

Routing Diagram for Quarry Street Dry Swale
 Prepared by VHB, Printed 11/27/2017
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Quarry_Street_Dry_Swale

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.053	95	50-75% Grass cover, Fair, HSG A (4S MCN)
0.366	95	>75% Grass cover, Good, HSG B (7S MCN)
0.863	95	Paved roads w/curbs & sewers, HSG B (4S MCN)
0.120	95	Woods/grass comb., Fair, HSG A (4S MCN)
0.111	95	Woods/grass comb., Fair, HSG B (4S MCN)
1.514	95	TOTAL AREA

Quarry_Street_Dry_Swale

Type II 24-hr WQV Rainfall=1.00"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 4S MCN: To CB 33 Runoff Area=49,971 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=120' Slope=0.1100 '/' Tc=1.0 min CN=WQ Runoff=1.36 cfs 0.054 af

Subcatchment 7S MCN: Direct to Swale Runoff Area=15,958 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=112' Slope=0.0550 '/' Tc=1.3 min CN=95 Runoff=0.43 cfs 0.017 af

Reach 1R: Pretreatment Swale Avg. Flow Depth=0.35' Max Vel=0.45 fps Inflow=1.79 cfs 0.071 af
n=0.150 L=150.0' S=0.0100 '/' Capacity=33.98 cfs Outflow=1.41 cfs 0.071 af

Pond 6P: DI-33 Peak Elev=717.95' Inflow=1.36 cfs 0.054 af
18.0" Round Culvert n=0.013 L=50.0' S=0.0470 '/' Outflow=1.36 cfs 0.054 af

Total Runoff Area = 1.514 ac Runoff Volume = 0.071 af Average Runoff Depth = 0.56"
100.00% Pervious = 1.514 ac 0.00% Impervious = 0.000 ac

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Type II 24-hr WQV Rainfall=1.00"

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Summary for Subcatchment 4S MCN: To CB 33

Runoff = 1.36 cfs @ 11.91 hrs, Volume= 0.054 af, Depth= 0.56"

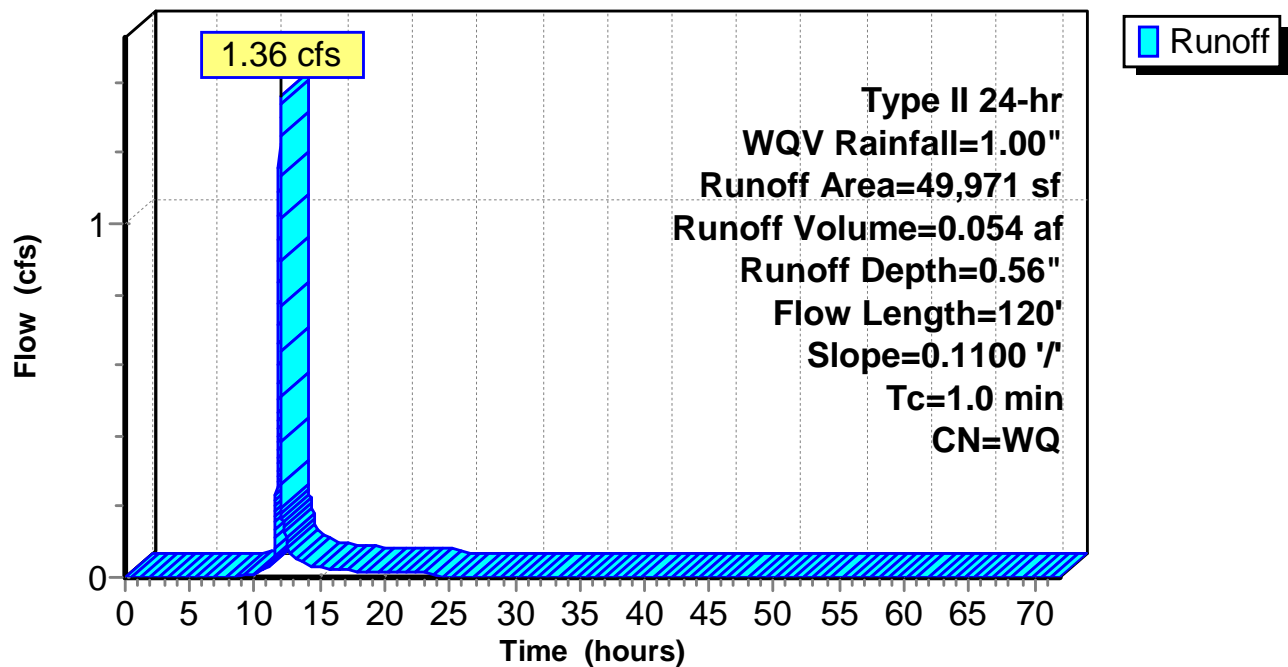
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
* 37,602	95	Paved roads w/curbs & sewers, HSG B
* 2,310	95	50-75% Grass cover, Fair, HSG A
* 5,237	95	Woods/grass comb., Fair, HSG A
* 4,822	95	Woods/grass comb., Fair, HSG B
49,971		Weighted Average
49,971		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	120	0.1100	2.04		Lag/CN Method,

Subcatchment 4S MCN: To CB 33

Hydrograph



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Type II 24-hr WQV Rainfall=1.00"

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Summary for Subcatchment 7S MCN: Direct to Swale

Runoff = 0.43 cfs @ 11.92 hrs, Volume= 0.017 af, Depth= 0.56"

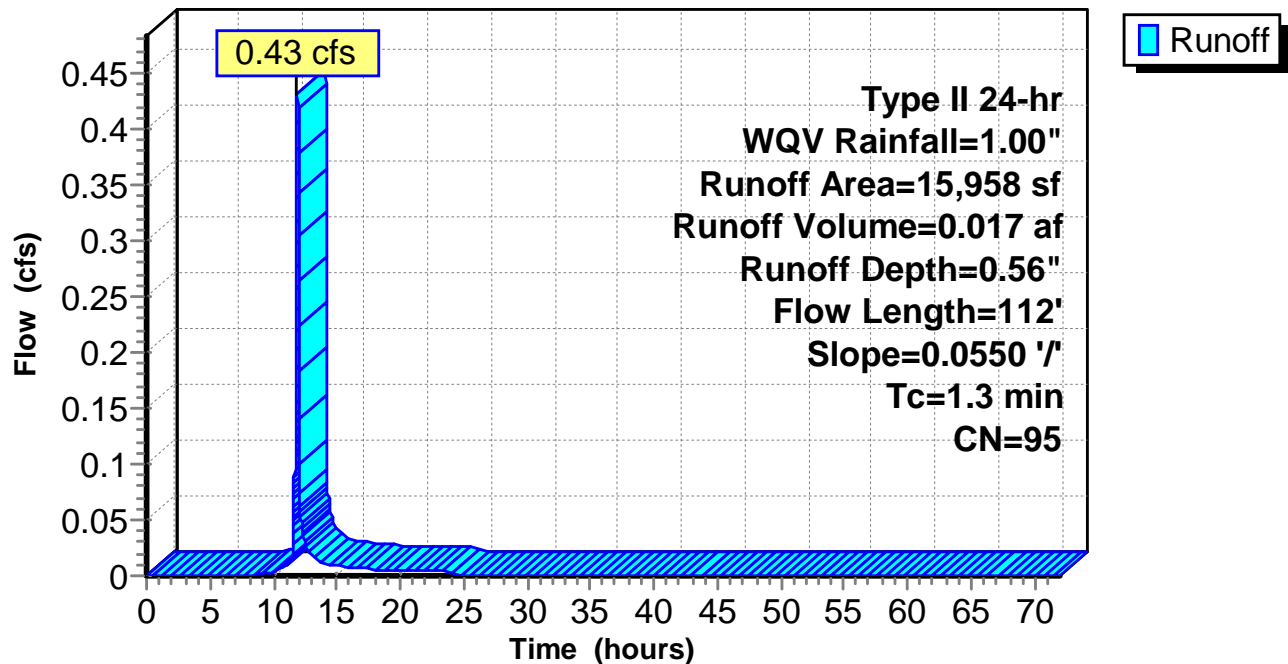
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
* 15,958	95	>75% Grass cover, Good, HSG B
15,958		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	112	0.0550	1.42		Lag/CN Method,

Subcatchment 7S MCN: Direct to Swale

Hydrograph



Summary for Reach 1R: Pretreatment Swale

Inflow Area = 1.514 ac, 0.00% Impervious, Inflow Depth = 0.56" for WQV event
Inflow = 1.79 cfs @ 11.91 hrs, Volume= 0.071 af
Outflow = 1.41 cfs @ 11.95 hrs, Volume= 0.071 af, Atten= 21%, Lag= 2.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.45 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 24.5 min

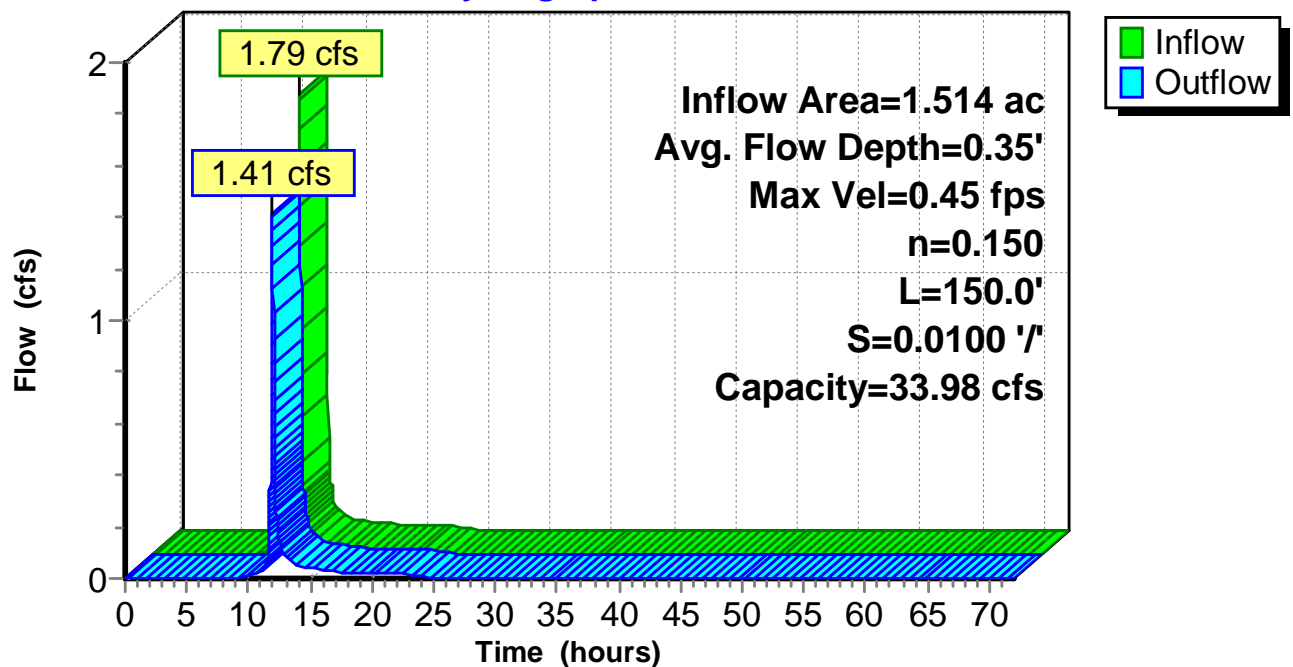
Peak Storage= 470 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 33.98 cfs

8.00' x 2.00' deep channel, n= 0.150
Side Slope Z-value= 3.0 ' Top Width= 20.00'
Length= 150.0' Slope= 0.0100 '
Inlet Invert= 715.00', Outlet Invert= 713.50'



Reach 1R: Pretreatment Swale

Hydrograph



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Type II 24-hr WQV Rainfall=1.00"

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Summary for Pond 6P: DI-33

Inflow Area = 1.147 ac, 0.00% Impervious, Inflow Depth = 0.56" for WQV event
 Inflow = 1.36 cfs @ 11.91 hrs, Volume= 0.054 af
 Outflow = 1.36 cfs @ 11.91 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.36 cfs @ 11.91 hrs, Volume= 0.054 af

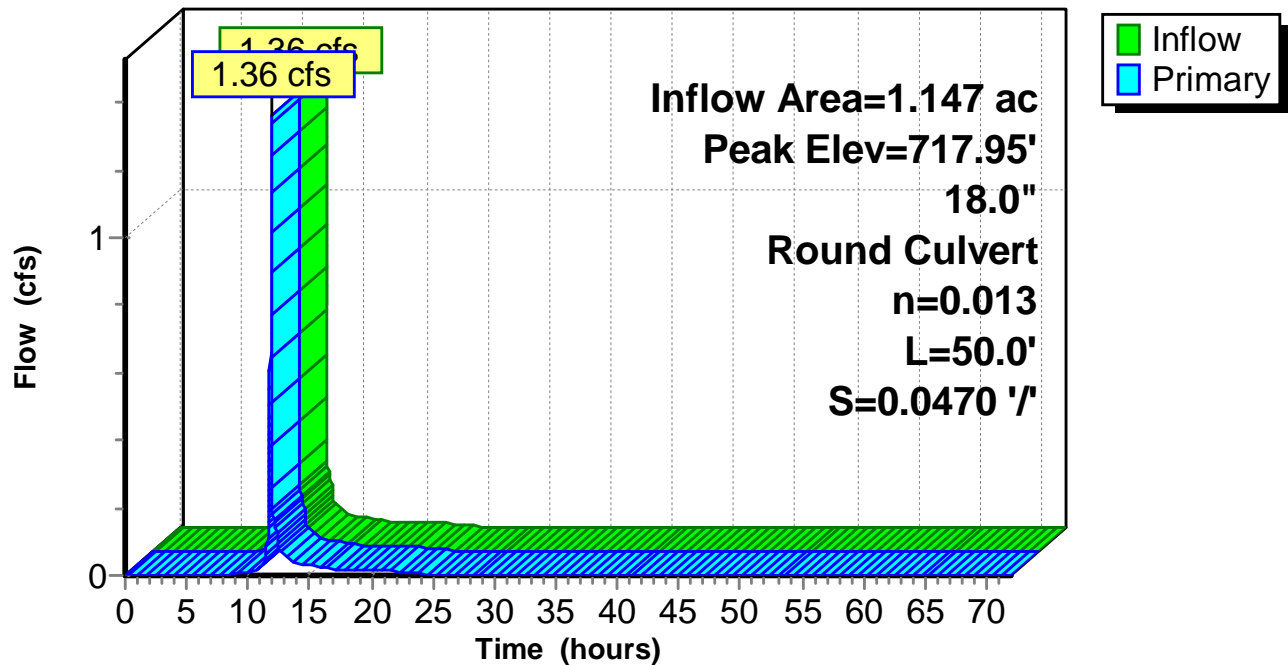
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 717.95' @ 11.91 hrs

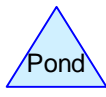
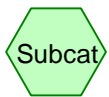
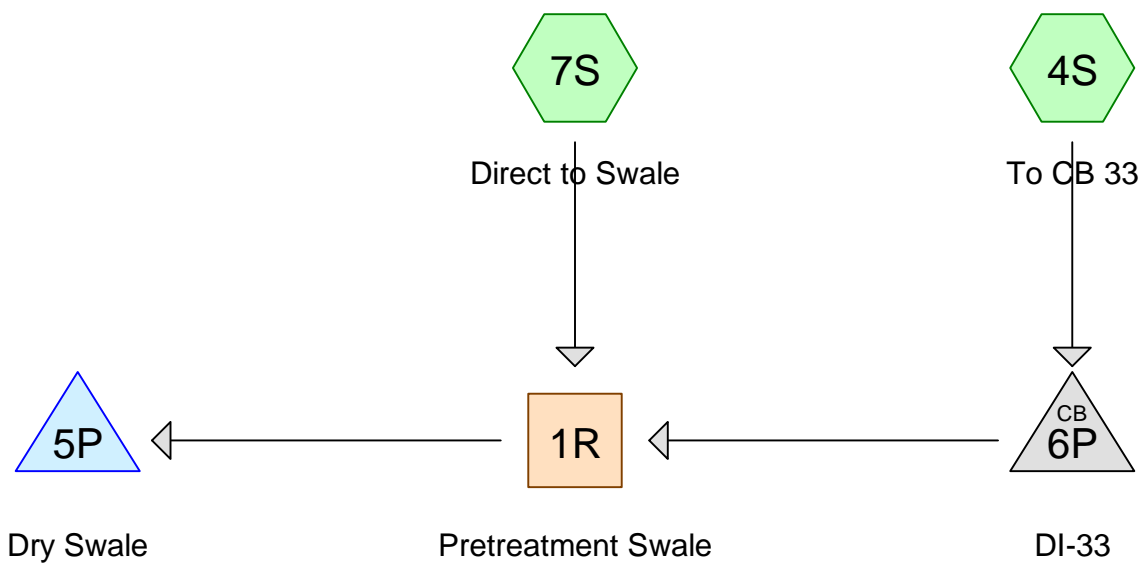
Device #1	Routing	Invert	Outlet Devices
	Primary	717.35'	18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 717.35' / 715.00' S= 0.0470 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.35 cfs @ 11.91 hrs HW=717.94' TW=715.32' (Dynamic Tailwater)
 ↑ **1=Culvert** (Inlet Controls 1.35 cfs @ 2.07 fps)

Pond 6P: DI-33

Hydrograph





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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.053	49	50-75% Grass cover, Fair, HSG A (4S)
0.366	61	>75% Grass cover, Good, HSG B (7S)
0.863	98	Paved roads w/curbs & sewers, HSG B (4S)
0.120	43	Woods/grass comb., Fair, HSG A (4S)
0.111	65	Woods/grass comb., Fair, HSG B (4S)
1.514	81	TOTAL AREA

Quarry Street Dry Swale

Type II 24-hr 10-YR Rainfall=3.47"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 4S: To CB 33 Runoff Area=49,971 sf 75.25% Impervious Runoff Depth=2.52"
Flow Length=120' Slope=0.1100 '/' Tc=1.4 min CN=WQ Runoff=5.05 cfs 0.241 af

Subcatchment 7S: Direct to Swale Runoff Area=15,958 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=112' Slope=0.0550 '/' Tc=4.0 min CN=61 Runoff=0.34 cfs 0.017 af

Reach 1R: Pretreatment Swale Avg. Flow Depth=0.57' Max Vel=0.87 fps Inflow=5.29 cfs 0.258 af
n=0.105 L=150.0' S=0.0100 '/' Capacity=48.55 cfs Outflow=4.81 cfs 0.258 af

Pond 5P: Dry Swale Peak Elev=707.38' Storage=27 cf Inflow=4.81 cfs 0.258 af
Discarded=0.00 cfs 0.003 af Primary=4.80 cfs 0.255 af Secondary=0.00 cfs 0.000 af Outflow=4.81 cfs 0.258 af

Pond 6P: DI-33 Peak Elev=718.66' Inflow=5.05 cfs 0.241 af
18.0" Round Culvert n=0.013 L=50.0' S=0.0470 '/' Outflow=5.05 cfs 0.241 af

Total Runoff Area = 1.514 ac Runoff Volume = 0.258 af Average Runoff Depth = 2.04"
42.97% Pervious = 0.650 ac 57.03% Impervious = 0.863 ac

Quarry Street Dry Swale

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Type II 24-hr 10-YR Rainfall=3.47"

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Summary for Subcatchment 4S: To CB 33

Runoff = 5.05 cfs @ 11.92 hrs, Volume= 0.241 af, Depth= 2.52"

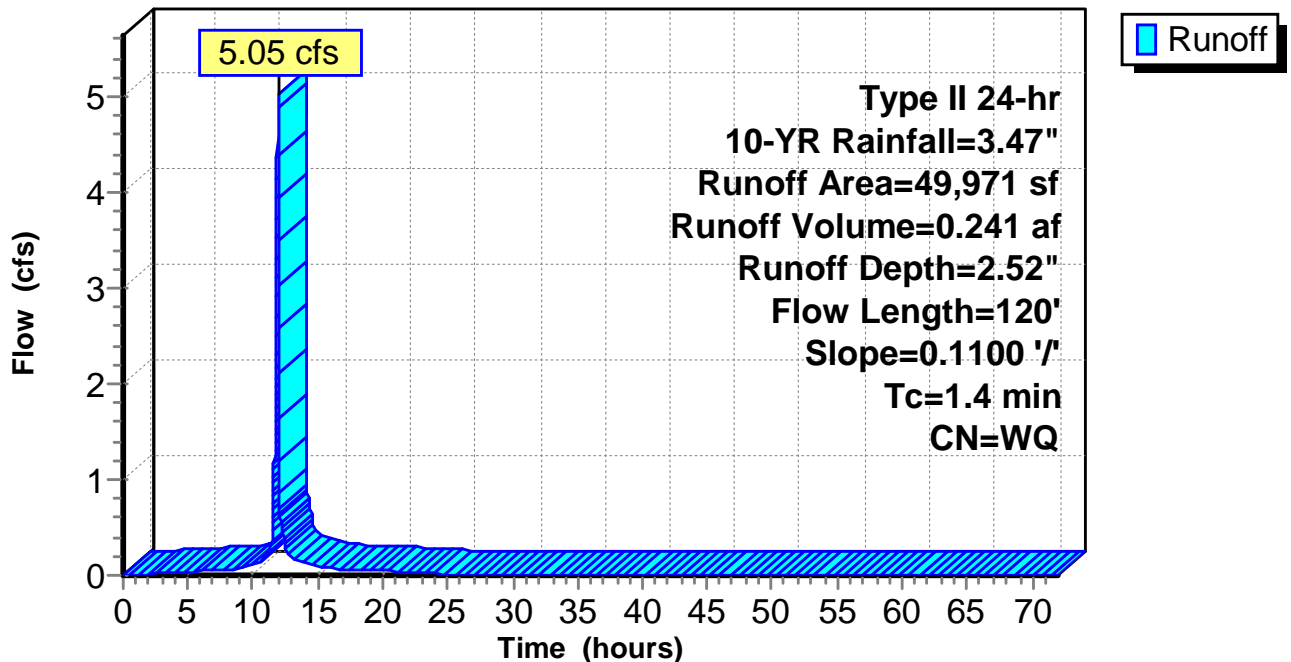
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.47"

Area (sf)	CN	Description
37,602	98	Paved roads w/curbs & sewers, HSG B
2,310	49	50-75% Grass cover, Fair, HSG A
5,237	43	Woods/grass comb., Fair, HSG A
4,822	65	Woods/grass comb., Fair, HSG B
49,971		Weighted Average
12,369		24.75% Pervious Area
37,602		75.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	120	0.1100	1.44		Lag/CN Method,

Subcatchment 4S: To CB 33

Hydrograph



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Type II 24-hr 10-YR Rainfall=3.47"

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Summary for Subcatchment 7S: Direct to Swale

Runoff = 0.34 cfs @ 11.97 hrs, Volume= 0.017 af, Depth= 0.56"

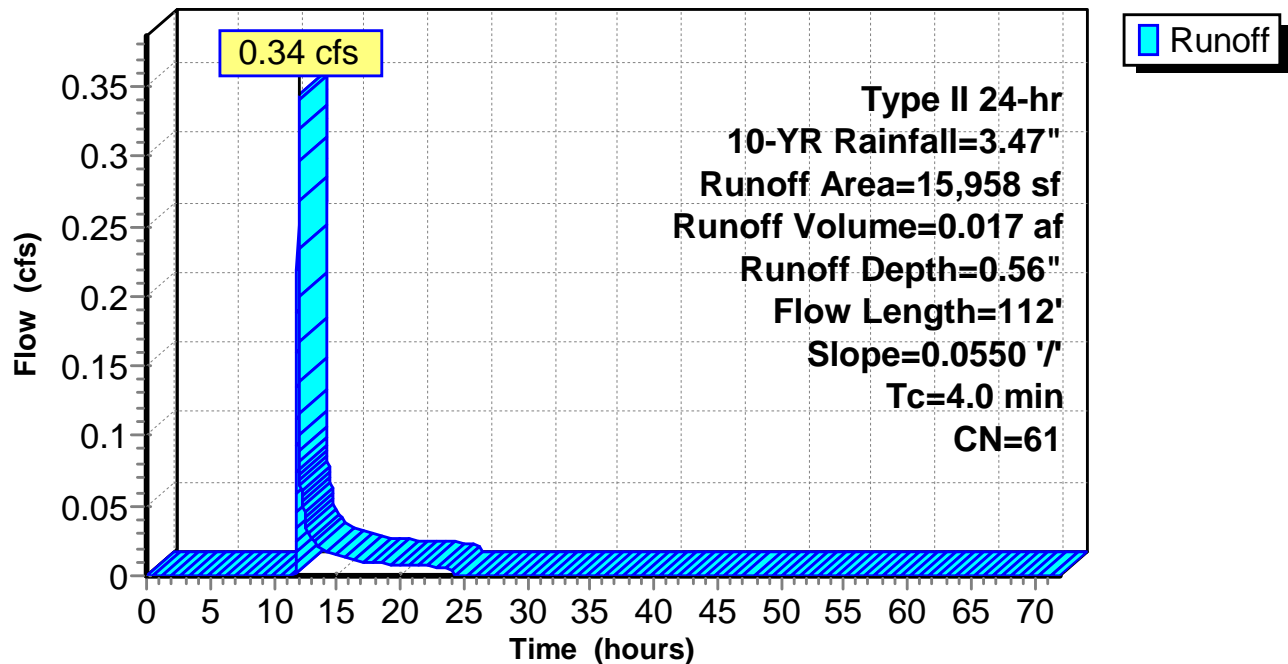
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.47"

Area (sf)	CN	Description
15,958	61	>75% Grass cover, Good, HSG B
15,958		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	112	0.0550	0.47		Lag/CN Method,

Subcatchment 7S: Direct to Swale

Hydrograph



Summary for Reach 1R: Pretreatment Swale

Inflow Area = 1.514 ac, 57.03% Impervious, Inflow Depth = 2.04" for 10-YR event
 Inflow = 5.29 cfs @ 11.92 hrs, Volume= 0.258 af
 Outflow = 4.81 cfs @ 11.94 hrs, Volume= 0.258 af, Atten= 9%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Max. Velocity= 0.87 fps, Min. Travel Time= 2.9 min
 Avg. Velocity = 0.18 fps, Avg. Travel Time= 13.6 min

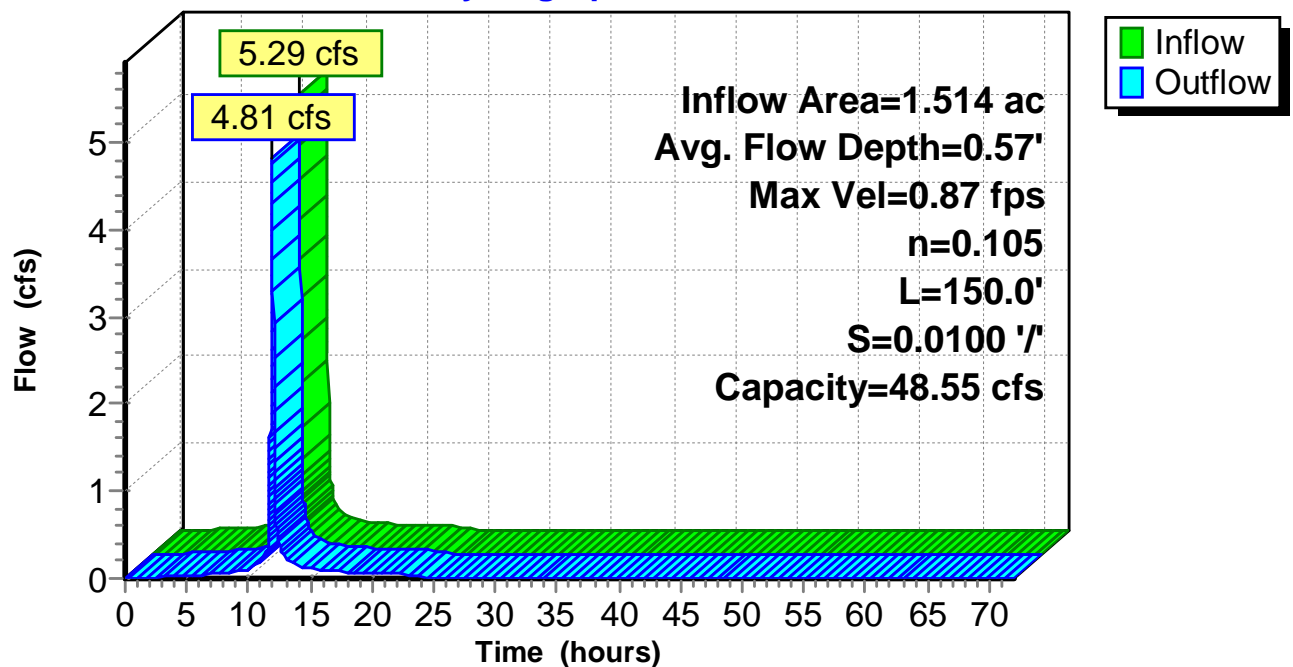
Peak Storage= 833 cf @ 11.94 hrs
 Average Depth at Peak Storage= 0.57'
 Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 48.55 cfs

8.00' x 2.00' deep channel, n= 0.105
 Side Slope Z-value= 3.0 ' / ' Top Width= 20.00'
 Length= 150.0' Slope= 0.0100 ' / '
 Inlet Invert= 715.00', Outlet Invert= 713.50'



Reach 1R: Pretreatment Swale

Hydrograph



Quarry Street Dry Swale

Type II 24-hr 10-YR Rainfall=3.47"

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Summary for Pond 5P: Dry Swale

Inflow Area = 1.514 ac, 57.03% Impervious, Inflow Depth = 2.04" for 10-YR event
 Inflow = 4.81 cfs @ 11.94 hrs, Volume= 0.258 af
 Outflow = 4.81 cfs @ 11.94 hrs, Volume= 0.258 af, Atten= 0%, Lag= 0.1 min
 Discarded = 0.00 cfs @ 11.94 hrs, Volume= 0.003 af
 Primary = 4.80 cfs @ 11.94 hrs, Volume= 0.255 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 707.38' @ 11.94 hrs Surf.Area= 120 sf Storage= 27 cf

Plug-Flow detention time= 0.1 min calculated for 0.258 af (100% of inflow)
 Center-of-Mass det. time= 0.1 min (770.3 - 770.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	707.00'	711 cf	Custom Stage Data (Pyramidal) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
707.00	30	0	0	30	
707.50	161	43	43	162	
708.00	355	126	169	359	
708.50	608	238	407	616	
709.00	608	304	711	665	

Device	Routing	Invert	Outlet Devices									
#1	Discarded	707.00'	1.750 in/hr Exfiltration over Horizontal area below 708.01' Phase-In= 0.01'									
#2	Primary	707.00'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads									
#3	Secondary	708.50'	10.1' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32									

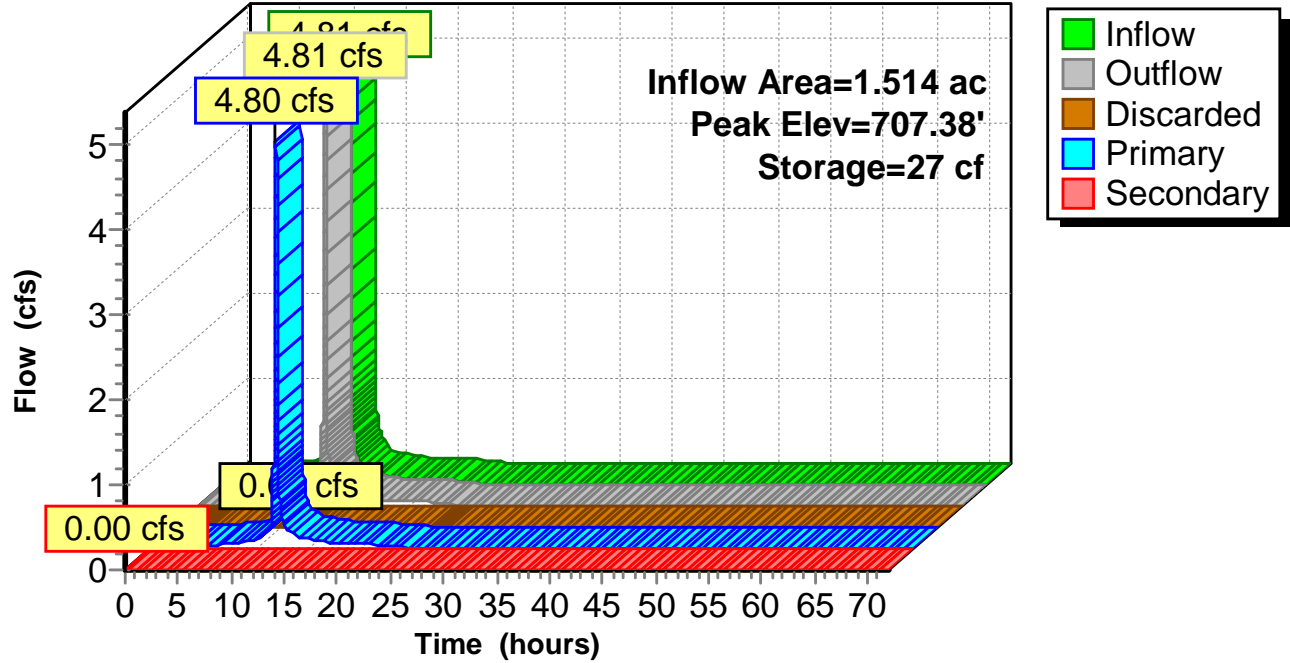
Discarded OutFlow Max=0.00 cfs @ 11.94 hrs HW=707.38' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=4.80 cfs @ 11.94 hrs HW=707.38' (Free Discharge)
 ↑2=Orifice/Grate (Weir Controls 4.80 cfs @ 2.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=707.00' (Free Discharge)
 ↑3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: Dry Swale

Hydrograph



Summary for Pond 6P: DI-33

Inflow Area = 1.147 ac, 75.25% Impervious, Inflow Depth = 2.52" for 10-YR event
 Inflow = 5.05 cfs @ 11.92 hrs, Volume= 0.241 af
 Outflow = 5.05 cfs @ 11.92 hrs, Volume= 0.241 af, Atten= 0%, Lag= 0.0 min
 Primary = 5.05 cfs @ 11.92 hrs, Volume= 0.241 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 718.66' @ 11.92 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	717.35'	18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 717.35' / 715.00' S= 0.0470 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.01 cfs @ 11.92 hrs HW=718.66' TW=715.55' (Dynamic Tailwater)
 ↑ **1=Culvert** (Inlet Controls 5.01 cfs @ 3.07 fps)

Pond 6P: DI-33

Hydrograph

