STORMWATER   MAINTENANCE   PLAN

FOR

James & Susan Morano
Block 37.03 Lot 44.01
Franklin Twp.
Somerset Cnty., NJ

Prepared by: _(signature)_ _____   11·24·20
Daniel M. Doran, PE & PLS   date

STORMWATER MAINTENANCE PLAN
MORANO
PG. 2

Stormwater Structures: The Stormwater structures that are to be installed within the development located on Block 70 Lot 20.09 are the following:

a.   645 LF 12" HDPE Pipe
b.   Infiltration Basin
c.   (4) ADS Inlets
d.   Riprap

The details and location of these structures are shown on the enclosed plans, said plans have been prepared by William M. Doran & Sons. When available, an "as built" plan of the system shall be made part of this document.

Party Responsible for the Maintenance of the Stormwater Structures:

James and Susan Morano
name

1 Kingsbridge Rd., Somerset, NJ 08873
Address

732-740-4004
telephone #

The above information shall be recorded on the deed(s) of the property. Any changes in this information, (i.e. sale of the property), must also be recorded on the deed(s).

The above party shall evaluate this maintenance plan for its effectiveness at least once a year and revise the plan as necessary.

The above party must retain and, upon request, make available the maintenance plan and associated logs and other records for the review by a public entity with administrative, health, environmental, or safety authority over the site.

Preventive and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure, removal of sediment, debris, or trash, restoration of eroded areas, snow and ice removal, or replacement, and the restoration of vegetation.

All maintenance work shall be in accordance with the Franklin Township Stormwater Ordinance.

Basin Characteristics:

The basin has been designed to achieve water quality, ground water recharge and provide a controlled flow of stormwater leaving the basin. The basin is required to drain in less than 72 hours. The lowest elevation found in the basin is elevation 105.0. The seasonal high water table was found to be at elevation 102.33. TSS removal Rate, 80%.

Design Parameters:

Storm Freq.	Surface Water Elev.	Depth of Rainfall	Runoff Volume	Peak Inflow Rate	Peak Outflow Rate	Deten. Time	Drain Time
2 yr	106.63	1.82"(24hrs)	0.000 af	2.03 cfs	0.46 cfs	37 min	13 hr
10	107.73	3.22	0.000	3.66	0.64	73	13
100	109.56	6.14	0.000	7.01	1.03	119	13
NJWQ	105.97	1.25(2hrs)	0.000	1.37	0.39	23	1.5

General Maintenance:

The entire system shall be inspected at least four times a year as well as after every major storm, (those storms that exceed 1 inch of rainfall).

Removal of silt shall be performed twice a year, (April and November) at a minimum. Sediment removal shall be performed when the basin is thoroughly dry.

Disposal of sediment, removed from the system, shall be in accordance with all local, state and federal waste regulations.

All structural components shall be inspected for cracking, subsidence, spalling, erosion and deterioration at least once a year. Replacement of components as required.

Considerations:

An *infiltration basin* is a stormwater management facility constructed of highly permeable soils, which provides temporary storage of stormwater runoff. Infiltration basins are used to remove pollutants and to infiltrate stormwater. In addition to pollutant removal and groundwater recharge, infiltration may help to reduce increases in both the peak rate and total runoff volume caused by land development. Pollutant removal is achieved through filtration of the runoff through the soil, as well as biological and chemical activity within the soil.

In order to promote the proper functioning of the infiltration basin the following measures are recommended:
- a. no heavy equipment shall be permitted on the surface of the basin, the compaction of the surface sand layer shall not be permitted
- b. the basin floor shall be kept free of all vegetation growth
- c. grass clippings and leaf litter shall not be permitted to buildup in the basin

      d.   sediment brought into the basin through the stormwater system shall be removed and not permitted to buildup on the floor of the basin

      e.   water entering the basin shall have a maximum drain time of 72 hours, if the maximum drain time is determined to be exceeded the permeability of the surface sand layer will need to be tested, if the testing determines that the sand layer does not meet or exceed the requirements of a K5 sand the sand will need to be removed and replaced with a certified K5 sand

      f.   the basin's surface shall be hand raked as required to promote the permeability of the surface sand and for the removal of all sediment and debris

Maintenance Costs:

The owner is recommended to contract a licensed maintenance company to perform the maintenance of the system. This contract should be renewed at least once a year. Consideration shall be given to the perspective company, in regards to their ability to perform the required tasks. The costs for performing these tasks will change over time. Yet, if the system is properly and regularly inspected the degree of maintenance required should not fluctuate over time.

Access to Structures: The entire stormwater system is located on the site with the components of the system easily accessible for anyone inspecting or maintaining the system.

Inspection Checklist / Maintenance Actions
Surface Infiltration – Extended Detention Basin

Checklist (circle one)**:** Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. _____   **Inspection Date:** _____

Date of most recent rain event: _____

Rain Condition (circle one)**:**
Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one)**:**
Dry / Moist / Ponding / Submerged / Snow accumulation

The following inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.

| Component No. Component Name | For Inspector | | Result | For Maintenance Crew |
	Inspection Item and Inspection Item No.			Preventative / Corrective Maintenance Actions
B Infiltration Bed	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours	Y__ N__	Recheck to determine if there is standing water after 72 hours. If standing water is present longer than 5 days, report to mosquito commission. Remove any sediment buildup Replace the sand layer, (6" of K5 sand on the entire basin floor Work Order # _____
	2	Excessive sediment, silt, or trash accumulation on basin bed	Y__ N__	Remove silt, sediment, and trash Work Order # _____
	3	Erosion or channelization is present	Y__ N__	Check outlet structure Re-grade the infiltration bed Work Order # _____
	4	Animal burrows/rodents are present	Y__ N__	Pest control Work Order # _____
	5	Uneven bed	Y__ N__	Use light equipment to resurface the bed Work Order # _____
	6	Evidence of sinkholes or subsidence	Y__ N__	Monitor for sinkhole development
Note:				

Component No. Component Name	For Inspector		Result	For Maintenance Crew
	Inspection Item and Inspection Item No.			Preventative / Corrective Maintenance Actions
C Vegetation	1	Large spot(s) showing bare soil	Y__ N__	Replace sand layer Work Order # _____
	2	Vegetation growth in basin	Y__ N__	Remove vegetation and restore sand layer Work Order # _____
	3		Y__ N__	

Note:

| Component No. Component Name | For Inspector | | | For Maintenance Crew |
	Inspection Item and Inspection Item No.		Result	Preventative / Corrective Maintenance Actions
D Basin Side Slope	1	Signs of erosion, soil slide or bulges, seeps and wet spots,	Y__ N__	Check for excessive overland runoff flow through the basin Check for any slope erosion Restabilize the slope Work Order # _____
E Outlet	1	Trash or debris accumulation more than 20%	Y__ N__	Clean and remove Determine source of trash and address to reduce future maintenance costs or basin failure
			Y__ N__	
	2	Outlet components (e.g., orifice plates or weir plate) skewed, misaligned, or missing	Y__ N__	Repair or replace component Work Order #_____
	3	Discharge pipe apron is eroded or scoured	Y__ N__	Restabilize the discharge riprap apron Work Order #_____
	4	Standing water is present in the outlet structure longer than 72 hours	Y__ N__	Pump out the standing water Work Order # _____

Note:

| Component No. Component Name | For Inspector | | Result | For Maintenance Crew |
	Inspection Item and Inspection Item No.			Preventative / Corrective Maintenance Actions
F Emergency Spillway	1	Condition of spillway/weir	Y__ N__	Repair Work Order #_____
	2	Damaged	Y__ N__	Repair Work Order #_____
G Miscellaneous	1	Excessive or overgrown vegetation blocking access to the basin	Y__ N__	Repair or replace Work Order #_____
	2		Y__ N__	Repair or replace Work Order #_____
	3		Y__ N__	Repair or replace Work Order #_____
	4		Y__ N__	Clear, trim, or prune the vegetation to allow access for inspection and maintenance Work Order #_____

Note:

Follow Up Items (Component No. / Inspection Item No.):

_____

Associated Work Orders: # _____, **#** _____, **#** _____, **#** _____, **#** _____

_____   _____   _____
        Inspector Name   **Signature**   **Date**

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

Corresponding Checklist No. _____
Component No._____, Inspection Item No._____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal **Sediment removal should take place when the basin is thoroughly dry.**	Pipe Network	
	B – Infiltration Bed	
	D – Basin Side Slopes	
	E – Outlet	
System Components	B – Infiltration Bed	
	D – Basin Walls	
	E – Weir	
	F – Emergency Spillway/Weir	
(List additional tasks, if applicable)		

Vegetation is removed by _____ (type of equipment) with minimum disruption to the remaining vegetation.

All use of fertilizers, pesticides, mechanical treatments, and other means to ensure optimum vegetation health must not compromise the intended purpose of the stormwater management measure. The fertilizer applied is _____ (type), and _____ (quantity per usage) is applied _____ (frequency of use).

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

If a sand layer is installed, replacement of the sand will occur according to the scheduled frequency (see Basin Configuration Targets above). The next scheduled replacement is _____ (date).

Crew member:_____/_____ **Date:** _____
(name/ signature)

Supervisor:_____/_____ **Date:** _____
(name/ signature)
File this Preventative Maintenance Record in the Maintenance Log after performing maintenance.

Corrective Maintenance Record

1. **Work Order #** _____ **Date Issued** _____

2. **Issue to be resolved**:

3. The issue was from **Corresponding Checklist No.** _____, **Component No**_____**Inspection Item No.**_____.

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

_____

6. **Special requirements**
   - Time of the season or weather condition:_____
   - Tools/equipment:_____
   - Subcontractor (name or specific type):_____

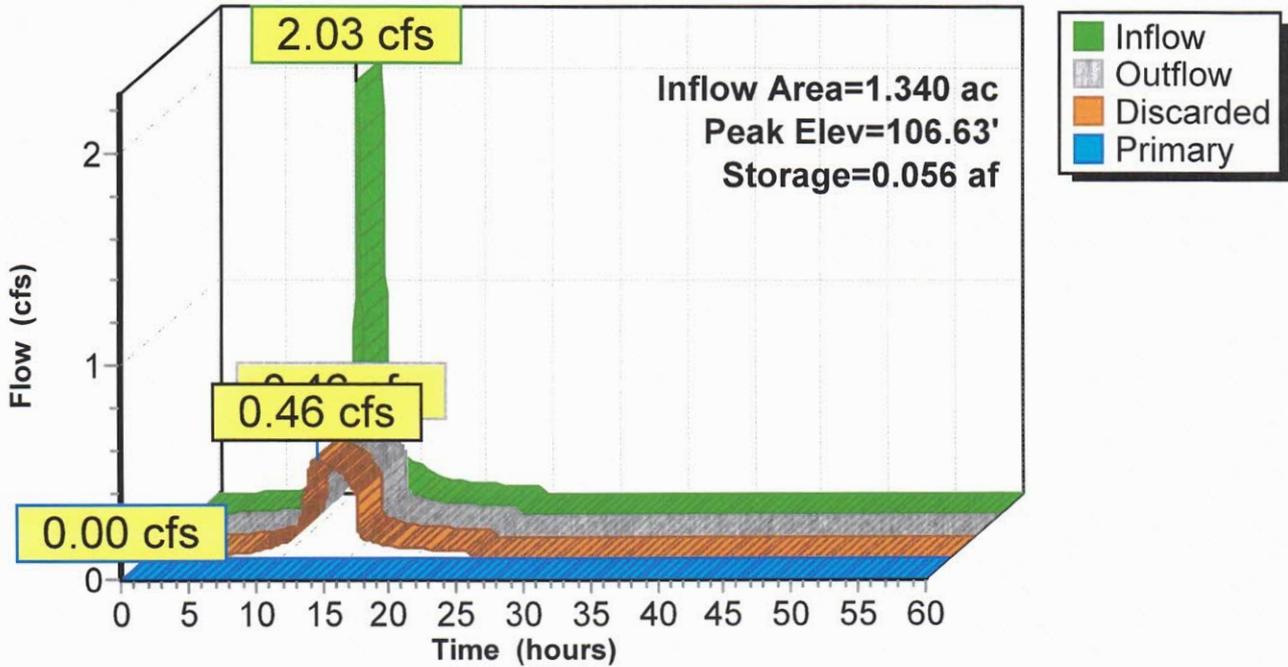**Approved by** _____/_____ **Date** _____
        (name/signature)

Verification of completion by _____/_____ **Date** _____
                (name/signature)

File this Corrective Maintenance Record in the Maintenance Log after performing maintenance.

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17053 MORANO
Type III 24-hr 2 YR STORM Rainfall=3.34"

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Pond 23P: PROP BASIN W/EXFIL

Hydrograph

Inflow Area=1.340 ac
Peak Elev=106.63'
Storage=0.056 af

Legend:
- Inflow
- Outflow
- Discarded
- Primary

2.03 cfs
0.46 cfs
0.00 cfs

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Summary for Pond 23P: PROP BASIN W/EXFIL

Inflow Area =   1.340 ac, 35.07% Impervious, Inflow Depth = 3.22"   for 10 YR STORM event
Inflow   =   3.66 cfs @ 12.19 hrs, Volume=   0.360 af
Outflow   =   0.64 cfs @ 12.84 hrs, Volume=   0.360 af, Atten= 83%, Lag= 38.8 min
Discarded =   0.64 cfs @ 12.84 hrs, Volume=   0.360 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 107.73' @ 12.84 hrs Surf.Area= 0.067 ac Storage= 0.122 af

Plug-Flow detention time=72.9 min calculated for 0.360 af (100% of inflow)
Center-of-Mass det. time=72.8 min (871.1 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**5.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 102.33'
#2	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Discarded OutFlow Max=0.64 cfs @ 12.84 hrs HW=107.73' (Free Discharge)
└─1=**Exfiltration** (Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' (Free Discharge)
└─2=**Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Pond 23P: PROP BASIN W/EXFIL

Hydrograph

Inflow Area=1.340 ac
Peak Elev=107.73'
Storage=0.122 af

Legend:
- Inflow
- Outflow
- Discarded
- Primary

3.66 cfs

0.64 cfs

0.00 cfs
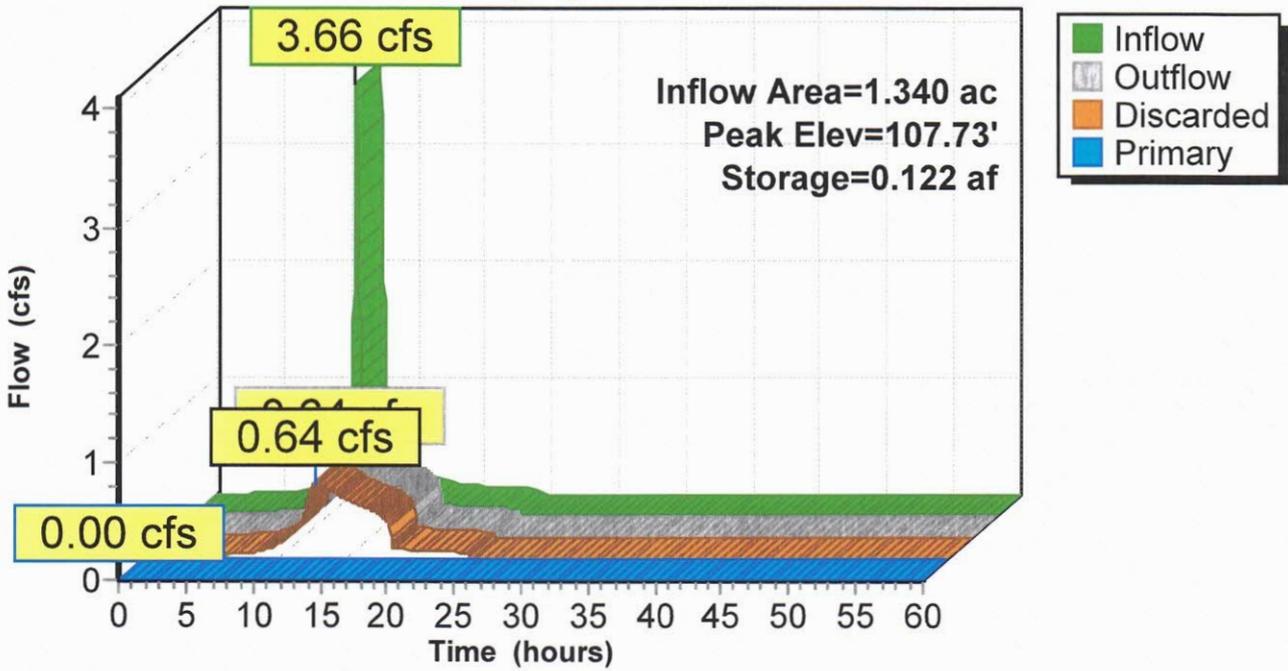
Summary for Pond 23P: PROP BASIN W/EXFIL

Inflow Area =	1.340 ac, 35.07% Impervious, Inflow Depth = 6.14" for 100 YR STORM event	
Inflow =	7.01 cfs @ 12.19 hrs, Volume=	0.686 af
Outflow =	1.03 cfs @ 12.93 hrs, Volume=	0.686 af, Atten= 85%, Lag= 44.2 min
Discarded =	1.03 cfs @ 12.93 hrs, Volume=	0.686 af
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 109.56' @ 12.93 hrs Surf.Area= 0.098 ac Storage= 0.272 af

Plug-Flow detention time= 119.2 min calculated for 0.686 af (100% of inflow)
Center-of-Mass det. time= 119.2 min (907.9 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**5.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 102.33'
#2	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Discarded OutFlow Max=1.03 cfs @ 12.93 hrs HW=109.56' (Free Discharge)
└─**1=Exfiltration** (Controls 1.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' (Free Discharge)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Pond 23P: PROP BASIN W/EXFIL

Hydrograph

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Type III 24-hr 2.00 hrs NJ WQ Rainfall=1.25"
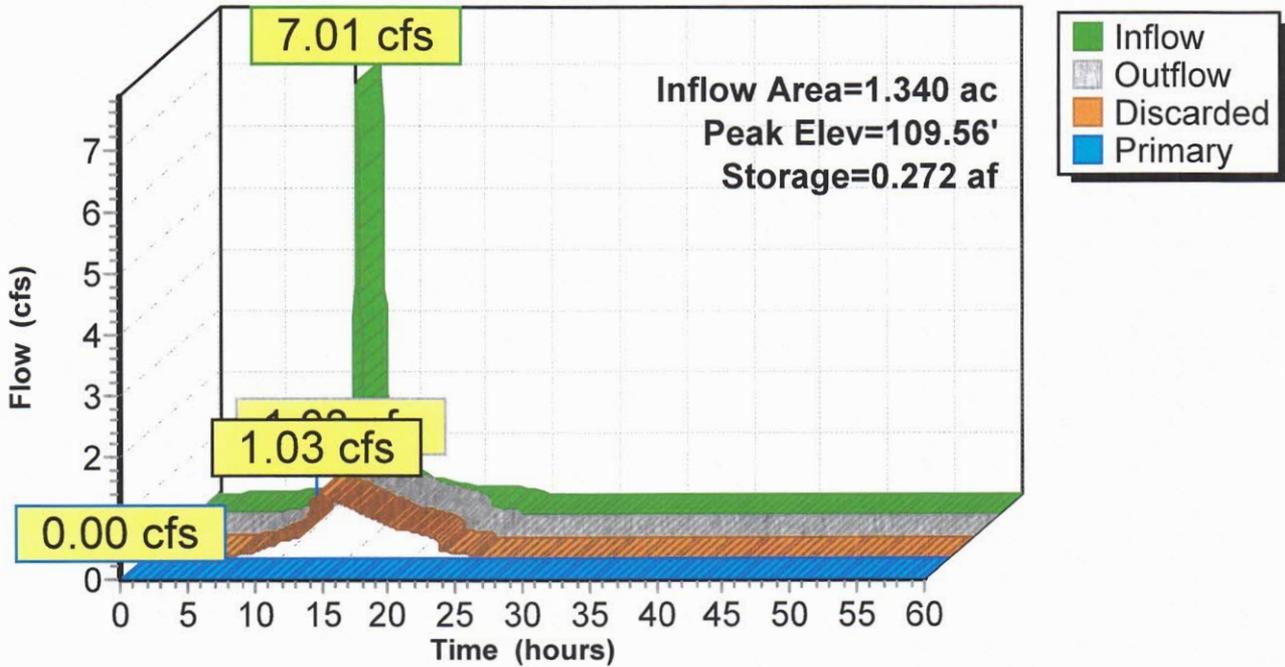
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Summary for Pond 23P: PROP BASIN W/EXFIL

Inflow Area =   1.340 ac, 35.07% Impervious, Inflow Depth = 0.41"   for NJ WQ event
Inflow   =   1.37 cfs @   1.18 hrs, Volume=   0.046 af
Outflow   =   0.39 cfs @   1.48 hrs, Volume=   0.046 af, Atten= 71%, Lag= 17.8 min
Discarded =   0.39 cfs @   1.48 hrs, Volume=   0.046 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 105.97' @ 1.48 hrs Surf.Area= 0.057 ac Storage= 0.019 af

Plug-Flow detention time=22.6 min calculated for 0.046 af (100% of inflow)
Center-of-Mass det. time=22.6 min (102.2 - 79.6)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**5.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 102.33'
#2	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Discarded OutFlow Max=0.39 cfs @ 1.48 hrs HW=105.97' (Free Discharge)
└─**1=Exfiltration** (Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' (Free Discharge)
└─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 2.00 hrs NJ WQ Rainfall=1.25"

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Pond 23P: PROP BASIN W/EXFIL

Hydrograph

1.37 cfs

0.39 cfs

0.00 cfs
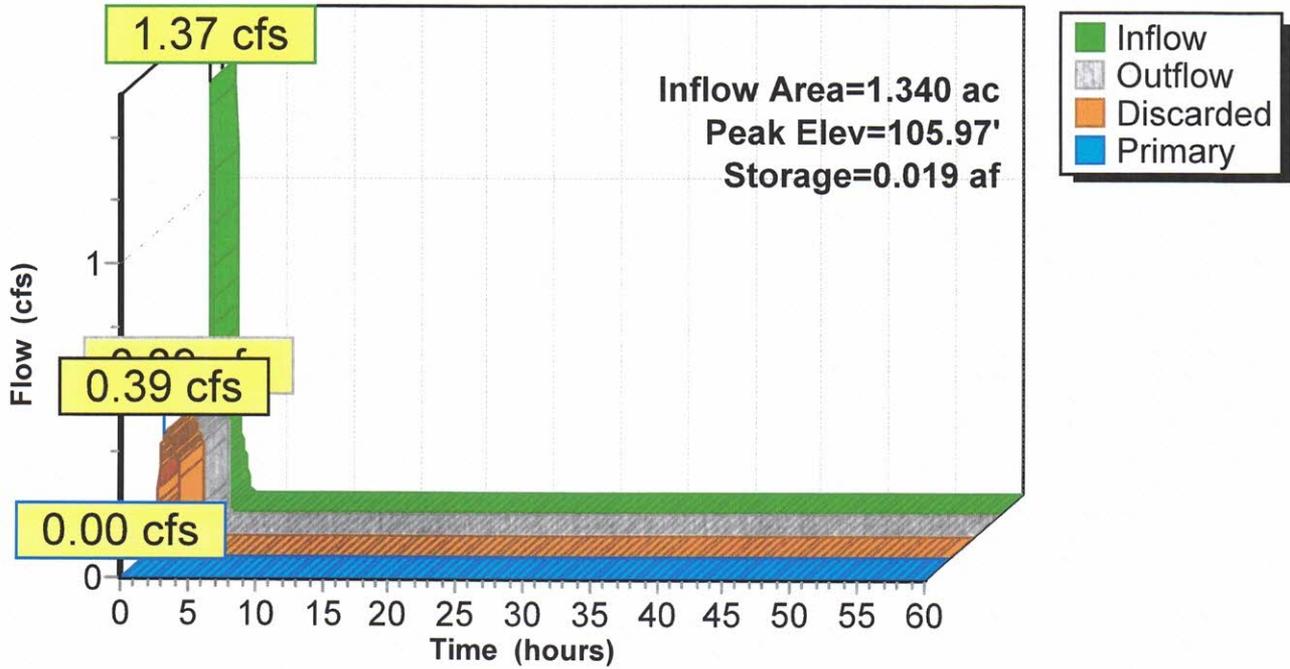
Inflow Area=1.340 ac
Peak Elev=105.97'
Storage=0.019 af

Inflow
Outflow
Discarded
Primary

Summary for Pond 25P: PROP BASIN NO EXFILTRATION

Inflow Area =   1.340 ac, 35.07% Impervious, Inflow Depth = 1.82"   for 2 YR STORM event
Inflow   =   2.03 cfs @ 12.19 hrs, Volume=   0.204 af
Outflow =   0.00 cfs @   0.00 hrs, Volume=   0.000 af, Atten= 100%, Lag= 0.0 min
Primary =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 108.81' @ 24.84 hrs Surf.Area= 0.085 ac Storage= 0.204 af

Plug-Flow detention time=(not calculated: initial storage exceeds outflow)
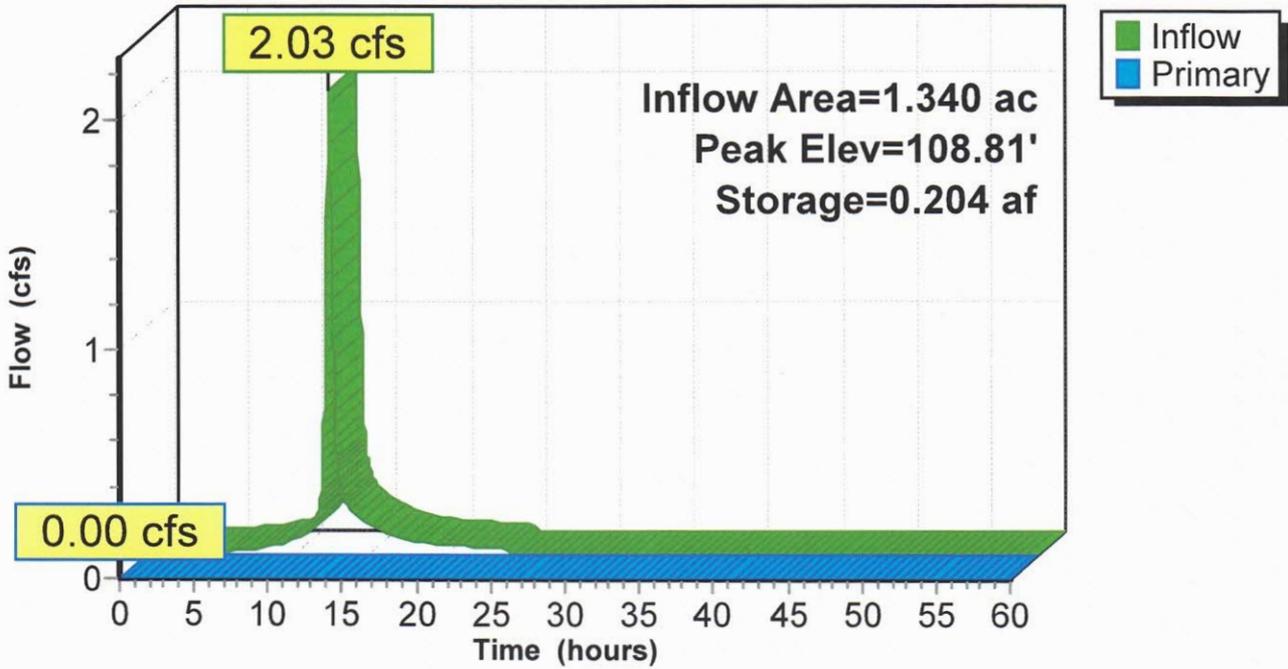Center-of-Mass det. time=(not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' (Free Discharge)
└—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 2 YR STORM Rainfall=3.34"

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Pond 25P: PROP BASIN NO EXFILTRATION

Hydrograph

Inflow Area=1.340 ac
Peak Elev=108.81'
Storage=0.204 af

2.03 cfs
0.00 cfs

Legend: Inflow, Primary

Summary for Pond 25P: PROP BASIN NO EXFILTRATION

Inflow Area =   1.340 ac, 35.07% Impervious, Inflow Depth = 3.22"   for 10 YR STORM event
Inflow   =   3.66 cfs @ 12.19 hrs, Volume=   0.360 af
Outflow   =   0.09 cfs @ 18.67 hrs, Volume=   0.043 af, Atten= 98%, Lag= 388.5 min
Primary   =   0.09 cfs @ 18.67 hrs, Volume=   0.043 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 110.03' @ 18.67 hrs Surf.Area= 0.107 ac Storage= 0.321 af

Plug-Flow detention time= 738.8 min calculated for 0.043 af (12% of inflow)
Center-of-Mass det. time= 450.5 min (1,248.8 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.08 cfs @ 18.67 hrs HW=110.03' (Free Discharge)
└—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.61 fps)
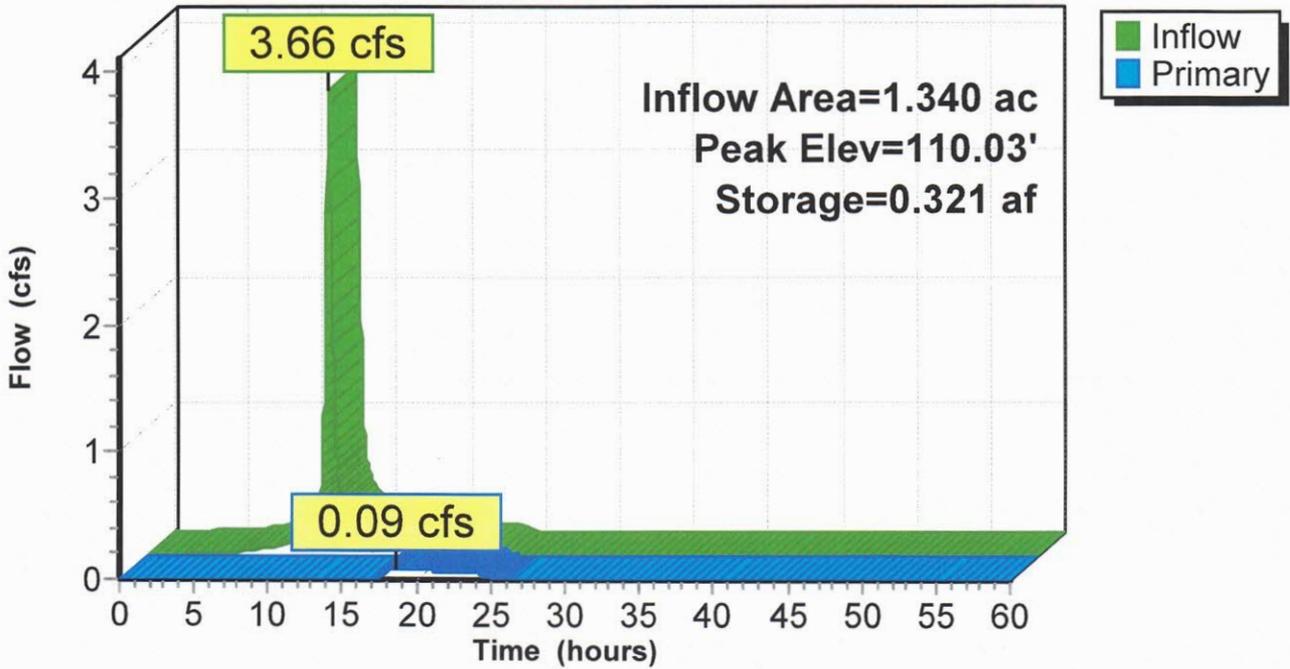
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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Pond 25P: PROP BASIN NO EXFILTRATION

Hydrograph

17053 MORANO

17053 MORANO

Type III 24-hr 100 YR STORM Rainfall=8.24"

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Summary for Pond 25P: PROP BASIN NO EXFILTRATION

Inflow Area =	1.340 ac, 35.07% Impervious, Inflow Depth = 6.14" for 100 YR STORM event			
Inflow =	7.01 cfs @ 12.19 hrs, Volume=	0.686 af		
Outflow =	3.08 cfs @ 12.51 hrs, Volume=	0.369 af, Atten= 56%, Lag= 19.3 min		
Primary =	3.08 cfs @ 12.51 hrs, Volume=	0.369 af		

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 110.37' @ 12.51 hrs Surf.Area= 0.113 ac Storage= 0.358 af

Plug-Flow detention time=246.6 min calculated for 0.369 af (54% of inflow)
Center-of-Mass det. time= 128.8 min (917.5 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=3.07 cfs @ 12.51 hrs HW=110.37' (Free Discharge)
└─1=Sharp-Crested Rectangular Weir (Weir Controls 3.07 cfs @ 2.09 fps)
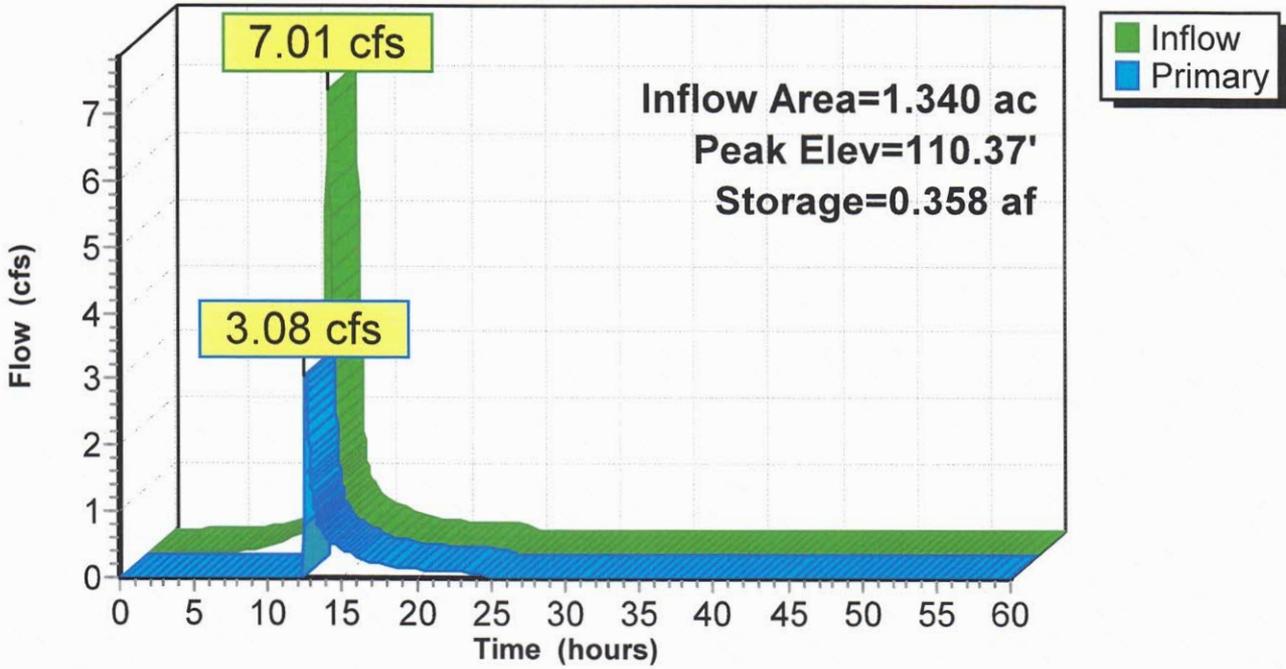
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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Pond 25P: PROP BASIN NO EXFILTRATION

Hydrograph

17053 MORANO
17053 MORANO
Type III 24-hr 2.00 hrs NJ WQ Rainfall=1.25"
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Summary for Pond 25P: PROP BASIN NO EXFILTRATION

Inflow Area =   1.340 ac, 35.07% Impervious, Inflow Depth = 0.41" for NJ WQ event
Inflow   =   1.37 cfs @ 1.18 hrs, Volume=   0.046 af
Outflow =   0.00 cfs @ 0.00 hrs, Volume=   0.000 af, Atten= 100%, Lag= 0.0 min
Primary =   0.00 cfs @ 0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 106.45' @ 2.82 hrs Surf.Area= 0.057 ac Storage= 0.046 af

Plug-Flow detention time=(not calculated: initial storage exceeds outflow)
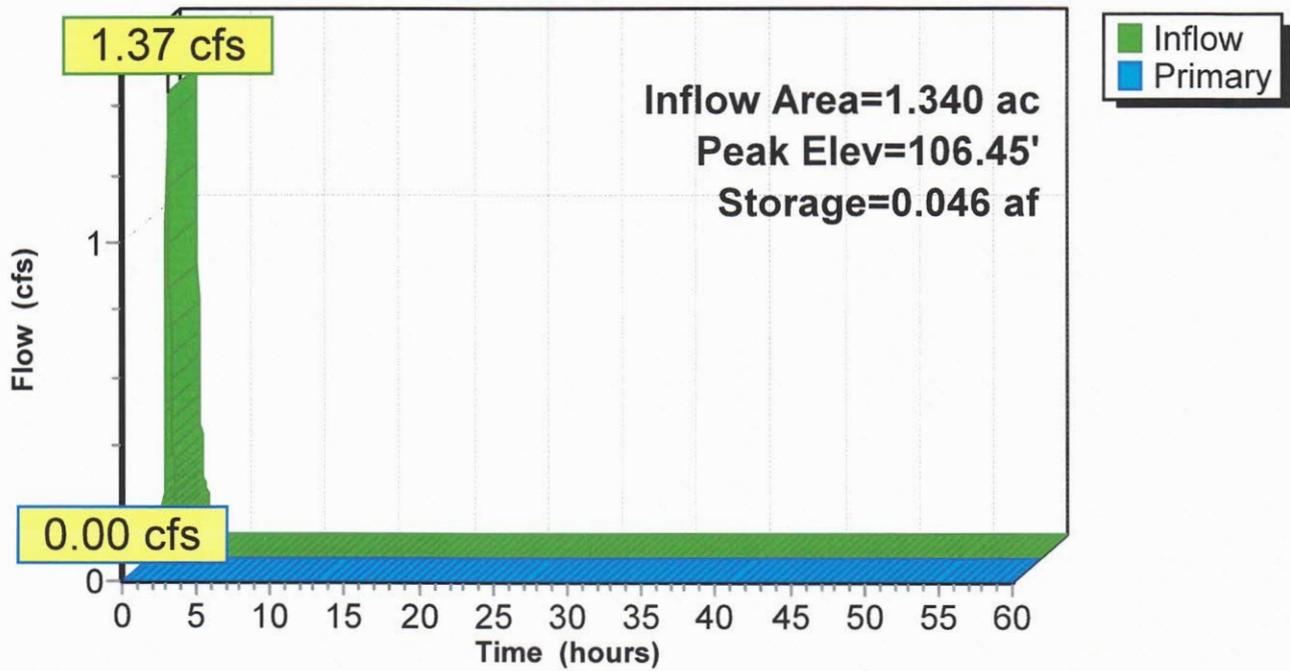Center-of-Mass det. time=(not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' (Free Discharge)
└─1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

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17053 MORANO
Type III 24-hr 2.00 hrs NJ WQ Rainfall=1.25"

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Pond 25P: PROP BASIN NO EXFILTRATION

Hydrograph

Inflow Area=1.340 ac
Peak Elev=106.45'
Storage=0.046 af

1.37 cfs

0.00 cfs

Legend: Inflow (green), Primary (blue)

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project: James & Susan Morano

Date: November 24, 2020

User: Daniel M. Doran, PE & PLS

Notes:

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 =   2.9   Acres

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:				100.0%			100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers	0.0	0.0	0.0	0.0	0.0	0
2	Lawn and Open Space	0.0		2.8	0.0	2.8	221
3	Brush and Shrub	0.0	0.0	0.0	0.0	0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination				0.0	0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt			0.1	0.0	0.1	6
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious					0.0	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0

	HSG A	HSG B	HSG C	HSG D		
HSG Subtotals (Acres):	0.0	0.0	2.9	0.0	**Total Area:**	2.9
HSG Subtotals (%):	0.0%	0.0%	100.0%	0.0%	**Total % Area:**	100.0%

Points Subtotal: 227

Total Existing Site Points: 227

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space			2.5		2.5	194
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious			0.5		0.5	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0

	HSG A	HSG B	HSG C	HSG D		
HSG Subtotals (Acres):	0.0	0.0	2.9	0.0	Total Area:	2.9
HSG Subtotals (%):	0.0%	0.0%	100.0%	0.0%	Total % Area:	100.0%

Points Subtotal: 194

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	16%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	16%	% of Site
Effective Site Impervious Coverage =	16%	% of Site

Specify Source of Maximum Allowable Impervious Coverage: Table   (None or Table)

Allowable Site Impervious Cover from Maximum Impervious Cover Table: 10%

Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal: 0

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =	77%	% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =	100%	% of Site

Points Subtotal: 11

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	0	Feet
Length of Vegetated Runoff Conveyance System =	0	Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: 0

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =		% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =		Acres
Maximum Proposed Cluster Lot Size (Note:1/4 Acre or Less) =		Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =		% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:

Yes	(Yes or No)

Percent of Proposed Lawn Areas to be Graded with Such Equipment:

70%	% of Lawn Areas

Points Subtotal: 16

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):

No	(Yes or No)

Stormwater Runoff Quality Standards (NJAC 7:8-5.5):

No	(Yes or No)

Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):

No	(Yes or No)

Points Subtotal: 0

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 220

Ratio of Proposed to Existing Site Points: 97%

Required Site Points Ratio: 94%

Nonstructural Point System Results: | **Proposed Nonstructural Measures are Adequate**

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DANIEL M. DORAN
NJ PE & PLS 32389
NJ PP 04427

Soil Log and Interpretation

Municipality **FRANKLIN TWP.** Lot **44.01** Block **37.03**

1. Log Number - Method (Check One): **X** Profile Pit _____Boring

2. Soil Log **1**   Depth (inches) **115"**
Top-Bottom
Munsel Color Name and Symbol; Estimated Textural Class: Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling-Abundance, Size and Contrast, If Present

SOIL LOG #1

0-12"   5YR 4/6 Silt Loam, 1% gravel, subangular weak medium, moist, friable

12"-30"   5YR 5/4 Silt Loam, 5% gravel, subangular moderate medium, moist, friable

30"-115"   5YR3/4 Silt Loam, 5% gravel 1% cobbles, subangular moderate medium, moist, friable

Seepage encountered at 105"

3. Ground Water Observations:
       _X_ Seepage –at a depth of: **105"** (inches from top)
       ____ Pit/Boring Flooded - at a depth of: _____ after_____ Hours(inches from top)
4. Soil Limiting Zones (Check Appropriate Categories):
       ____ Fractured Rock Substratum-Depth to Top
       ____ Massive Rock Substratum-Depth to Top
       ____ Excessively Coarse Horizon-Depth Top to Bottom
       ____ Excessively Coarse Substratum-Depth to Top
       ____ Hydraulically Restrictive Horizon-Depth Top to Bottom
       ____ Hydraulically Restrictive Substratum-Depth to Top
       _ _ Perched Zone of Saturation-Depth Top to Bottom
       _X_ Regional Zone of Saturation-Depth to Top,   **105"**

Signature of Site Evaluator/ Date(If no signature Professional Engineer is the Site Evaluator)

_Daniel Doran_____ 32389_____ 7-17-18
Signature of Professional Engineer   License #   Date

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Soil Log and Interpretation

Municipality **FRANKLIN TWP.** Lot **44.01** Block **37.03**

1. Log Number - Method (Check One): **X** Profile Pit _____ Boring

2. Soil Log **2**   Depth (inches) **102"**
Top-Bottom
Munsel Color Name and Symbol; Estimated Textural Class: Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling-Abundance, Size and Contrast, If Present

SOIL LOG #1

0-11"   5YR 4/4 Silt Loam, 1% gravel, subangular weak medium, moist, friable

11"-55"   2.5YR 3/4 Silt Clay Loam, 5% gravel, subangular strong medium, moist, friable

55"-102" 5YR4/6 Silt Loam, 5% gravel 2% cobbles, subangular weak medium, moist, friable

Seepage encountered at 92"

3. Ground Water Observations:
        _X_ Seepage –at a depth of: **92"** (inches from top)
        _____ Pit/Boring Flooded - at a depth of: _____ after _____ Hours(inches from top)
4. Soil Limiting Zones (Check Appropriate Categories):
        _____ Fractured Rock Substratum-Depth to Top
        _____ Massive Rock Substratum-Depth to Top
        _____ Excessively Coarse Horizon-Depth Top to Bottom
        _____ Excessively Coarse Substratum-Depth to Top
        _____ Hydraulically Restrictive Horizon-Depth Top to Bottom
        _____ Hydraulically Restrictive Substratum-Depth to Top
        _ _ Perched Zone of Saturation-Depth Top to Bottom
        _X_ Regional Zone of Saturation-Depth to Top, **92"**

Signature of Site Evaluator/ Date(If no signature Professional Engineer is the Site Evaluator)

_____ 32389_____ 7·17·18____
Signature of Professional Engineer   License #   Date

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Tube Permeameter Test Data

Block **37.03** Lot **44.01** **Franklin Twp., Somerset Cnty., NJ**

1. Test # **1**   Replicate **A**   Date Collected **7-11-2018**

2. Material Tetsed: __ Fill   **X** Native Soil,   Depth **60"**

3. Type of Sample __ Disturbed   **X** Undisturbed

4. Radius of Sample Tube, R, (cm) __ __   Sample Length, L(in) **4.5**

5. Bulk Density: a. Wt. of Sampling Tube _ __ b. Wt. of Tube with Soil Sample _
    Wt. of Sample (b - a) _____

    Volume of Sample, (L)(2.54cm/in)(3.14R^2), cc _ _____
    Bulk Density, (Sample Wt./Sample Volume), g/cc _____

6. Standpipe used: ____ Yes **X** No   Internal Radius of Standpipe, cm _____

7. Height of Water Level above rim of Test Basin, (in)
    At beginning of each test interval, = H(1)
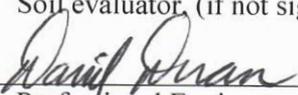   At the end of each test interval, = H(2)

    Rate of Water Level Drop:

Time Interval(min)	H(1)	H(2)
7.0	1.9"	1.5"
7.0	1.9"	1.4"
7.0	1.9"	1.4"
7.0	1.9"	1.4"
7.0	1.9"	1.4"

8. Permeability Rate, (in/hr) = K = (60 min/hr)(L/T)(ln H(1)/H(2))(r / R), *(omit the radius portion of the equation if no standpipe is used)*

    K = **11.76 in/hr**

9. Defects in Sample: **X** None ___ Cracks ___ Worm Channels ___ Root Channel
    ___ Soil/Tube Contact ___ Large Gravel ___ Large Roots
    ___ Dry Soil ___ Smearing ___ Compaction ___ Other(specify)

    _____   _____
    Soil evaluator, (if not signed, engineer was the soil evaluator)   date

    _____   32389   11·17·18
    Professional Engineer   Lic.#   date

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NJ PP 04427

Tube Permeameter Test Data

Block **37.03** Lot **44.01** Franklin Twp., Somerset Cnty., NJ

1.   Test # **1**   Replicate **B**   Date Collected **7-11-2018**

2.   Material Tetsed: __ Fill   **X** Native Soil,   Depth **60"**

3.   Type of Sample __ Disturbed   **X** Undisturbed

4.   Radius of Sample Tube, R, (cm) __ __   Sample Length, L(in) **4.3**

5.   Bulk Density: a. Wt. of Sampling Tube _ __ b. Wt. of Tube with Soil Sample _
      Wt. of Sample (b - a) _____
      Volume of Sample, (L)(2.54cm/in)(3.14R), cc _ _____
      ^{2}
      Bulk Density, (Sample Wt./Sample Volume), g/cc _____

6.   Standpipe used: ____ Yes   **X** No   Internal Radius of Standpipe, cm _____

7.   Height of Water Level above rim of Test Basin, (in)
      At beginning of each test interval, = H(1)
      At the end of each test interval, = H(2)

      Rate of Water Level Drop:

Time Interval(min)	H(1)	H(2)
5.33	**2.0"**	**1.7"**
5.33	**2.0"**	**1.6"**
5.33	**2.0"**	**1.6"**
5.33	**2.0"**	**1.6"**
5.33	**2.0"**	**1.6"**

8.   Permeability Rate, (in/hr) = K = (60 min/hr)(L/T)(ln H(1)/H(2))(r / R), *(omit the radius portion of the equation if no standpipe is used)*
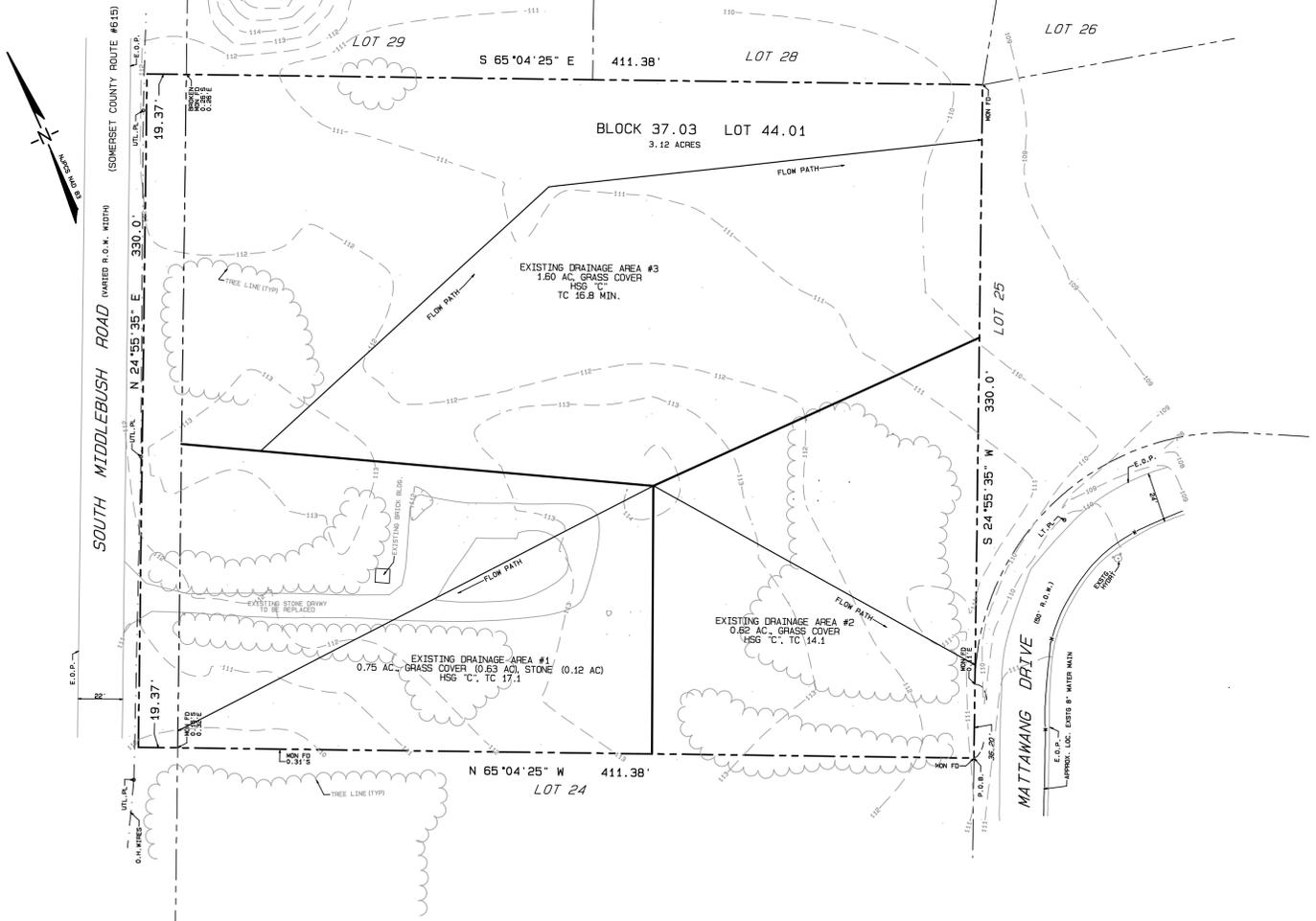
      K = **10.7 in/hr**

9.   Defects in Sample: **X** None ___ Cracks ___ Worm Channels ___ Root Channel
      ___ Soil/Tube Contact ___ Large Gravel ___Large Roots
      ___ Dry Soil ___ Smearing ___ Compaction ___ Other(specify)

_____
      Soil evaluator, (if not signed, engineer was the soil evaluator)   date
      Daniel Doran   32389   11-17-18
      Professional Engineer   Lic.#   date

EXISTING DRAINAGE MAP

- LOT 29
- LOT 28
- LOT 26
- S 65°04'25" E   411.38'
- BLOCK 37.03   LOT 44.01
  3.12 ACRES
- FLOW PATH
- EXISTING DRAINAGE AREA #3
  1.60 AC. GRASS COVER
  HSG "C"
  TC 16.8 MIN.
- EXISTING DRAINAGE AREA #2
  0.62 AC. GRASS COVER
  HSG "C", TC 14.1
- EXISTING DRAINAGE AREA #1
  0.75 AC. GRASS COVER (0.63 AC). STONE (0.12 AC)
  HSG "C", TC 17.1
- SOUTH MIDDLEBUSH ROAD (VARIED R.O.W. WIDTH) (SOMERSET COUNTY ROUTE #615)
- N 24°55'35" E   330.0'
- S 24°55'35" W   330.0'
- N 65°04'25" W   411.38'
- LOT 24
- LOT 25
- MATTAWANG DRIVE
- FLOW PATH
- EXISTING STONE DRIVEWAY TO BE REPLACED
- TREE LINE (TYP)
- 19.37'

PROPOSED DRAIANGE MAP

- LOT 29
- LOT 28
- LOT 26
- S 65°04'25" E   411.38'
- BLOCK 37.03   LOT 44.01
  3.12 ACRES
- PROPOSED DRAINAGE AREA "C"
  1.06 AC. GRASS COVER
  HSG "C", TC 29.5
- PROPOSED SINGLE FAMILY DWELLING
- PROPOSED DRAINAGE AREA "A" (EXCLUDING DRIVEWAY)
  0.47 AC. GRASS COVER HSG "C", TC 15.1
- PROPOSED DRAINAGE AREA "B"
  0.06 AC. GRASS COVER
  HSG "C", TC 13.5 MIN.
- FF 115.53
- GF 114.52
- SEPTIC FIELD
- FLOW PATH
- FLOW INTO BASIN
- SOUTH MIDDLEBUSH ROAD (VARIED R.O.W. WIDTH) (SOMERSET COUNTY ROUTE #615)
- N 24°55'35" E   330.0'
- S 24°55'35" W   330.0'
- N 65°04'25" W   411.38'
- LOT 24
- LOT 25
- MATTAWANG DRIVE
- 19.37'

PROJECT
BLOCK 37.03 LOT 44.01
730 SOUTH MIDDLEBUSH ROAD
FRANKLIN TWP.
SOMERSET CNTY., NJ

DWG. NUMBER : 17053

DWG. TITLE   DRAINAGE AREA MAPS

OWNER & APPLICANT:
JAMES & SUSAN MORANO
1 KINGSBRIDGE ROAD SOMERSET NJ 08873 732-740-4004

DATE	SCALE	DRAWN BY:	CHECK BY:	FIELD BOOK
11-24-2020	1"=40'	TJA	DMD	147GPSTSFL

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GRAPHIC SCALE   1"=40'
0   40   80   120

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Prepared by: _Daniel Doran_ 11.24.20
Daniel M. Doran, PE & PLS   date

STORMWATER MANAGEMENT REPORT

James & Susan Morano
Block 37.03 Lot 44.01
Franklin Twp.
Somerset Cnty., NJ

EXISTING CONDITIONS:

The site, technically known as Block 37.03 Lot 44.01, is located on the easterly side of South Middlebush Road approximately 569' south of Lenape Drive. The south easterly corner of the site has frontage on Mattawang Drive. The site is 2.94 acres in size.

A residential dwelling, (2141 sf footprint), was located on the westerly side of the site. This dwelling has recently been destroyed by fire. With the removal of the dwelling the former owner of the site also removed a frame garage, (481 sf), a metal garage, (2600 sf), and a frame barn, (2027 sf). The remaining portions of the site are a maintained lawn area.

There is no water body located on the site and as per the FEMA mapping the site is not affected by any flood areas. The USDA Soil Survey has mapped the site's soil as Penn Silt Loam having a hydrolic soil group "C". Soil borings have been performed throughout the site and the existing soil conditions do not meet the criteria of a hydric soil.

A majority of the site, (existing drainage areas 2 & 3, 2.22 ac.) currently drain in a northeasterly direction eventually flowing to the easterly boundary of the site. This portion of the site is relatively flat having an average slope of 1%. The southwesterly portion of the site, (existing drainage area 1, 0.65 ac), drain to the southwesterly corner of the property. This portion of the site has an approximate slope of 1.5%. The site has no additional upland drainage areas impacting the drainage pattern of the site.

PROPOSED CONDITIONS:

The applicant is proposing to construct his residence, (8141 sf footprint), on the site. Access to the property will be from South Middlebush Road and Mattawang Drive. The existing stone driveway from

South Middlebush Road will be expanded and paved. A new asphalt driveway from Mattawang Drive is proposed. A proposed stormwater basin will be located on the northeasterly corner of the site. The location of the proposed site improvements are shown on the enclosed drawings.

All of the proposed impervious surfaces will drain into the proposed stormwater system. This system includes a proposed infiltration basin. The roof leaders for the proposed dwelling will be connected to the proposed stormwater system. The stormwater system has been designed to collect the surface runoff of a majority of the site and the system will discharge into the basin. The outflow from the basin has been directed to the easterly boundary of the site. A portion of the site's existing grass areas will not be collected by the stormwater system and the calculations will consider these areas as bypass. The existing drainage pattern of the site will not be altered by the proposed improvements.

Soil logs have been performed within the area of the basin. The location of the logs are shown on the enclosed plans. Soil samples were taken from the logs. Permeability testing has been performed on the existing soil and the slowest permeability rate was found to be 10.7 in/hr. From the soil logs the seasonal high water table was found to be at elevation 102.33 which is greater than two feet below the bottom of the proposed basin. The results of the soil logs and the permeability testing can be found at the end of this report.

WATER QUALITY:

The proposed basin has been designed to permit the entire New Jersey Water Quality Design storm to infiltrate back into the ground. The calculations will show that the water quality design storm will drain from the basin in significantly less time than the maximum seventy-two hours permitted. The total suspended solid (TSS) removal rate of the basin is 80% thereby satisfying the water quality requirements for the proposed development and stormwater management system.

WATER QUANTITY:

The basin has been designed to control the outflow from the site meeting the water quantity requirements. Please see the following Stormwater Summary Table found on sheet 5 of this report. The table shows the existing flow created by the site, the required reduced rates for the existing flow and the total proposed rate of flow created by the proposed conditions. The following chart shows that the proposed rate of flow leaving the site does not exceed the existing reduced flow conditions thus, the water quantity requirement has been met.

RECHARGE:

The existing site conditions create 0.293 af of runoff volume during the 2 year storm event. The proposed conditions create 0.356 af. Thus in order to meet the recharge requirement 0.063 af, (0.356-0.293=0.063) is required to be recharged. The basin has been designed to recharge 0.204 af during the 2 year storm event thus meeting the recharge requirement.

METHODOLOGY:

The NRCS, TR 20, has been utilized to compare the pre and post development peak rates, volumes and hydrographs. The 2, 10, and 100 year storm events have been evaluated. The following calculations have been prepared in accordance with the New Jersey Stormwater Best Management Practices Manual.

CONCLUSIONS:

The following calculations and the stormwater design for the site have been prepared in accordance with NJAC 7:8, and the Standards for Soil Erosion and Sediment Control. The Stormwater Report will show that the site meets the water recharge, quality and quantity requirements. Since these criteria have been met the proposed conditions will provide an adequate drainage system for the proposed development. The existing drainage pattern of the site has not been altered by the proposed conditions and the proposed conditions will have no significant negative impact to the site or the surrounding properties drainage conditions. In fact, it is anticipated that the existing drainage conditions of the site will be improved as a result of the proposed stormwater design.

RIP RAP CALCULATIONS:

Into Basin From Inlet #2
$Q(25 \text{ yr}) = 1.97$ cfs, $D(o) = 1.0$, $q = 1.97/1.0 = 1.97$
$L = [1.8(1.97/1.0^{0.5})] + (7)(1.0) = 10.54'$ say 11', $W = (3)(1.0) + 10.54 = 13.54'$ say 14'

$D_{50} = [0.02/(1.0)(0.2)](1.97)^{1.33} = 0.25'$ use 6" stone

Into basin (from inlet#3): $Q(25) = 1.92$ cfs, $D(o) = 1.0'$ $q=1.92$
$L = [1.8(1.92/1.0^{0.5}) + (7)(1.0) = 10.45'$ say 11', $W = (3)(1.0) + 10.45 = 13.45'$ say 14'

$D_{50} = [0.02/(1.0)(0.2)](1.92)^{1.33} = 0.24'$ use 6" stone

OFFSITE STABILITY:

The proposed basin has been designed to ensure that the rate of flow created by the proposed conditions will be less than the required reduced rate of flow created by the existing conditions. In fact, at the point of discharge for the proposed basin the flows have been significantly reduced. The calculated flow rates have been shown in the Stormwater Summary Table shown on sheet 5 of this report.

Based on the following calculations and the proposed system design, offsite stability has been met as a result of the following:

- the discharge area has a silt loam soil at the surface, this area has an existing slope of 1% which is less than the maximum permitted slope of 2.5%

- flow from the detention basin, during the 100 year storm event, is 3.08 cfs (no exfiltration) which is significantly less than the 10 cfs permitted

- flow over the discharge area is 0.31cfs/ft which is less than the 0.5cfs/ft permitted

- discharge area will have perennial grasses, flow will not concentrate

EMERGENCY SPILLWAY:

The proposed 4' wide weir, located at elevation 110.0, on the southeasterly corner of the basin will function as the basins emergency spillway. The following calculations will show that during the 100 year storm event the spillway will function properly if the basins loses its ability to permit exfiltration of the water entering the basin. The the calculations show that the surface water depth in the basin will be at elevation 110.37 during the 100 year storm event and under an emergency condition.

STORMWATER SUMMARY TABLE

Area, (ac),	Existing	Proposed
Site	2.95	2.95
Impervious	0.00	0.47
Pervious	2.95	2.48
Runoff, (cfs), 2 yr	2.69 cfs	3.32 cfs
10 yr	5.79	6.48
100 yr	12.4	13.15

INFILTRATION BASIN SUMMARY (no infiltration considered)

	Inflow(cfs)	Stage Elev	Primary(cfs)
2 yr	2.03	108.81	0.00
10 yr	3.66	110.03	0.09
100 yr	7.01	110.37	3.08

SITE OUTFLOW SUMMARY (no infiltration considered)

Event	Existing (total, cfs)	*Reduced Permitted Flow From Site*, cfs	Proposed Basin	Bypass cfs	Total cfs
2 yr	2.69	1.35	0.00	1.29	**1.29**
10 yr	5.79	4.34	0.09	2.82	**2.91**
100 yr	12.4	9.92	3.08	6.14	**9.22**

Water Quantity has been met

In order to meet the Water Quality requirements when utilizing an infiltration basin the flow created by the asphalt areas during the NJWQ storm must be infiltrated. The calculations are conservative because we have not separated out the flow created by the dwelling and any grass areas that enter the basin.

Event	Inflow(cfs)	Stage Elev.	Primary	Infiltrated(cfs)
NJWQ	1.37	105.97	0	0.39

Entire NJWQ storm has been infiltrated Water Quality has been met

WATER RECHARGE REQUIREMENT

Proposed 2 yr Runoff Volume, 0.356 af - Existing 2 yr Runoff Volume, 0.293 af = **0.063 af reqd.**

The proposed basin will allow **0.204 af**, of the proposed 2 year storm, to permeate back into the ground

Ground Water Recharge has been met

Rational Methode, Q = ACI
Proposed Storm Sewer Pipe Calculations: $I(25) = 6.17$ $C(imprv) = 0.98$ $C(grass) = 0.35$
$n = 0.013$

Flow into inlets 1 & 2

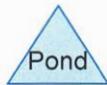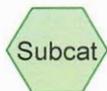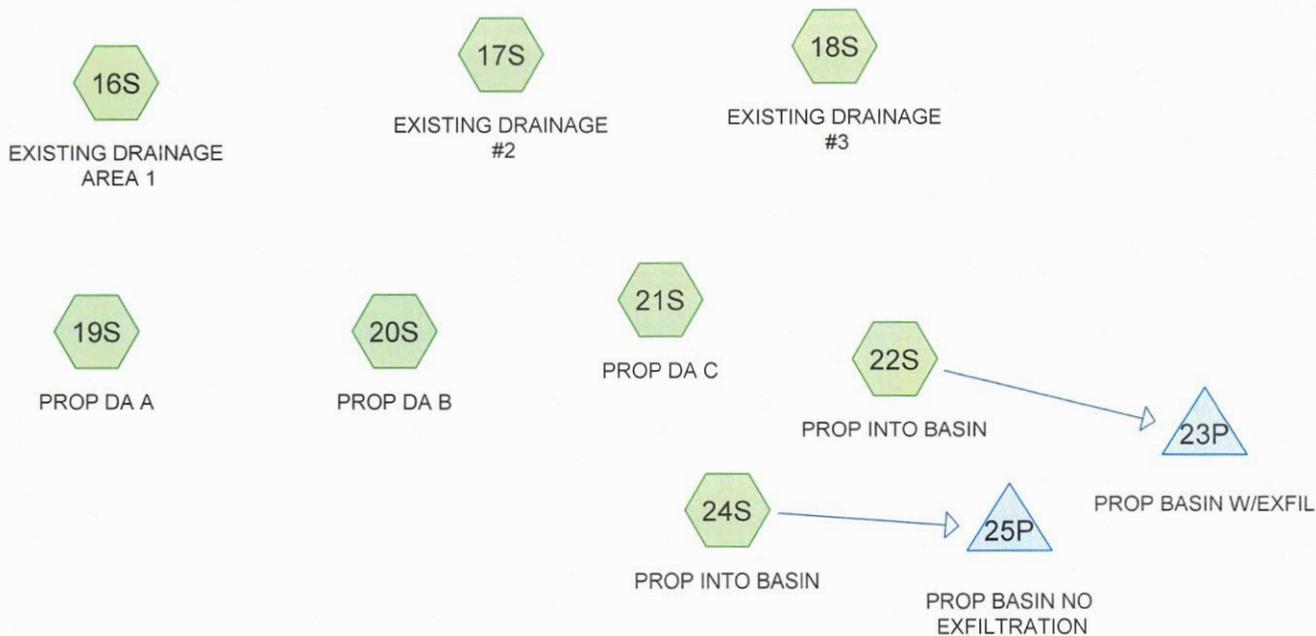$A(imprv) = 0.2$ ac $A(grass) = 0.35$ ac

$Q = [(0.2)(.98) + (0.35)(.35)]6.17 = 1.97$ cfs

Use a 12" dia. HDPE pipe from inlet #1 through inlet #2 and into the basin, (s=0.005, n=0.013, v=3.2 ft/s, Q=2.5 cfs)

Flow into inlet #3 (includes the entire westerly driveway that includes flow into inlet #4)

$A(imprv) = 0.25$ ac $A(grass) = 0.19$

$Q = [(0.25)(0.98) + (0.19)(0.35)]6.17 = 1.92$ cfs

Use a 12" dia. HDPE pipe from inlet #4 into the basin (s=0.005, n=0.013, v=3.2 ft/s, Q=2.5 cfs)

16S

EXISTING DRAINAGE
AREA 1

17S

EXISTING DRAINAGE
#2

18S

EXISTING DRAINAGE
#3

19S

PROP DA A

20S

PROP DA B

21S

PROP DA C

22S

PROP INTO BASIN

23P

PROP BASIN W/EXFIL

24S

PROP INTO BASIN

25P

PROP BASIN NO
EXFILTRATION

Subcat   Reach   Pond   Link

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Type III 24-hr 2 YR STORM Rainfall=3.34"

Page 1

Summary for Subcatchment 16S: EXISTING DRAINAGE AREA 1

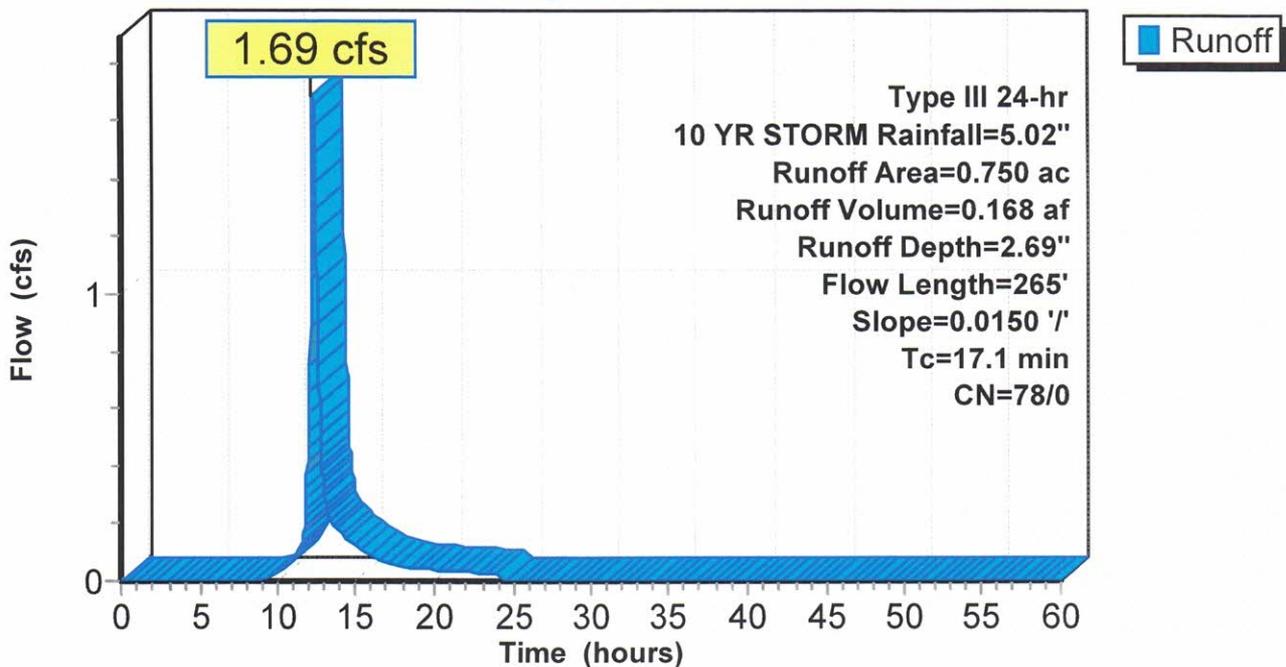Runoff = 0.83 cfs @ 12.25 hrs, Volume= 0.084 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR STORM Rainfall=3.34"

Area (ac)	CN	Description
0.120	96	Gravel surface, HSG C
0.630	74	>75% Grass cover, Good, HSG C
0.750	78	Weighted Average
0.750	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0150	0.17		**Sheet Flow, DA #1**
					Grass: Short n= 0.150 P2= 3.34"
2.2	115	0.0150	0.86		**Shallow Concentrated Flow, DA #1**
					Short Grass Pasture Kv= 7.0 fps
17.1	265	Total			

Subcatchment 16S: EXISTING DRAINAGE AREA 1

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Summary for Subcatchment 16S: EXISTING DRAINAGE AREA 1

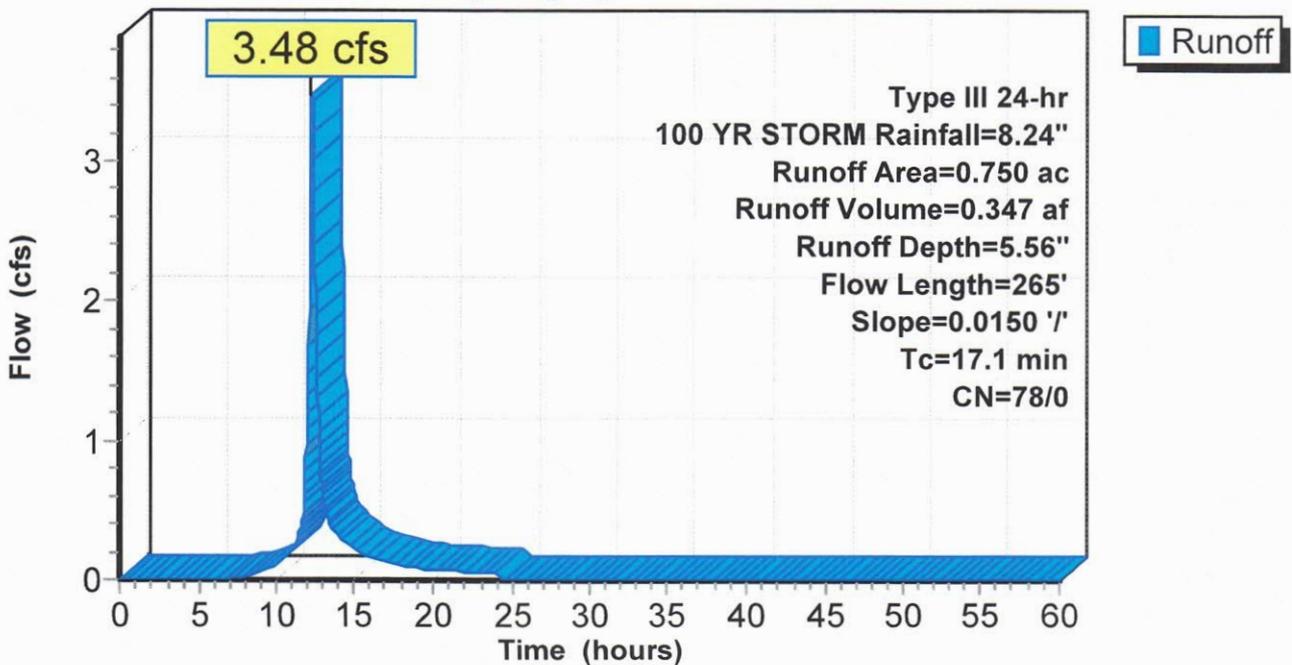Runoff   =   1.69 cfs @ 12.24 hrs, Volume=   0.168 af, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR STORM Rainfall=5.02"

Area (ac)	CN	Description
0.120	96	Gravel surface, HSG C
0.630	74	>75% Grass cover, Good, HSG C
0.750	78	Weighted Average
0.750	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0150	0.17		**Sheet Flow, DA #1**
					Grass: Short n= 0.150 P2= 3.34"
2.2	115	0.0150	0.86		**Shallow Concentrated Flow, DA #1**
					Short Grass Pasture Kv= 7.0 fps
17.1	265	Total			

Subcatchment 16S: EXISTING DRAINAGE AREA 1

Hydrograph

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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Summary for Subcatchment 16S: EXISTING DRAINAGE AREA 1

Runoff   =   3.48 cfs @ 12.23 hrs, Volume=   0.347 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR STORM Rainfall=8.24"

Area (ac)	CN	Description
0.120	96	Gravel surface, HSG C
0.630	74	>75% Grass cover, Good, HSG C
0.750	78	Weighted Average
0.750	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0150	0.17		**Sheet Flow, DA #1**
					Grass: Short n= 0.150 P2= 3.34"
2.2	115	0.0150	0.86		**Shallow Concentrated Flow, DA #1**
					Short Grass Pasture Kv= 7.0 fps
17.1	265	Total			

Subcatchment 16S: EXISTING DRAINAGE AREA 1

Hydrograph

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Summary for Subcatchment 17S: EXISTING DRAINAGE #2

Runoff   =   0.60 cfs @ 12.21 hrs, Volume=   0.058 af, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
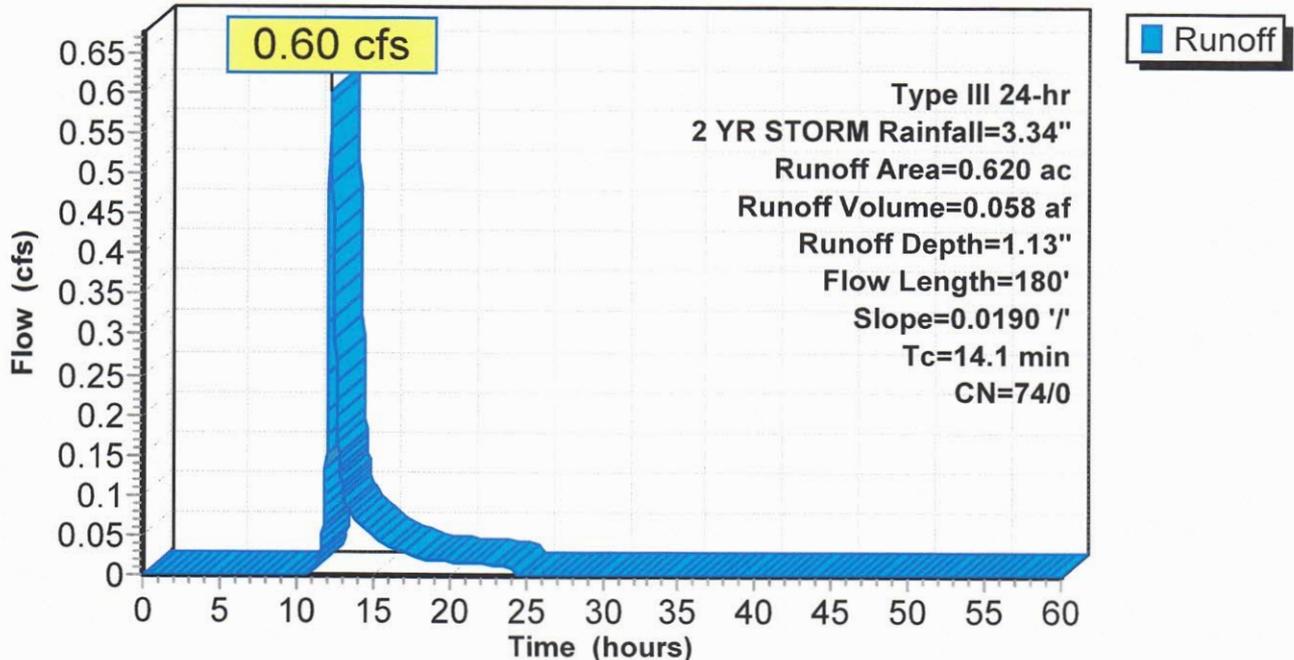Type III 24-hr 2 YR STORM Rainfall=3.34"

Area (ac)	CN	Description
0.620	74	>75% Grass cover, Good, HSG C
0.620	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	150	0.0190	0.18		**Sheet Flow, DA #2**
					Grass: Short n= 0.150 P2= 3.34"
0.5	30	0.0190	0.96		**Shallow Concentrated Flow, DA #2**
					Short Grass Pasture Kv= 7.0 fps
14.1	180	Total			

Subcatchment 17S: EXISTING DRAINAGE #2

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Summary for Subcatchment 17S: EXISTING DRAINAGE #2

Runoff   =   1.33 cfs @ 12.20 hrs, Volume=   0.123 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
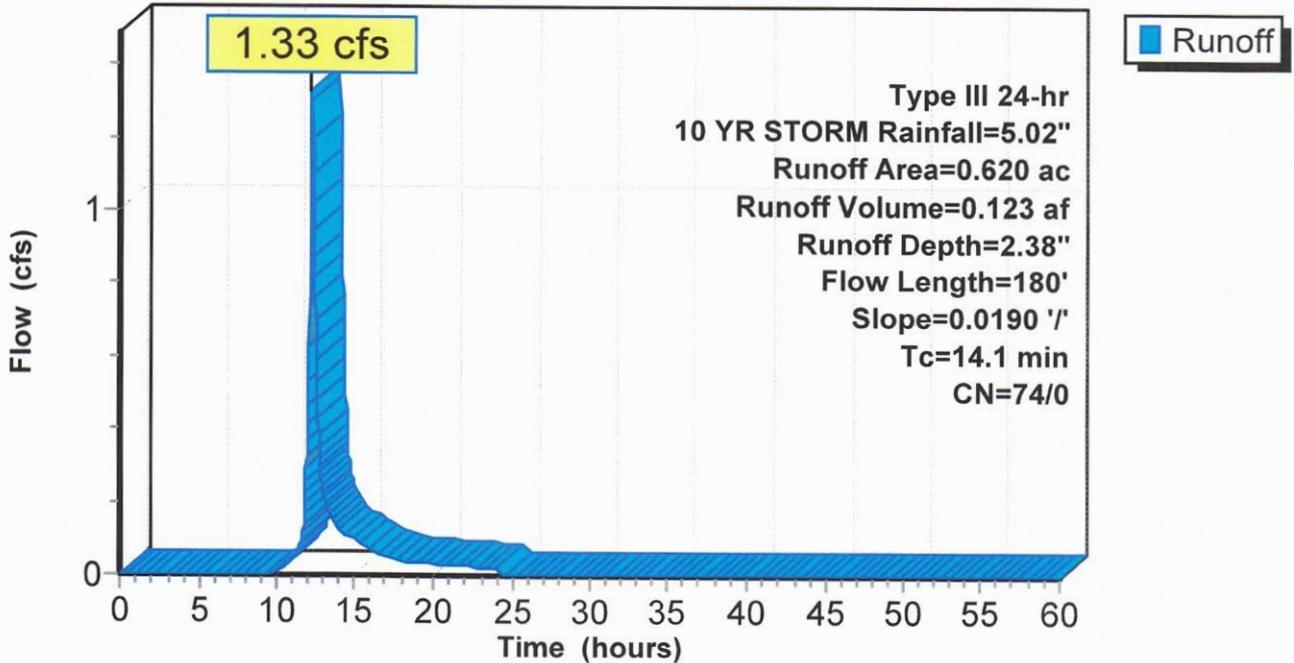Type III 24-hr 10 YR STORM Rainfall=5.02"

Area (ac)	CN	Description
0.620	74	>75% Grass cover, Good, HSG C
0.620	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	150	0.0190	0.18		**Sheet Flow, DA #2**
					Grass: Short n= 0.150 P2= 3.34"
0.5	30	0.0190	0.96		**Shallow Concentrated Flow, DA #2**
					Short Grass Pasture Kv= 7.0 fps
14.1	180	Total			

Subcatchment 17S: EXISTING DRAINAGE #2

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Summary for Subcatchment 17S: EXISTING DRAINAGE #2

Runoff = 2.89 cfs @ 12.19 hrs, Volume= 0.266 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
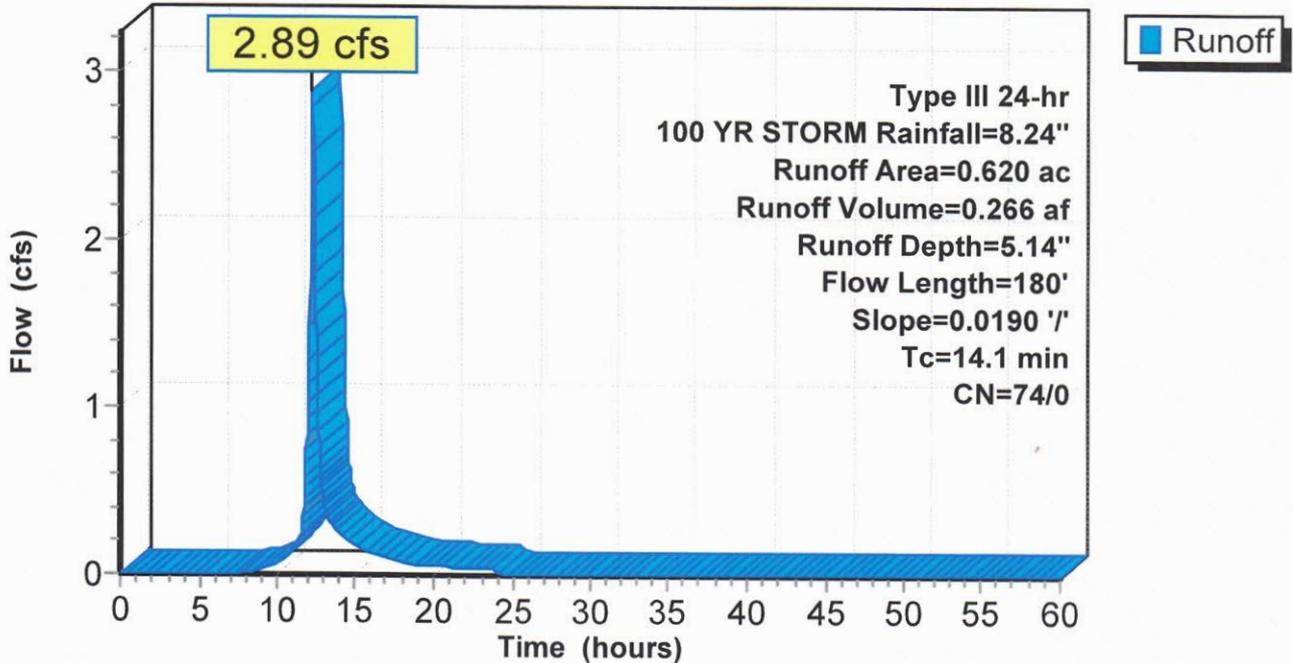Type III 24-hr 100 YR STORM Rainfall=8.24"

Area (ac)	CN	Description
0.620	74	>75% Grass cover, Good, HSG C
0.620	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	150	0.0190	0.18		**Sheet Flow, DA #2**
					Grass: Short n= 0.150 P2= 3.34"
0.5	30	0.0190	0.96		**Shallow Concentrated Flow, DA #2**
					Short Grass Pasture Kv= 7.0 fps
14.1	180	Total			

Subcatchment 17S: EXISTING DRAINAGE #2

Hydrograph

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Type III 24-hr 2 YR STORM Rainfall=3.34"

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Summary for Subcatchment 18S: EXISTING DRAINAGE #3

Runoff   =   1.26 cfs @ 12.36 hrs, Volume=   0.151 af, Depth= 1.13"
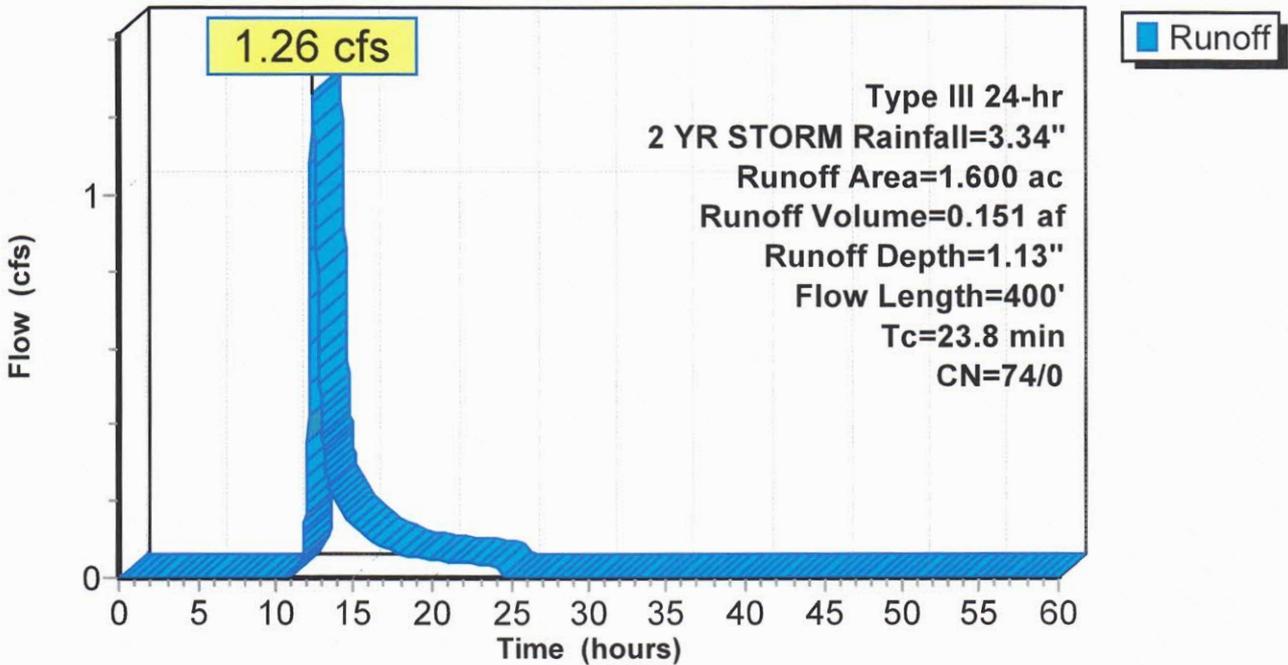
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR STORM Rainfall=3.34"

Area (ac)	CN	Description
1.600	74	>75% Grass cover, Good, HSG C
1.600	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	150	0.0110	0.15		**Sheet Flow, DA #3**
					Grass: Short n= 0.150 P2= 3.34"
0.7	30	0.0110	0.73		**Shallow Concentrated Flow, DA #3**
					Short Grass Pasture Kv= 7.0 fps
6.3	220	0.0070	0.59		**Shallow Concentrated Flow, DA #3**
					Short Grass Pasture Kv= 7.0 fps
23.8	400	Total			

Subcatchment 18S: EXISTING DRAINAGE #3

Hydrograph

1.26 cfs

■ Runoff

Type III 24-hr
2 YR STORM Rainfall=3.34"
Runoff Area=1.600 ac
Runoff Volume=0.151 af
Runoff Depth=1.13"
Flow Length=400'
Tc=23.8 min
CN=74/0

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Summary for Subcatchment 18S: EXISTING DRAINAGE #3

Runoff   =   2.77 cfs @ 12.34 hrs, Volume=   0.317 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
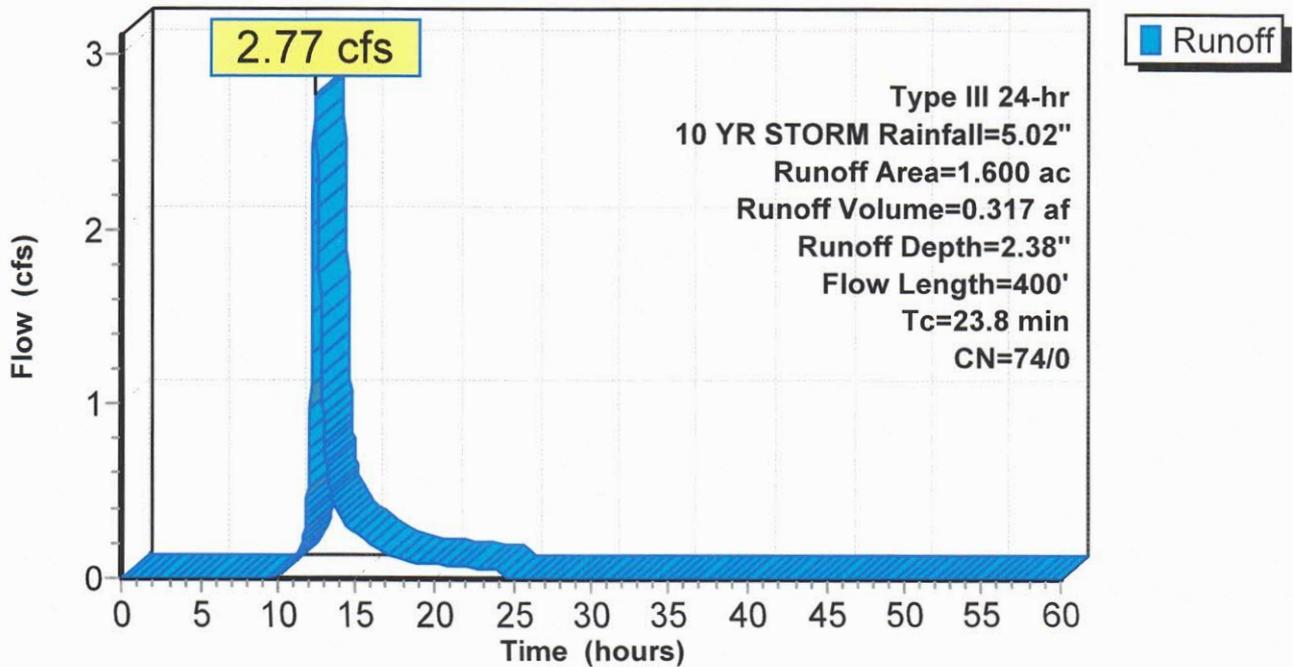Type III 24-hr 10 YR STORM Rainfall=5.02"

Area (ac)	CN	Description
1.600	74	>75% Grass cover, Good, HSG C
1.600	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	150	0.0110	0.15		**Sheet Flow, DA #3**
					Grass: Short n= 0.150 P2= 3.34"
0.7	30	0.0110	0.73		**Shallow Concentrated Flow, DA #3**
					Short Grass Pasture Kv= 7.0 fps
6.3	220	0.0070	0.59		**Shallow Concentrated Flow, DA #3**
					Short Grass Pasture Kv= 7.0 fps
23.8	400	Total			

Subcatchment 18S: EXISTING DRAINAGE #3

Hydrograph

Summary for Subcatchment 18S: EXISTING DRAINAGE #3

Runoff   =   6.03 cfs @ 12.33 hrs, Volume=   0.685 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
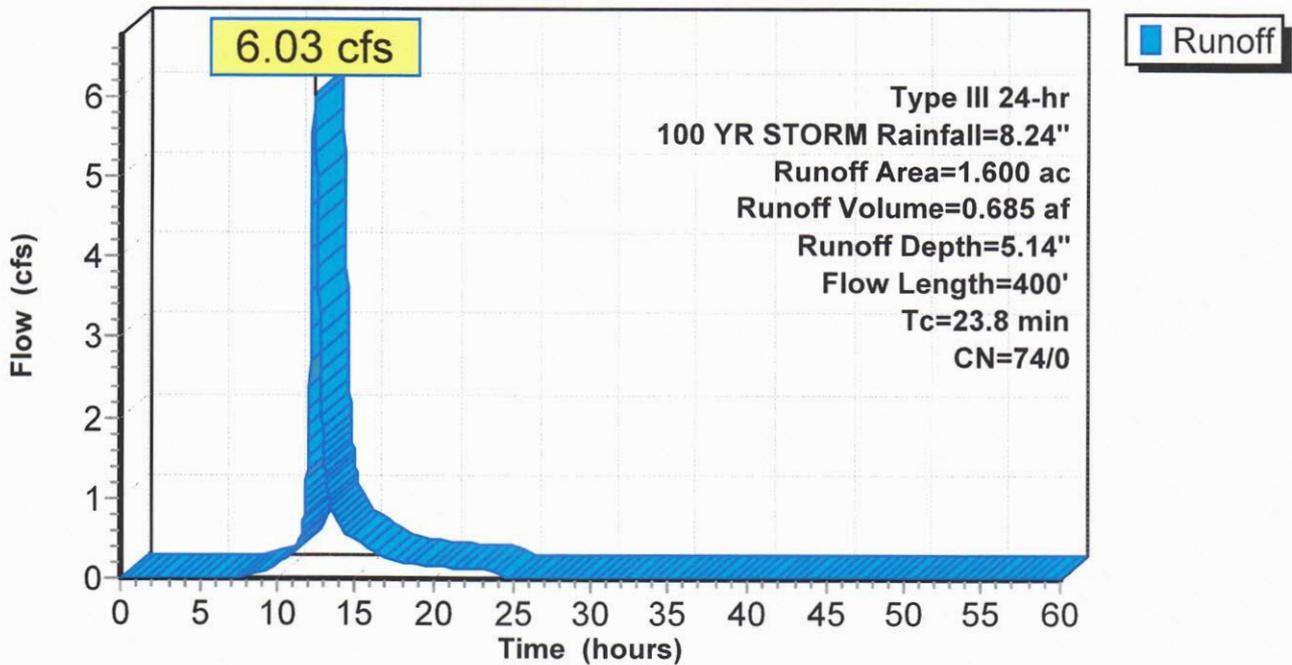Type III 24-hr 100 YR STORM Rainfall=8.24"

Area (ac)	CN	Description
1.600	74	>75% Grass cover, Good, HSG C
1.600	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	150	0.0110	0.15		**Sheet Flow, DA #3**
					Grass: Short n= 0.150 P2= 3.34"
0.7	30	0.0110	0.73		**Shallow Concentrated Flow, DA #3**
					Short Grass Pasture Kv= 7.0 fps
6.3	220	0.0070	0.59		**Shallow Concentrated Flow, DA #3**
					Short Grass Pasture Kv= 7.0 fps
23.8	400	Total			

Subcatchment 18S: EXISTING DRAINAGE #3

Hydrograph

6.03 cfs

Type III 24-hr
100 YR STORM Rainfall=8.24"
Runoff Area=1.600 ac
Runoff Volume=0.685 af
Runoff Depth=5.14"
Flow Length=400'
Tc=23.8 min
CN=74/0

■ Runoff

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Summary for Subcatchment 19S: PROP DA A

Runoff   =   0.45 cfs @ 12.22 hrs, Volume=   0.044 af, Depth= 1.13"
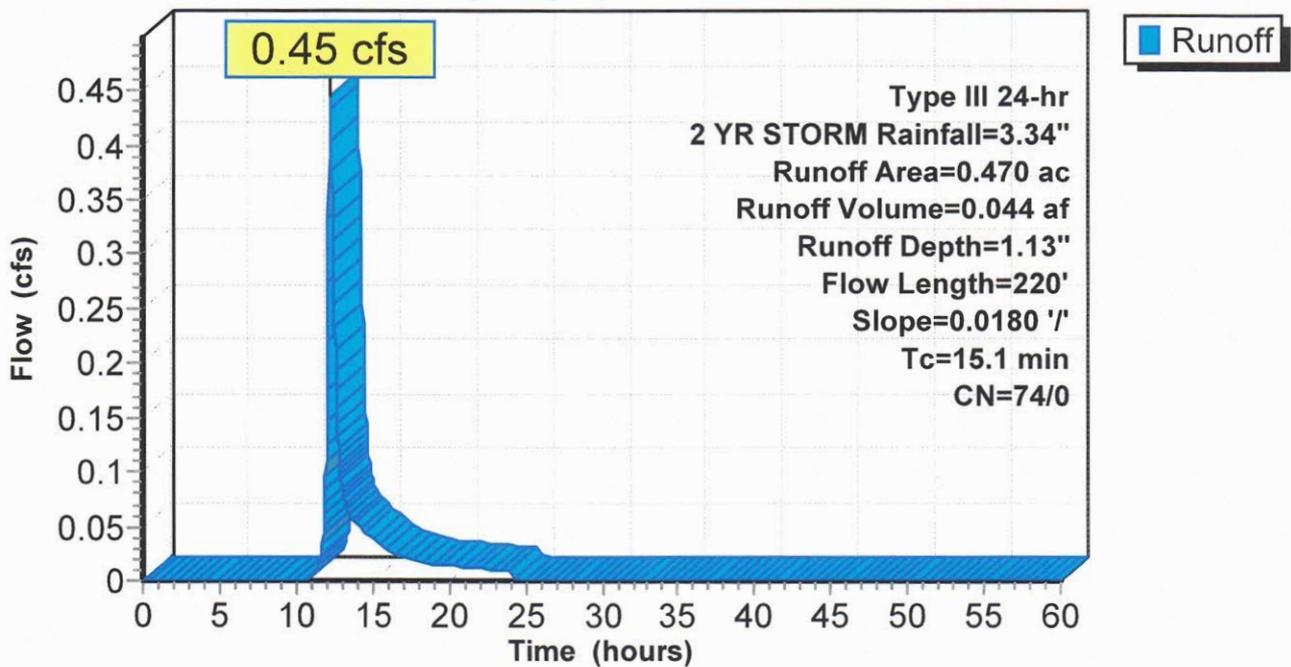
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR STORM Rainfall=3.34"

Area (ac)	CN	Description
0.350	74	>75% Grass cover, Good, HSG C
0.120	74	>75% Grass cover, Good, HSG C
0.470	74	Weighted Average
0.470	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	150	0.0180	0.18		**Sheet Flow, PROP DA A**
					Grass: Short n= 0.150 P2= 3.34"
1.2	70	0.0180	0.94		**Shallow Concentrated Flow, PROP DA A**
					Short Grass Pasture Kv= 7.0 fps
15.1	220	Total			

Subcatchment 19S: PROP DA A

Hydrograph

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Summary for Subcatchment 19S: PROP DA A

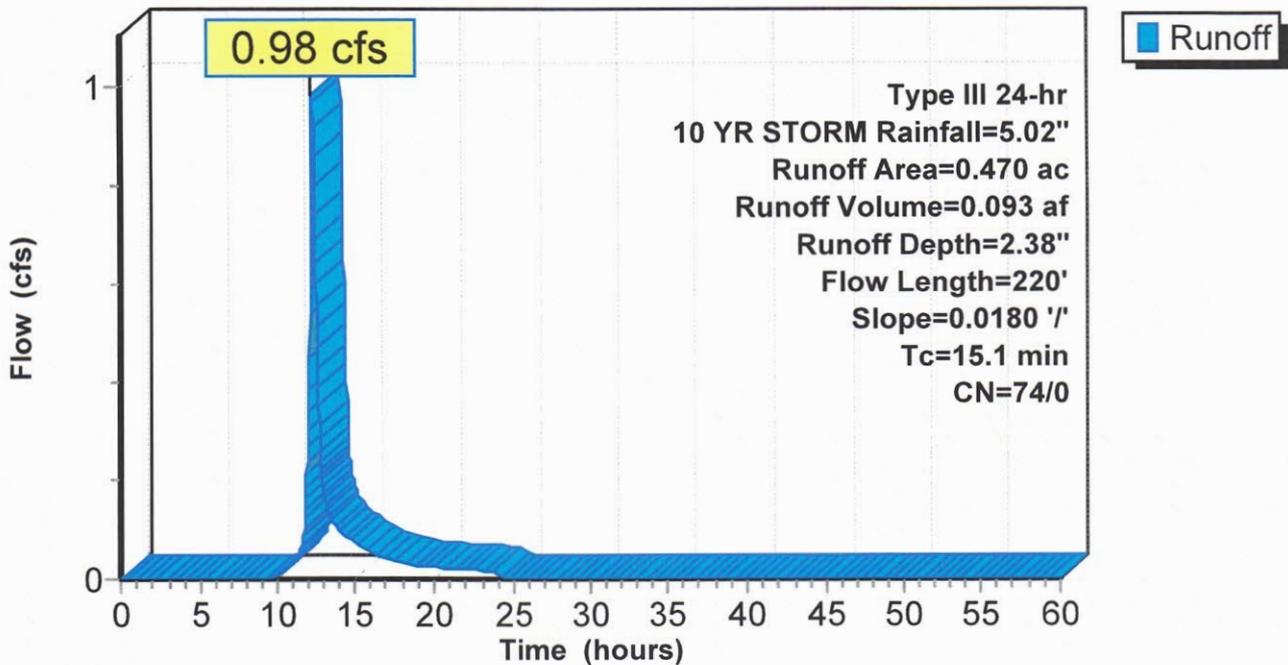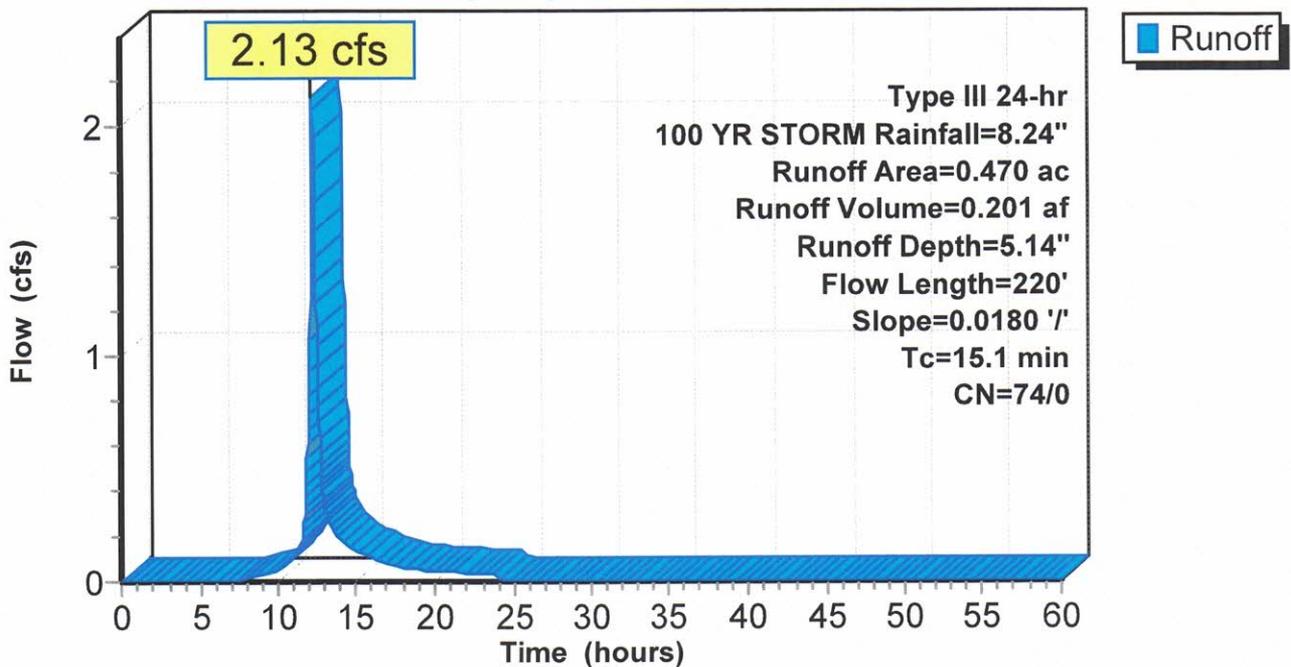Runoff   =   0.98 cfs @ 12.21 hrs, Volume=   0.093 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR STORM Rainfall=5.02"

Area (ac)	CN	Description
0.350	74	>75% Grass cover, Good, HSG C
0.120	74	>75% Grass cover, Good, HSG C
0.470	74	Weighted Average
0.470	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	150	0.0180	0.18		**Sheet Flow, PROP DA A**
					Grass: Short n= 0.150 P2= 3.34"
1.2	70	0.0180	0.94		**Shallow Concentrated Flow, PROP DA A**
					Short Grass Pasture Kv= 7.0 fps
15.1	220	Total			

Subcatchment 19S: PROP DA A

Hydrograph

0.98 cfs

■ Runoff

**Type III 24-hr
10 YR STORM Rainfall=5.02"
Runoff Area=0.470 ac
Runoff Volume=0.093 af
Runoff Depth=2.38"
Flow Length=220'
Slope=0.0180 '/'
Tc=15.1 min
CN=74/0**

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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Summary for Subcatchment 19S: PROP DA A

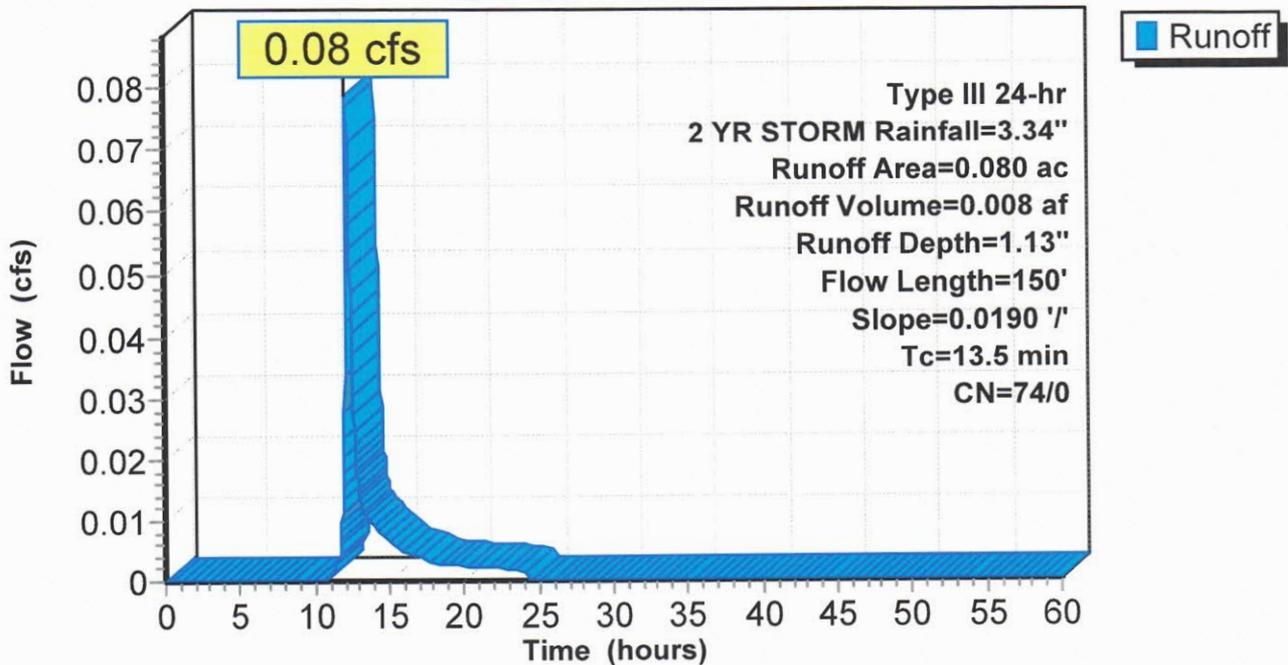Runoff   =   2.13 cfs @ 12.21 hrs, Volume=   0.201 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR STORM Rainfall=8.24"

Area (ac)	CN	Description
0.350	74	>75% Grass cover, Good, HSG C
0.120	74	>75% Grass cover, Good, HSG C
0.470	74	Weighted Average
0.470	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	150	0.0180	0.18		**Sheet Flow, PROP DA A**
					Grass: Short n= 0.150 P2= 3.34"
1.2	70	0.0180	0.94		**Shallow Concentrated Flow, PROP DA A**
					Short Grass Pasture Kv= 7.0 fps
15.1	220	Total			

Subcatchment 19S: PROP DA A

Hydrograph

Type III 24-hr
100 YR STORM Rainfall=8.24"
Runoff Area=0.470 ac
Runoff Volume=0.201 af
Runoff Depth=5.14"
Flow Length=220'
Slope=0.0180 '/'
Tc=15.1 min
CN=74/0

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Type III 24-hr 2 YR STORM Rainfall=3.34"

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Summary for Subcatchment 20S: PROP DA B

Runoff   =   0.08 cfs @ 12.20 hrs, Volume=   0.008 af, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR STORM Rainfall=3.34"

Area (ac)	CN	Description
0.080	74	>75% Grass cover, Good, HSG C
0.080	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	150	0.0190	0.18		**Sheet Flow, PROP DA B**
					Grass: Short n= 0.150 P2= 3.34"

Subcatchment 20S: PROP DA B

Hydrograph

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Summary for Subcatchment 20S: PROP DA B

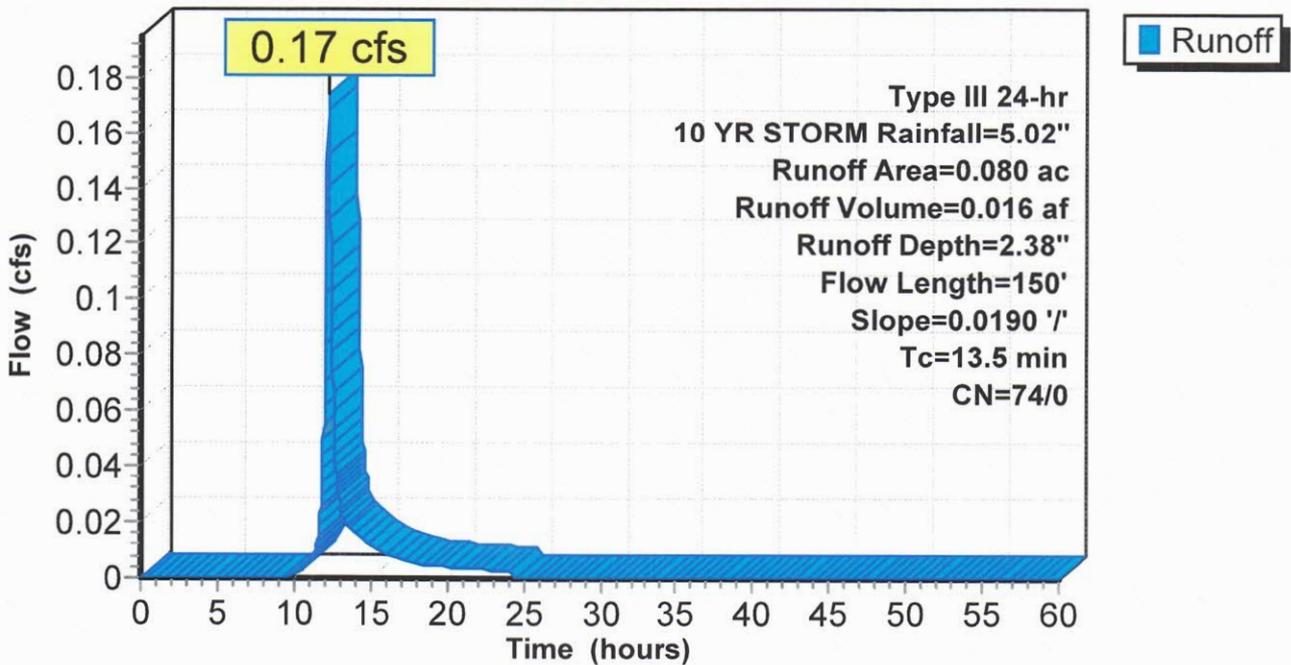Runoff   =   0.17 cfs @ 12.19 hrs, Volume=   0.016 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR STORM Rainfall=5.02"

Area (ac)	CN	Description
0.080	74	>75% Grass cover, Good, HSG C
0.080	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	150	0.0190	0.18		**Sheet Flow, PROP DA B**
					Grass: Short n= 0.150 P2= 3.34"

Subcatchment 20S: PROP DA B

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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Summary for Subcatchment 20S: PROP DA B

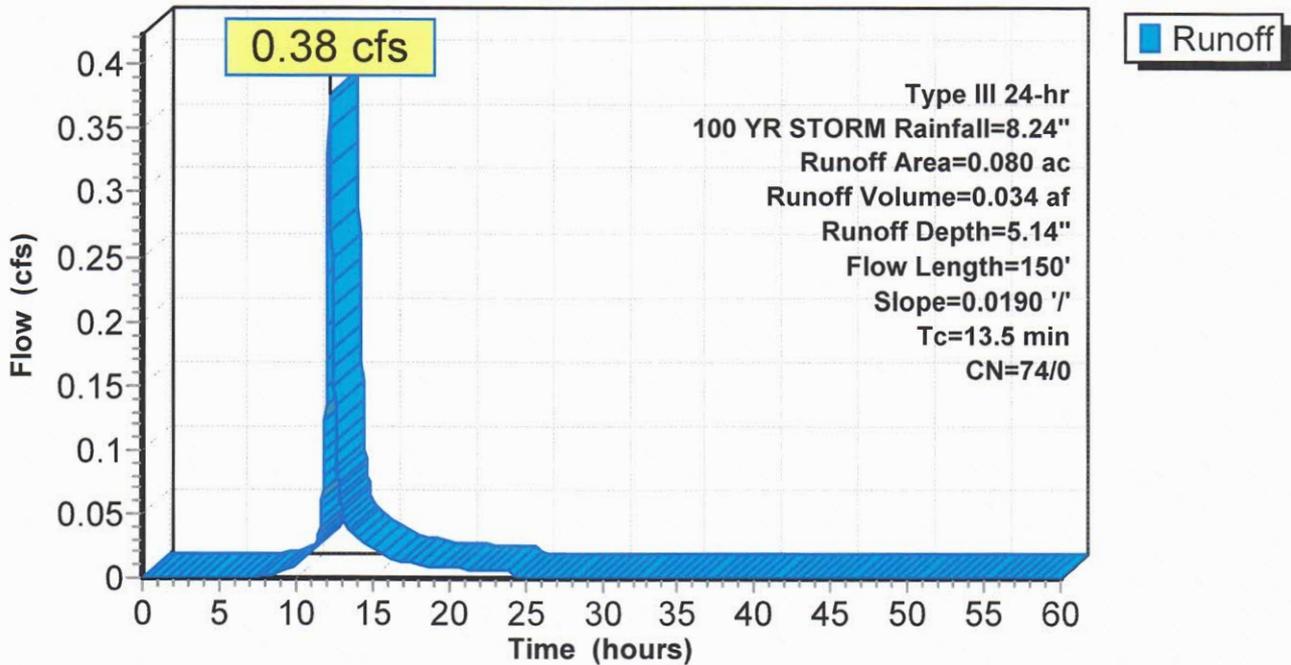Runoff = 0.38 cfs @ 12.19 hrs, Volume= 0.034 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR STORM Rainfall=8.24"

Area (ac)	CN	Description
0.080	74	>75% Grass cover, Good, HSG C
0.080	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	150	0.0190	0.18		Sheet Flow, PROP DA B Grass: Short n= 0.150 P2= 3.34"

Subcatchment 20S: PROP DA B

Hydrograph

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Type III 24-hr 2 YR STORM Rainfall=3.34"

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Summary for Subcatchment 21S: PROP DA C

Runoff   =   0.76 cfs @ 12.44 hrs, Volume=   0.100 af, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
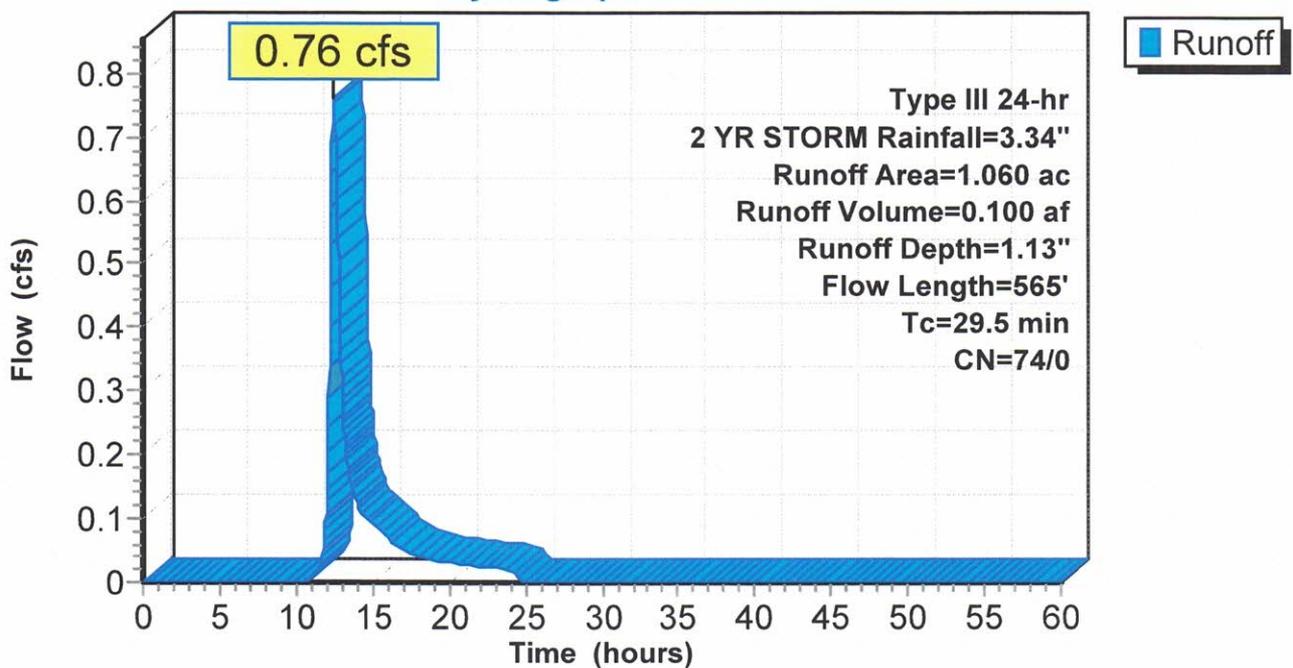Type III 24-hr 2 YR STORM Rainfall=3.34"

Area (ac)	CN	Description
1.060	74	>75% Grass cover, Good, HSG C
1.060	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	150	0.0100	0.14		**Sheet Flow, DA C**
					Grass: Short n= 0.150 P2= 3.34"
5.8	230	0.0090	0.66		**Shallow Concentrated Flow, DA C**
					Short Grass Pasture Kv= 7.0 fps
6.2	185	0.0050	0.49		**Shallow Concentrated Flow, DA C**
					Short Grass Pasture Kv= 7.0 fps
29.5	565	Total			

Subcatchment 21S: PROP DA C

Hydrograph

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Summary for Subcatchment 21S: PROP DA C

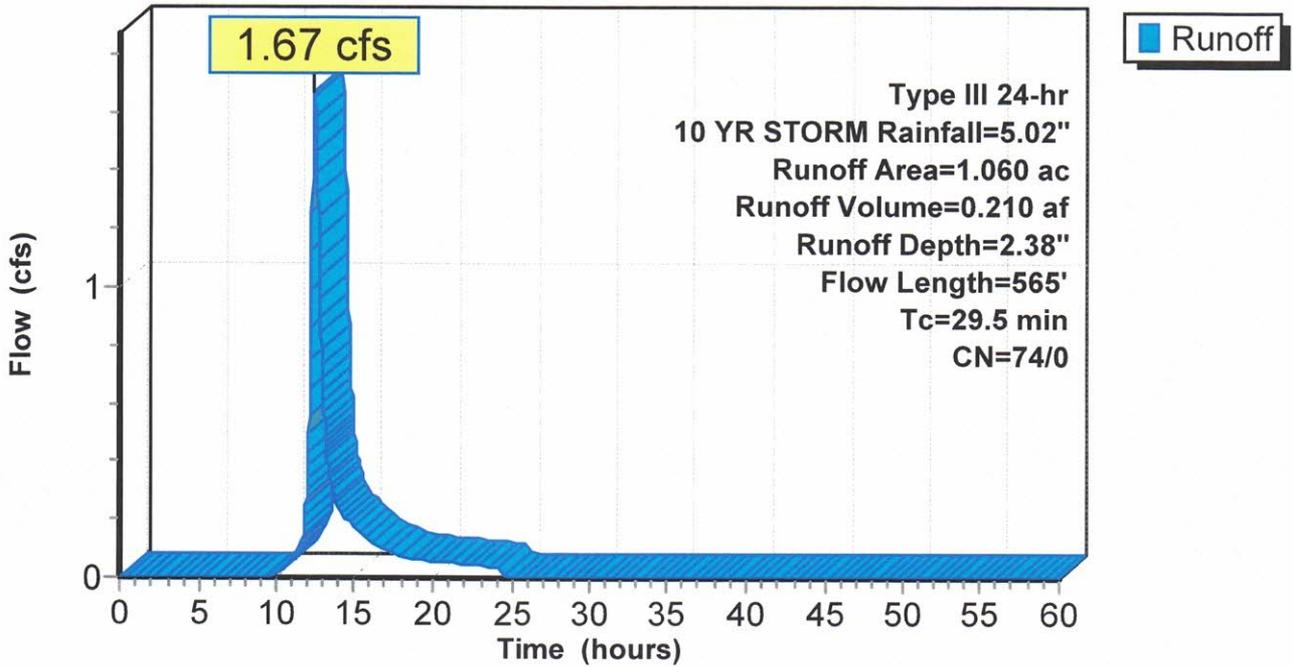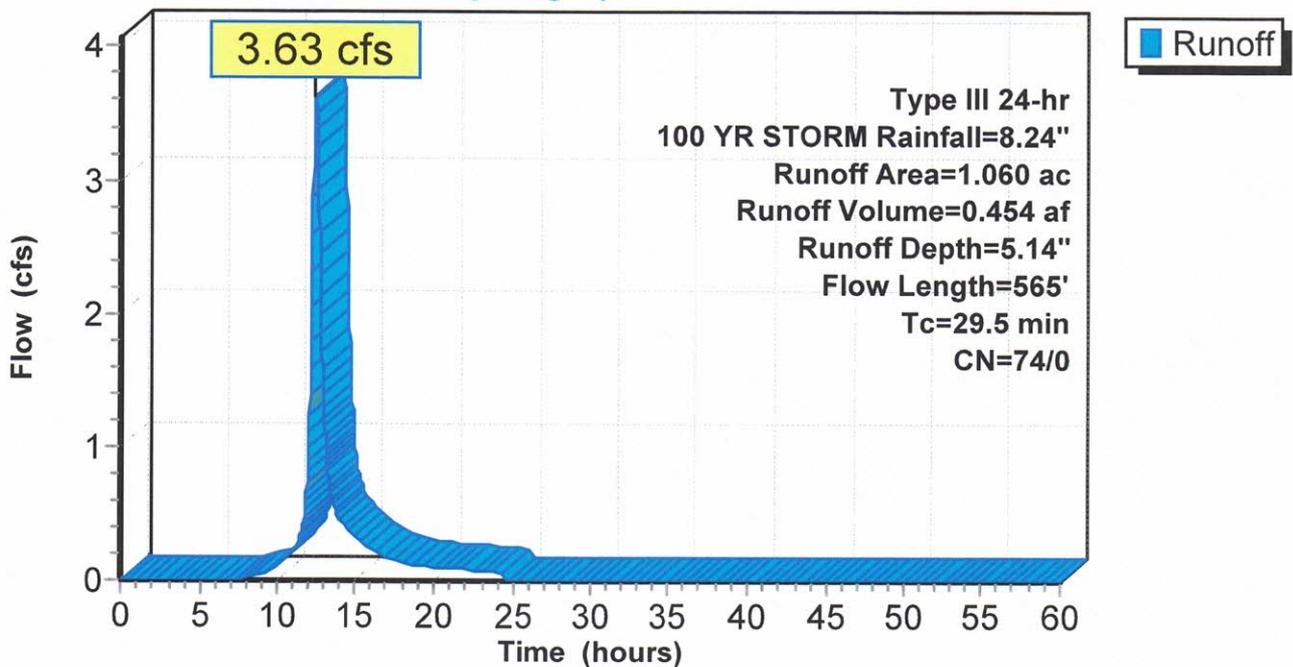Runoff   =   1.67 cfs @ 12.42 hrs, Volume=   0.210 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR STORM Rainfall=5.02"

Area (ac)	CN	Description
1.060	74	>75% Grass cover, Good, HSG C
1.060	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	150	0.0100	0.14		**Sheet Flow, DA C**
					Grass: Short n= 0.150 P2= 3.34"
5.8	230	0.0090	0.66		**Shallow Concentrated Flow, DA C**
					Short Grass Pasture Kv= 7.0 fps
6.2	185	0.0050	0.49		**Shallow Concentrated Flow, DA C**
					Short Grass Pasture Kv= 7.0 fps
29.5	565	Total			

Subcatchment 21S: PROP DA C

Hydrograph

1.67 cfs

Type III 24-hr
10 YR STORM Rainfall=5.02"
Runoff Area=1.060 ac
Runoff Volume=0.210 af
Runoff Depth=2.38"
Flow Length=565'
Tc=29.5 min
CN=74/0

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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Summary for Subcatchment 21S: PROP DA C

Runoff = 3.63 cfs @ 12.41 hrs, Volume= 0.454 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR STORM Rainfall=8.24"

Area (ac)	CN	Description
1.060	74	>75% Grass cover, Good, HSG C
1.060	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.5	150	0.0100	0.14		**Sheet Flow, DA C**
					Grass: Short n= 0.150 P2= 3.34"
5.8	230	0.0090	0.66		**Shallow Concentrated Flow, DA C**
					Short Grass Pasture Kv= 7.0 fps
6.2	185	0.0050	0.49		**Shallow Concentrated Flow, DA C**
					Short Grass Pasture Kv= 7.0 fps
29.5	565	Total			

Subcatchment 21S: PROP DA C

Hydrograph

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Type III 24-hr 2 YR STORM Rainfall=3.34"

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Summary for Subcatchment 22S: PROP INTO BASIN

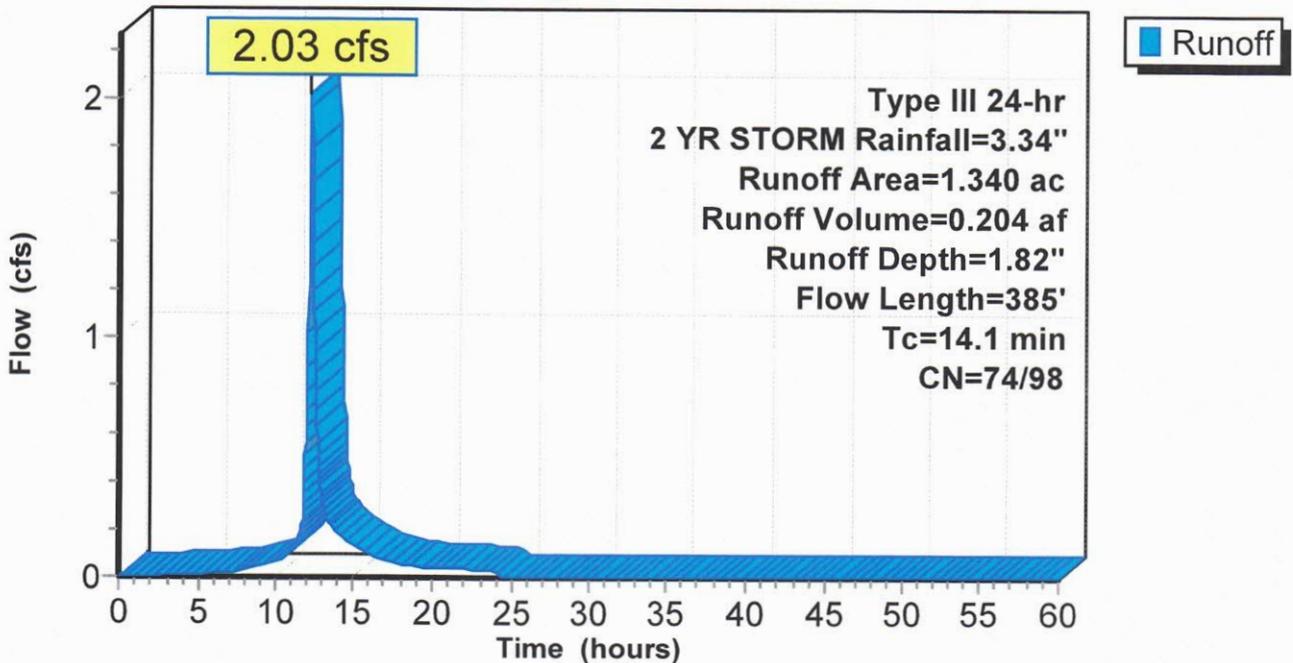Runoff   =   2.03 cfs @ 12.19 hrs, Volume=   0.204 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR STORM Rainfall=3.34"

	Area (ac)	CN	Description
*	0.470	98	ALL IMPERVIOUS
	0.870	74	>75% Grass cover, Good, HSG C
	1.340	82	Weighted Average
	0.870	74	64.93% Pervious Area
	0.470	98	35.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	150	0.0200	0.19		**Sheet Flow, DA C INTO BASIN**
					Grass: Short n= 0.150 P2= 3.34"
0.9	235	0.0100	4.54	3.56	**Pipe Channel, DA C INTO BASIN**
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
14.1	385				Total

Subcatchment 22S: PROP INTO BASIN

Hydrograph

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Type III 24-hr 10 YR STORM Rainfall=5.02"

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Summary for Subcatchment 22S: PROP INTO BASIN

Runoff   =   3.66 cfs @   12.19 hrs, Volume=   0.360 af, Depth= 3.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
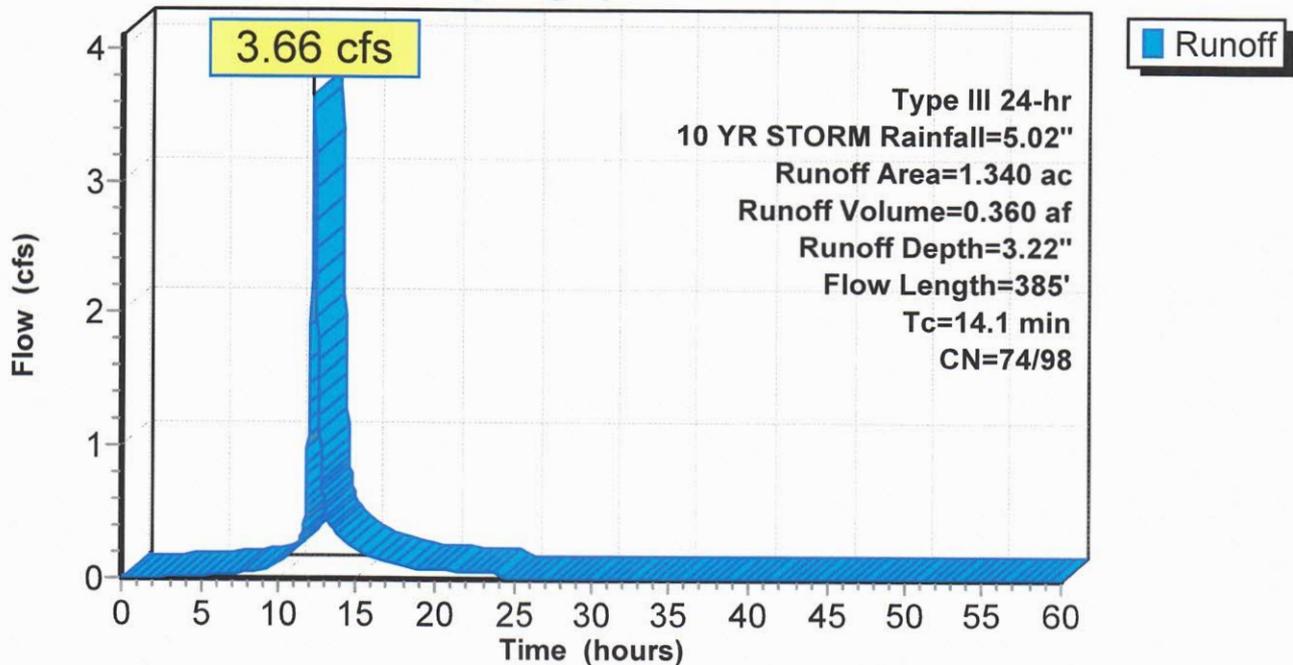Type III 24-hr 10 YR STORM Rainfall=5.02"

	Area (ac)	CN	Description
*	0.470	98	ALL IMPERVIOUS
	0.870	74	>75% Grass cover, Good, HSG C
	1.340	82	Weighted Average
	0.870	74	64.93% Pervious Area
	0.470	98	35.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	150	0.0200	0.19		**Sheet Flow, DA C INTO BASIN**
					Grass: Short n= 0.150 P2= 3.34"
0.9	235	0.0100	4.54	3.56	**Pipe Channel, DA C INTO BASIN**
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
14.1	385	Total			

Subcatchment 22S: PROP INTO BASIN

Hydrograph

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Type III 24-hr 100 YR STORM Rainfall=8.24"

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Summary for Subcatchment 22S: PROP INTO BASIN

Runoff = 7.01 cfs @ 12.19 hrs, Volume= 0.686 af, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
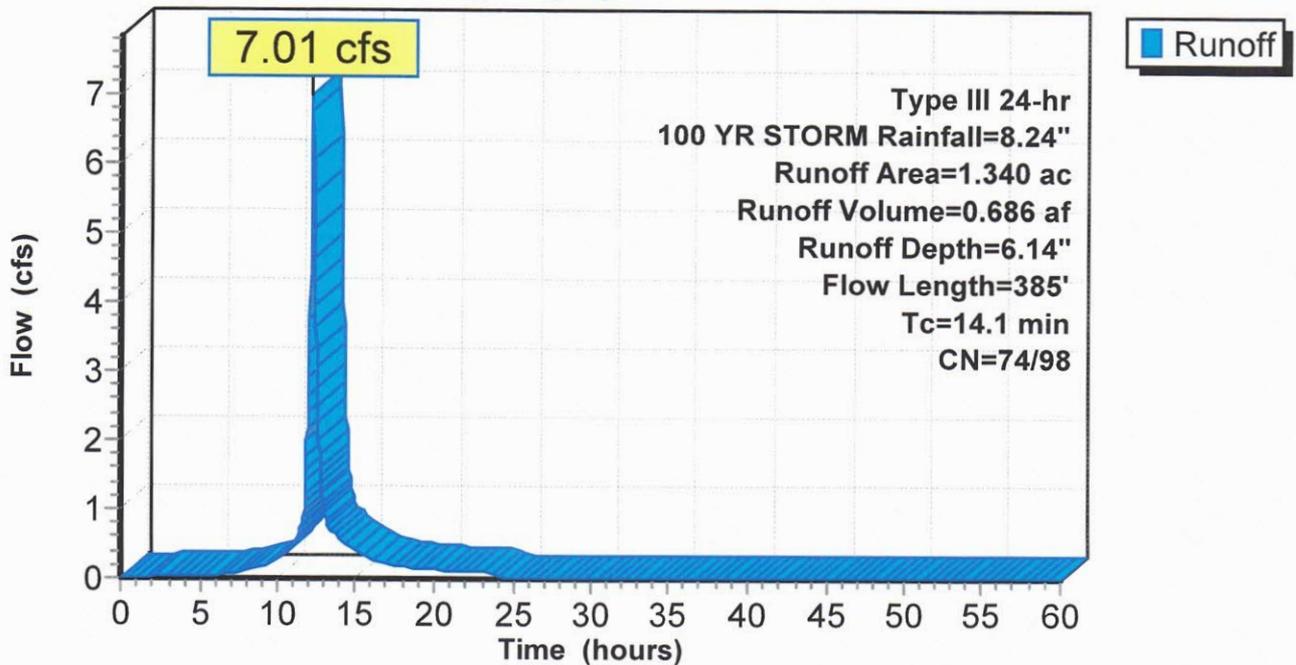Type III 24-hr 100 YR STORM Rainfall=8.24"

	Area (ac)	CN	Description
*	0.470	98	ALL IMPERVIOUS
	0.870	74	>75% Grass cover, Good, HSG C
	1.340	82	Weighted Average
	0.870	74	64.93% Pervious Area
	0.470	98	35.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	150	0.0200	0.19		**Sheet Flow, DA C INTO BASIN** Grass: Short n= 0.150 P2= 3.34"
0.9	235	0.0100	4.54	3.56	**Pipe Channel, DA C INTO BASIN** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
14.1	385	Total			

Subcatchment 22S: PROP INTO BASIN

Hydrograph

Summary for Subcatchment 22S: PROP INTO BASIN

Runoff   =   1.37 cfs @   1.18 hrs, Volume=   0.046 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
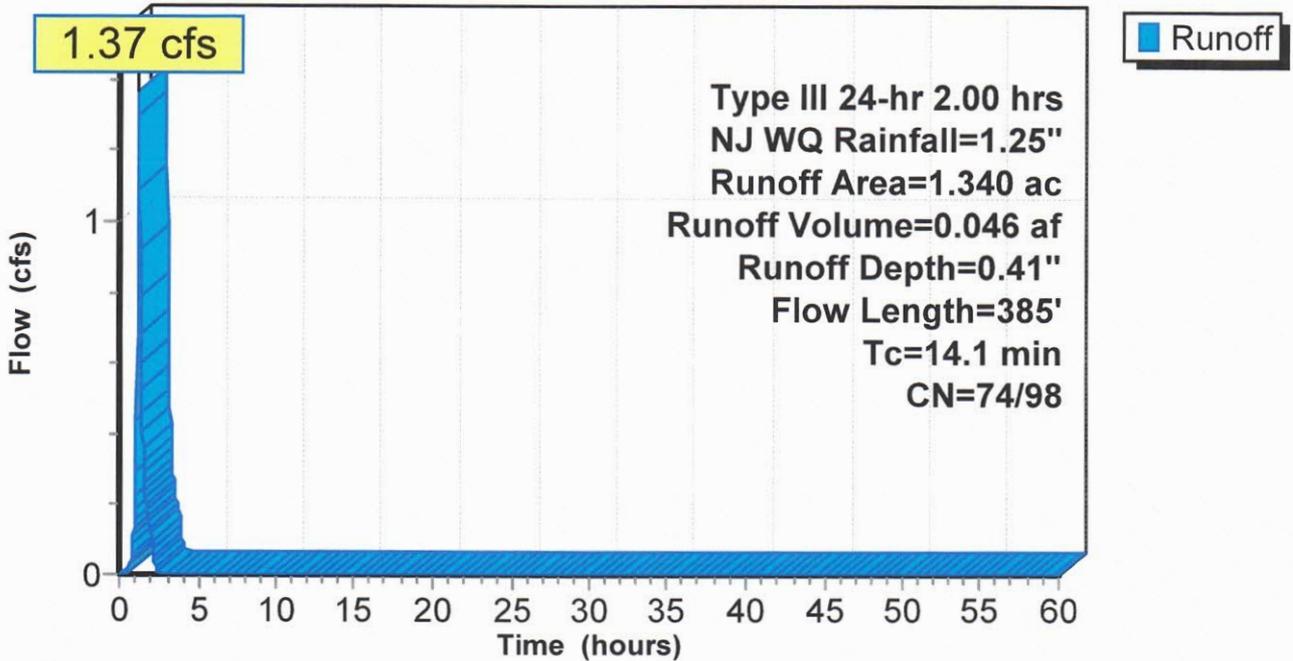Type III 24-hr 2.00 hrs NJ WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.470	98	ALL IMPERVIOUS
	0.870	74	>75% Grass cover, Good, HSG C
	1.340	82	Weighted Average
	0.870	74	64.93% Pervious Area
	0.470	98	35.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	150	0.0200	0.19		**Sheet Flow, DA C INTO BASIN**
					Grass: Short n= 0.150 P2= 3.34"
0.9	235	0.0100	4.54	3.56	**Pipe Channel, DA C INTO BASIN**
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
14.1	385	Total			

Subcatchment 22S: PROP INTO BASIN

Hydrograph

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Type III 24-hr 2 YR STORM Rainfall=3.34"
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Summary for Pond 23P: PROP BASIN W/EXFIL

Inflow Area =   1.340 ac, 35.07% Impervious, Inflow Depth =   1.82"   for 2 YR STORM event
Inflow   =   2.03 cfs @   12.19 hrs, Volume=   0.204 af
Outflow   =   0.46 cfs @   12.73 hrs, Volume=   0.204 af, Atten= 77%, Lag= 32.0 min
Discarded =   0.46 cfs @   12.73 hrs, Volume=   0.204 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Peak Elev= 106.63' @ 12.73 hrs   Surf.Area= 0.057 ac   Storage= 0.056 af

Plug-Flow detention time=36.5 min calculated for 0.204 af (100% of inflow)
Center-of-Mass det. time=36.5 min (841.3 - 804.9)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	0.432 af	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Voids (%)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
105.00	0.057	200.0	0.0	0.000	0.000	0.057
106.00	0.057	200.0	35.0	0.020	0.020	0.062
107.00	0.057	200.0	100.0	0.057	0.077	0.066
108.00	0.071	224.0	100.0	0.064	0.141	0.085
109.00	0.088	248.0	100.0	0.079	0.220	0.107
110.00	0.106	272.0	100.0	0.097	0.317	0.130
111.00	0.125	296.0	100.0	0.115	0.432	0.156

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**5.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 102.33'
#2	Primary	110.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Discarded OutFlow Max=0.46 cfs @ 12.73 hrs HW=106.63' (Free Discharge)
└—**1=Exfiltration** (Controls 0.46 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' (Free Discharge)
└—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)