

**SURFACE WATER MANAGEMENT REPORT
FOR
GLEN RIDGE COUNTRY CLUB
555 RIDGEWOOD AVE
GLEN RIDGE, NEW JERSEY**

December 2024

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SURFACE WATER MANAGEMENT REPORT

GLEN RIDGE COUNTRY CLUB

GLEN RIDGE, NEW JERSEY

1.0 Introduction

Glen Ridge Country Club (GRCC), is located at Block 132, Lots 1, 1.01, 2 and 4. GRCC is a country club featuring a golf course, tennis courts, swimming pools, a club house and other amenities. The site improvements discussed herein will take place within lots 1.01 and 2. An existing conditions plan and a proposed site plan are attached as Exhibit 1. The proposed improvements entail: the replacement of the kiddie pool with pavers and a seating area, new pavers surrounding the main pool replacing a concrete deck, expanded outdoor dining areas under pergolas, and new gaming areas. TR 20 storm water calculations were performed for the Pre-development and post-development conditions using HydroCAD software.

2.0 Existing Conditions

The site is bounded by Ridgewood Ave to the west, and residential areas to the north, east and south. The overall facility lies within the PRD, Planned Residential Development, zone. Lots 1.01 and 2 contain outdoor recreational facilities. The Existing Conditions Plan is localized to this area.

Existing drainage patterns are as follows: The main pool is drained via strip drains surrounding the pool to 4 - 4" pipes through the adjacent retaining wall and onto planting beds. The structures are drained via roof leaders to splash pads and thence sheet flow towards the golf course. The existing kiddie pool storm water sheet flows to the adjacent lawn. The lawn/turf area, which will become a new seating area, sheet flows towards the adjacent retaining walls.

The existing lawn area located to the west of the pool complex drains from west to east, away from Ridgewood Ave and towards residences to the north.

3.0 Post Development Conditions

Please refer to the Proposed Site Plan located in Exhibit 1. The proposed post

development stormwater pattern is as follows:

Main pool: Pavers will replace the concrete deck and a portion of lawn area. New strip drains will be installed which will route the stormwater to the retaining wall drains as before. The small increase in runoff from the new paver area will be absorbed by the planting beds and will not impact the adjacent cart path. Buildings: Roof leaders to splash pads will drain the roofs as before.

Kiddie pool and surrounding paver patio: The overall design entails collecting storm water from the kiddie pool and eastern – most play area by strip drains and directing that flow to storage chambers, located in the lawn area, for detention. The surrounding paver area will be directed to a permeable paver and storage system for water quality treatment for the water quality storm, specified as 80% Total Suspended Solids (TSS) Removal. The permeable paver system is designed in accordance with Section 9.6 of the NJDEP Best Management Practices Manual. The outflow from the permeable paver system will be directed to the storage chambers located in the lawn area.

Detention System: The detention system is designed to store and attenuate the increase in flow from the kiddie pool/new pavers area. Test pits were performed in the detention system area, yielding K2 soils (0.6-2.0 inches pe hour). A 0.5"/hr infiltration rate was used to calculate the exfiltration rate from the storage chambers. The system, consisting of 75 Cultech Recharger 360HD chambers, 5 rows of 15 units, will attenuate the peak flow rates of the 2, 10, and 100 year storms via an outlet box. The attenuated flow will be routed to the storm sewer system in Ridgewood Ave. The existing lawn area will be re-graded, the storm water collected and combined with the routed storm water to the Ridgewood storm sewers. The lawn stormwater will not be routed through the chambers since post development conditions equal pre development conditions; there is no increase in impervious surfaces.

Detailed hydraulic calculations are contained in Exhibit 2. Pre and post development flows for the kiddie pool area are presented in Table 1:

TABLE 1

Storm Event	Pre-Development Flow (CFS)	Target Outflow (CFS)	Post Development Routed Flow (CFS)
2 Year	0.31	1.17	0.14
10 Year	0.66	0.50	0.21
100 Year	1.35	1.08	1.04

CONCLUSION

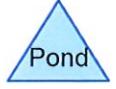
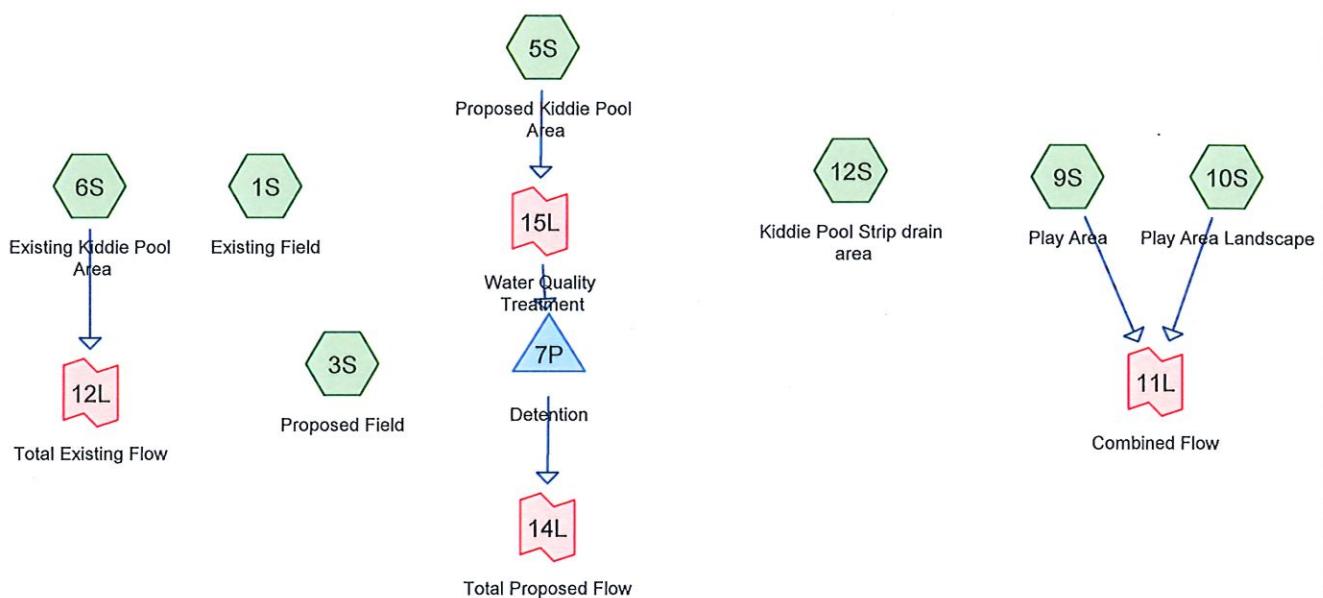
The proposed system treats the water quality storm and attenuates the peak flow rates from the new kiddie pool area to less than pre-development peak flow rates.

EXHIBIT 1

EXISTING AND PROPOSED SITE PLANS

EXHIBIT 2

HYDROCAD MODEL



Routing Diagram for Storm Water Model
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Storm Water Model

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.398	74	(3S, 5S, 10S)
0.433	98	(5S, 9S, 12S)
0.624	74	>75% Grass cover, Good, HSG C (1S, 6S)
0.060	98	Pool and Sidewalk (6S)
1.516	82	TOTAL AREA

Storm Water Model

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.624	HSG C	1S, 6S
0.000	HSG D	
0.891	Other	3S, 5S, 6S, 9S, 10S, 12S
1.516		TOTAL AREA

Storm Water Model

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.832	0.832		3S, 5S, 9S, 10S, 12S
0.000	0.000	0.624	0.000	0.000	0.624	>75% Grass cover, Good	1S, 6S
0.000	0.000	0.000	0.000	0.060	0.060	Pool and Sidewalk	6S
0.000	0.000	0.624	0.000	0.891	1.516	TOTAL AREA	

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

Subcatchment 1S: Existing Field Runoff Area=14,022 sf 0.00% Impervious Runoff Depth>0.98"
Flow Length=180' Slope=0.0100 '/' Tc=14.4 min CN=74 Runoff=0.30 cfs 0.026 af

Subcatchment 3S: Proposed Field Runoff Area=14,022 sf 0.00% Impervious Runoff Depth>0.98"
Flow Length=100' Slope=0.0200 '/' Tc=13.8 min CN=74 Runoff=0.30 cfs 0.026 af

Subcatchment 5S: Proposed Kiddie Pool Runoff Area=15,777 sf 87.35% Impervious Runoff Depth>2.55"
Flow Length=100' Slope=0.0100 '/' Tc=1.6 min CN=95 Runoff=1.18 cfs 0.077 af

Subcatchment 6S: Existing Kiddie Pool Runoff Area=15,777 sf 16.46% Impervious Runoff Depth>1.21"
Flow Length=280' Slope=0.0050 '/' Tc=26.9 min CN=78 Runoff=0.31 cfs 0.036 af

Subcatchment 9S: Play Area Runoff Area=1,209 sf 100.00% Impervious Runoff Depth>2.81"
Tc=0.5 min CN=98 Runoff=0.10 cfs 0.006 af

Subcatchment 10S: Play Area Landscape Runoff Area=1,331 sf 0.00% Impervious Runoff Depth>0.99"
Tc=1.0 min CN=74 Runoff=0.04 cfs 0.003 af

Subcatchment 12S: Kiddie Pool Strip drain Runoff Area=3,887 sf 100.00% Impervious Runoff Depth>2.81"
Tc=0.5 min CN=98 Runoff=0.31 cfs 0.021 af

Pond 7P: Detention Peak Elev=235.29' Storage=1,516 cf Inflow=1.18 cfs 0.077 af
Discarded=0.02 cfs 0.022 af Primary=0.14 cfs 0.045 af Outflow=0.16 cfs 0.067 af

Link 11L: Combined Flow Inflow=0.14 cfs 0.009 af
Primary=0.14 cfs 0.009 af

Link 12L: Total Existing Flow Inflow=0.31 cfs 0.036 af
Primary=0.31 cfs 0.036 af

Link 14L: Total Proposed Flow Inflow=0.14 cfs 0.045 af
Primary=0.14 cfs 0.045 af

Link 15L: Water Quality Treatment Inflow=1.18 cfs 0.077 af
Primary=1.18 cfs 0.077 af

Total Runoff Area = 1.516 ac Runoff Volume = 0.196 af Average Runoff Depth = 1.55"
67.48% Pervious = 1.023 ac 32.52% Impervious = 0.493 ac

Storm Water Model

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NOAA 24-hr D 2 year Rainfall=3.30"

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Summary for Subcatchment 1S: Existing Field

Runoff = 0.30 cfs @ 12.24 hrs, Volume= 0.026 af, Depth> 0.98"

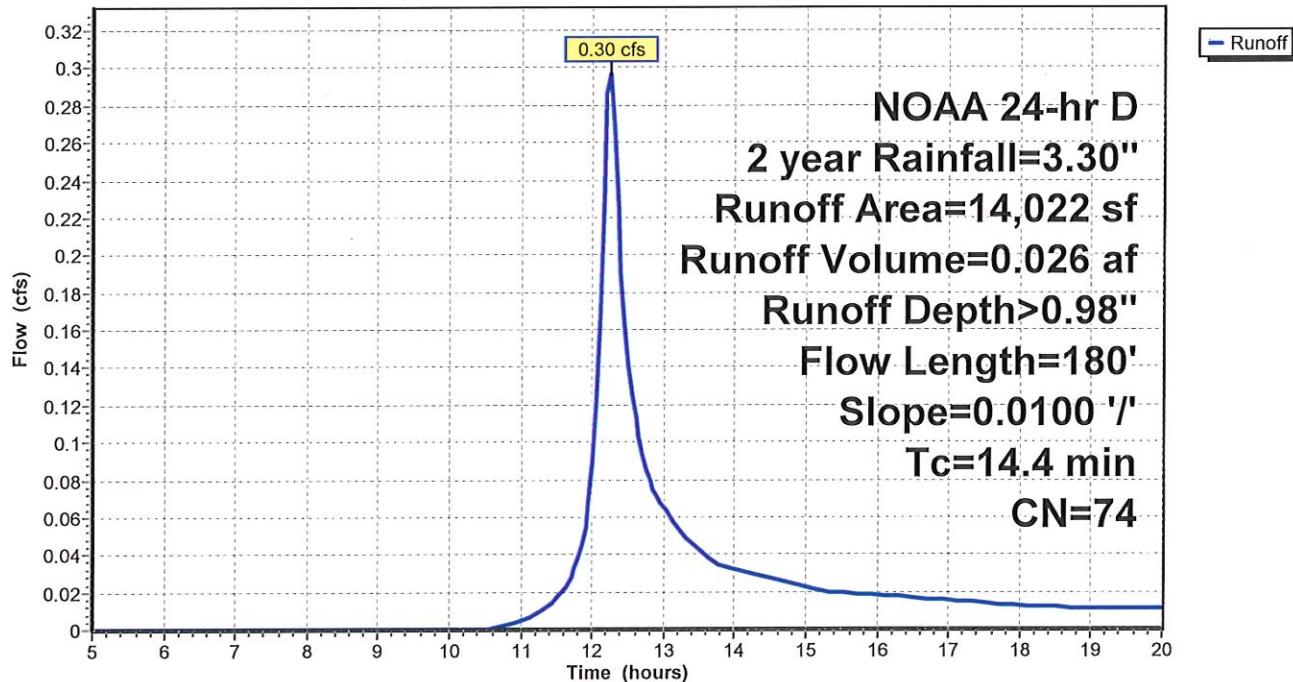
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 year Rainfall=3.30"

Area (sf)	CN	Description
14,022	74	>75% Grass cover, Good, HSG C
14,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0100	0.13		Sheet Flow, sheet flow Grass: Short n= 0.150 P2= 3.40"
1.9	80	0.0100	0.70		Shallow Concentrated Flow, Shallow conc. flow Short Grass Pasture Kv= 7.0 fps
14.4	180	Total			

Subcatchment 1S: Existing Field

Hydrograph



Storm Water Model

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NOAA 24-hr D 2 year Rainfall=3.30"

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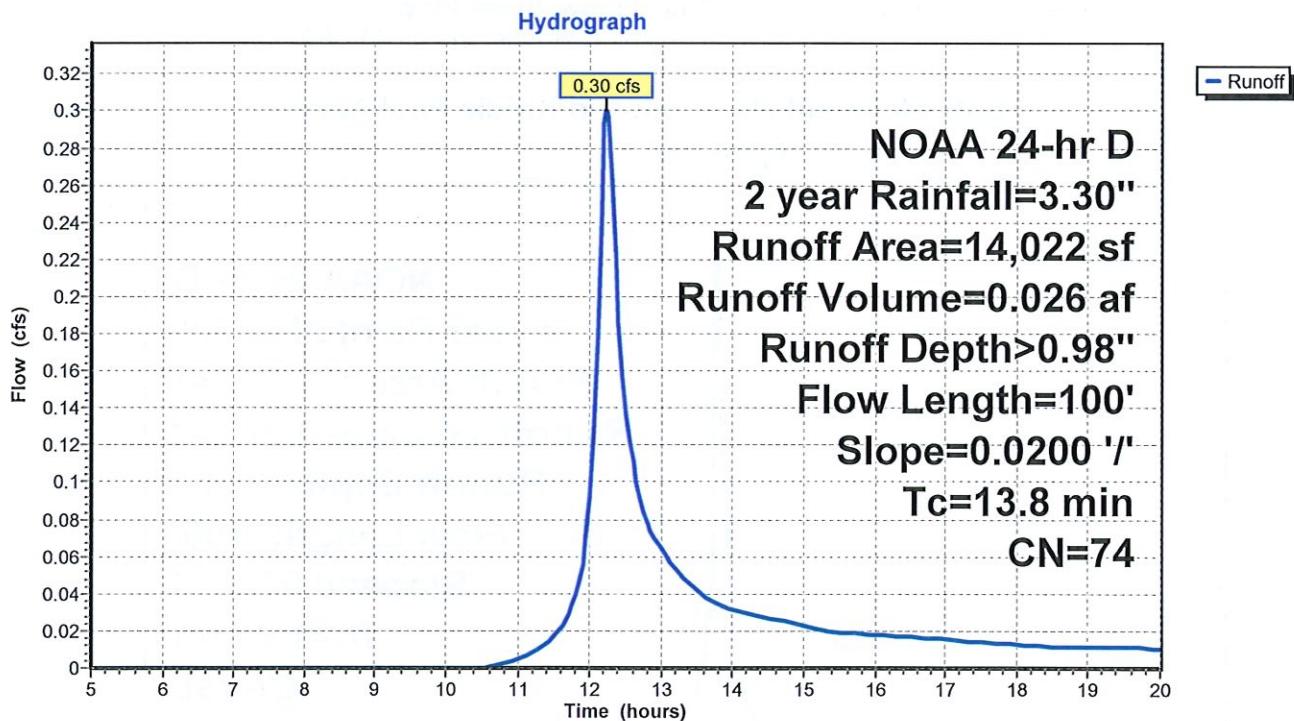
Summary for Subcatchment 3S: Proposed Field

Runoff = 0.30 cfs @ 12.23 hrs, Volume= 0.026 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 year Rainfall=3.30"

Area (sf)	CN	Description
*	14,022	74
14,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	100	0.0200	0.12		Sheet Flow, Sheet Flow Grass: Dense n= 0.240 P2= 3.40"

Subcatchment 3S: Proposed Field

Summary for Subcatchment 5S: Proposed Kiddie Pool Area

Runoff = 1.18 cfs @ 12.07 hrs, Volume= 0.077 af, Depth> 2.55"
 Routed to Link 15L : Water Quality Treatment

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 2 year Rainfall=3.30"

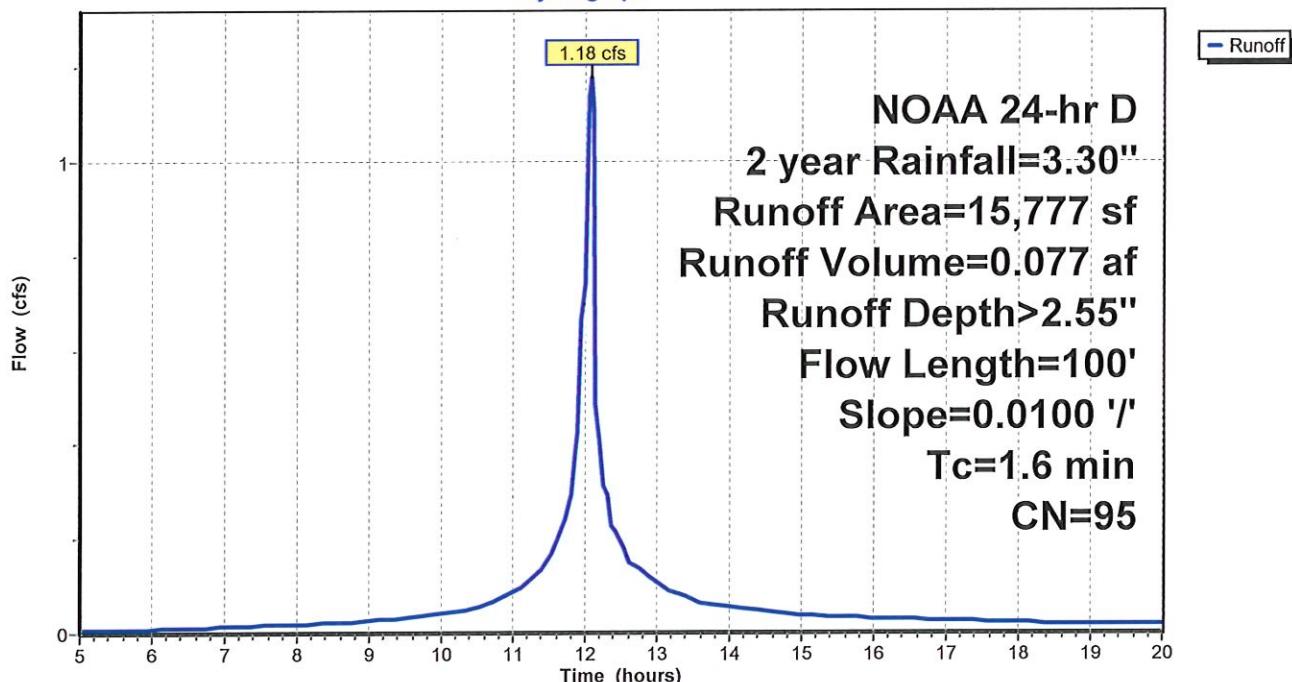
Area (sf)	CN	Description
* 13,781	98	
* 1,996	74	
15,777	95	Weighted Average
1,996		12.65% Pervious Area
13,781		87.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		Sheet Flow, Sheet Flow

Smooth surfaces n= 0.011 P2= 3.40"

Subcatchment 5S: Proposed Kiddie Pool Area

Hydrograph



Storm Water Model

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NOAA 24-hr D 2 year Rainfall=3.30"

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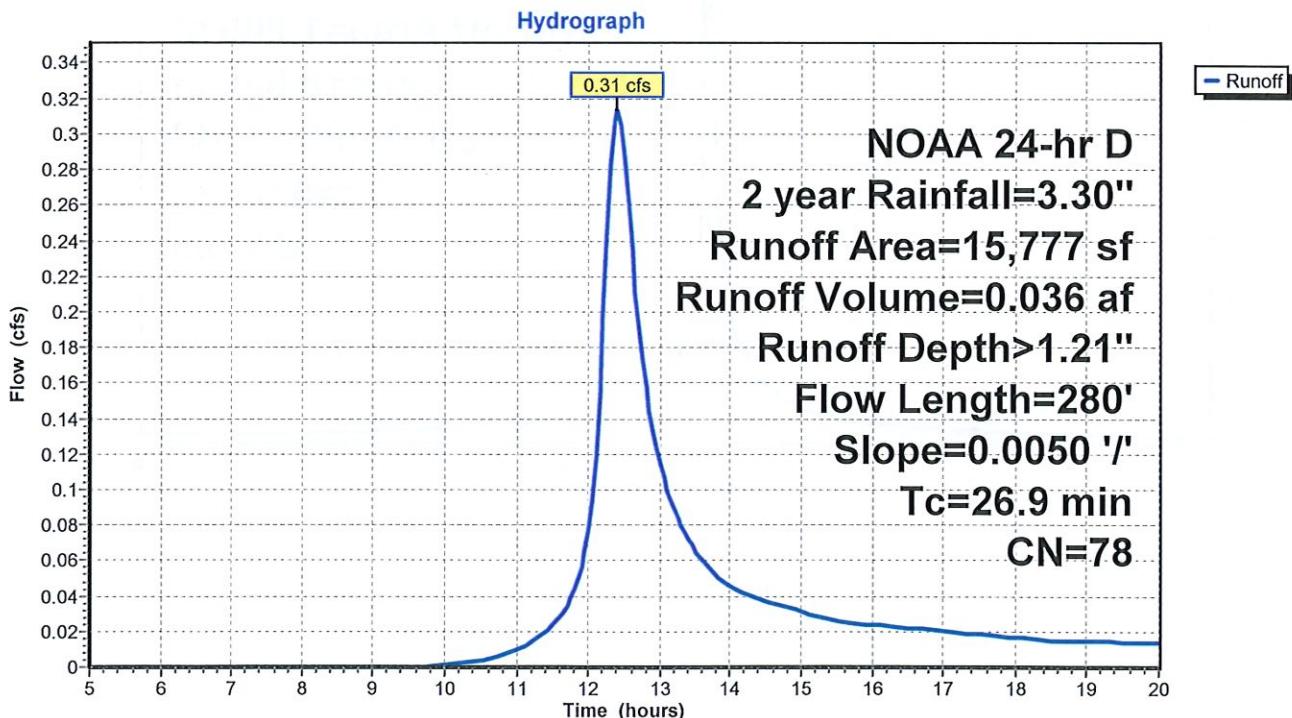
Summary for Subcatchment 6S: Existing Kiddie Pool Area

Runoff = 0.31 cfs @ 12.40 hrs, Volume= 0.036 af, Depth> 1.21"
 Routed to Link 12L : Total Existing Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 2 year Rainfall=3.30"

Area (sf)	CN	Description
* 2,597	98	Pool and Sidewalk
13,180	74	>75% Grass cover, Good, HSG C
15,777	78	Weighted Average
13,180		83.54% Pervious Area
2,597		16.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0050	0.07		Sheet Flow, Sheet Flow Grass: Dense n= 0.240 P2= 3.40"
2.8	180	0.0050	1.06		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
26.9	280	Total			

Subcatchment 6S: Existing Kiddie Pool Area

Storm Water Model

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NOAA 24-hr D 2 year Rainfall=3.30"

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Summary for Subcatchment 9S: Play Area

Runoff = 0.10 cfs @ 12.05 hrs, Volume= 0.006 af, Depth> 2.81"
Routed to Link 11L : Combined Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 year Rainfall=3.30"

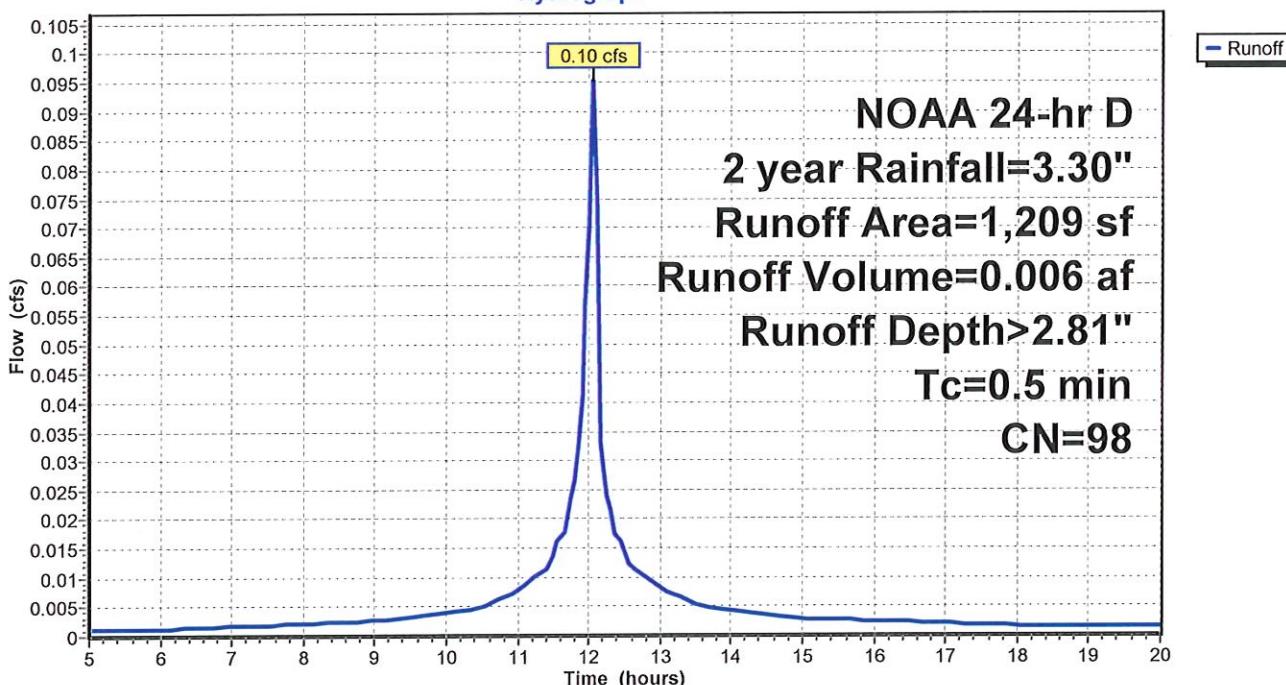
Area (sf)	CN	Description
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*	1,209	98
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1,209	100.00% Impervious Area
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Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	

0.5					Direct Entry, Direct
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Subcatchment 9S: Play Area**Hydrograph**

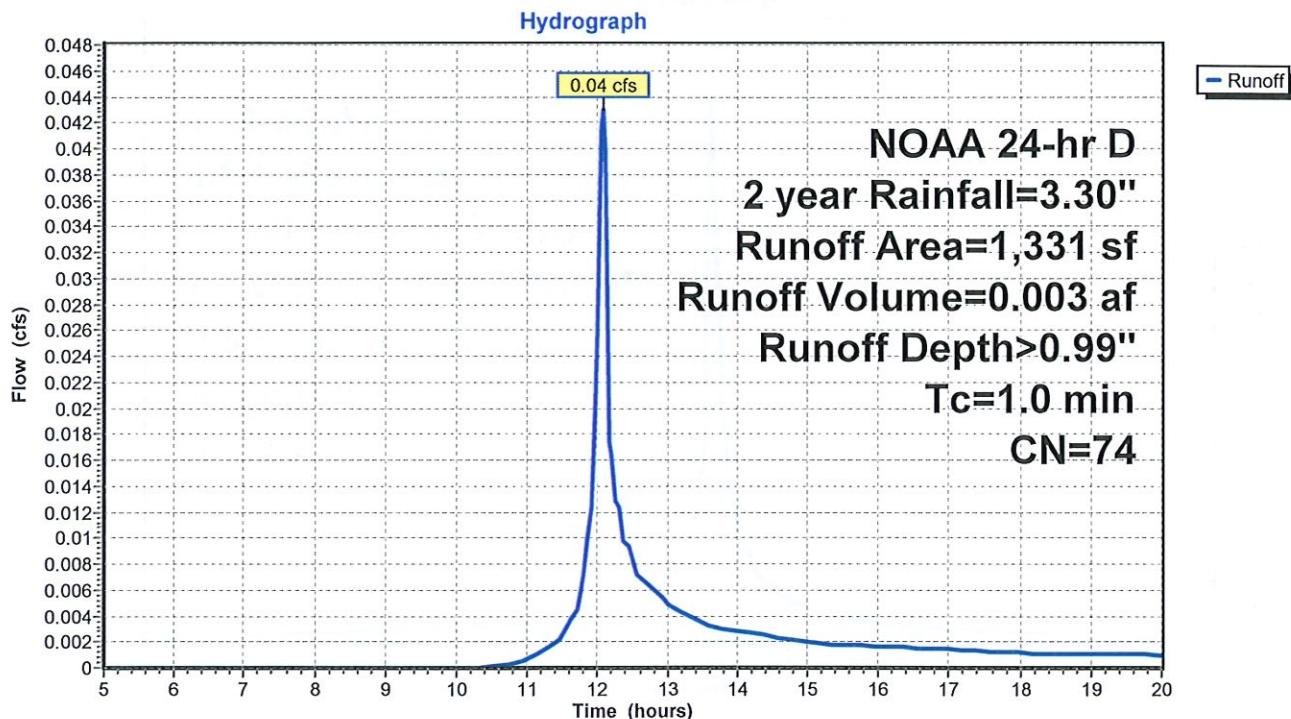
Summary for Subcatchment 10S: Play Area Landscape

Runoff = 0.04 cfs @ 12.07 hrs, Volume= 0.003 af, Depth> 0.99"
Routed to Link 11L : Combined Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 year Rainfall=3.30"

Area (sf)	CN	Description
*		
1,331	74	
1,331		100.00% Pervious Area

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

Subcatchment 10S: Play Area Landscape

Storm Water Model

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NOAA 24-hr D 2 year Rainfall=3.30"

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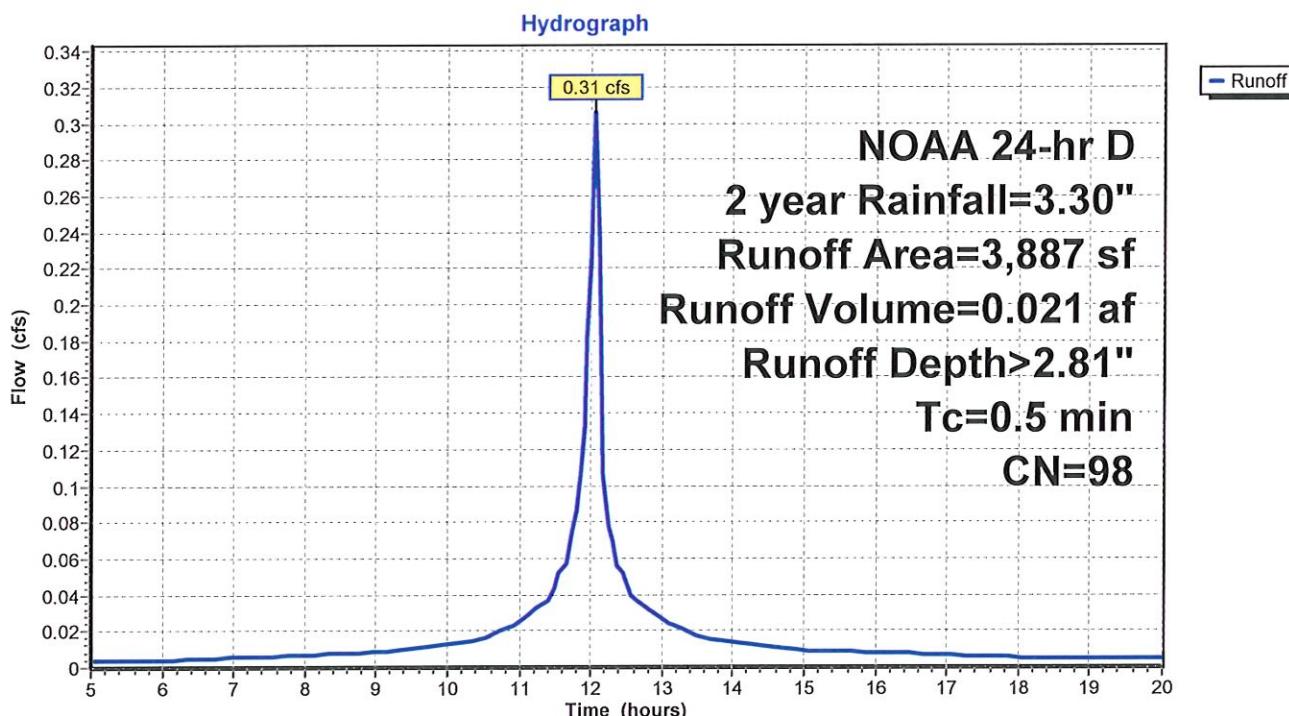
Summary for Subcatchment 12S: Kiddie Pool Strip drain area

Runoff = 0.31 cfs @ 12.05 hrs, Volume= 0.021 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2 year Rainfall=3.30"

Area (sf)	CN	Description
*	3,887	98
3,887		100.00% Impervious Area

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

Subcatchment 12S: Kiddie Pool Strip drain area

Summary for Pond 7P: Detention

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 2.55" for 2 year event
 Inflow = 1.18 cfs @ 12.07 hrs, Volume= 0.077 af
 Outflow = 0.16 cfs @ 12.58 hrs, Volume= 0.067 af, Atten= 87%, Lag= 30.7 min
 Discarded = 0.02 cfs @ 8.45 hrs, Volume= 0.022 af
 Primary = 0.14 cfs @ 12.58 hrs, Volume= 0.045 af

Routed to Link 14L : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 235.29' @ 12.58 hrs Surf.Area= 1,785 sf Storage= 1,516 cf

Plug-Flow detention time= 130.3 min calculated for 0.067 af (87% of inflow)
 Center-of-Mass det. time= 88.3 min (837.5 - 749.2)

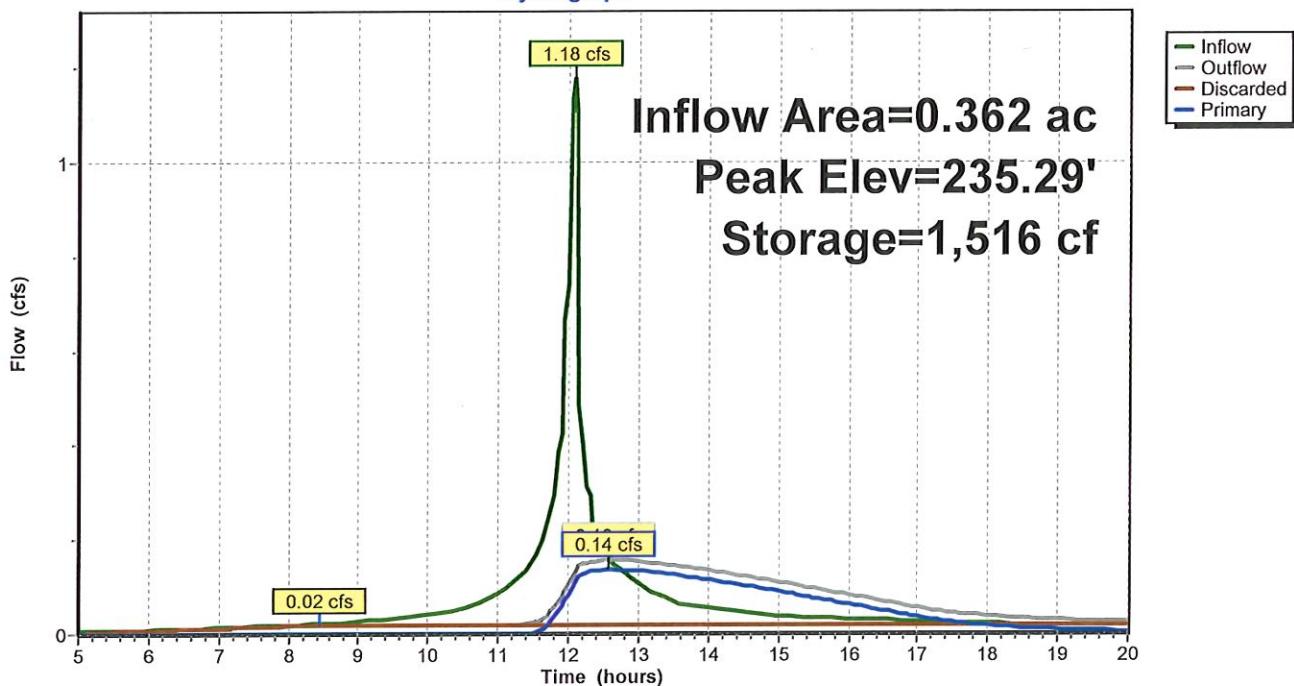
Volume	Invert	Avail.Storage	Storage Description
#1A	234.00'	1,731 cf	30.00'W x 59.50'L x 4.00'H Field A 7,140 cf Overall - 2,813 cf Embedded = 4,327 cf x 40.0% Voids
#2A	234.50'	2,813 cf	Cultec R-360HD x 75 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 75 Chambers in 5 Rows Cap Storage= 6.5 cf x 2 x 5 rows = 64.6 cf
4,544 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	234.50'	2.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	237.75'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	236.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	234.00'	0.02 cfs Exfiltration at all elevations

Discarded OutFlow Max=0.02 cfs @ 8.45 hrs HW=234.04' (Free Discharge)
 ↑ 4=Exfiltration (Exfiltration Controls 0.02 cfs)

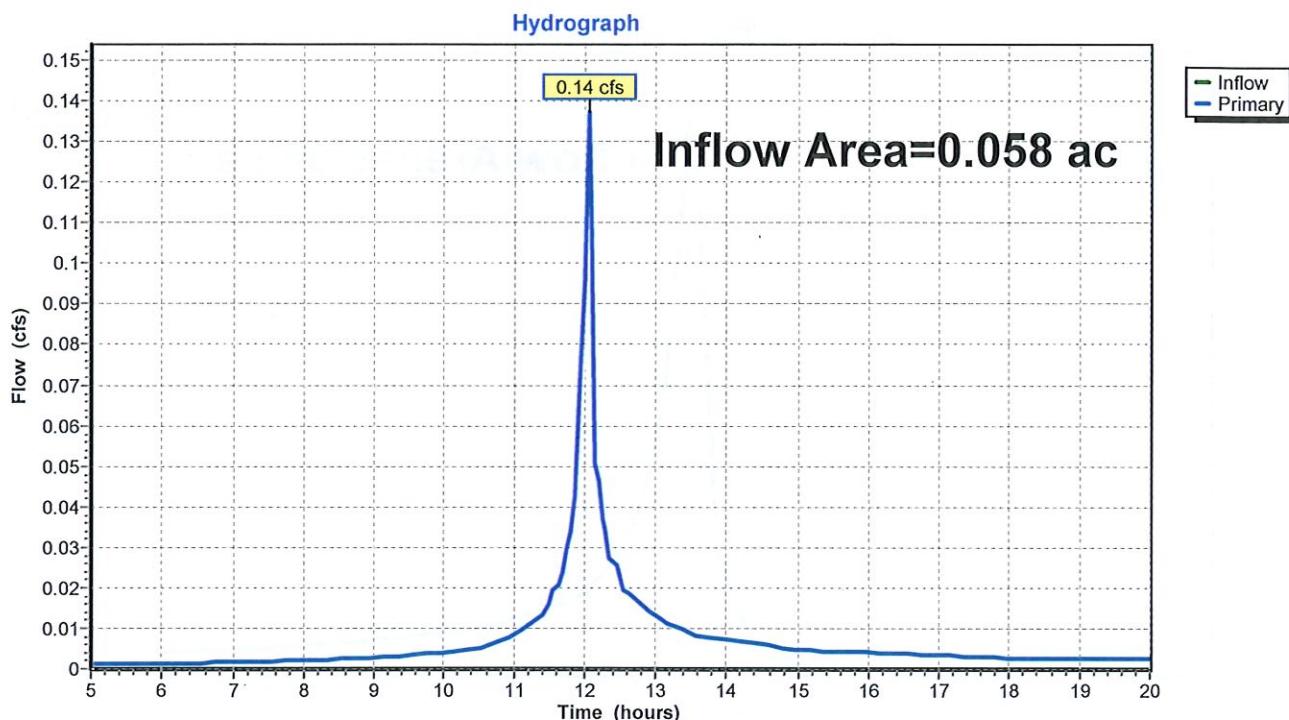
Primary OutFlow Max=0.14 cfs @ 12.58 hrs HW=235.29' (Free Discharge)
 ↑ 1=Orifice/Grate (Orifice Controls 0.14 cfs @ 3.99 fps)
 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond 7P: Detention**Hydrograph**

Summary for Link 11L: Combined Flow

Inflow Area = 0.058 ac, 47.60% Impervious, Inflow Depth > 1.86" for 2 year event
Inflow = 0.14 cfs @ 12.06 hrs, Volume= 0.009 af
Primary = 0.14 cfs @ 12.06 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

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

Link 11L: Combined Flow

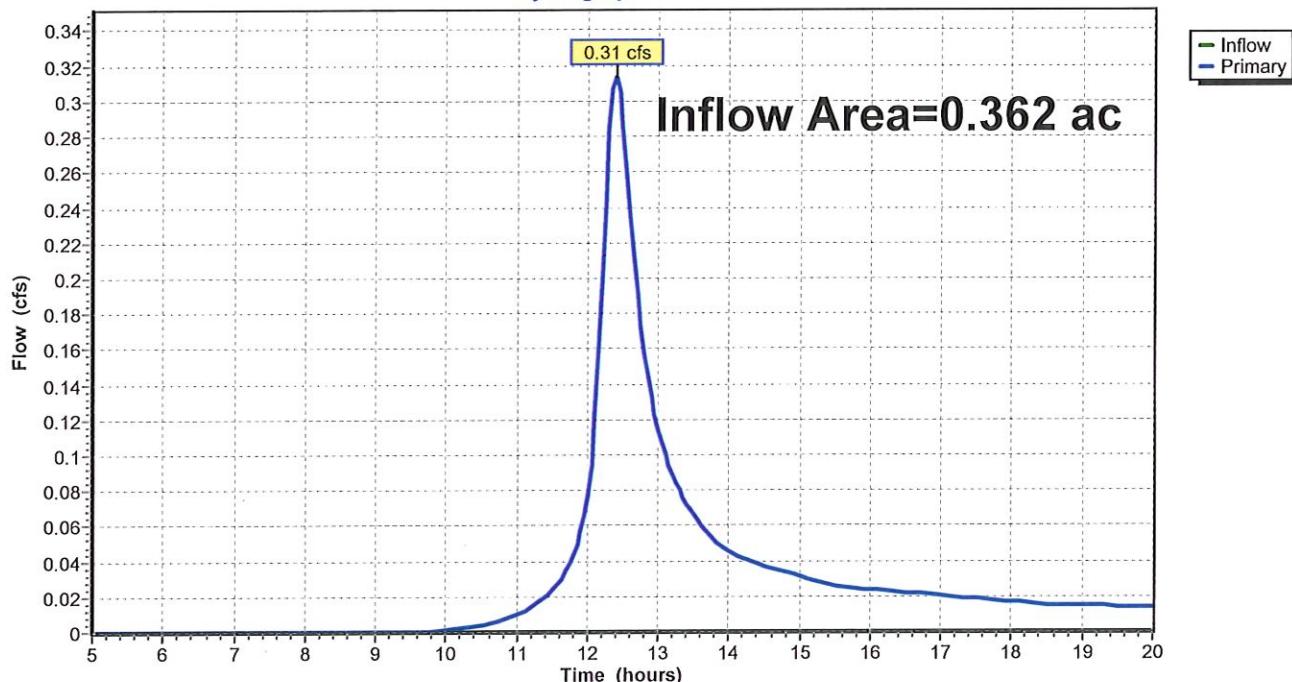
Summary for Link 12L: Total Existing Flow

Inflow Area = 0.362 ac, 16.46% Impervious, Inflow Depth > 1.21" for 2 year event

Inflow = 0.31 cfs @ 12.40 hrs, Volume= 0.036 af

Primary = 0.31 cfs @ 12.40 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

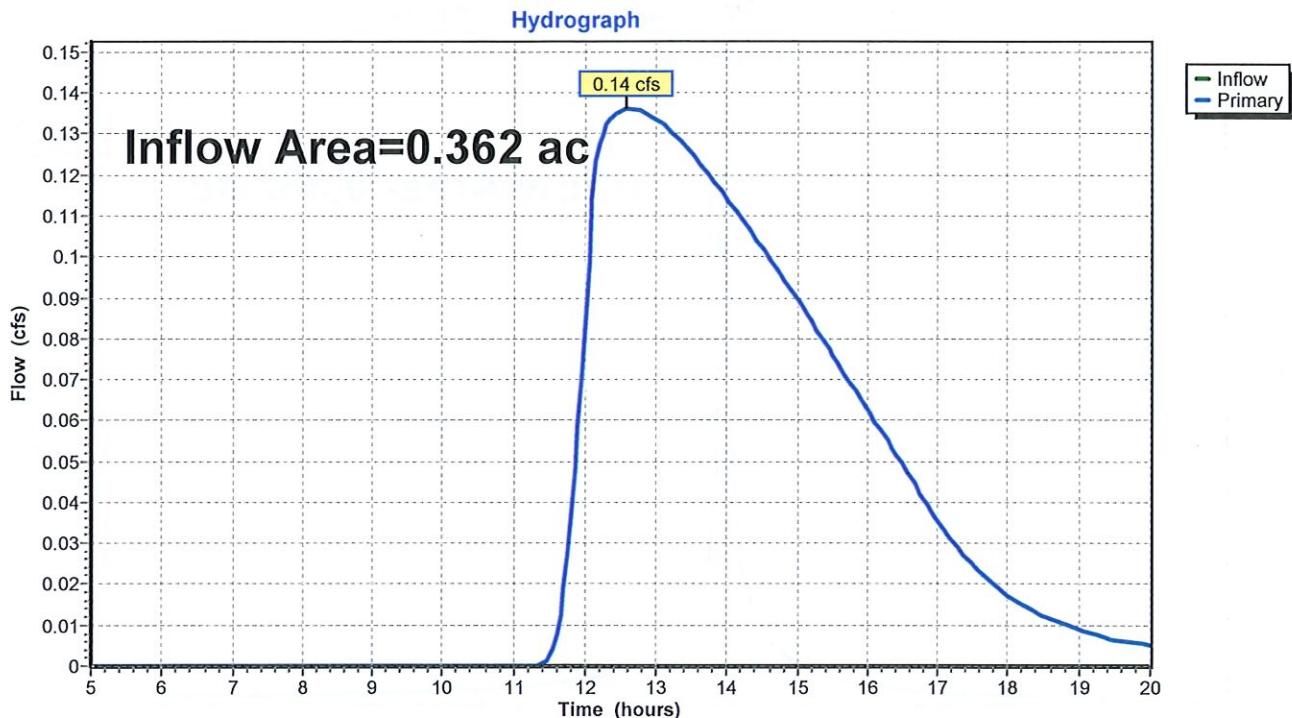
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 12L: Total Existing Flow**Hydrograph**

Summary for Link 14L: Total Proposed Flow

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 1.49" for 2 year event
Inflow = 0.14 cfs @ 12.58 hrs, Volume= 0.045 af
Primary = 0.14 cfs @ 12.58 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

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

Link 14L: Total Proposed Flow

Summary for Link 15L: Water Quality Treatment

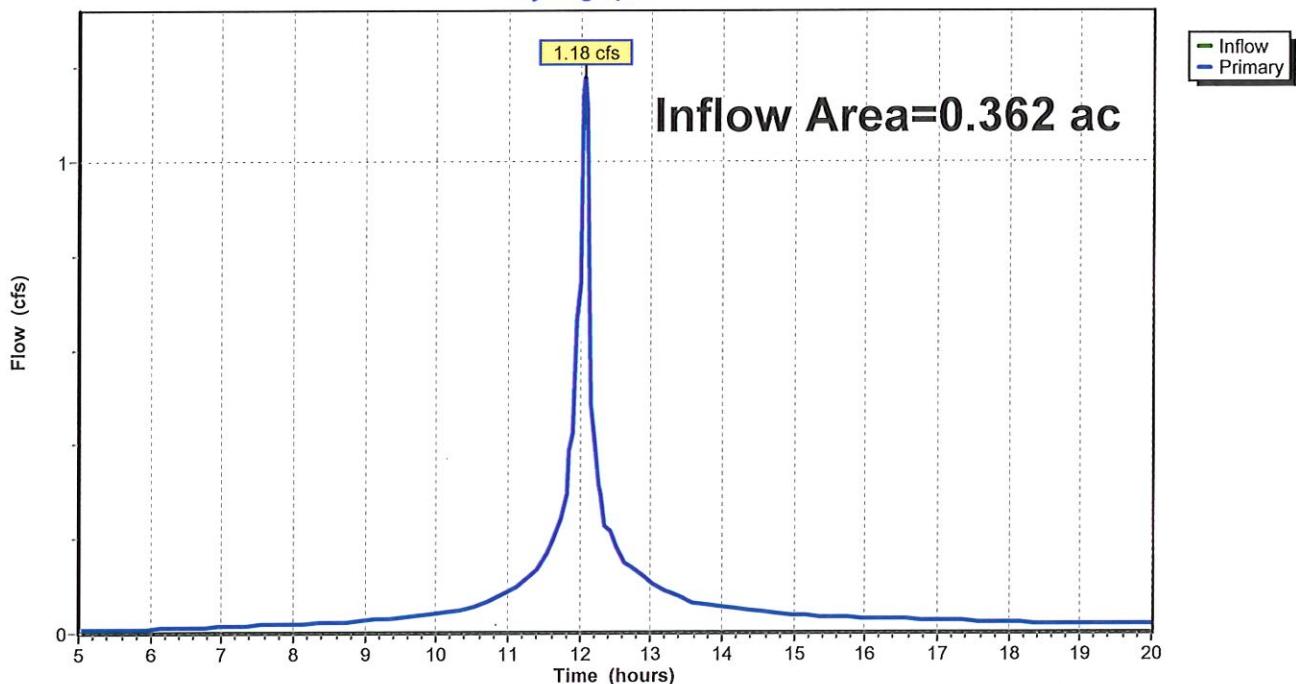
Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 2.55" for 2 year event

Inflow = 1.18 cfs @ 12.07 hrs, Volume= 0.077 af

Primary = 1.18 cfs @ 12.07 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Routed to Pond 7P : Detention

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

Link 15L: Water Quality Treatment**Hydrograph**

Storm Water Model

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NOAA 24-hr D 10 year Rainfall=5.10"

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

Subcatchment 1S: Existing Field Runoff Area=14,022 sf 0.00% Impervious Runoff Depth>2.22"
Flow Length=180' Slope=0.0100 '/' Tc=14.4 min CN=74 Runoff=0.68 cfs 0.060 af

Subcatchment 3S: Proposed Field Runoff Area=14,022 sf 0.00% Impervious Runoff Depth>2.22"
Flow Length=100' Slope=0.0200 '/' Tc=13.8 min CN=74 Runoff=0.69 cfs 0.060 af

Subcatchment 5S: Proposed Kiddie Pool Runoff Area=15,777 sf 87.35% Impervious Runoff Depth>4.18"
Flow Length=100' Slope=0.0100 '/' Tc=1.6 min CN=95 Runoff=1.88 cfs 0.126 af

Subcatchment 6S: Existing Kiddie Pool Runoff Area=15,777 sf 16.46% Impervious Runoff Depth>2.54"
Flow Length=280' Slope=0.0050 '/' Tc=26.9 min CN=78 Runoff=0.66 cfs 0.077 af

Subcatchment 9S: Play Area Runoff Area=1,209 sf 100.00% Impervious Runoff Depth>4.41"
Tc=0.5 min CN=98 Runoff=0.15 cfs 0.010 af

Subcatchment 10S: Play Area Landscape Runoff Area=1,331 sf 0.00% Impervious Runoff Depth>2.23"
Tc=1.0 min CN=74 Runoff=0.10 cfs 0.006 af

Subcatchment 12S: Kiddie Pool Strip drain Runoff Area=3,887 sf 100.00% Impervious Runoff Depth>4.41"
Tc=0.5 min CN=98 Runoff=0.48 cfs 0.033 af

Pond 7P: Detention Peak Elev=236.06' Storage=2,584 cf Inflow=1.88 cfs 0.126 af
Discarded=0.02 cfs 0.024 af Primary=0.21 cfs 0.090 af Outflow=0.23 cfs 0.114 af

Link 11L: Combined Flow Inflow=0.24 cfs 0.016 af
Primary=0.24 cfs 0.016 af

Link 12L: Total Existing Flow Inflow=0.66 cfs 0.077 af
Primary=0.66 cfs 0.077 af

Link 14L: Total Proposed Flow Inflow=0.21 cfs 0.090 af
Primary=0.21 cfs 0.090 af

Link 15L: Water Quality Treatment Inflow=1.88 cfs 0.126 af
Primary=1.88 cfs 0.126 af

Total Runoff Area = 1.516 ac Runoff Volume = 0.371 af Average Runoff Depth = 2.93"
67.48% Pervious = 1.023 ac 32.52% Impervious = 0.493 ac

Storm Water Model

Prepared by DJ Egarian

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NOAA 24-hr D 10 year Rainfall=5.10"

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Summary for Subcatchment 1S: Existing Field

Runoff = 0.68 cfs @ 12.23 hrs, Volume= 0.060 af, Depth> 2.22"

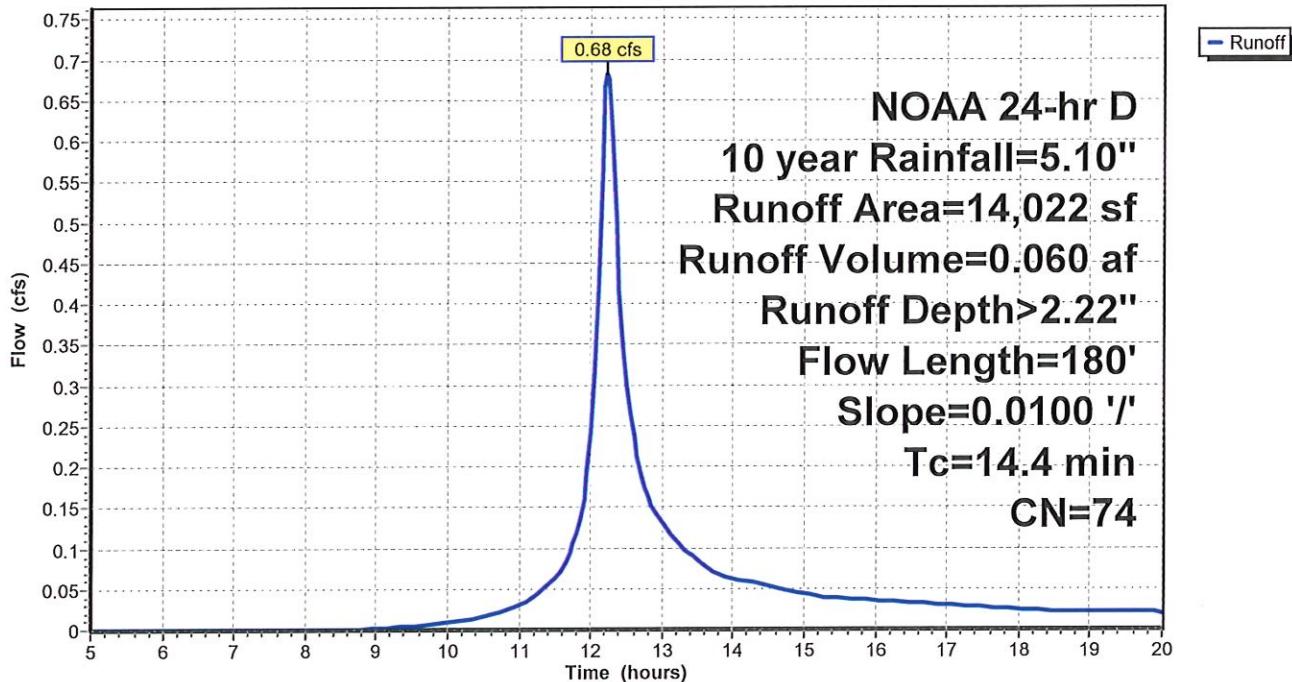
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 year Rainfall=5.10"

Area (sf)	CN	Description
14,022	74	>75% Grass cover, Good, HSG C
14,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0100	0.13		Sheet Flow, sheet flow Grass: Short n= 0.150 P2= 3.40"
1.9	80	0.0100	0.70		Shallow Concentrated Flow, Shallow conc. flow Short Grass Pasture Kv= 7.0 fps
14.4	180	Total			

Subcatchment 1S: Existing Field

Hydrograph



Storm Water Model

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NOAA 24-hr D 10 year Rainfall=5.10"

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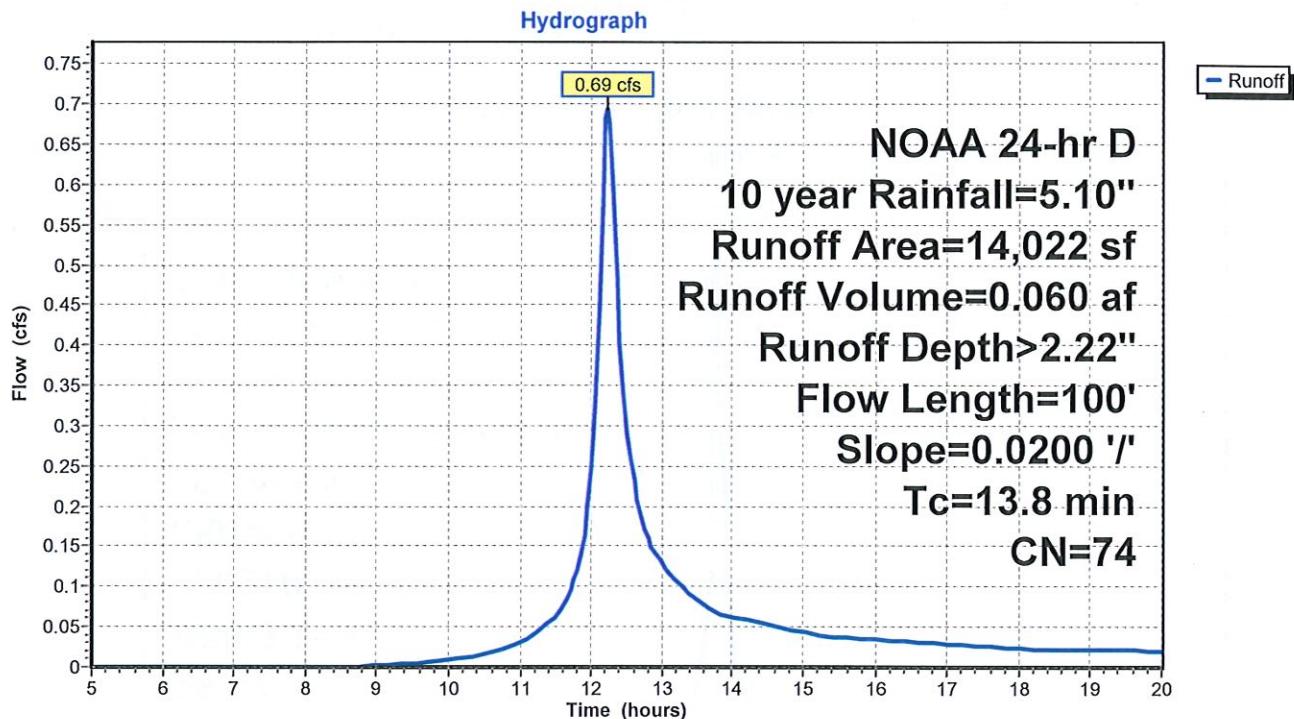
Summary for Subcatchment 3S: Proposed Field

Runoff = 0.69 cfs @ 12.22 hrs, Volume= 0.060 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 year Rainfall=5.10"

	Area (sf)	CN	Description	
*	14,022	74		
	14,022	100.00% Pervious Area		

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	100	0.0200	0.12		Sheet Flow, Sheet Flow Grass: Dense n= 0.240 P2= 3.40"

Subcatchment 3S: Proposed Field

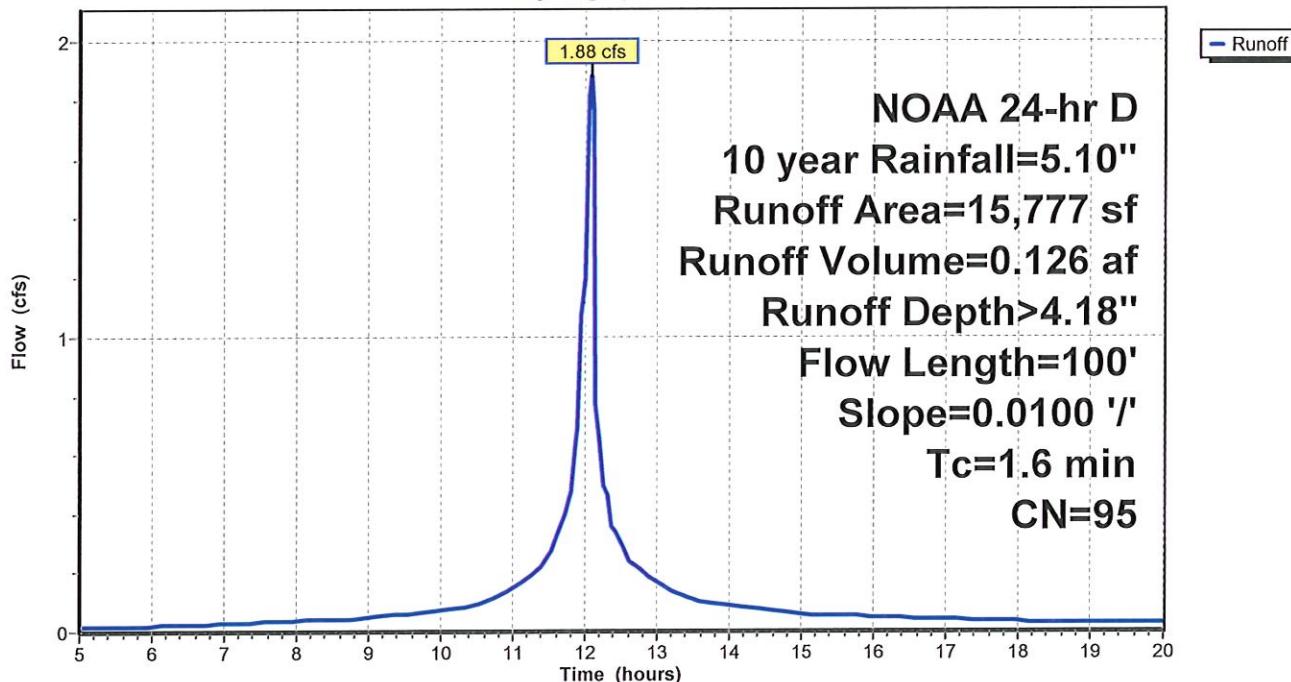
Summary for Subcatchment 5S: Proposed Kiddie Pool Area

Runoff = 1.88 cfs @ 12.07 hrs, Volume= 0.126 af, Depth> 4.18"
Routed to Link 15L : Water Quality Treatment

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 year Rainfall=5.10"

Area (sf)	CN	Description
*	13,781	98
*	1,996	74
15,777	95	Weighted Average
1,996		12.65% Pervious Area
13,781		87.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		Sheet Flow, Sheet Flow Smooth surfaces n= 0.011 P2= 3.40"

Subcatchment 5S: Proposed Kiddie Pool Area**Hydrograph**

Storm Water Model

Prepared by DJ Egarian

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NOAA 24-hr D 10 year Rainfall=5.10"

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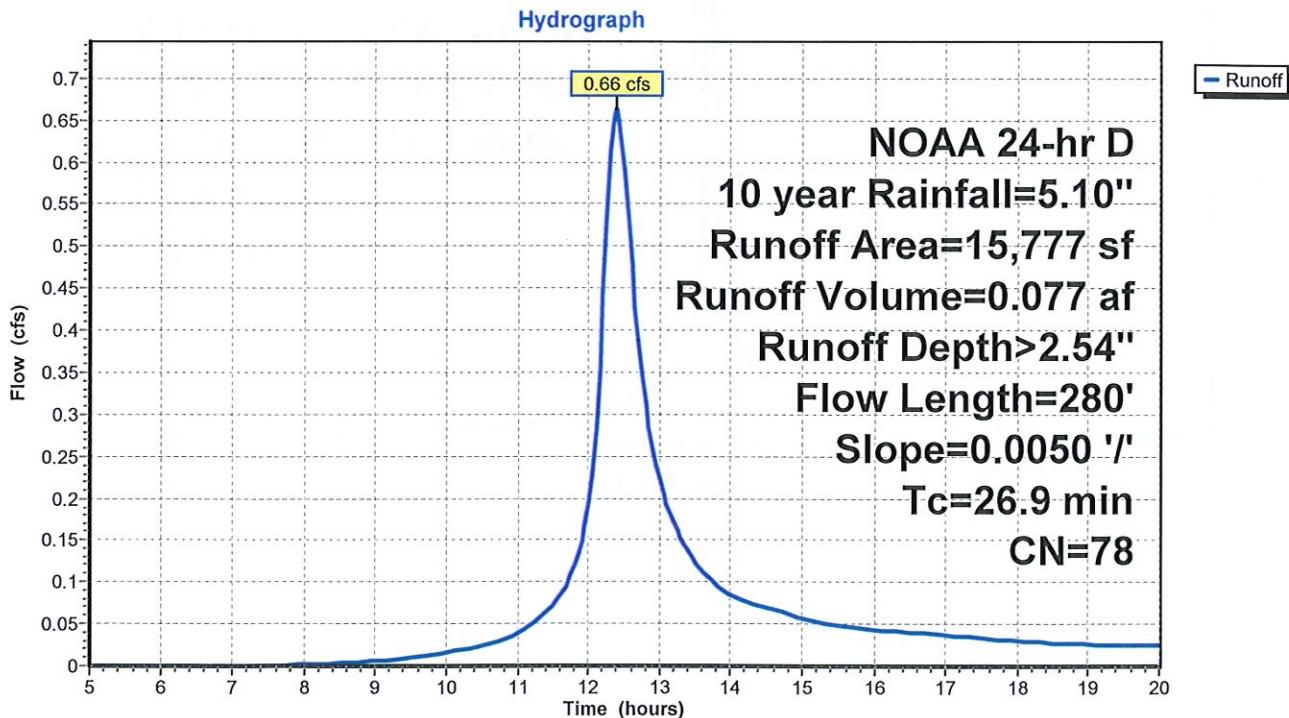
Summary for Subcatchment 6S: Existing Kiddie Pool Area

Runoff = 0.66 cfs @ 12.39 hrs, Volume= 0.077 af, Depth> 2.54"
 Routed to Link 12L : Total Existing Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 10 year Rainfall=5.10"

Area (sf)	CN	Description
* 2,597	98	Pool and Sidewalk
13,180	74	>75% Grass cover, Good, HSG C
15,777	78	Weighted Average
13,180		83.54% Pervious Area
2,597		16.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0050	0.07		Sheet Flow, Sheet Flow Grass: Dense n= 0.240 P2= 3.40"
2.8	180	0.0050	1.06		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
26.9	280	Total			

Subcatchment 6S: Existing Kiddie Pool Area

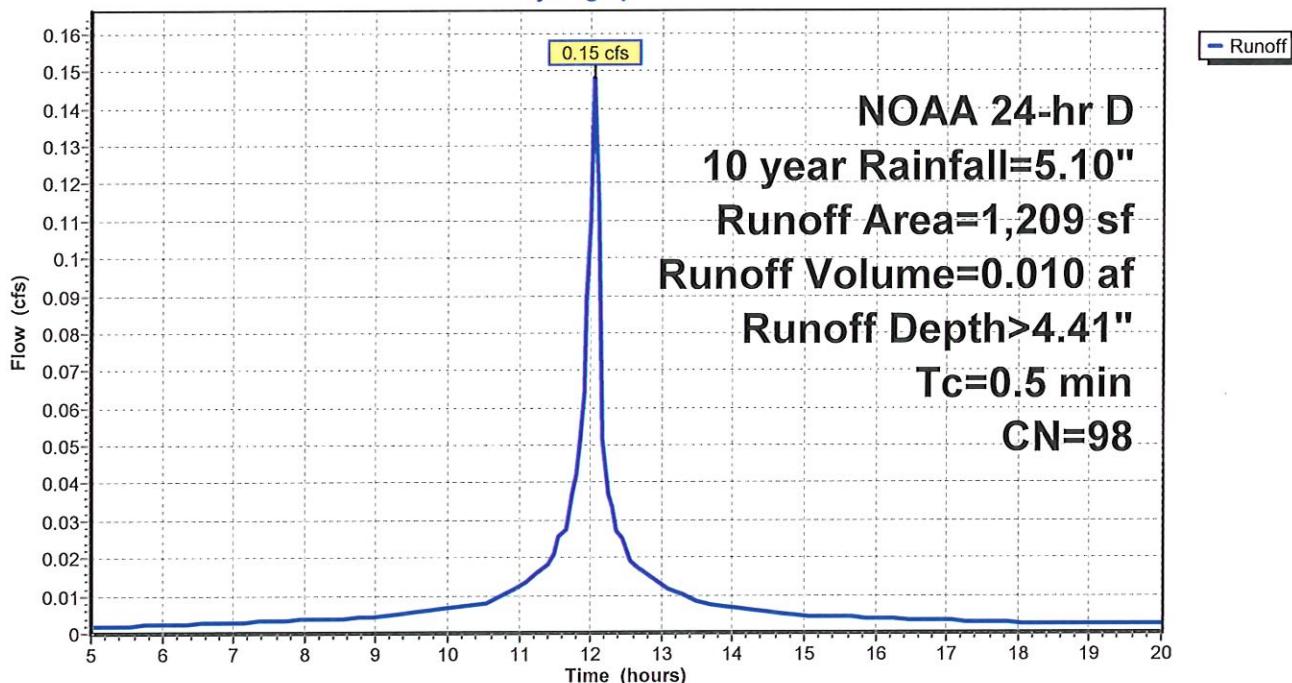
Summary for Subcatchment 9S: Play Area

Runoff = 0.15 cfs @ 12.05 hrs, Volume= 0.010 af, Depth> 4.41"
Routed to Link 11L : Combined Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 year Rainfall=5.10"

Area (sf)	CN	Description
*	1,209	98
1,209		100.00% Impervious Area

Tc	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5					Direct Entry, Direct

Subcatchment 9S: Play Area**Hydrograph**

Storm Water Model

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NOAA 24-hr D 10 year Rainfall=5.10"

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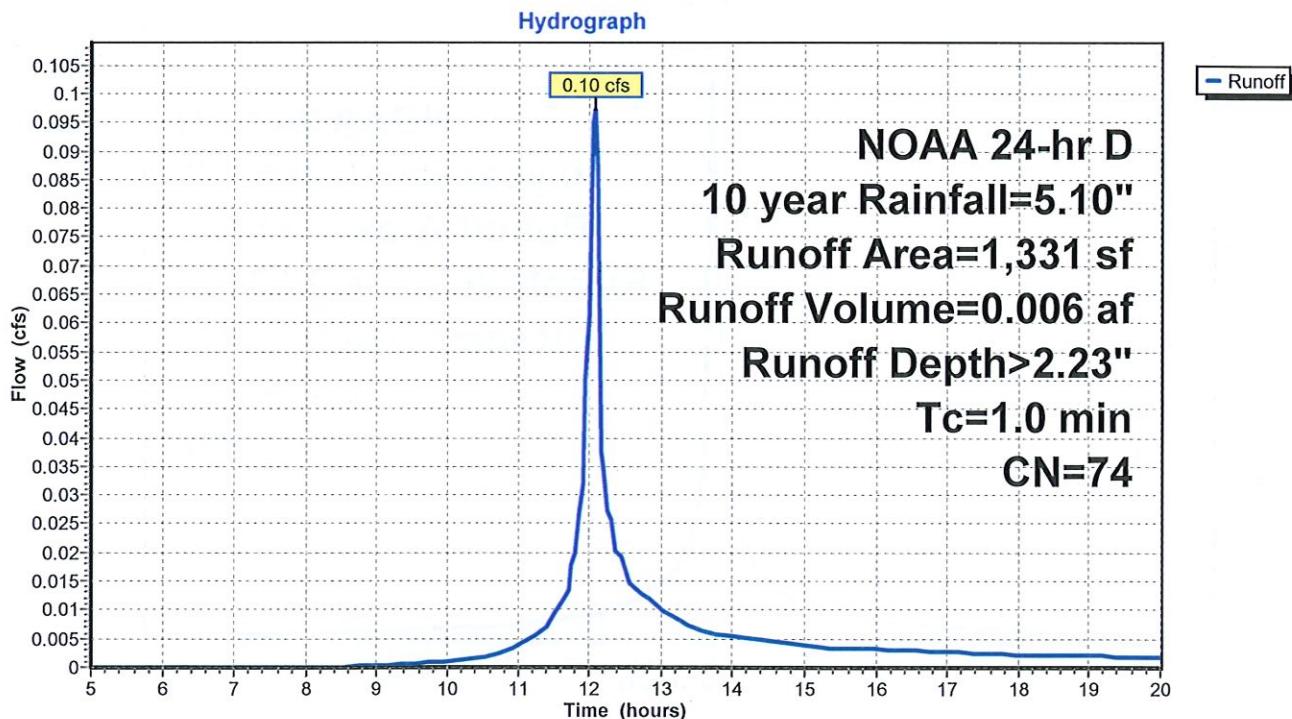
Summary for Subcatchment 10S: Play Area Landscape

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.006 af, Depth> 2.23"
Routed to Link 11L : Combined Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 year Rainfall=5.10"

Area (sf)	CN	Description
*	1,331	74
1,331		100.00% Pervious Area

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

Subcatchment 10S: Play Area Landscape

Storm Water Model

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NOAA 24-hr D 10 year Rainfall=5.10"

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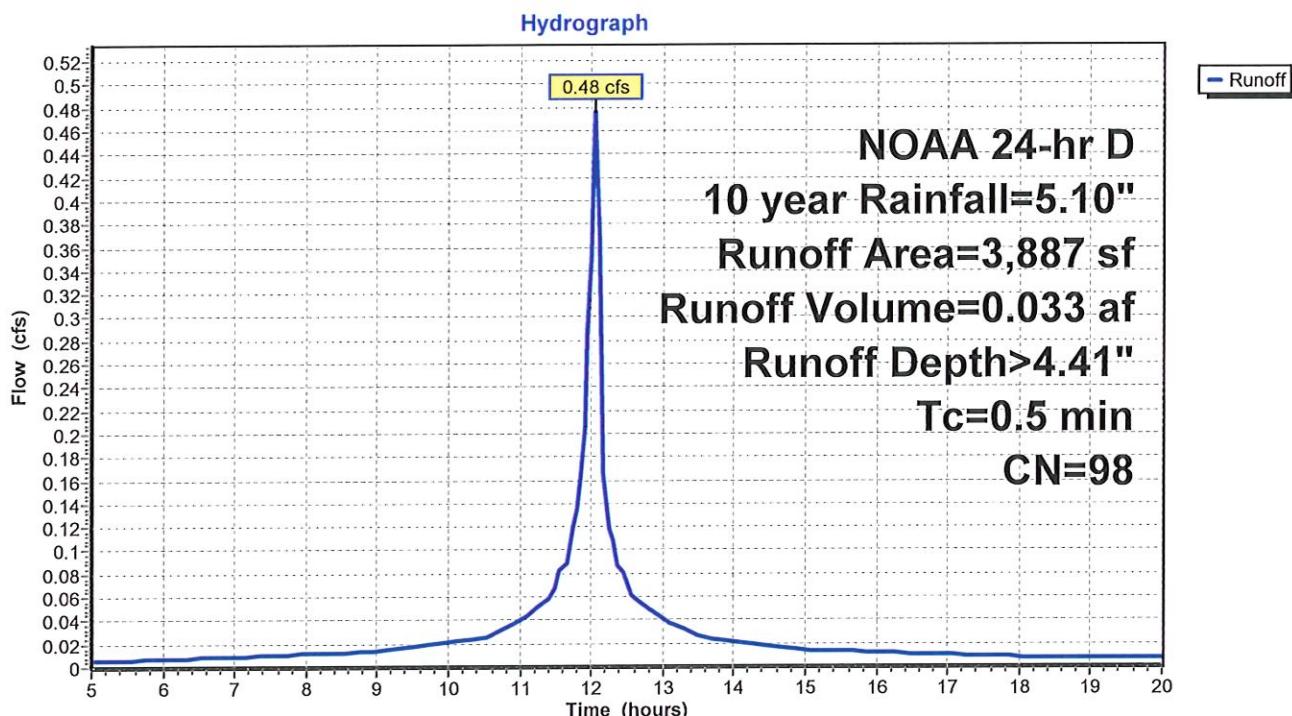
Summary for Subcatchment 12S: Kiddie Pool Strip drain area

Runoff = 0.48 cfs @ 12.05 hrs, Volume= 0.033 af, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10 year Rainfall=5.10"

Area (sf)	CN	Description
*	3,887	98
3,887		100.00% Impervious Area

Tc	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5					Direct Entry, Direct

Subcatchment 12S: Kiddie Pool Strip drain area

Storm Water Model

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NOAA 24-hr D 10 year Rainfall=5.10"

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Summary for Pond 7P: Detention

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 4.18" for 10 year event
 Inflow = 1.88 cfs @ 12.07 hrs, Volume= 0.126 af
 Outflow = 0.23 cfs @ 12.65 hrs, Volume= 0.114 af, Atten= 88%, Lag= 34.8 min
 Discarded = 0.02 cfs @ 6.35 hrs, Volume= 0.024 af
 Primary = 0.21 cfs @ 12.65 hrs, Volume= 0.090 af

Routed to Link 14L : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 236.06' @ 12.65 hrs Surf.Area= 1,785 sf Storage= 2,584 cf

Plug-Flow detention time= 151.6 min calculated for 0.114 af (90% of inflow)
 Center-of-Mass det. time= 116.1 min (857.5 - 741.5)

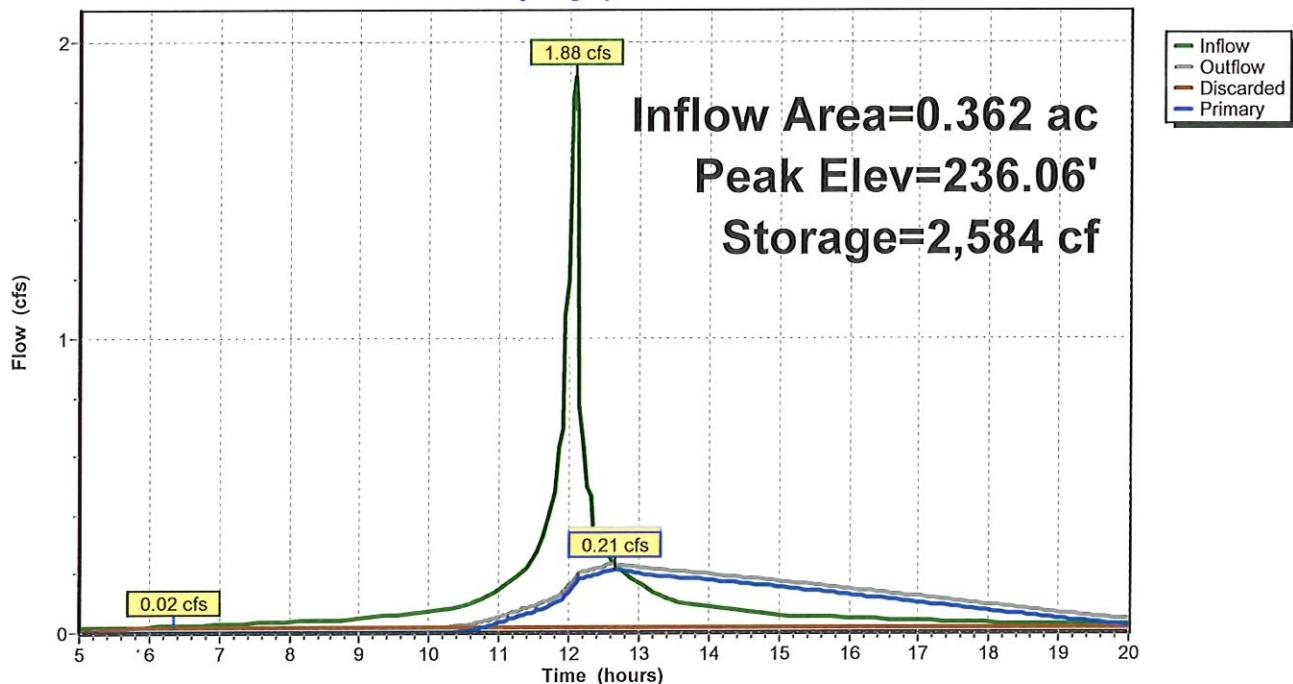
Volume	Invert	Avail.Storage	Storage Description
#1A	234.00'	1,731 cf	30.00'W x 59.50'L x 4.00'H Field A 7,140 cf Overall - 2,813 cf Embedded = 4,327 cf x 40.0% Voids
#2A	234.50'	2,813 cf	Cultec R-360HD x 75 Inside #1 Effective Size= 54.9" W x 36.0" H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0" W x 36.0" H x 4.17'L with 0.50' Overlap 75 Chambers in 5 Rows Cap Storage= 6.5 cf x 2 x 5 rows = 64.6 cf
4,544 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	234.50'	2.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	237.75'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	236.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	234.00'	0.02 cfs Exfiltration at all elevations

Discarded OutFlow Max=0.02 cfs @ 6.35 hrs HW=234.04' (Free Discharge)
 ↑ 4=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.21 cfs @ 12.65 hrs HW=236.06' (Free Discharge)
 ↑ 1=Orifice/Grate (Orifice Controls 0.20 cfs @ 5.82 fps)
 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 3=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.86 fps)

Pond 7P: Detention**Hydrograph**

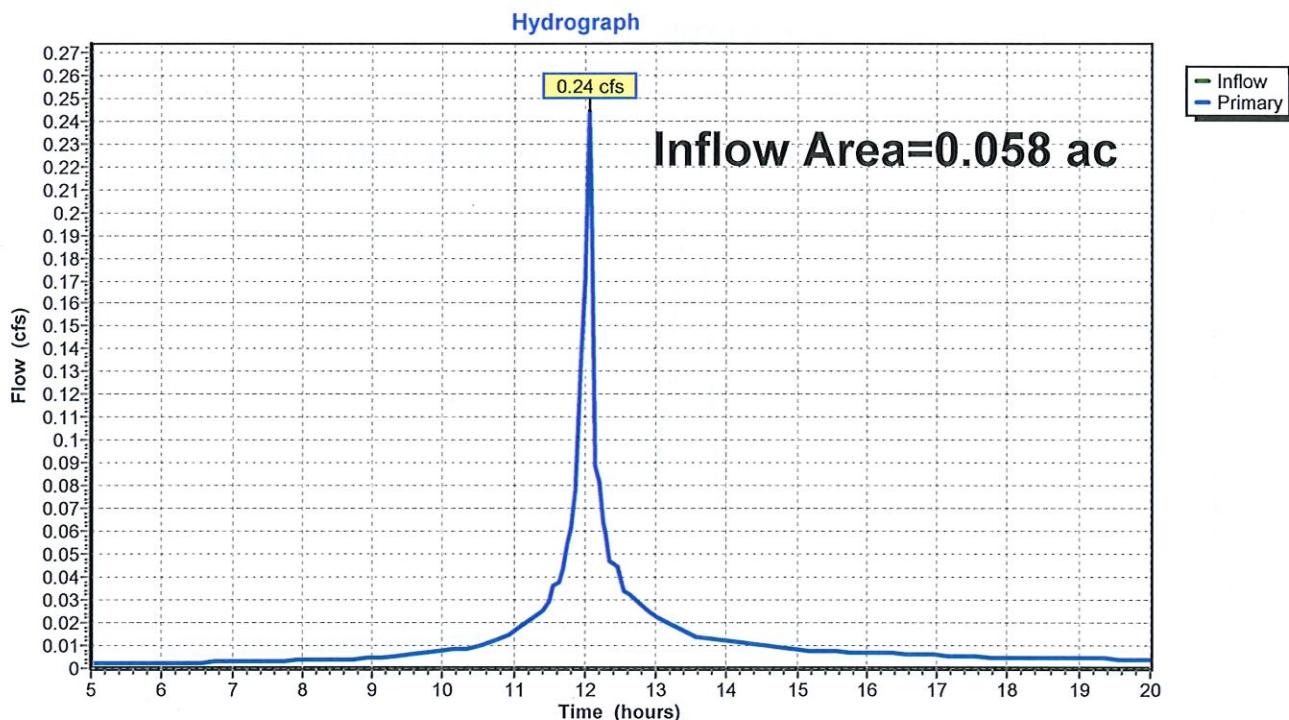
Summary for Link 11L: Combined Flow

Inflow Area = 0.058 ac, 47.60% Impervious, Inflow Depth > 3.27" for 10 year event

Inflow = 0.24 cfs @ 12.06 hrs, Volume= 0.016 af

Primary = 0.24 cfs @ 12.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

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

Link 11L: Combined Flow

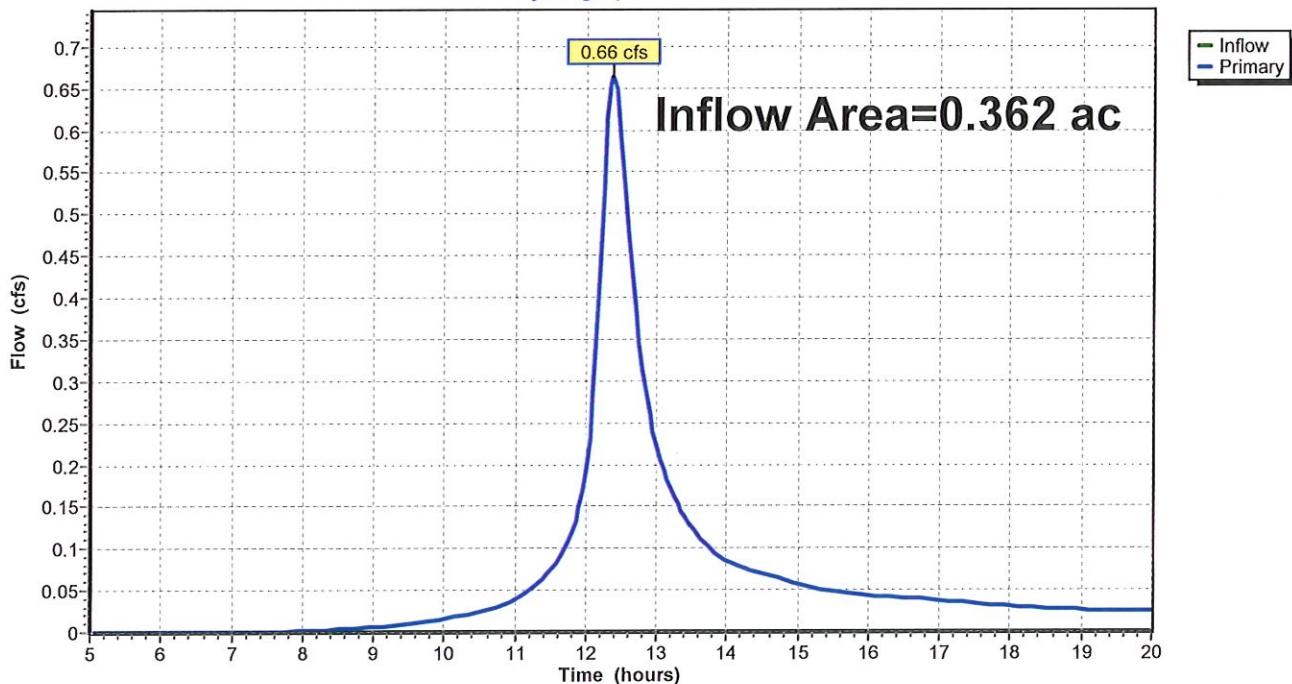
Summary for Link 12L: Total Existing Flow

Inflow Area = 0.362 ac, 16.46% Impervious, Inflow Depth > 2.54" for 10 year event

Inflow = 0.66 cfs @ 12.39 hrs, Volume= 0.077 af

Primary = 0.66 cfs @ 12.39 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

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

Link 12L: Total Existing Flow**Hydrograph**

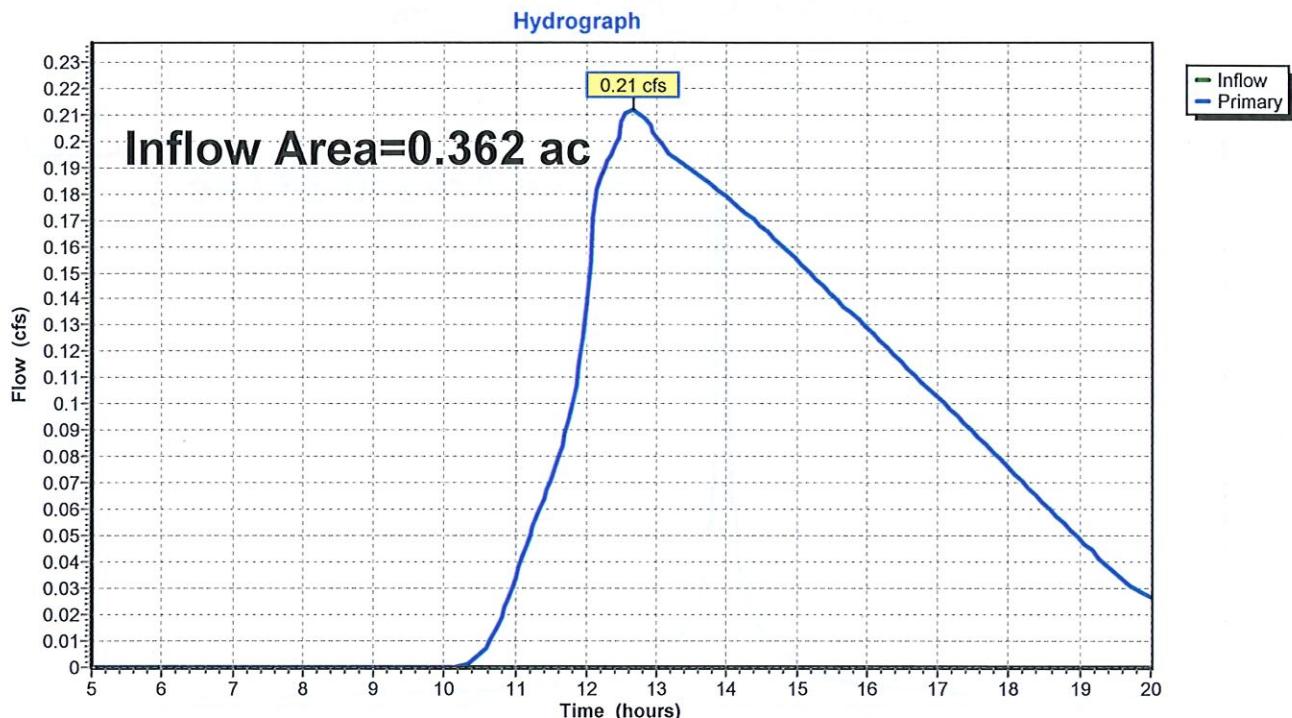
Summary for Link 14L: Total Proposed Flow

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 2.97" for 10 year event

Inflow = 0.21 cfs @ 12.65 hrs, Volume= 0.090 af

Primary = 0.21 cfs @ 12.65 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.0 min

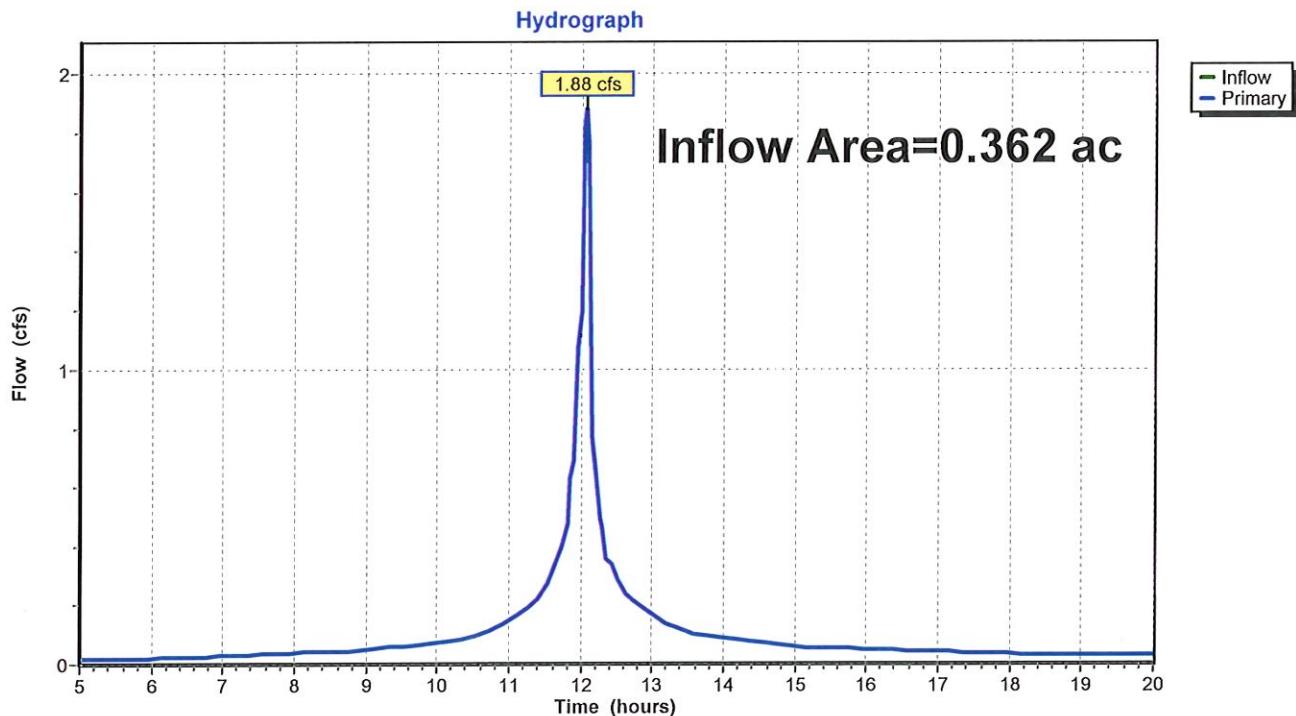
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 14L: Total Proposed Flow

Summary for Link 15L: Water Quality Treatment

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 4.18" for 10 year event
Inflow = 1.88 cfs @ 12.07 hrs, Volume= 0.126 af
Primary = 1.88 cfs @ 12.07 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 7P : Detention

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

Link 15L: Water Quality Treatment

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

Subcatchment 1S: Existing Field Runoff Area=14,022 sf 0.00% Impervious Runoff Depth>4.87"
Flow Length=180' Slope=0.0100 '/' Tc=14.4 min CN=74 Runoff=1.47 cfs 0.131 af

Subcatchment 3S: Proposed Field Runoff Area=14,022 sf 0.00% Impervious Runoff Depth>4.87"
Flow Length=100' Slope=0.0200 '/' Tc=13.8 min CN=74 Runoff=1.49 cfs 0.131 af

Subcatchment 5S: Proposed Kiddie Pool Runoff Area=15,777 sf 87.35% Impervious Runoff Depth>7.14"
Flow Length=100' Slope=0.0100 '/' Tc=1.6 min CN=95 Runoff=3.16 cfs 0.216 af

Subcatchment 6S: Existing Kiddie Pool Runoff Area=15,777 sf 16.46% Impervious Runoff Depth>5.31"
Flow Length=280' Slope=0.0050 '/' Tc=26.9 min CN=78 Runoff=1.35 cfs 0.160 af

Subcatchment 9S: Play Area Runoff Area=1,209 sf 100.00% Impervious Runoff Depth>7.34"
Tc=0.5 min CN=98 Runoff=0.24 cfs 0.017 af

Subcatchment 10S: Play Area Landscape Runoff Area=1,331 sf 0.00% Impervious Runoff Depth>4.89"
Tc=1.0 min CN=74 Runoff=0.21 cfs 0.012 af

Subcatchment 12S: Kiddie Pool Strip drain Runoff Area=3,887 sf 100.00% Impervious Runoff Depth>7.34"
Tc=0.5 min CN=98 Runoff=0.79 cfs 0.055 af

Pond 7P: Detention Peak Elev=236.95' Storage=3,678 cf Inflow=3.16 cfs 0.216 af
Discarded=0.02 cfs 0.025 af Primary=1.04 cfs 0.173 af Outflow=1.06 cfs 0.198 af

Link 11L: Combined Flow Inflow=0.45 cfs 0.029 af
Primary=0.45 cfs 0.029 af

Link 12L: Total Existing Flow Inflow=1.35 cfs 0.160 af
Primary=1.35 cfs 0.160 af

Link 14L: Total Proposed Flow Inflow=1.04 cfs 0.173 af
Primary=1.04 cfs 0.173 af

Link 15L: Water Quality Treatment Inflow=3.16 cfs 0.216 af
Primary=3.16 cfs 0.216 af

Total Runoff Area = 1.516 ac Runoff Volume = 0.721 af Average Runoff Depth = 5.71"
67.48% Pervious = 1.023 ac 32.52% Impervious = 0.493 ac

Storm Water Model

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NOAA 24-hr D 100 year Rainfall=8.40"

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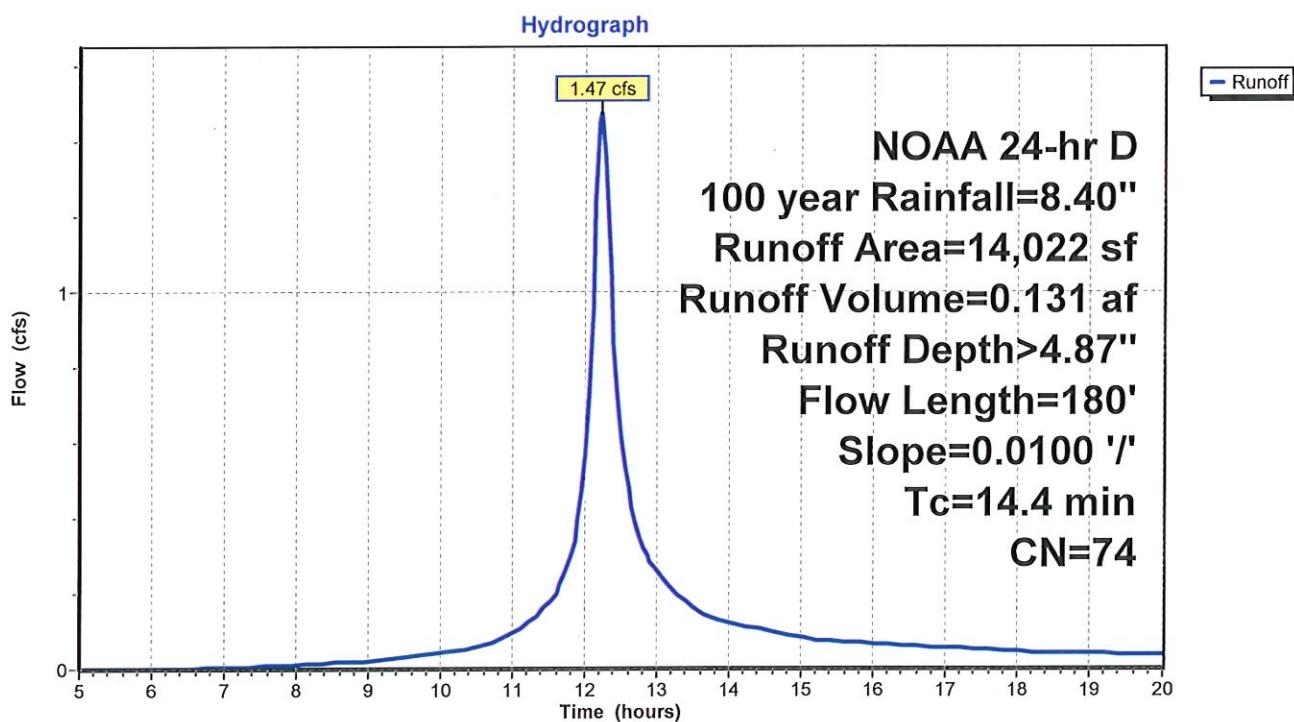
Summary for Subcatchment 1S: Existing Field

Runoff = 1.47 cfs @ 12.22 hrs, Volume= 0.131 af, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 year Rainfall=8.40"

Area (sf)	CN	Description
14,022	74	>75% Grass cover, Good, HSG C
14,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0100	0.13		Sheet Flow, sheet flow Grass: Short n= 0.150 P2= 3.40"
1.9	80	0.0100	0.70		Shallow Concentrated Flow, Shallow conc. flow Short Grass Pasture Kv= 7.0 fps
14.4	180	Total			

Subcatchment 1S: Existing Field

Storm Water Model

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NOAA 24-hr D 100 year Rainfall=8.40"

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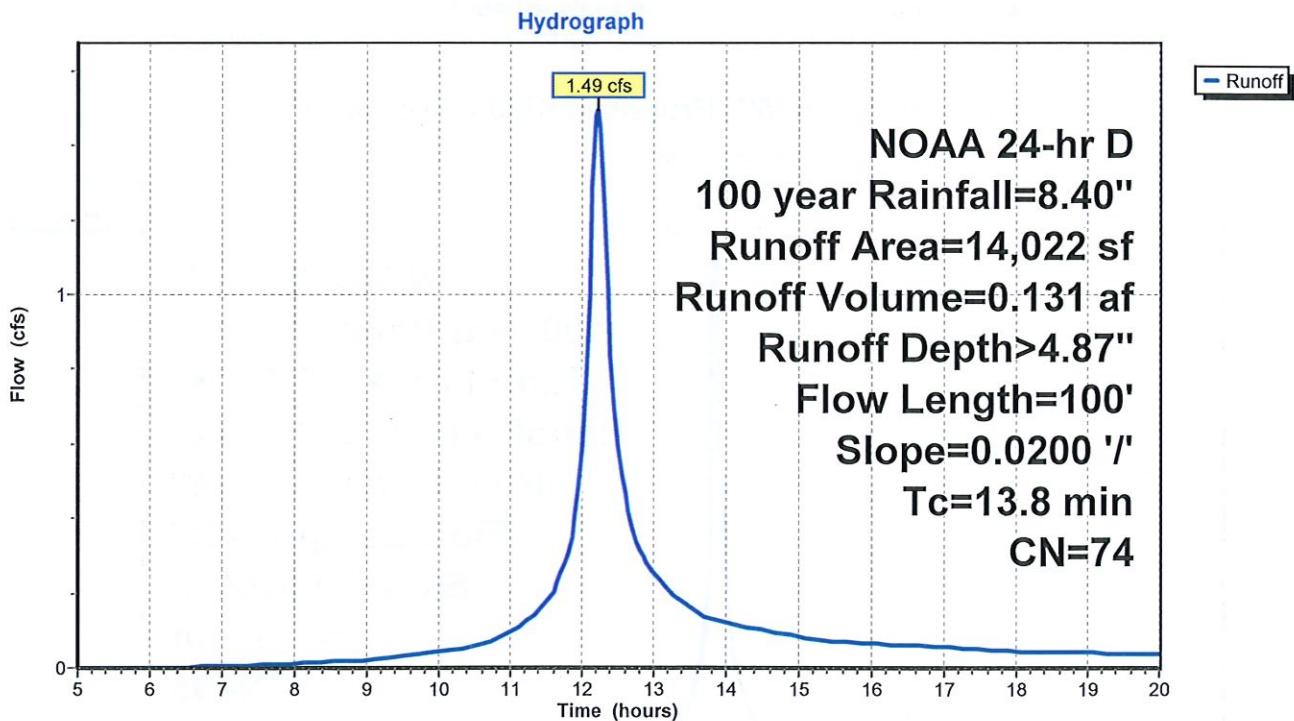
Summary for Subcatchment 3S: Proposed Field

Runoff = 1.49 cfs @ 12.22 hrs, Volume= 0.131 af, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 year Rainfall=8.40"

Area (sf)	CN	Description
*	14,022	74
14,022		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	100	0.0200	0.12		Sheet Flow, Sheet Flow Grass: Dense n= 0.240 P2= 3.40"

Subcatchment 3S: Proposed Field

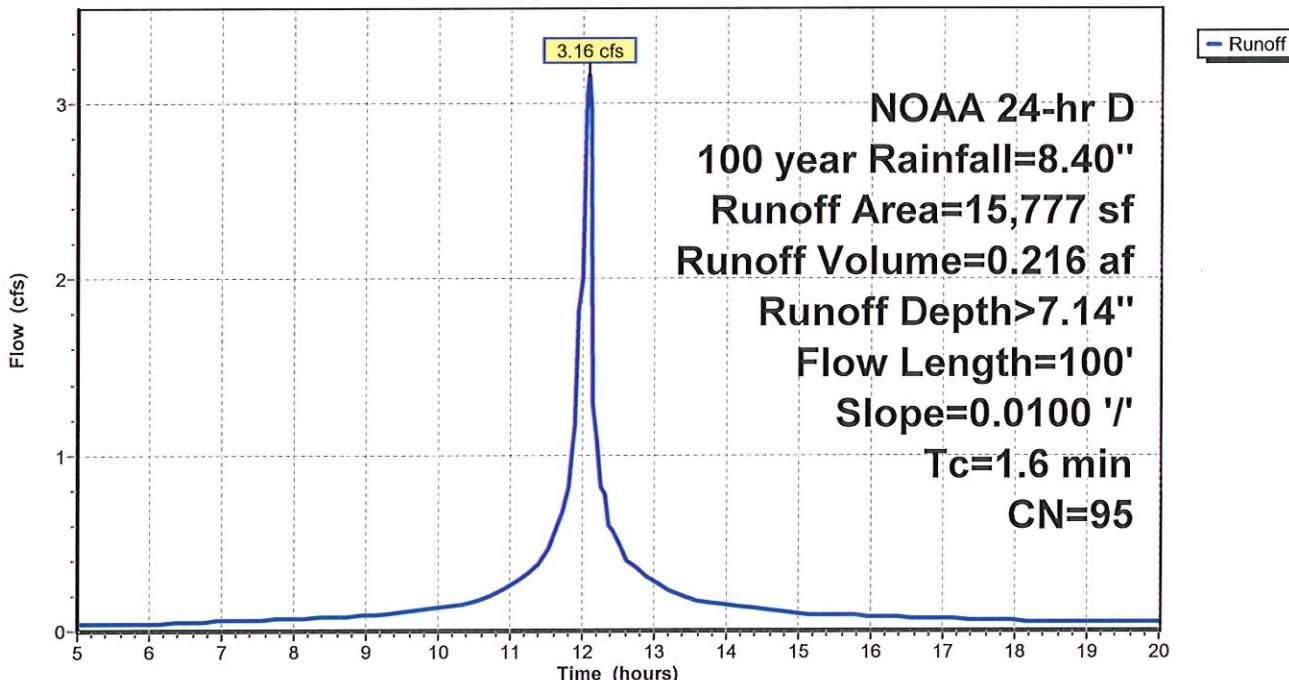
Summary for Subcatchment 5S: Proposed Kiddie Pool Area

Runoff = 3.16 cfs @ 12.07 hrs, Volume= 0.216 af, Depth> 7.14"
 Routed to Link 15L : Water Quality Treatment

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 100 year Rainfall=8.40"

Area (sf)	CN	Description
*	13,781	98
*	1,996	74
15,777	95	Weighted Average
1,996		12.65% Pervious Area
13,781		87.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		Sheet Flow, Sheet Flow Smooth surfaces n= 0.011 P2= 3.40"

Subcatchment 5S: Proposed Kiddie Pool Area**Hydrograph**

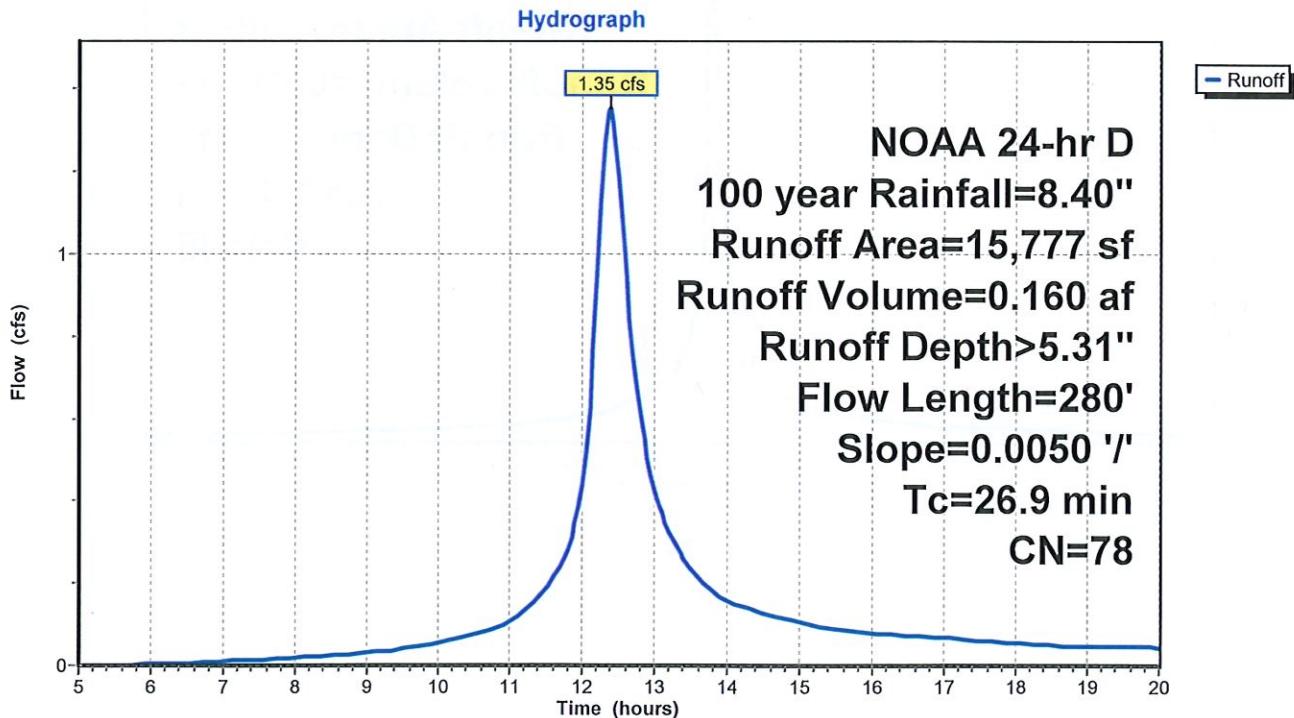
Summary for Subcatchment 6S: Existing Kiddie Pool Area

Runoff = 1.35 cfs @ 12.38 hrs, Volume= 0.160 af, Depth> 5.31"
 Routed to Link 12L : Total Existing Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 100 year Rainfall=8.40"

Area (sf)	CN	Description
* 2,597	98	Pool and Sidewalk
13,180	74	>75% Grass cover, Good, HSG C
15,777	78	Weighted Average
13,180		83.54% Pervious Area
2,597		16.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	100	0.0050	0.07		Sheet Flow, Sheet Flow Grass: Dense n= 0.240 P2= 3.40"
2.8	180	0.0050	1.06		Shallow Concentrated Flow, Shallow Grassed Waterway Kv= 15.0 fps
26.9	280	Total			

Subcatchment 6S: Existing Kiddie Pool Area

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NOAA 24-hr D 100 year Rainfall=8.40"

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Summary for Subcatchment 9S: Play Area

Runoff = 0.24 cfs @ 12.05 hrs, Volume= 0.017 af, Depth> 7.34"
Routed to Link 11L : Combined Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 year Rainfall=8.40"

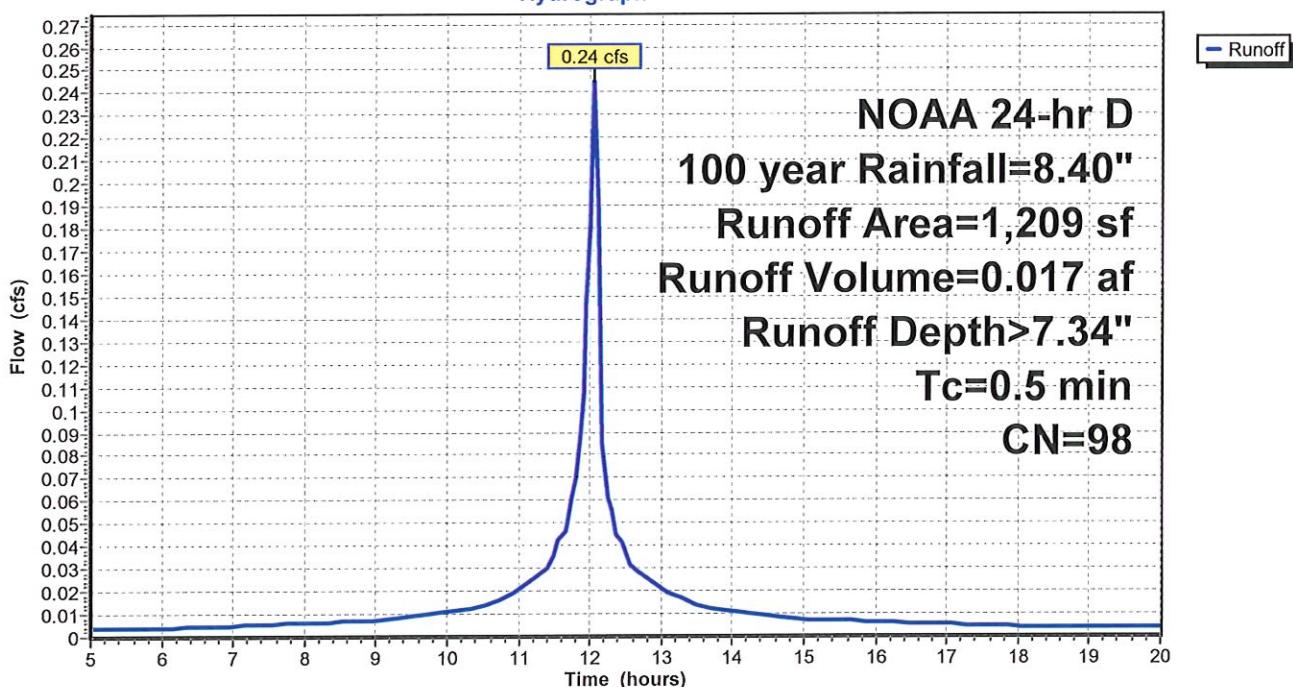
Area (sf)	CN	Description
-----------	----	-------------

*	1,209	98
---	-------	----

1,209	100.00% Impervious Area
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Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	

0.5	Direct Entry, Direct
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Subcatchment 9S: Play Area**Hydrograph**

Storm Water Model

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NOAA 24-hr D 100 year Rainfall=8.40"

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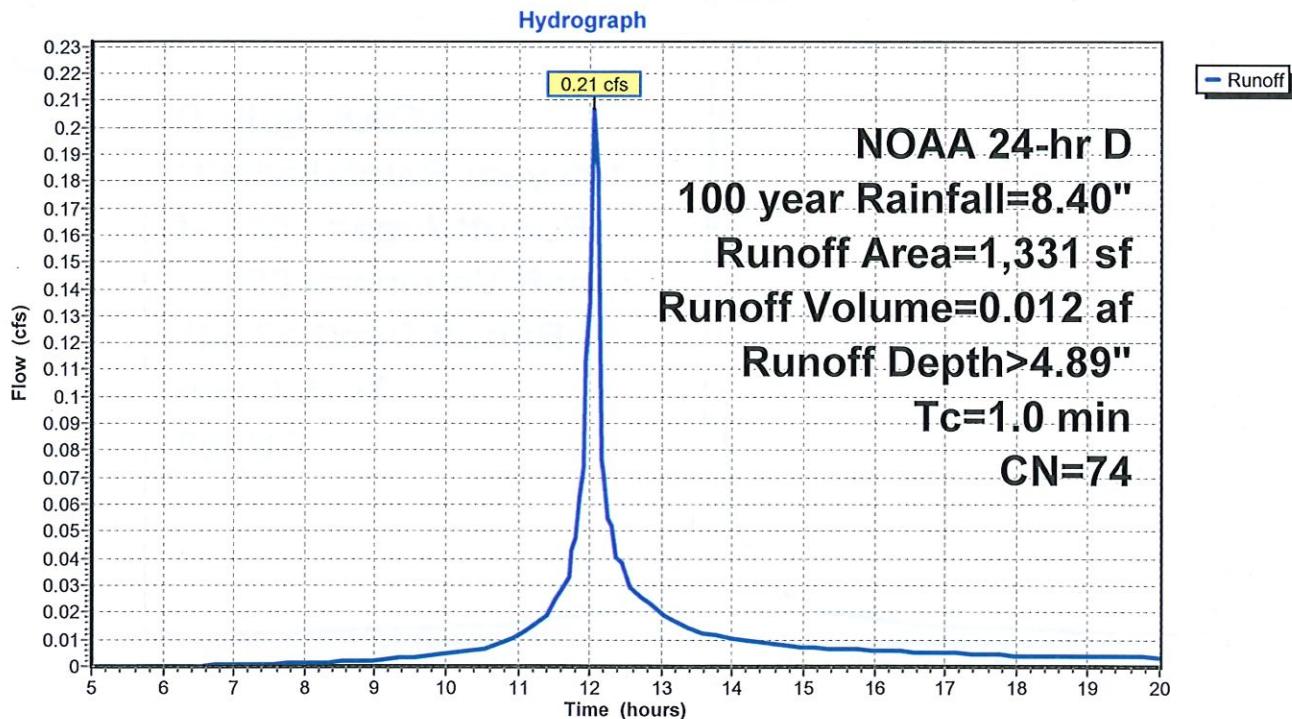
Summary for Subcatchment 10S: Play Area Landscape

Runoff = 0.21 cfs @ 12.06 hrs, Volume= 0.012 af, Depth> 4.89"
Routed to Link 11L : Combined Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 year Rainfall=8.40"

Area (sf)	CN	Description
*	1,331	74
1,331		100.00% Pervious Area

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

Subcatchment 10S: Play Area Landscape

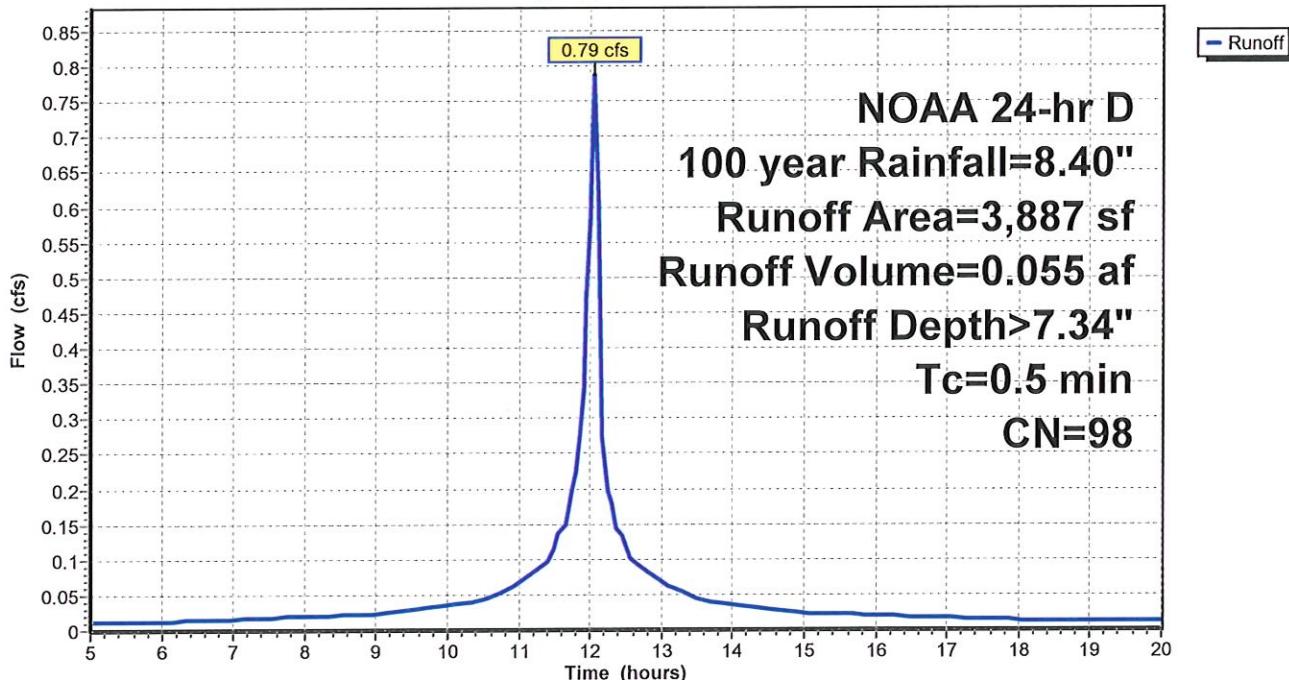
Summary for Subcatchment 12S: Kiddie Pool Strip drain area

Runoff = 0.79 cfs @ 12.05 hrs, Volume= 0.055 af, Depth> 7.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100 year Rainfall=8.40"

Area (sf)	CN	Description
*	3,887	98
	3,887	100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
0.5				0.79	Direct Entry, Direct

Subcatchment 12S: Kiddie Pool Strip drain area**Hydrograph**

Summary for Pond 7P: Detention

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 7.14" for 100 year event
 Inflow = 3.16 cfs @ 12.07 hrs, Volume= 0.216 af
 Outflow = 1.06 cfs @ 12.20 hrs, Volume= 0.198 af, Atten= 66%, Lag= 7.8 min
 Discarded = 0.02 cfs @ 5.30 hrs, Volume= 0.025 af
 Primary = 1.04 cfs @ 12.20 hrs, Volume= 0.173 af

Routed to Link 14L : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 236.95' @ 12.20 hrs Surf.Area= 1,785 sf Storage= 3,678 cf

Plug-Flow detention time= 122.9 min calculated for 0.198 af (92% of inflow)
 Center-of-Mass det. time= 91.7 min (827.3 - 735.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	234.00'	1,731 cf	30.00'W x 59.50'L x 4.00'H Field A 7,140 cf Overall - 2,813 cf Embedded = 4,327 cf x 40.0% Voids
#2A	234.50'	2,813 cf	Cultec R-360HD x 75 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 75 Chambers in 5 Rows Cap Storage= 6.5 cf x 2 x 5 rows = 64.6 cf
4,544 cf			Total Available Storage

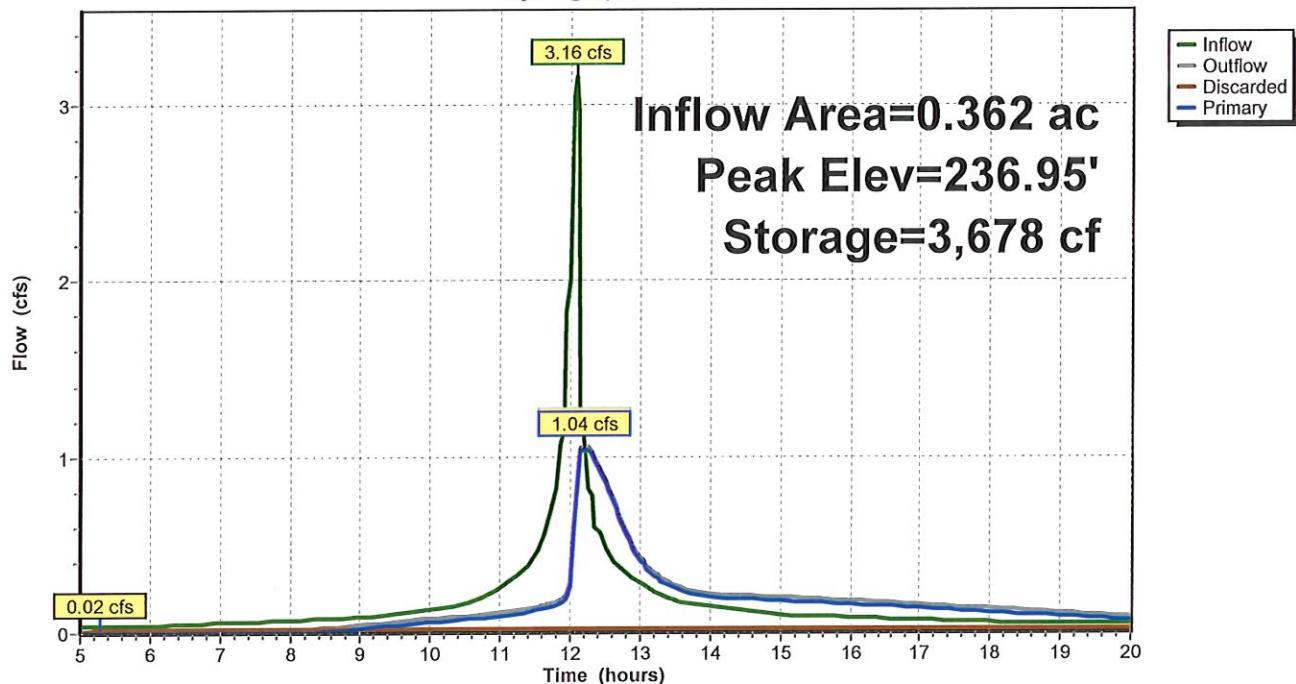
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	234.50'	2.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	237.75'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	236.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Discarded	234.00'	0.02 cfs Exfiltration at all elevations

Discarded OutFlow Max=0.02 cfs @ 5.30 hrs HW=234.04' (Free Discharge)
 ↑ 4=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.04 cfs @ 12.20 hrs HW=236.95' (Free Discharge)

↑ 1=Orifice/Grate (Orifice Controls 0.25 cfs @ 7.37 fps)
 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 3=Orifice/Grate (Orifice Controls 0.79 cfs @ 4.02 fps)

Pond 7P: Detention**Hydrograph**

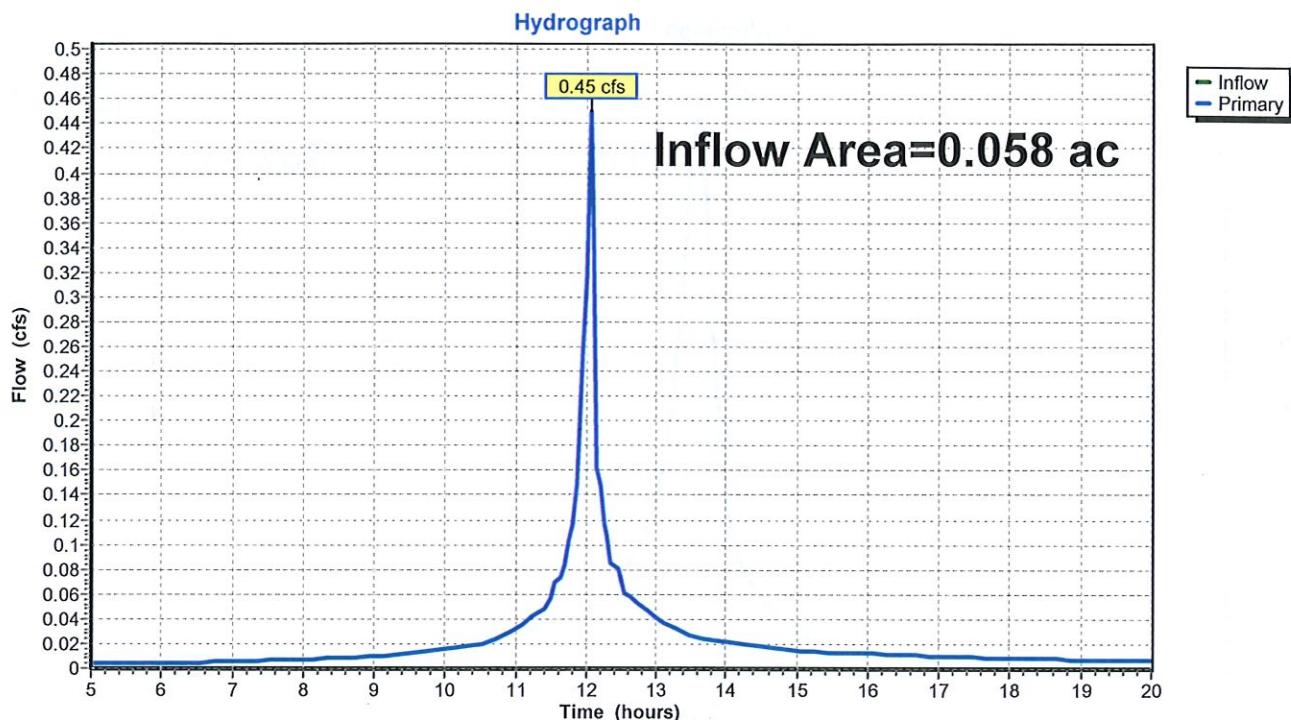
Summary for Link 11L: Combined Flow

Inflow Area = 0.058 ac, 47.60% Impervious, Inflow Depth > 6.06" for 100 year event

Inflow = 0.45 cfs @ 12.06 hrs, Volume= 0.029 af

Primary = 0.45 cfs @ 12.06 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

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

Link 11L: Combined Flow

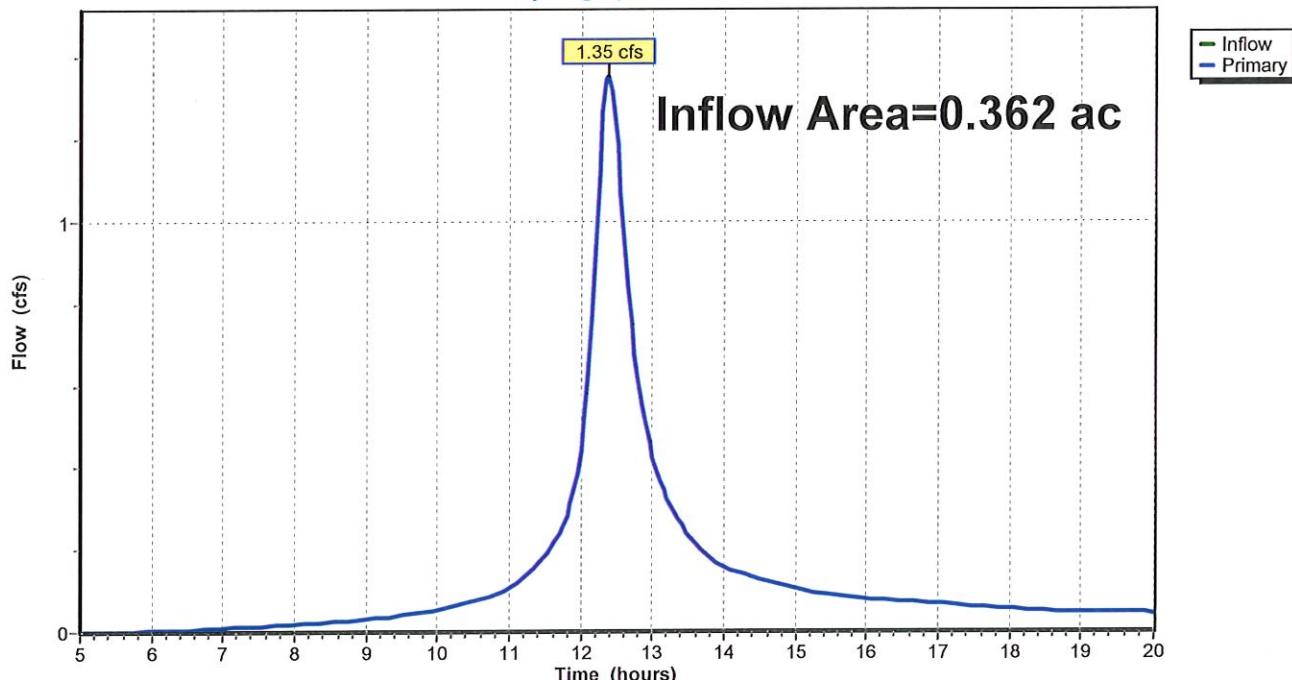
Summary for Link 12L: Total Existing Flow

Inflow Area = 0.362 ac, 16.46% Impervious, Inflow Depth > 5.31" for 100 year event

Inflow = 1.35 cfs @ 12.38 hrs, Volume= 0.160 af

Primary = 1.35 cfs @ 12.38 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min

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

Link 12L: Total Existing Flow**Hydrograph**

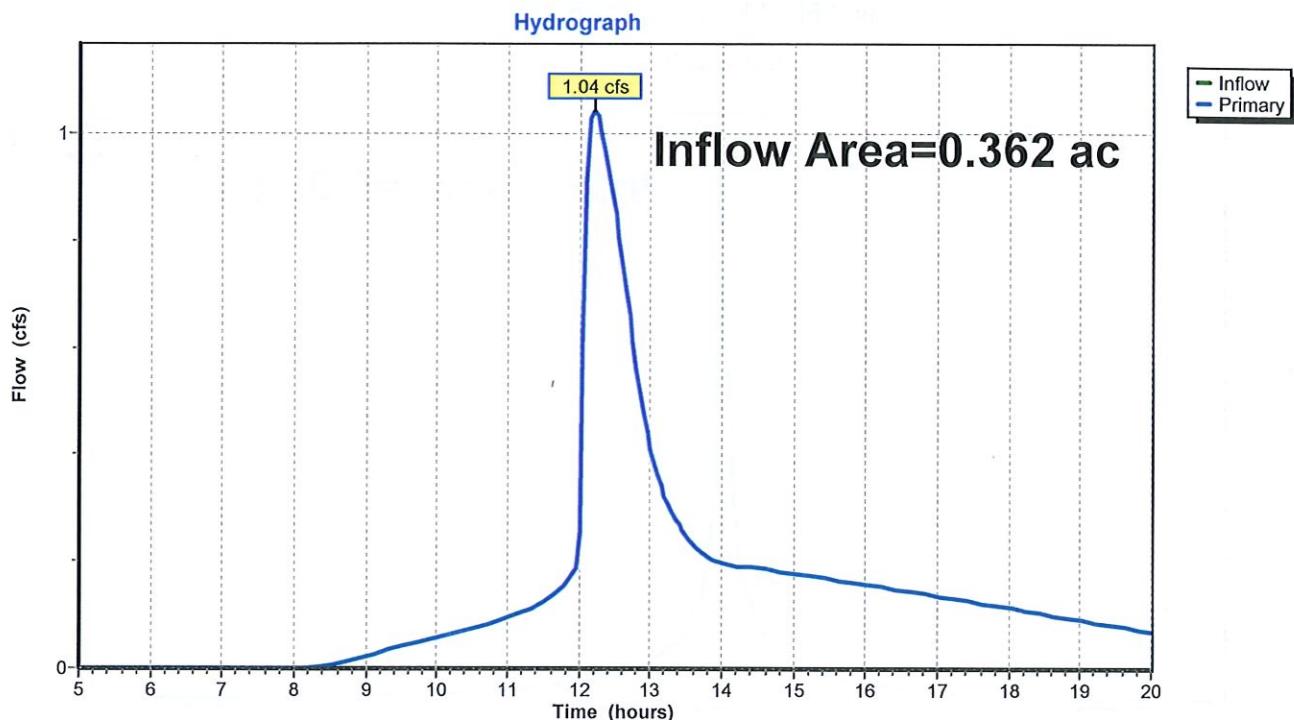
Summary for Link 14L: Total Proposed Flow

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 5.74" for 100 year event

Inflow = 1.04 cfs @ 12.20 hrs, Volume= 0.173 af

Primary = 1.04 cfs @ 12.20 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

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

Link 14L: Total Proposed Flow

Summary for Link 15L: Water Quality Treatment

Inflow Area = 0.362 ac, 87.35% Impervious, Inflow Depth > 7.14" for 100 year event

Inflow = 3.16 cfs @ 12.07 hrs, Volume= 0.216 af

Primary = 3.16 cfs @ 12.07 hrs, Volume= 0.216 af, Atten= 0%, Lag= 0.0 min

Routed to Pond 7P : Detention

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

Link 15L: Water Quality Treatment