and a high water alarm

3.01 CONSTRUCTION

Each centrifugal effluent pump shall be equal to the certified FL30-Series pumps as manufactured by Liberty Pumps, Bergen NY. The castings shall be constructed of class 25 cast iron. The motor housing shall be oil filled to dissipate heat. Air filled motors shall not be considered equal since they do not properly dissipate heat from the motor. All mating parts shall be machined and sealed with a Buna-N O-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity, eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with a unitized ceramic/carbon seal with stainless steel housings and spring. The pump shall be furnished with stainless steel handle.

4.01 ELECTRICAL POWER CORD

The submersible pump shall be supplied with 10, 25, 35, or 50 feet of multiconductor power cord. It shall be cord type SJTW, capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a watertight compression fitting cord plate assembly, with molded pins to conduct electricity. This will eliminate the ability of water to enter internally through the cord by means of a damaged or wicking cord.

5.01 MOTORS

Single-phase motors shall be oil filled, permanent split capacitor, class B insulated NEMA B design, rated for continuous duty. Since air filled motors are not capable of dissipating heat as effectively, they shall not be considered equal. At maximum load, the winding temperature shall not exceed 130°C unsubmerged. The pump motor shall have an integral thermal overload switch in the windings for protecting the motor. The capacitor circuit shall be mounted internally in the pump.

6.01 BEARINGS AND SHAFT

Upper and lower ball bearings shall be required. The bearings shall be a single ball/race type bearing. Both bearings shall be permanently lubricated by the oil that fills the motor housing. The motor shaft shall be made of 300 or 400 series stainless steel and have a minimum diameter of 0.500".

7.01 SEALS

The pump shall have a unitized carbon/ceramic seal with stainless steel housings and spring equal to Crane Type 6a. The motor plate/ housing interface shall be sealed with a Buna-N O-ring.

8.01 IMPELLER

The impeller shall be engineered polymer, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be threaded to the motor shaft.

9.01 CONTROLS

All units can be supplied with CSA and UL approved automatic wide angle tilt float switches. The switches shall be equipped with piggyback style plug that allows the pump to be operated manually without the removal of the pump in the event that a switch becomes inoperable. Manual pumps are operable by means of a pump control panel.

10.01 PAINT

The exterior of the casting shall be protected with powder coat paint.

11.01 SUPPORT

The pump shall have cast iron support legs, enabling it to be a freestanding unit. The legs will be high enough to allow 3/4” solids to enter the volute.

12.01 SERVICEABILITY

Components required for the repair of the pump shall be shipped within a period of 24 hours.

*7000 Apple Tree Avenue Bergen NY 14416 ■ **Phone** 800-543-2550 ■ **Fax** 585-494-1839 ■ **Email** Liberty@LibertyPumps.com ■ **Web** www.LibertyPumps.com*

13.01 FACTORY ASSEMBLED TANK SYSTEMS WITH GUIDE RAIL AND QUICK DISCONNECT DISCHARGE

_______ Factory mounted guide rail system with pump suspended by means of bolt-on quick disconnect that is sealed by means of nitrile grommets or O-rings. The discharge piping shall be schedule 80 PVC and furnished with a PVC check valve and shut-off ball valve. The tank shall be wound fiberglass or roto-molded plastic. An inlet hub shall be provided with the fiberglass systems.

_______ Stainless steel guide rail

_______ Zinc plated steel guide rail

_______ " diameter of basin

_______ " height of basin

_______ " distance from top of tank to discharge pipe outlet

_______ Fiberglass cover

_______ Structural foam polymer cover

_______ Steel cover

_______ Simplex system with outdoor panel and alarm

_______ Duplex system with outdoor panel and alarm

_______ Separate outdoor alarm

_______ Remote outdoor alarm

14.01 TESTING

The pump shall have a ground continuity check and the motor chamber shall be hi-potted to test for electrical integrity, moisture content, and insulation defects. The motor and volute housing shall be pressurized, and an air leak decay test performed to ensure integrity of the motor housing. The pump shall be run, voltage current monitored, and checked for noise or other malfunction.

15.01 QUALITY CONTROL

The pump shall be manufactured in an ISO 9001 certified facility.

16.01 WARRANTY

Standard limited warranty shall be 3 years.

*7000 Apple Tree Avenue Bergen NY 14416 ■ **Phone** 800-543-2550 ■ **Fax** 585-494-1839 ■ **Email** Liberty@LibertyPumps.com ■ **Web** www.LibertyPumps.com*

NEW YORK STATE DEPARTMENT OF HEALTH
Bureau of Water Supply Protection

Percolation Test Data

(see instructions on reverse side)

Development Site: RURAL OUTREACH CENTER (T/V/C): (T) AURORA County: ERIE

Date: 12/4/20 Tests Conducted By: J. UTZIG (C+S ENGINEERS)

Weather Conditions: OVERCAST, 41°F

Test Hole No.	Test Hole Depth (inches)	Lot No.	Soil Profile Description and Groundwater Depth (if identified)	Presoaking Date & Time	Time	Percolation Test 1	2	3	4	5	6
P1	30"		See Deep Hole #1	12/3/20 11AM-3-PM	End	10:06 AM					
					Begin	9:06 AM					
					Result	FAIL					
P2	30"		See Deep Hole #1	12/3/20 11AM-3PM	End	9:13A	9:21	9:30			
					Begin	9:07AM	9:15	9:24			
					Result	6 MIN	6 MIN	6 MIN			
					End						
					Begin						
					Result						
P3 (RESERVE AREA)	30"		See Deep Hole #2	12/3/20 11AM-3PM	End		DID NOT DROP				
					Begin		FROM PRESOAK				
					Result		=> EVEN 24 AFTERWARDS				
			GRADE 899.30'		End						
					Begin						
					Result						
					End						
					Begin						
					Result						

Begin time, end time, and result in minutes for a water elevation change from 6" to 5" above the bottom of the test hole.

INSTRUCTIONS

Procedure:

1) At least two percolation tests shall be performed within the proposed absorption area. At least one percolation test should also be performed within the proposed absorption system expansion area.

(2) Dig each hole with vertical sides approximately 12 inches in diameter. If an absorption field is being considered, the depth of test holes should be 24 to 30 inches below final grade or at the projected bottom of trenches in shallower/deeper systems based upon test hole evaluation. The sides of the percolation holes should be scraped to avoid smearing. Place washed aggregate in the lower two inches of each test hole to reduce scouring and silting action when water is poured into the hole.

(3) Presoak the test holes by periodically filling the hole with water and allowing the water to seep away. This procedure should be performed for at least four hours and should begin one day before the test (except in clean coarse sand and gravel). After the water from the final presoaking has seeped away, remove any soil that has fallen from the sides of the hole.

(4) Pour clean water into the hole, with as little splashing as possible, to a depth of six inches above the bottom of the test hole.

(5) Observe and record the time in minutes required for the water to drop from the six-inch depth to the five-inch depth.

(6) Repeat steps (4) and (5) a minimum of three times until the time for the water to drop from six inches to five inches for two successive tests is approximately equal (i.e., ≤ 1 min. for 1-30 min./inch, ≤ 2 min. for 31-60 min./inch). The longest time interval to drop one inch will be taken as the stabilized rate of percolation.

(7) Percolation test results shall be consistent with soil classification and if different results are obtained for multiple holes in a proposed absorption area, the slowest stabilized rate shall be used for system design.

I JASON UTZIG, the undersigned certify that the percolation tests were conducted by me or under my direction in accord with the above procedure. The data and results are true and correct.

Date: 12/4/20

Signature: Jason Utzig

License No. (P.E., R.A., L.S.) 089686

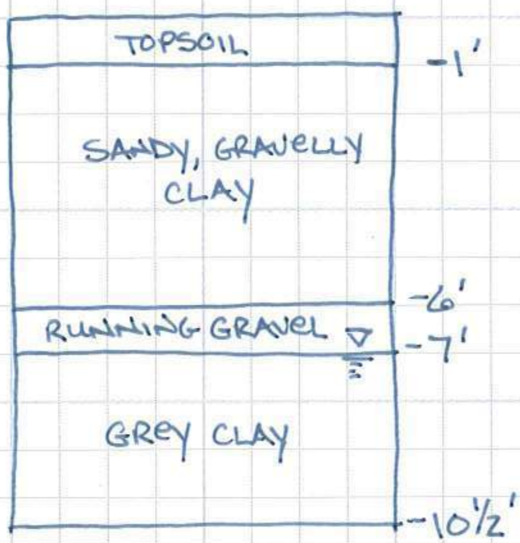
C&S COMPANIES®
www.cscos.com

Project: RURAL OUTREACH CENTER
SEPTIC SYSTEM / DEEP HOLE
Prepared by: JU
Checked by:

Sheet: 1 of
File #:
Date: 12/4/20
Date:

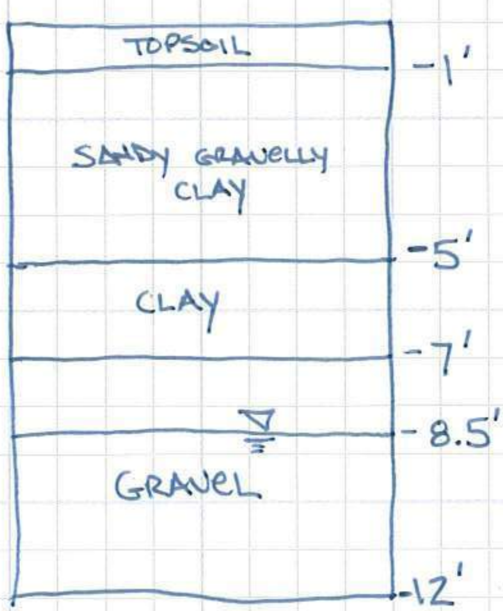
DEEP HOLE #1 (ELEV. 898.20)

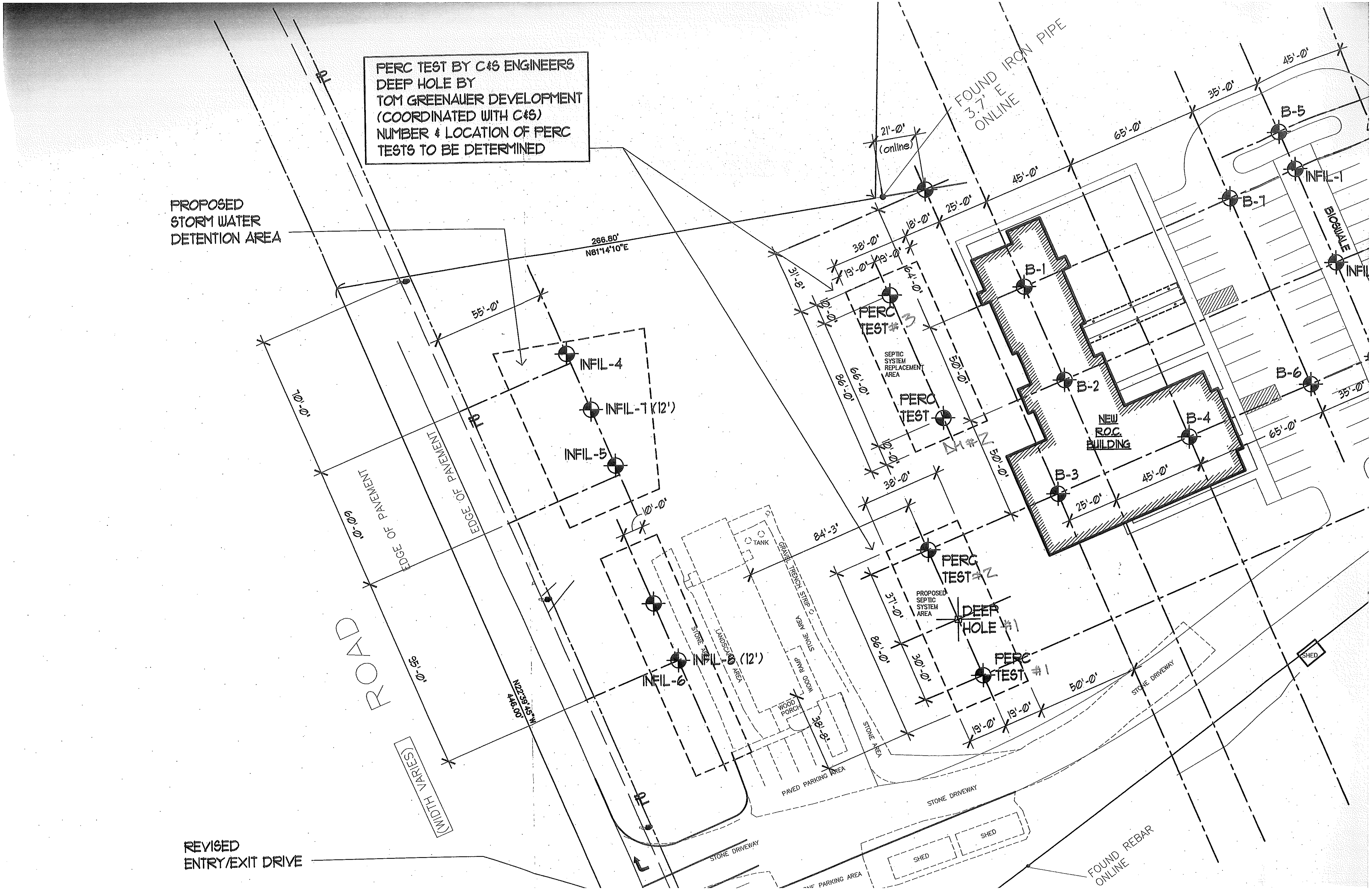
⇒ NO MINERAL DEPOSITS OBSERVED



DEEP HOLE # 2 (ELEV 899.30)

⇒ NO MINERAL DEPOSITS OBSERVED




PERC TEST BY C&S ENGINEERS
DEEP HOLE BY
TOM GREENAUER DEVELOPMENT
(COORDINATED WITH C&S)
NUMBER & LOCATION OF PERC
TESTS TO BE DETERMINED
PROPOSED
STORM WATER
DETENTION AREA
REVISED
ENTRY/EXIT DRIVE
FOUND IRON PIPE
3.7' E
ONLINE
FOUND REBAR
ONLINE
266.80'
N81°14'10"E
N22°39'45"W
446.00'
ROAD
(WIDTH VARIES)
EDGE OF PAVEMENT
EDGE OF PAVEMENT
INFIL-1
INFIL-4
INFIL-7 (12')
INFIL-5
INFIL-6
INFIL-8 (12')
B-1
B-2
B-3
B-4
B-5
B-6
B-7
BIOSWALE
NEW
R.O.C.
BUILDING
PERC
TEST #3
SEPTIC
SYSTEM
REPLACEMENT
AREA
PERC
TEST
DH #2
PERC
TEST #2
PROPOSED
SEPTIC
SYSTEM
AREA
DEEP
HOLE #1
PERC
TEST #1
TANK
GRAVEL TRENCH STRIP
STONE AREA
LANDSCAPED AREA
WOOD RAMP
WOOD
PORCH
PAVED PARKING AREA
STONE DRIVEWAY
SHED
21'-0"
(online)
45'-0"
35'-0"
65'-0"
25'-0"
18'-0"
38'-0"
19'-0"
64'-0"
31'-8"
10'-0"
50'-0"
66'-0"
98'-0"
55'-0"
10'-0"
60'-0"
56'-0"
84'-3"
37'-0"
30'-0"
86'-0"
19'-0"
13'-3"

APPENDIX D

WATER CALCULATIONS

WATER H_L CALCULATIONS FOR RURAL OUTREACH CENTER

Water Demand

Domestic Service

Assume 120% of the sewer design flow

Domestic water demand approximately equal to peak sewer flow = 5.63 gpm
However, per plumbing engineer, the peak domestic flow based upon fixture units is 80 gpm.
Accordingly, use a peak domestic flow of 80 gpm

$Q_{DomesticPeak} := 80$ gpm

Hydrant Flow Test information from the Erie County Water Authority dated 11/10/2009.

Static Pressure = 64 psi

Residual Pressure = 56 psi with total flow of 1,138 gpm

$Pressure_{static} := 64$ psi

$Pressure_{residual} := 56$ psi

Determine headloss in proposed domestic service:

Length of 3 inch PE domestic service from tap location to the building = 320 ft

$L_D := 320$ feet

$D_D := 3$ inches

$C_D := 140$

$$h_L := \frac{10.44 \cdot L_D \cdot Q_{DomesticPeak}^{1.85}}{C_D^{1.85} \cdot D_D^{4.87}}$$

$h_L = 5.632$ feet

$h_{Lpsi} := 0.433 \cdot h_L$

$h_{Lpsi} = 2.4$ psi

Determine headloss due to fittings:

$h_{Lfittings} := 1$ psi

Determine headloss due to elevation:

Elevation Charge = 905.00 - 886.00 = 19 feet

$h_{lelevation.ft} := 19$ feet

$h_{lelevation} := 0.433 \cdot h_{lelevation.ft}$

$h_{lelevation} = 8.2$ psi

Determine headloss through 2 1/2-inch Watts LF957 RPZ:
- refer to attached cut sheet w/ 80 gpm domestic flow

$h_{LRPZ} := 10$ psi

Determine headloss through 2-inch Neptune T-10 meter:
- refer to attached cut sheet w/ 80 gpm domestic flow

$h_{LMeter} := 2.5$ psi

Calculate Residual Pressure at building:

Residual Pressure = Residual in watermain - Sum of headloss

$$Pressure_{residualbldg} := Pressure_{residual} - \left(h_{Lpsi} + h_{Lfittings} + h_{lelevation} + h_{LRPZ} + h_{LMeter}\right)$$

$Pressure_{residualbldg} = 31.8$ psi

A 3-inch PE domestic water service lateral has capacity for the proposed domestic water demand with a residual pressure of 31.8 psi at the building.

Residual Pressure at Building with Required Fire Flow

Required Fire Flow = 500 gpm (preliminary per fire protection engineer)

$Q_{fireflow} := 500$ gpm

Determine headloss in proposed fire protection service:

Length of 6-inch PVC fire protection service from tap location to the building = 365 ft

$L_F := 320$ feet

$D_F := 6$ inches

$C_F := 140$

$$h_L := \frac{10.44 \cdot L_F \cdot Q_{fireflow}^{1.85}}{C_F^{1.85} \cdot D_F^{4.87}}$$

$h_L = 5.715$ feet

$h_{Lpsi} := 0.433 \cdot h_L$

$h_{Lpsi} = 2.5$ psi

Determine headloss due to fittings:

$h_{Lfittings} := 1$ psi

Determine headloss due to elevation:

Elevation Charge = 905.00 - 886.00 = 19 feet

$h_{lelevation.ft} := 19$ feet

$h_{lelevation} := 0.433 \cdot h_{lelevation.ft}$

$h_{lelevation} = 8.2$ psi

Determine headloss through 4-inch Watts LF757 DCDA:
- refer to attached cut sheet w/ 500 gpm fire flow

$h_{LDCDA} := 8$ psi

Calculate residual pressure at building using required fire flow:

Residual Pressure = Residual at watermain - Sum of headloss

$$Pressure_{residualbldg} := Pressure_{residual} - \left(h_{Lpsi} + h_{Lfittings} + h_{lelevation} + h_{LDCDA}\right)$$

$Pressure_{residualbldg} = 36.3$ psi

At the building, a 500 gpm fire flow can be provided within a 6-inch PVC fire protection service with 36.3 psi residual pressure.

A PRODUCT SHEET OF NEPTUNE TECHNOLOGY GROUP

T-10® METER

SIZES: 1 ½" and 2"

Construction

Every Neptune® T-10® water meter meets or exceeds the latest AWWA C700 Standard. Its nutating disc, positive displacement principle has been time-proven for accuracy and dependability since 1892, ensuring maximum utility revenue.

The T-10 water meter consists of three major assemblies: a register, a lead free, high-copper alloy maincase, and a nutating disc measuring chamber.

The T-10 meter is available with a variety of register types. For reading convenience, the register can be mounted in one of four positions on the meter.

The corrosion-resistant, lead-free, high-copper alloy maincase will withstand most service conditions: internal water pressure, rough handling, and in-line piping stress.

The innovative floating chamber design of the nutating disc measuring element protects the chamber from frost damage while the unique chamber seal extends the low-flow accuracy by sealing the chamber outlet port to the maincase outlet port. The nutating disc measuring element utilizes corrosion-resistant materials throughout and a thrust roller to minimize wear.

Warranty

Neptune provides a limited warranty for performance, materials and workmanship. See warranty statement for details.

KEY FEATURES

Register

- Magnetic-driven, low-torque registration ensures accuracy
- Impact-resistant register
- High-resolution, low-flow leak detection
- Bayonet-style register mount allows in-line serviceability
- Tamperproof seal pin deters theft
- Date of manufacture, size, and model stamped on dial face

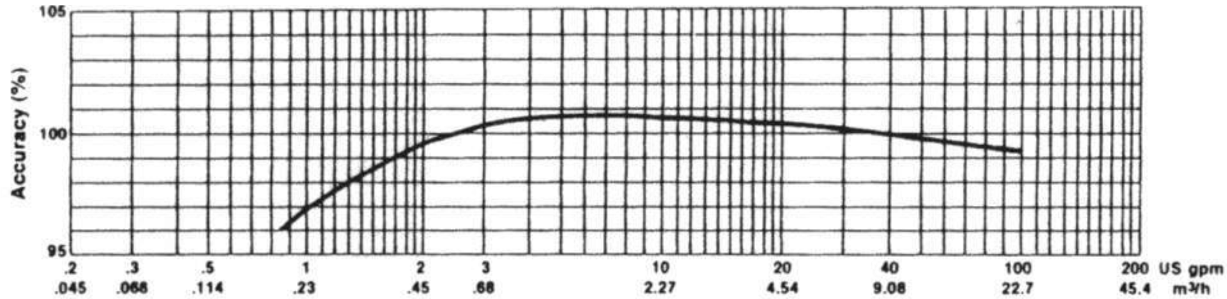
Lead Free Maincase

- Made from lead free, high-copper alloy
- NSF/ANSI 61 Certified
- NSF/ANSI 372 Certified
- Lifetime guarantee
- Resists internal pressure stresses and external damage
- Handles in-line piping variations and stresses
- Lead free, high-copper alloy provides residual value vs. plastic
- Electrical grounding continuity

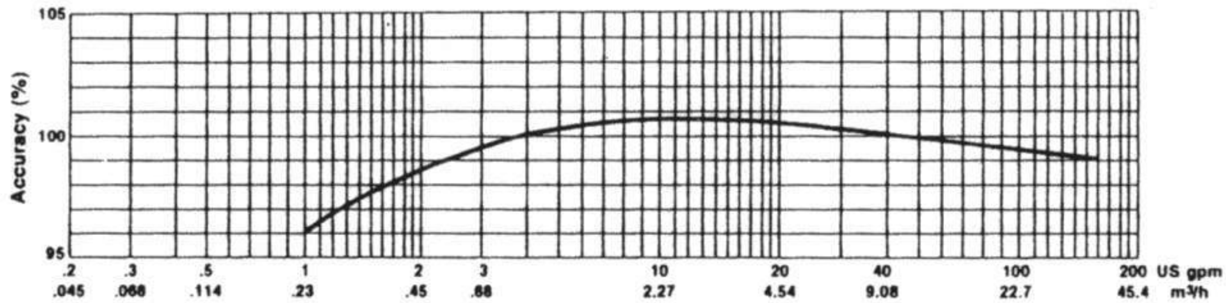
Nutating Disc Measuring Chamber

- Positive displacement
- Widest effective flow range for maximum revenue
- Proprietary polymer materials maximize long-term accuracy
- Floating chamber design is unaffected by meter position or in-line piping stresses

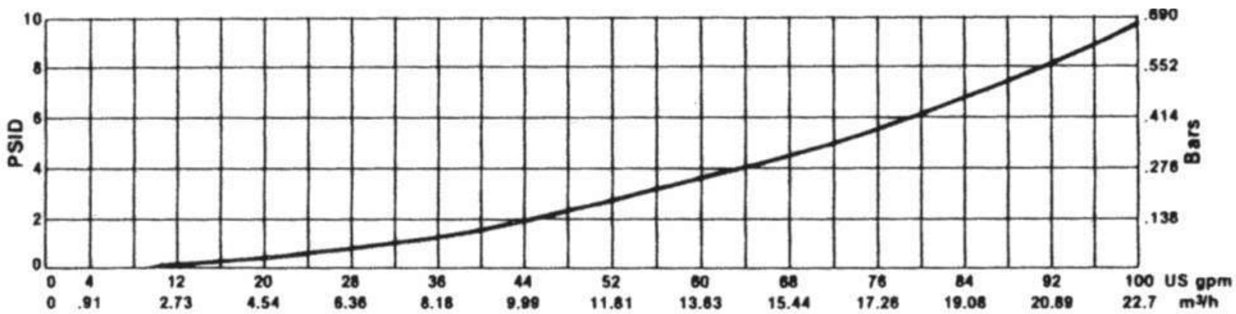
1 ½" Accuracy



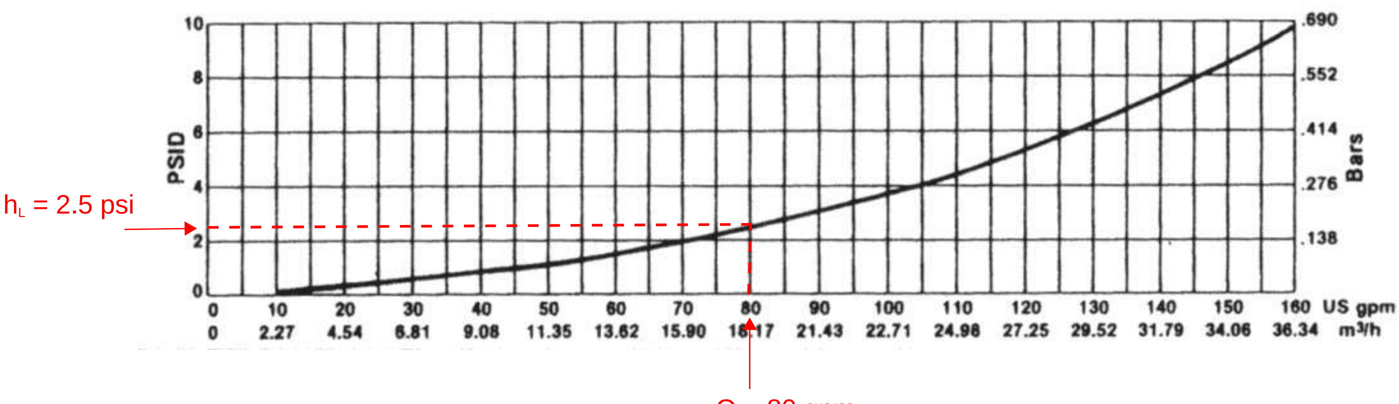
2" Accuracy



1 ½" Pressure Loss



2" Pressure Loss



These charts show typical meter performance. Individual results may vary.

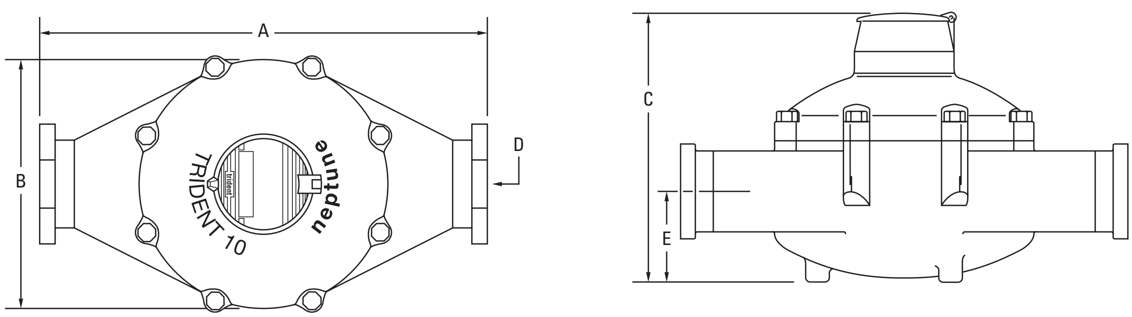
Operating Characteristics

Meter Size	Normal Operating Range @100% Accuracy (±1.5%)	AWWA Standard	Low Flow @ 95% Accuracy
1 ½″	2 to 100 US gpm 0.46 to 22.73 m^3/h	5 to 100 US gpm 1.1 to 22.7 m^3/h	3/4 US gpm 0.17 m^3/h
2″	2 1/2 to 160 US gpm 0.57 to 36.36 m^3/h	8 to 160 US gpm 1.8 to 36.3 m^3/h	1 US gpm 0.23 m^3/h

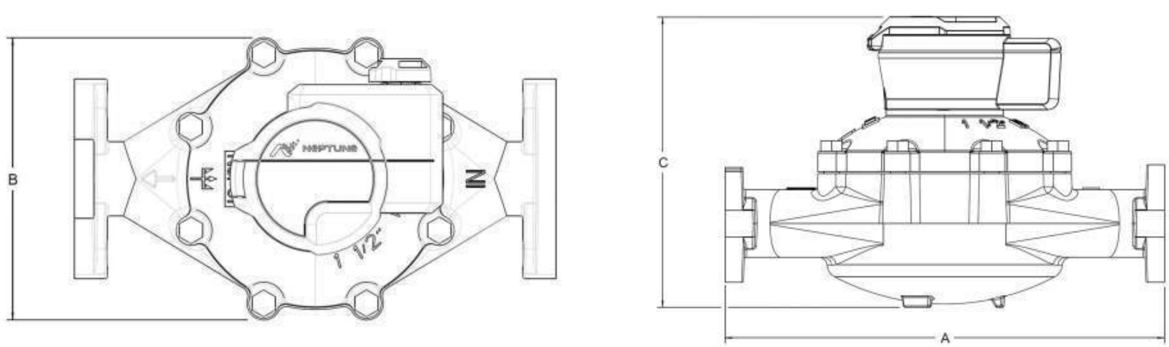
Dimensions

Meter Size	A in/mm	B in/mm	C-Std. in/mm	C-ARB in/mm	C- E-CODER®) R900*i*™ or ProCoder™) R900*i*™	D- Threads per inch	D- Thread Type	E in/mm	Weight lbs/kg
1 ½″ Screw End	12 5/8 321	8 1/16 205	8 1/8 206	8 13/16 220.3	8 3/8 213	11 1/2	1 1/2 NPT	2 9/16 65	31 14.1
1 ½″ Flanged End	13 330	8 1/16 205	8 1/8 206	8 13/16 220.3	8 3/8 213	—	—	2 9/16 65	35 15.9
2″ Screw End	15 1/4 387	9 7/16 240	9 5/16 237	9 15/16 248.4	9 1/2 241	11 1/2	2″ NPT	3 1/8 79	40 18.1
2″ Flanged End	17 432	9 7/16 240	9 5/16 237	9 15/16 248.4	9 1/2 241	—	—	3 1/8 79	44 20.0

T-10 With Standard Register



T-10 With E-CODER®)R900*i*™ or ProCoder™)R900*i*™ Pit Register



Guaranteed Systems Compatibility

All T-10 meters are guaranteed adaptable to our ARB®V, ProRead™ (ARB VI), ProCoder™, E-CODER® (ARB VII), E-CODER®)R900*i*™, E-CODER®)R450*i*™, ProCoder™)R900*i*™, TRICON®/S, TRICON/E®3, and Neptune ARB® Utility Systems™ without removing the meter from service.

Registration

ProRead Registration (per sweep hand revolution)		1 ½"	2"
100	US Gallons	✓	✓
100	Imperial Gallons	✓	✓
10	Cubic Feet	✓	✓
1	Cubic Metre		✓
.01	Cubic Metre	✓	
Register Capacity ProRead, ProCoder, and E-CODER		**1 ½"**	**2"**
100,000,000	US Gallons	✓	✓
100,000,000	Imperial Gallons	✓	✓
10,000,000	Cubic Feet	✓	✓
100,000	Cubic Metres	✓*	
1,000,000	Cubic Metres	✓**	✓
E-CODER High Resolution (8-digit reading)		**1 ½"**	**2"**
1	US Gallons	✓	✓
1	Imperial Gallons	✓	✓
0.1	Cubic Feet	✓	✓
0.01	Cubic Metres		✓
0.001	Cubic Metres	✓	
ProCoder High Resolution (8-digit reading)		**1 ½"**	**2"**
1	US Gallons	✓	✓
1	Imperial Gallons	✓	✓
0.1	Cubic Feet	✓	✓
0.01	Cubic Metres	✓	✓

**ProRead and E-CODER only **ProCoder only*

Specifications

Certification
- NSF/ANSI 61, NSF/ANSI 372

Application
- Cold water measurement of flow in one direction

Maximum Operating Water Pressure
- 150 psi (1,034 kPa)

Maximum Operating Water Temperature
- 80°F

Measuring Chamber
- Nutating disc technology design made from proprietary synthetic polymer

Options

Sizes
- 1 ½" flanged or threaded end
- 2" flanged or threaded end

Units of Measure
- U.S. gallons, imperial gallons, cubic feet, cubic metres

Register Types
- Direct reading: Bronze box and cover
- Remote reading: ProRead Absolute Encoder, ProCoder, E-CODER, E-CODER)R900*i*, E-CODER)R450*i*, ProCoder™)R900*i*™, TRICON/S, TRICON/E3
- Reclaim

Measuring Chamber
- Synthetic polymer

Companion Flanges
- Lead free, high-copper alloy

Environmental Conditions
- Operating temperature: +33ºF to +149ºF (0ºC to +65ºC)
- Storage temperature:
- +33ºF to +158ºF (0ºC to +70ºC)

Test Ports
- 1" (optional)

NEPTUNE TECHNOLOGY GROUP

#winyourday
neptunetg.com

Neptune Technology Group
1600 Alabama Highway 229
Tallassee, AL 36078
800-633-8754 f 334-283-7293

Job Name Rural Outreach Center
Job Location 730 Olean Road
Engineer C&S Engineers, Inc.
Approval
Contractor
Approval
Contractor's P.O. No.
Representative

LEAD FREE*

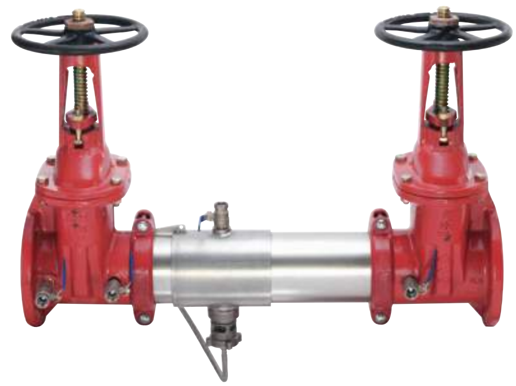
Series 957, 957N, 957Z

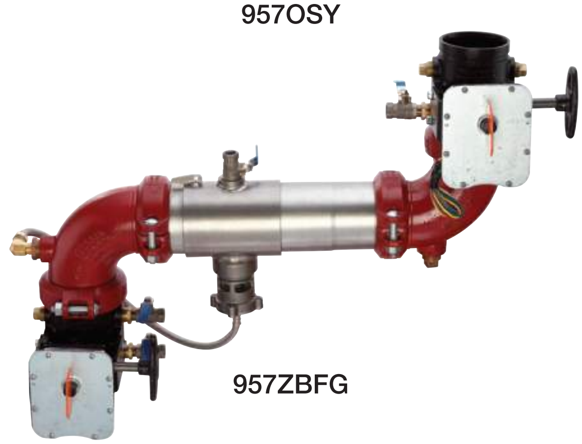
Reduced Pressure Zone Assemblies

Sizes: 2½" – 10"

Series 957, 957N, 957Z Reduced Pressure Zone Assemblies provide protection to the potable water system from contamination in accordance with national plumbing codes. Series 957, 957N, 957Z are normally used in health hazard applications for protection against backsiphonage or backpressure.

Series 957 is also available with SentryPlus™ Alert technology to detect catastrophic relief valve discharge that could potentially cause flooding, and issue a multi-channel alert (call, email, text) to selected users so they can take action to avoid potentially costly flooding.


957OSY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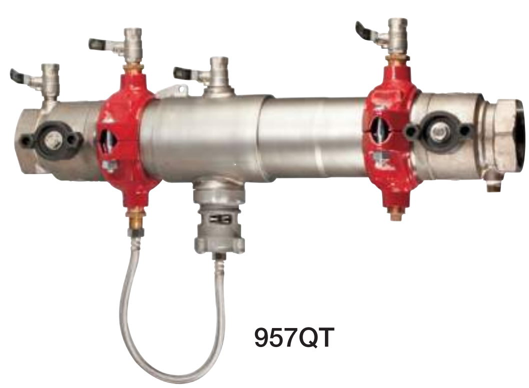

957QT

Features

- 2½", 3" and 4" sizes available with quarter-turn ball valve shutoffs
- Replaceable check disc rubber
- Extremely compact design
- 70% Lighter than traditional designs
- 304 (Schedule 40) stainless steel housing & sleeve
- Groove fittings allow integral pipeline adjustment
- Patented torsion spring checks provide lowest pressure loss
- Unmatched ease of serviceability
- Bottom mounted cast stainless steel relief valve
- Available with grooved butterfly valve shutoffs

NOTICE

Inquire with governing authorities for local installation requirements

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

WATTS®

Specifications

The Reduced Pressure Zone Assembly shall consist of two independent torsion spring check modules, a differential pressure relief valve located between and below the two modules, two drip tight shutoff valves, and required torsion spring check modules and relief valve shall be contained with a sleeve accessible single housing constructed from 304 (Schedule 40) stainless steel pipe with groove end connections. Torsion spring checks shall have replaceable elastomer discs and in operation produce drip tight closure against the reverse flow of liquid caused by backpressure or backsiphonage. Assembly shall be a Watts Regulator Company Series 957, 957N, 957Z.

NOTICE

When installing a drain line on Series 957 backflow preventers, use 957AG air gaps. See ES-AG/EL/TC for additional information.

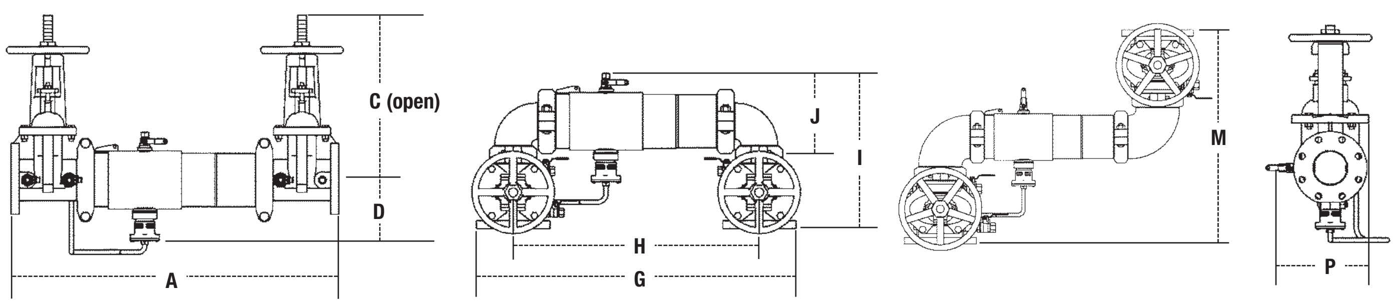
Available Models & Options

Suffix:

NRS –	non-rising stem, resilient seated gate valves
OSY –	UL/FM outside stem and yoke resilient seated gate valves
BFG –	UL/FM grooved gear operated butterfly valves with tamper switch
QT –	2½" - 4" (65 - 100mm) quarter-turn ball valves
*OSY FxG –	Flanged inlet gate connection and grooved outlet gate connection
**OSY GxF –	Grooved inlet gate connection and flanged outlet gate connection
***OSY GxG –	Grooved inlet gate connection and grooved outlet gate connection
****ALERT	with SentryPlus™ Alert flood detection system

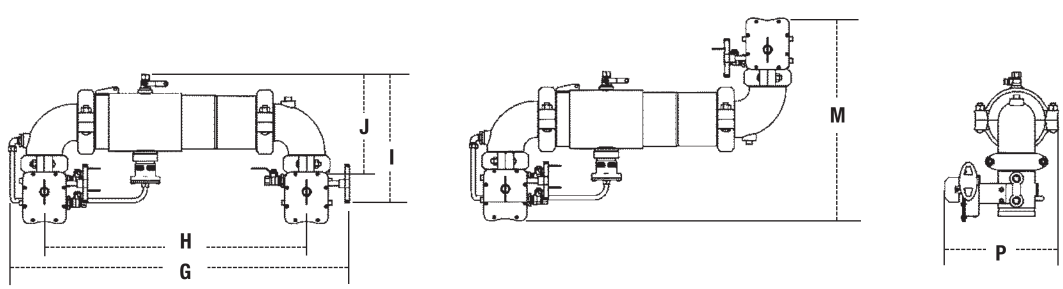
*Available with grooved NRS gate valves – consult factory
**Post indicator plate and operating nut available – consult factory
***Consult factory for dimensions

**** Not available with the 957N or 957Z



957, 957N, 957Z

SIZE	DIMENSIONS																			WEIGHT							
	A		C (OSY)		C (NRS)		D		G		H		I		J		M		P		957NRS		957OSY		957N NRS		957N OSY	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*	*lbs.*	*kgs.*	*lbs.*	*kgs.*	*lbs.*	*kgs.*
2½	30¾	781	16⅜	416	9⅜	238	6½	165	29 1⁄16	738	21½	546	15½	393	8 13⁄16	223	21¼	540	9 3⁄16	234	118	54	128	58	126	57	136	62
3	31¾	806	18⅞	479	10¼	260	6 11⁄16	170	30¼	768	22¼	565	17⅛	435	9 3⁄16	233	23	584	10½	267	134	61	148	67	147	67	161	73
4	33¾	857	22¾	578	12 3⁄16	310	7	178	33	838	23½	597	18½	470	9 15⁄16	252	26¼	667	11 3⁄16	284	164	74	164	74	187	85	187	85
6	43½	1105	30⅛	765	16	406	8½	216	44¾	1137	33½	851	23 3⁄16	589	13 1⁄16	332	34¼	870	15	381	276	125	298	135	317	144	339	154
8	49¾	1264	37¾	959	19 15⁄16	506	9 11⁄16	246	54⅛	1375	40⅛	1019	27 7⁄16	697	15 11⁄16	399	36⅞	937	17 3⁄16	437	441	200	483	219	516	234	558	253
10	57¾	1467	45¾	1162	23 13⁄16	605	11 3⁄16	285	66	1676	49½	1257	32½	826	17 5⁄16	440	44½	1124	20	508	723	328	783	355	893	405	950	431



957NBFG, 957ZBFG

SIZE	DIMENSIONS												WEIGHT	
	G		H		I		J		M		P		957N/957Z	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*
2½	32½	826	23	584	15½	394	9½	241	19¾	502	11 13⁄16	300	67	30
3	34	864	24	610	16 5⁄16	414	10 1⁄16	256	21¼	540	12⅛	308	70	32
4	35⅝	905	25½	648	17 3⁄16	437	10 15⁄16	279	23½	597	12⅝	321	87	39
6	46½	1181	35¼	895	20½	521	13½	343	27¼	692	15	382	160	73

Dimensions — Weight

Materials

Housing & Sleeve: 304 (Schedule 40) Stainless Steel

Elastomers: EPDM, Silicone and Buna-N

Torsion Spring Checks: Noryl®, Stainless Steel

Check Discs: Reversible Silicone or EPDM

Test Cocks: Lead Free* Bronze Body

Pins & Fasteners: 300 Series Stainless Steel

Springs: Stainless Steel

Pressure — Temperature

Temperature Range: 33°F – 140°F (0.5°C – 60°C)

Maximum Working Pressure: 175psi (12.1 bar)

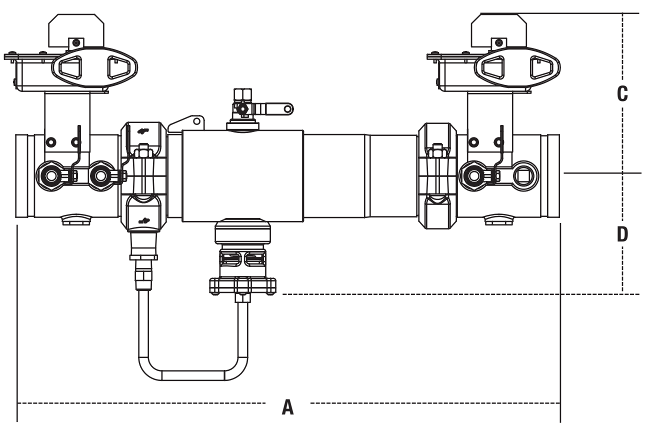
Approvals

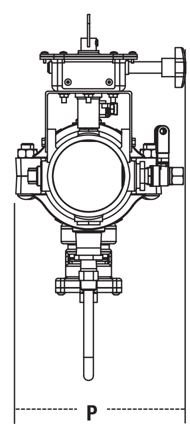
- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at The University of Southern California (FCCCHR-USC)
  (Excluding ‘N’ Pattern – 10", ‘Z’ Pattern – 6" and 10")
- AWWA C511-97

1013 B64.4 (**BFG & OSY Only)

For additional approval information please contact the factory or visit our website at Watts.com

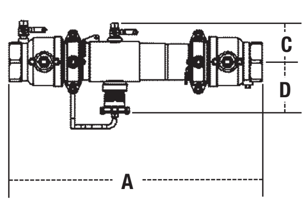
Dimensions — Weight continued

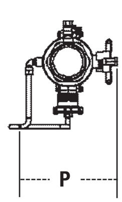


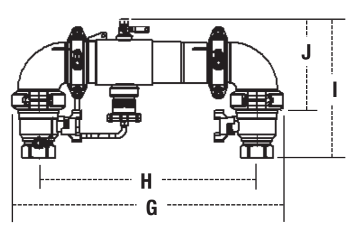


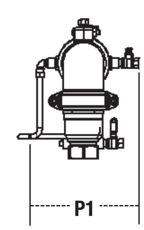
957 BFG

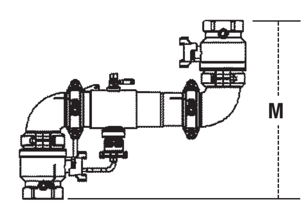
SIZE	DIMENSIONS								WEIGHT	
	A		C		D		P			
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*
4	29	737	7¾	197	6⅜	162	9½	241	66	30
6	36½	927	9¹¹⁄₁₆	246	7⁷⁄₁₆	189	14¼	362	122	55











957QT

SIZE	DIMENSIONS																				WEIGHT			
	A		C		D		G		H		I		J		M		P		P1		QT		QTN	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*	*lbs.*	*kgs.*
2½	27½	698	4⅞	124	6⅞	175	30¼	768	21½	546	16 ¹⁄₁₆	407	11⅜	289	19⅞	505	11⁵⁄₁₆	287	11⁵⁄₁₆	287	46	21	57	26
3	28	711	4⅞	124	6⅞	175	30¼	768	22¼	565	16⁹⁄₁₆	420	11⅜	289	20⅞	531	11⁵⁄₁₆	287	11⁵⁄₁₆	287	56	25	67	30
4	28¾	730	4⅞	124	6⅞	175	30¼	768	23½	597	18⁵⁄₁₆	465	11⅜	289	24⅜	619	11⁵⁄₁₆	287	11⁵⁄₁₆	287	76	34	87	39

Capacity

Series 957, 957N, 957Z flow curves as tested by Underwriters Laboratory.

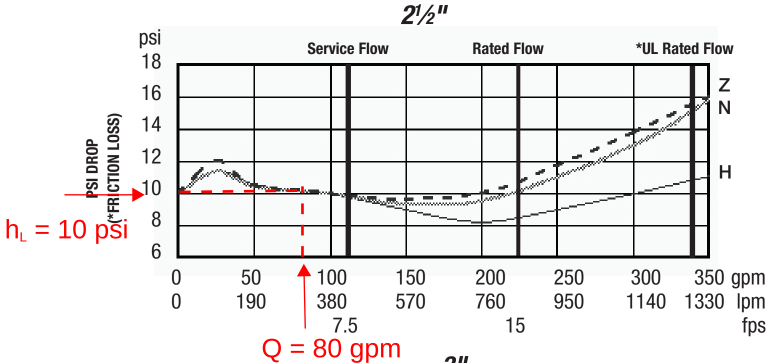
Flow characteristics collected using butterfly shutoff valves

Horizontal — N-Pattern ----- Z-Pattern

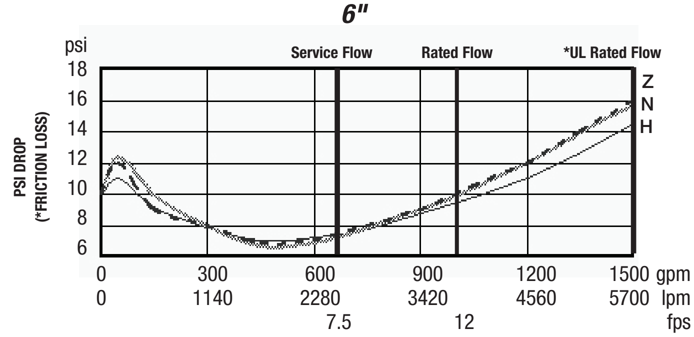
Flow capacity chart identifies valve performance based upon rated water velocity up to 25fps

- Service Flow is typically determined by a rated velocity of 7.5fps based upon schedule 40 pipe.
- Rated Flow identifies maximum continuous duty performance determined by AWWA.
- UL Flow Rate is 150% of Rated Flow and is not recommended for continuous duty.
- AWWA Manual M22 [Appendix C] recommends that the maximum water velocity in services be not more than 10fps.

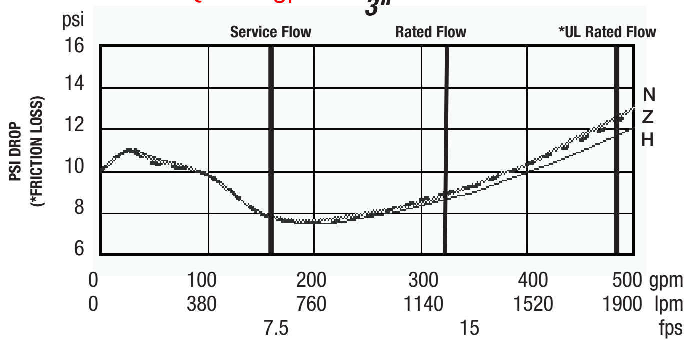
2½"



6"



3"



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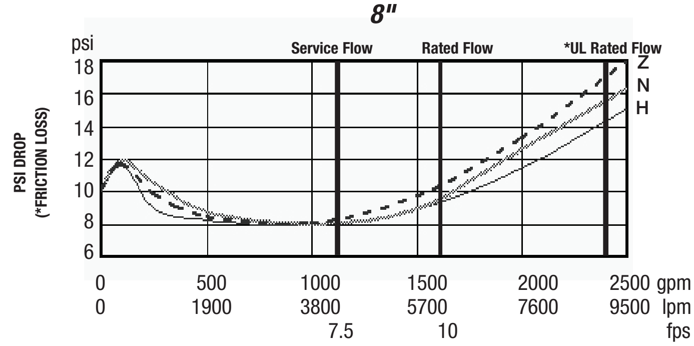
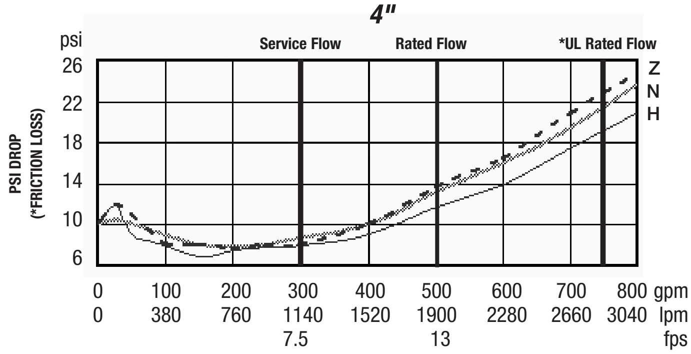
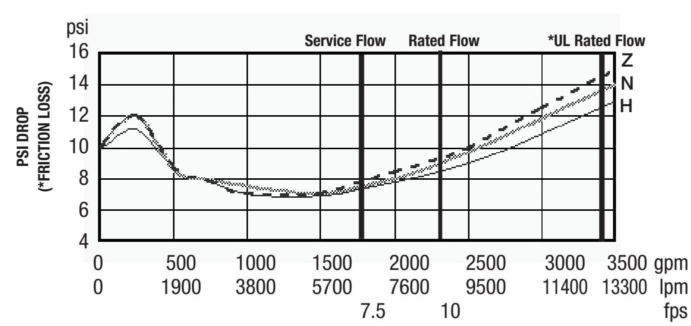


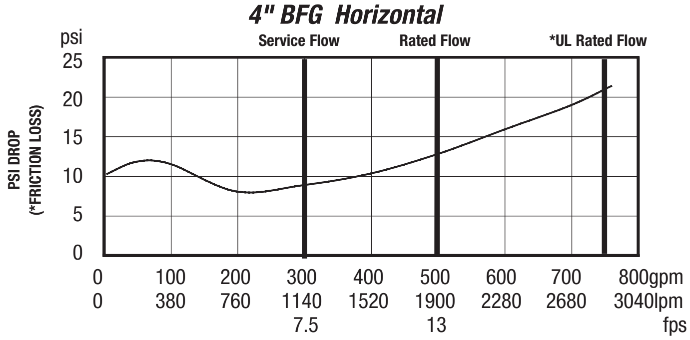
4"



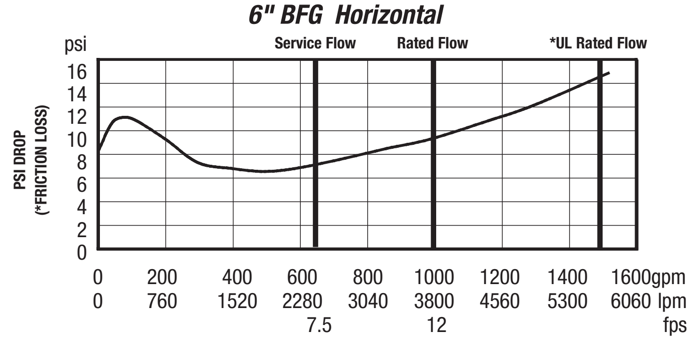
10"



4" BFG Horizontal



6" BFG Horizontal



USA: T: (978) 689-6066 • F: (978) 975-8350 • Watts.com
Canada: T: (888) 208-8927 • F: (888) 479-2887 • Watts.ca
Latin America: T: (52) 55-4122-0138 • Watts.com

Job Name Rural Outreach Center

Job Location 730 Olean Road, Aurora, NY

Engineer C&S Engineers, Inc.

Approval

Contractor

Approval

Contractor's P.O. No.

Representative

LEAD FREE*

Series LF757DCDA, LF757NDCDA

Double Check Detector Assemblies

Sizes: 2½" – 10"

Series LF757DCDA, LF757NDCDA Double Check Detector Assemblies are used to prevent backflow of non-health hazard pollutants that are objectionable but not toxic, from entering the potable water supply system. The LF757DCDA, LF757NDCDA may be installed under continuous pressure service and may be subjected to backpressure and backsiphonage. Series LF757DCDA, LF757NDCDA is used primarily on fire line sprinkler systems when it is necessary to monitor unauthorized use of water.

Features

- Lead Free* construction
- Extremely compact design
- 70% lighter than traditional designs
- 304 (Schedule 40) stainless steel housing & sleeve
- Groove fittings allow integral pipeline adjustment
- Unique tri-link spring check provides lowest pressure loss
- Unmatched ease of serviceability
- Available with grooved butterfly valve shutoffs
- May be used for horizontal, vertical or N pattern installations
- Replaceable check disc rubber

Specifications

The Lead Free* Double Check Detector Assembly shall consist of two independent tri-link check modules within a single housing, sleeve access port, four test cocks and two drip tight shutoff valves. Tri-link checks shall be removable and serviceable, without the use of special tools. The housing shall be constructed of 304 Schedule 40 stainless steel pipe with groove end connections. Tri-link checks shall have reversible elastomer discs and in operation shall produce drip tight closure against reverse flow caused by backpressure or backsiphonage. The bypass assembly shall consist of a meter, which registers in either gallon or cubic measurement, a double check backflow assembly and required test cocks. Assembly shall be a Watts Series LF757DCDA, LF757NDCDA.

LF757DCDAOSY

LF757DCDABFG

LF757NDCDAOSY

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

WATTS®

Available Models

Suffix:

OSY – UL/FM outside stem and yoke resilient seated gate valves

BFG – UL/FM grooved gear operated butterfly valves with tamper switch

**OSY FxG – Flanged inlet gate connection and grooved outlet gate connection

**OSY GxF – Grooved inlet gate connection and flanged outlet gate connection

**OSY GxG – Grooved inlet gate connection and grooved outlet gate connection

Available with grooved NRS gate valves - consult factory**
Post indicator plate and operating nut available - consult factory**
**Consult factory for dimensions

Materials

Housing & Sleeve: 304 (Schedule 40) Stainless Steel
Elastomers: EPDM, Silicone and Buna-N
Tri-link Checks: Noryl®, Stainless Steel
Check Discs: Reversible Silicone or EPDM
Test Cocks: Lead Free* Bronze Body
Pins & Fasteners: 300 Series Stainless Steel
Springs: Stainless Steel

Pressure — Temperature

Temperature Range: 33°F – 140°F (0.5°C – 60°C)
Maximum Working Pressure: 175psi (12.1 bar)

Approvals

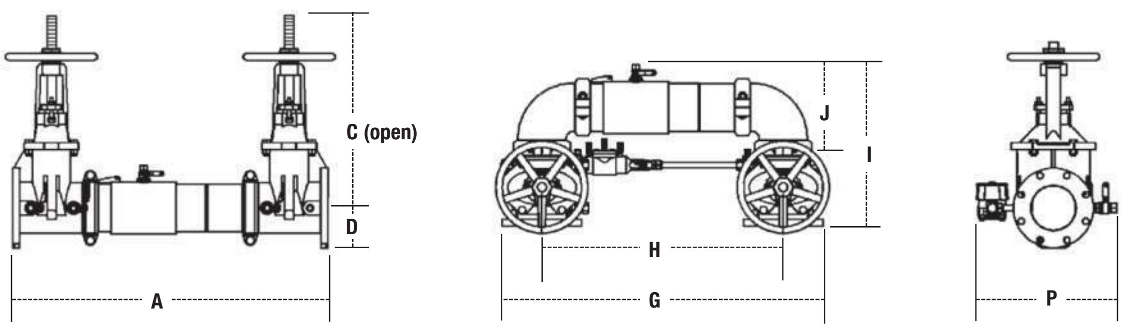
- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at The Unversity of Southern California (FCCCHR-USC)
- AWWA C510-97

** **

1048 B64.5 (**BFG & OSY Only)

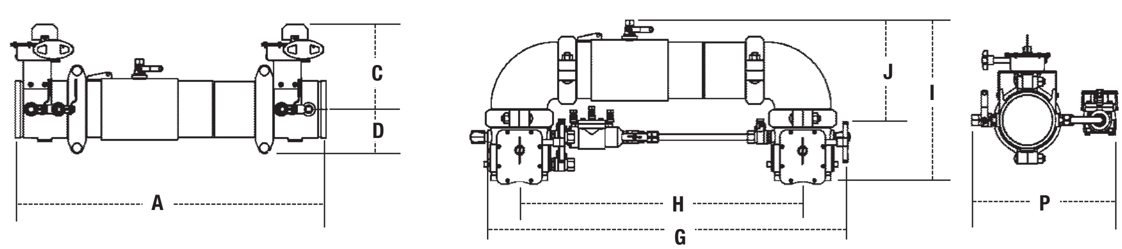
Certified to NSF/ANSI 372

Dimensions — Weight



LF757DCDA, LF757NDCDA

SIZE	DIMENSIONS																WEIGHT			
	A		C (OSY)		D		G		H		I		J		P		LF757DCDA		LF757NDCDA	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*	*lbs.*	*kgs.*
2 1/2	30 3/4	781	16 3/8	416	3 1/2	89	29 1/16	738	21 1/2	546	15 1/2	393	8 13/16	223	13 3/16	335	139	63	147	67
3	31 3/4	806	18 7/8	479	3 11/16	94	30 1/4	768	22 1/4	565	17 1/8	435	9 3/16	233	14 1/2	368	159	72	172	78
4	33 3/4	857	22 3/4	578	4	102	33	838	23 1/2	597	18 1/2	470	9 15/16	252	15 3/16	386	175	79	198	90
6	43 1/2	1105	30 1/8	765	5 1/2	140	44 3/4	1137	33 1/4	845	23 3/16	589	13 1/16	332	19	483	309	140	350	159
8	49 3/4	1264	37 3/4	959	6 11/16	170	54 1/8	1375	40 1/8	1019	27 7/16	697	15 11/16	399	21 3/16	538	494	224	569	258
10	57 3/4	1467	45 3/4	1162	8 3/16	208	66	1676	49 1/2	1257	32 1/2	826	17 5/16	440	24	610	795	361	965	438



LF757DCDABFG, LF757NDCDABFG

SIZE	DIMENSIONS																WEIGHT			
	A		C		D		G		H		I		J		P		LF757DCDABFG		LF757NDCDA BFG	
in.	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.	lbs.	kgs.
2 1/2	27 3/4	705	8	203	3 1/2	89	29 7/8	759	21 1/2	546	14 15/16	379	8 13/16	223	13	330	70	32	78	35
3	28 1/4	718	8 5/16	211	3 11/16	94	30 11/16	779	22 1/4	565	15 7/16	392	9 3/16	233	13 1/2	343	68	31	81	37
4	29	737	8 15/16	227	3 11/16	94	31 15/16	811	23 1/2	597	16 1/4	412	9 15/16	252	14	356	75	34	98	44
6	36 1/2	927	10	254	5	127	43 3/16	1097	33 1/4	845	19 11/16	500	13 1/16	332	14 1/2	368	131	59	171	78
8	42 3/4	1086	12 1/4	311	6 1/2	165	51 1/16	1297	40 1/8	1019	23 5/16	592	15 11/16	399	18 3/16	462	275	125	351	159

Noryl® is a registered trademark of General Electric Company.

Capacity

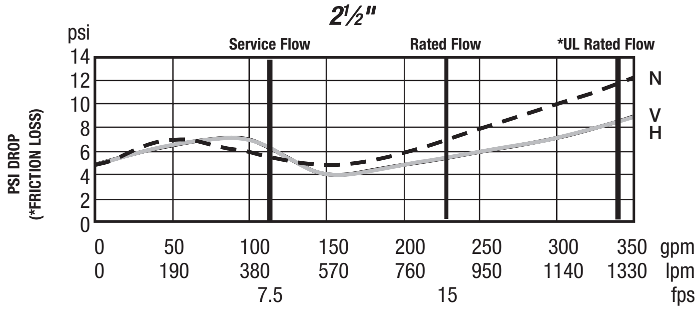
Series LF757DCDA flow curves as tested by Underwriters Laboratory. Flow characteristics collected using butterfly shutoff valves

Horizontal — Vertical — N - Pattern

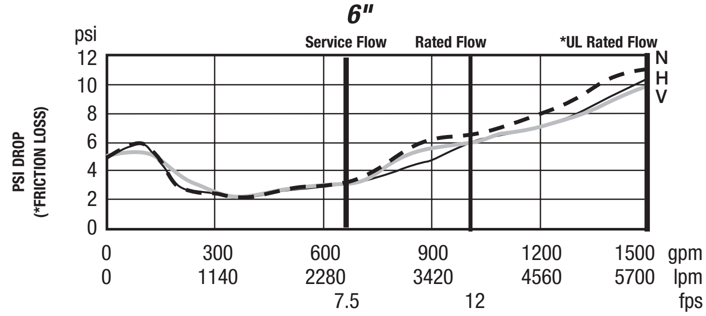
Flow capacity chart identifies valve performance based upon rated water velocity up to 25fps

- Service Flow is typically determined by a rated velocity of 7.5fps based upon schedule 40 pipe.
- Rated Flow identifies maximum continuous duty performance determined by AWWA.
- UL Flow Rate is 150% of Rated Flow and is not recommended for continuous duty.
- AWWA Manual M22 [Appendix C] recommends that the maximum water velocity in services be not more than 10fps.

2½"



6"



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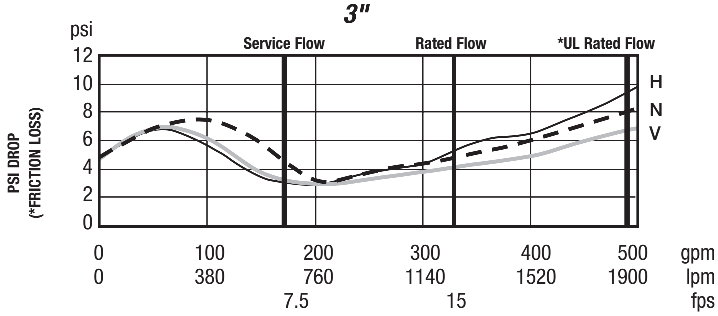

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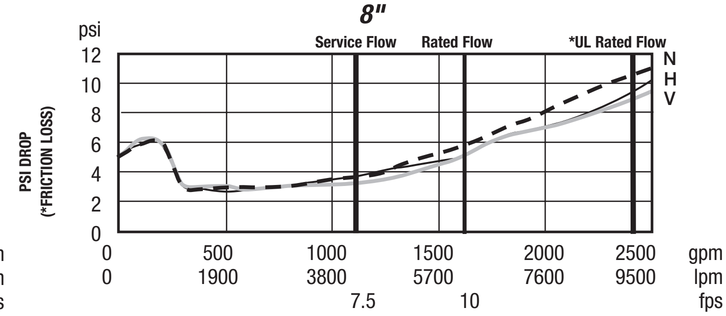

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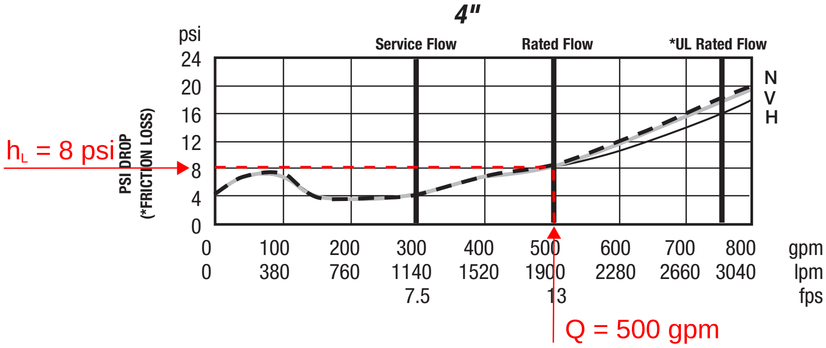
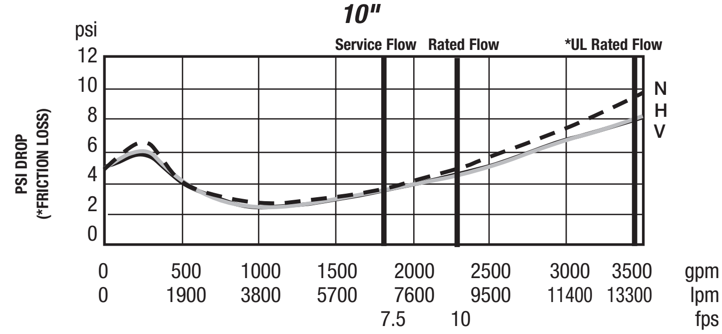


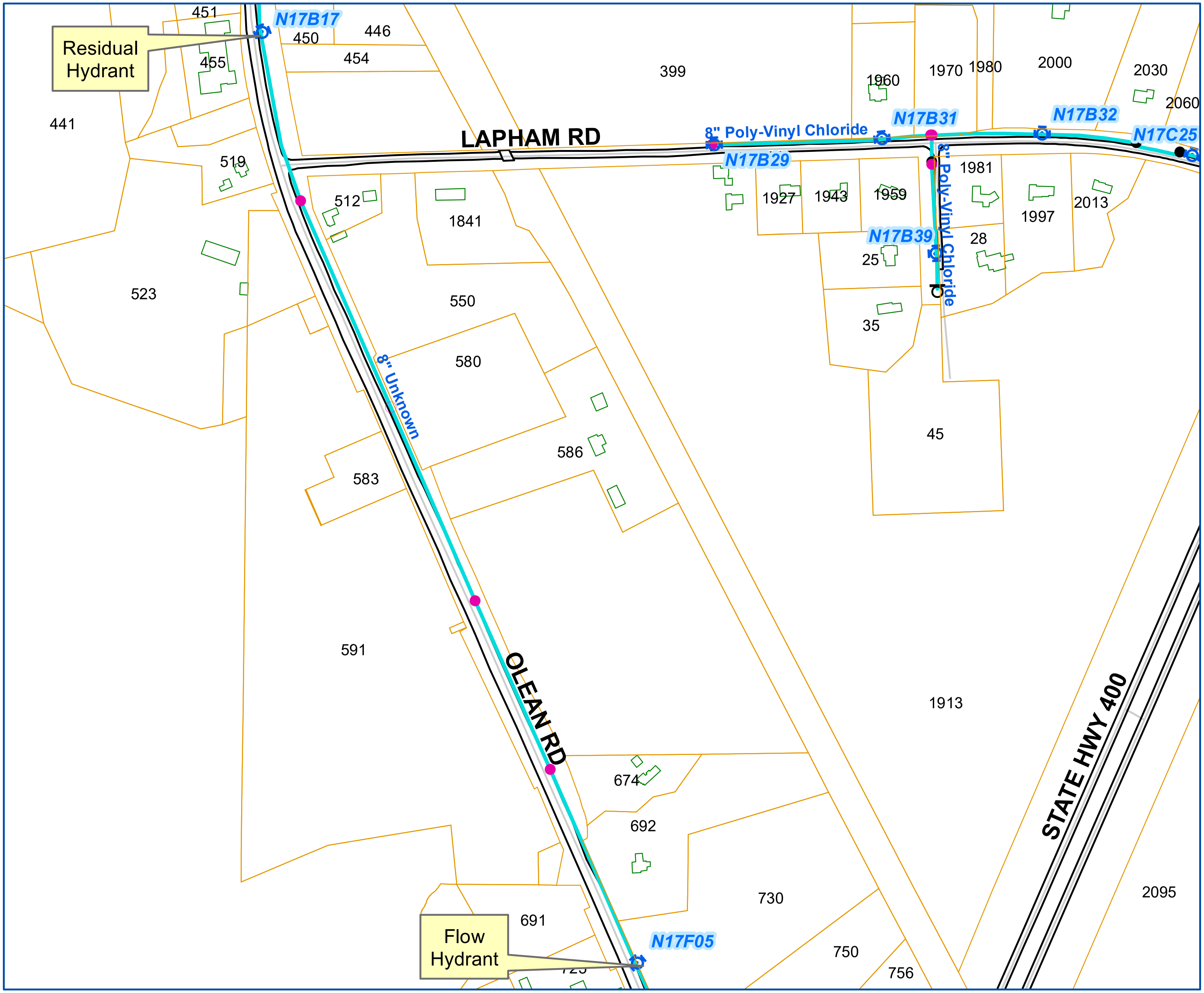
10"



NOTICE

Inquire with governing authorities for local installation requirements

730 Olean Rd



N

1 inch = 450 feet

Legend:

Parcels

DWP Hydrant Flow Test Inquiry -- Hydrant: N17B17 Test Date/Time: 11/10/2009 13:45 CHI095-B
Address: 450 OLEAN RD Side: E Location: 1ST HYD N/O LAPHAM RD
AURORA
Size of Main/Branch: 8"/6" Fire District: 24020 FIRE PROTECT DIST 1 Water District: 059 ECWA AREA-TOWN OF AURORA

Performed By: BM, RLS Comments: HYDRANT FLOW TEST REQUESTED BY RAY CROMBE, ISO
PHONE: 1-585-978-1281; FAX: 1-201-748-1394

Dischrge Coef: .90 Elvtn Usgs(ft): Static(psi): 64 Residual(psi): 56 Required Residual Pressure(psi): 20
Gallons Used..: 3,420 Total Flow(gpm): 1,138 Flow at Reqd Resid Pressure: 2,857

Flow Hydrants:

C	Flow Hyd	Flow Hydrant Address	Main/Brnch	Nzle	Size	Pitot	Flow	Comments
_	N17 F05	OP 725 OLEAN RD	8"/6"	1:	2.50	46.0	1,138	
		9TH HYD N/O BLAKELEY RD		2:				
				3:				Tot Flow: 1,138

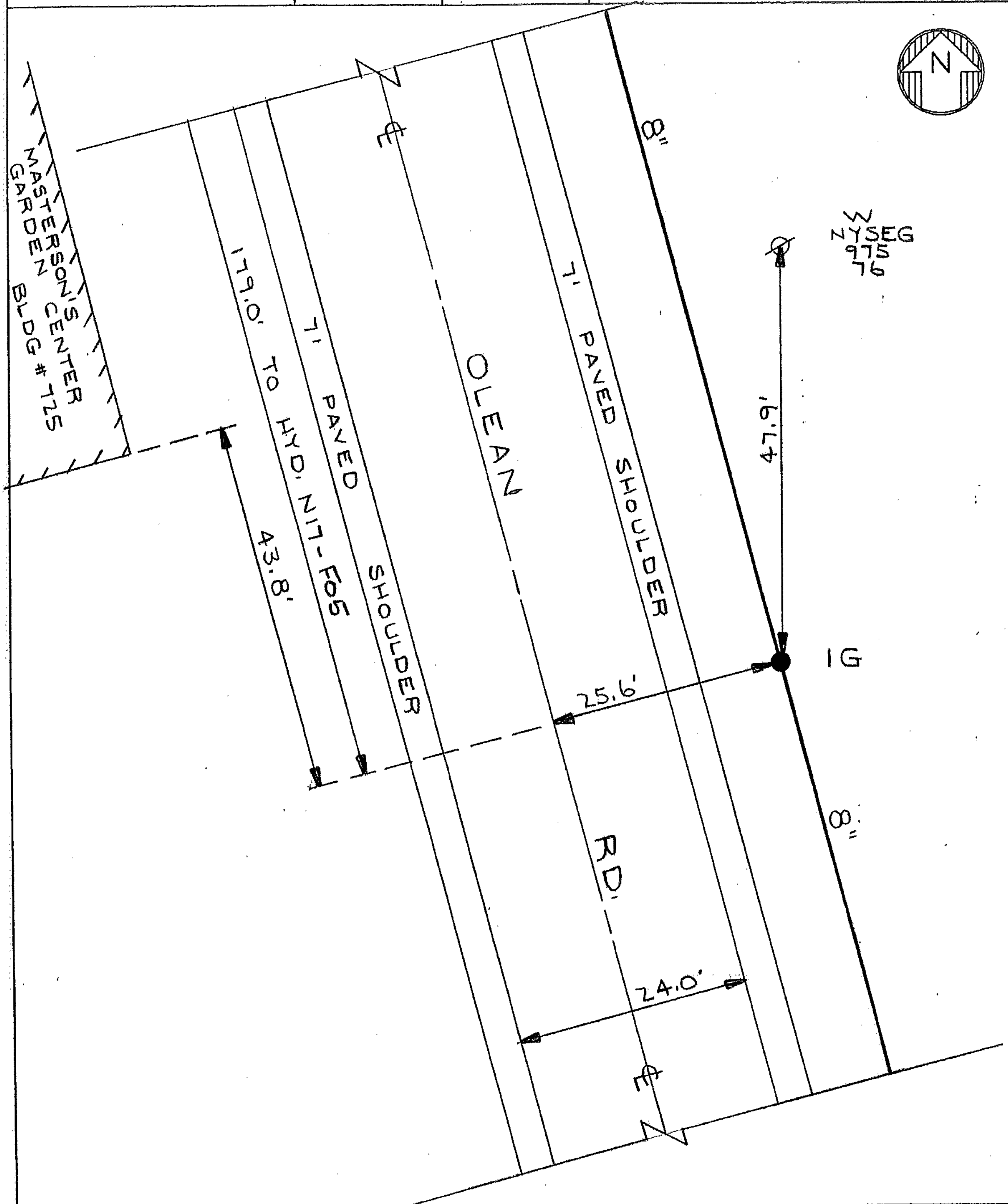
Bottom

I=Flow Hydrant Inquiry
ENTER=Continue F3=Exit F6=Maintain Test F7=Test Hydrant Inquiry F15=Print Test Information

730 Olean Rd


674
591
692
8" Unknown
730
1913
691
OLEAN RD
N17F05
750
Detail
N17-F05
725
756
766
765
N
1 inch = 150 feet
Legend:
Parcels

ECWA ERIE COUNTY WATER AUTHORITY BUFFALO, NEW YORK	DR. D.K.C. DATE: 9.22.06 FIELD	DR. DATE: OFFICE	TOWN OF AURORA W.D. 6	N17-F05 DETAIL SHT. NO. 200500179 CURRENT PROJECT NO.



DWGSET6
AUTN-039-0502

N17-F05
DETAIL SHT. NO.

Service No: 906000981 **Location Id:** 245145 Print Date: 1/11/2021

Service Address
730 OLEAN RD
EAST AURORA NY 14052

Cross Streets
LAPHAM RD (NSEW): N
RTE 400 (NSEW): S

ECWA Service Information:
Service Size...: 1" **Depth.:** .0 **Type:** RESID
Matl @ Main/Src: COPPER/SRVC MATL
Matl @ Box/Src.: COPPER/SRVC MATL
Main Size/Type.: 8" PV **Side of Street:** E
Color of Main..: WHITE

Customer Line Information:
Line Size: 1"
Matl @ Box/Src.: COPPER/SRVC MATL
Matl @ Met/Src.: COPPER/MET ORD

Service Started: 7/01/2015
Date Tapped....: 6/14/2015 **Date Replaced.:**
Field Book/Page:

Description of Curb Box Measurements

74.0	HOUSE TO BOX,
2.0	BOX TO MAIN,
10.0	LEFT OF LHC,

Materials

SADDLE	8" X	1"
CORP		1"
COPPER	2'	1"
C+C STOP		1"
95E BOX		

```
N+   .............|____________|
           |      .
    74.0 |< 10.0 >.
           |      .
      __|__       .
           |      .
    2.0    |      .
           |      .
  8"  ___|_________
```

See attached image documents

#14087

SERVICE INSTALLATION OR REPLACEMENT

Rec 5/22

Service .: 906000981 Type: New Service - Replacement - Measurement

Location: 730 OLEAN RD, Town: AUTN

Inspected by: 659 Inspection Date:

Qty.	Unit	CONTRACT ITEMS (circle one)			Description
			¾" 1"	1½" - 2"	
	Each		1A1	1A2	Basic Service - Cast Iron, Ductile, Asbestos
	Each		1B1	1B2	Basic Service - Prestressed Concrete Pipe
1	Each		1C1	1C2	Basic Service - PVC
	Each		1D1	1D2	Service Replacement in Pavement Driveway or Parking Lot
	Each		1D3	1D4	Service Replacement in Grass
	L F		2A1	2A2	Pushing - Open Trench - Boring (Copper tubing >10')
	L F		2A3	2A4	Pushing - Open Trench - Boring (Poly tubing >10')
	Each	3A1-new or 3A2-existing			Meter Box Settings (New Service - Existing Service)
	CY	4A1			Rock Excavation
	L F	4B1			Rock Drilling (¾" thru 2"; up to 10 feet)
	L F		4B2		Rock Drilling (¾" thru 1"; beyond 10 feet)
	L F			4B3	Rock Drilling (1½" thru 2"; beyond 10 feet)
	CY	5A1			Test Pit Excavation and Backfill
	Hrs	7A1			Crew Labor and Equipment
	Hrs	7A2			Dump Truck with Operator
2	FT Total Installation				Installation Type: S / L (Circle one)

MATERIALS					
DESCRIPTION	SIZE				
Saddle	8 x 1 Brass				
Corp.	5/8"	¾"	1"	1½"	2"
C & C Stop		¾"	1"	1½"	2"
Copper 2 Ft		¾"	1"	1½"	2"
Curb Box	95E			145R	
Tile Setting Meter No.					

House NSEW: E

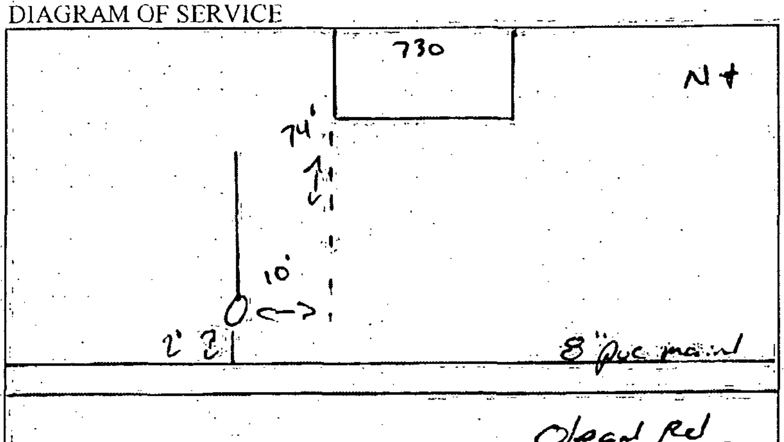
Cross Streets

Caplam Rd		NSEW:	
		NSEW:	
Service Size:	1	Depth	
Main Size:	8	O.D.:	
Main Type:	PVC	Side of St (NSEW)	E
Main Color:	White		

A

Date Tapped: 6/11/15 Date Replaced: Field Book: Page:

DIAGRAM OF SERVICE



CURB BOX MEASUREMENTS

House to Box	74 '	"
Box to Main	2 '	"
C of L	10 '	"

Service Notes:

MED
JUL 21 2015
ECWA

Excavation Notes

Asphalt:
Concrete:
Road Shoulder:
Sidewalk:
Lawn: NA
Field:
Other:

Contractor Name: Russo Dev.
Foreman's Name: JEFF Sills
Vendor No.: V 7286
Address: 3710 Milestrip Rd
Telephone: 716 - 844 - 8745

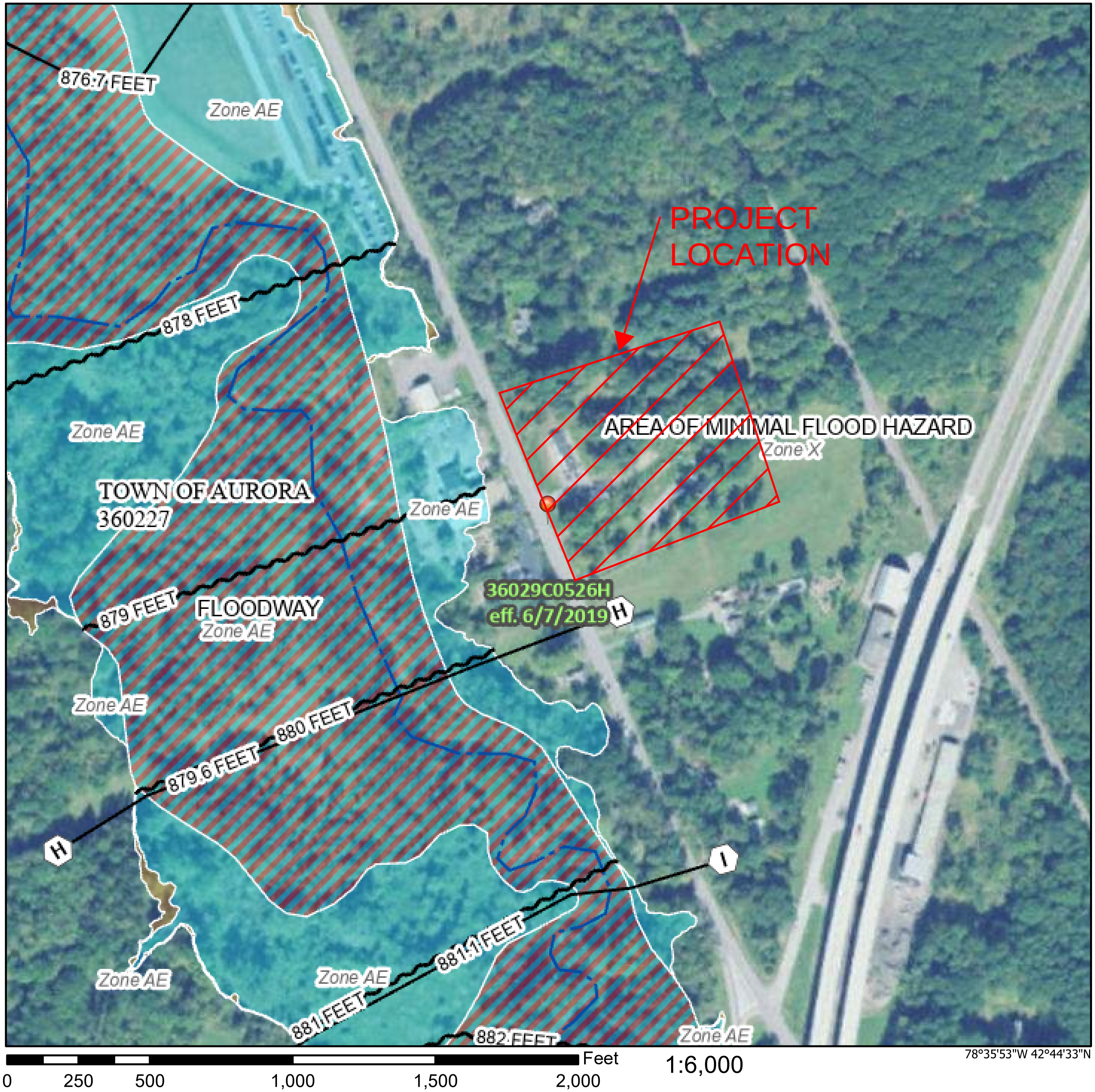
Consulting Engineer:
Telephone:

APPENDIX E

FEMA FIRMette MAP

National Flood Hazard Layer FIRMette

78°36'30"W 42°44'59"N



78°35'53"W 42°44'33"N

1:6,000

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

Legend

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/7/2021 at 3:12 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

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