

Drainage Computations

for the Proposed Site Improvements at 20 Owenoke Park; Westport, CT

WPL-10957-20
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Inspection & As-Built: Yes/Yes

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**TOWN OF WESTPORT
CONSERVATION DEPARTMENT**

February 10, 2020

Prepared for 1720 Owenoke Park LLC

by Chappa Site Consulting, LLC

CLIENT: 1720 Owenoke Park LLC

PROPERTY LOCATION: 20 Owenoke Park; Westport, CT

SOILS: The United States Department of Agriculture, Soil Conservation Service, Soil Survey of Fairfield County, Connecticut indicates that the onsite soils are Agawam (AfB), fine sandy loam. The soil is considered a hydrological group "B" soil.

EXISTING CONDITIONS: The 0.32 acre site is presently vacant with the exception of the existing drive entrance and dock ramp. Grey's Creek borders the north side of the site. The remainder of the site is comprised of level to gentle sloping lawn areas.

PROPOSAL: The applicant proposes to modify the existing drive entrance and construct a pervious parking area. Also, the existing stone wall located along the Owenoke Park pavement edge shall be relocated entirely onto the property. The balance of the site is proposed to be landscaped garden areas. The proposed drive entrance, parking area, pedestrian stairs, existing dock ramp and stairs will create an onsite impervious area of approximately 1,540 s.f.

DRAINAGE: A 21' wide x 57' long x 1' deep trap rock bed will be installed to collect the post developed stormwater runoff. The proposed stormwater system has been designed to accommodate the additional runoff produced during a 25 year storm. Furthermore in order to remove storm water pollutants and provide water quality treatment the drainage system has been sized to handle the first 1.0" of rainfall from all proposed areas as recommended in the Connecticut Stormwater Quality Manual. The following pages contain the necessary drainage computations. Future development may require additional storm-water runoff retention/detention


Laura Ruocco Pulie, P.E. CT REG. NO. 14924



Chappa Site Consulting, LLC
3255 Fairfield Avenue; Bridgeport, CT 06605

<i>Client</i>	<i>Address</i>	<i>Project #</i>
1720 Owenoke Park LLC	20 Owenoke Park; Westport, CT	30273

1. Trap Rock Bed Volume Below Pervious Parking Area:

Calculate 40% Trap Rock Void Ratio:

$$21' \text{ wide} \times 57' \text{ long} \times 1' \text{ deep} = 1,197 \text{ c.f.} \times 0.40 = 478.8 \text{ c.f.}$$

2. Stormwater Drainage System Size Required for storage of first 1" of runoff:

A. Impervious Area = 1,540 s.f.*

*(This is the area of the Proposed Drive Entrance, Pedestrian Stairs, Pervious Parking, Existing Dock Ramp & Stairs)

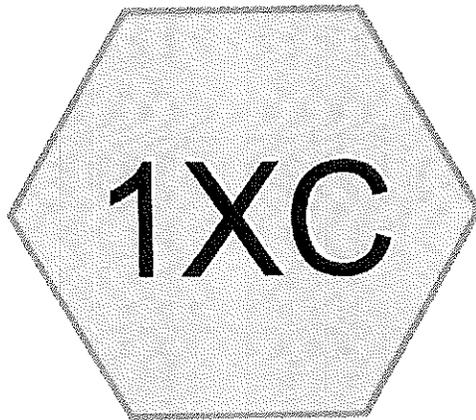
B. Volume of runoff from 1" of rainfall

$$= 1,540 \text{ s.f.} \times (1/12) = 128.33 \text{ c.f.} - \text{Use } \underline{129 \text{ c.f.}}$$

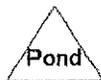
Proposed Trap Rock Bed Storage = 478 c.f. > First inch of Runoff Volume = 129 c.f.

Conclusion:

The 21' x 57' x 1' deep trap rock bed will be more than sufficient to handle the first 1" of runoff from the proposed site development and will accommodate the additional runoff produced during a 25 year storm.



EXISTING UPLAND AREA



Routing Diagram for c30273XCONHYD
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c30273XCONHYD

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
13,756	61	>75% Grass cover, Good, HSG B (1XC)
13,756	61	TOTAL AREA

c30273XCONHYD

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20 OWENOKE PARK

Type III 24-hr 25 year Rainfall=6.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1XC: EXISTING UPLAND AREA Runoff Area=13,756 sf 0.00% Impervious Runoff Depth>2.27"
Flow Length=143' Slope=0.0266 '/' Tc=11.1 min CN=61 Runoff=0.68 cfs 2,605 cf

Total Runoff Area = 13,756 sf Runoff Volume = 2,605 cf Average Runoff Depth = 2.27"
100.00% Pervious = 13,756 sf 0.00% Impervious = 0 sf

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20 OWENOKE PARK

Type III 24-hr 25 year Rainfall=6.40"

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Summary for Subcatchment 1XC: EXISTING UPLAND AREA

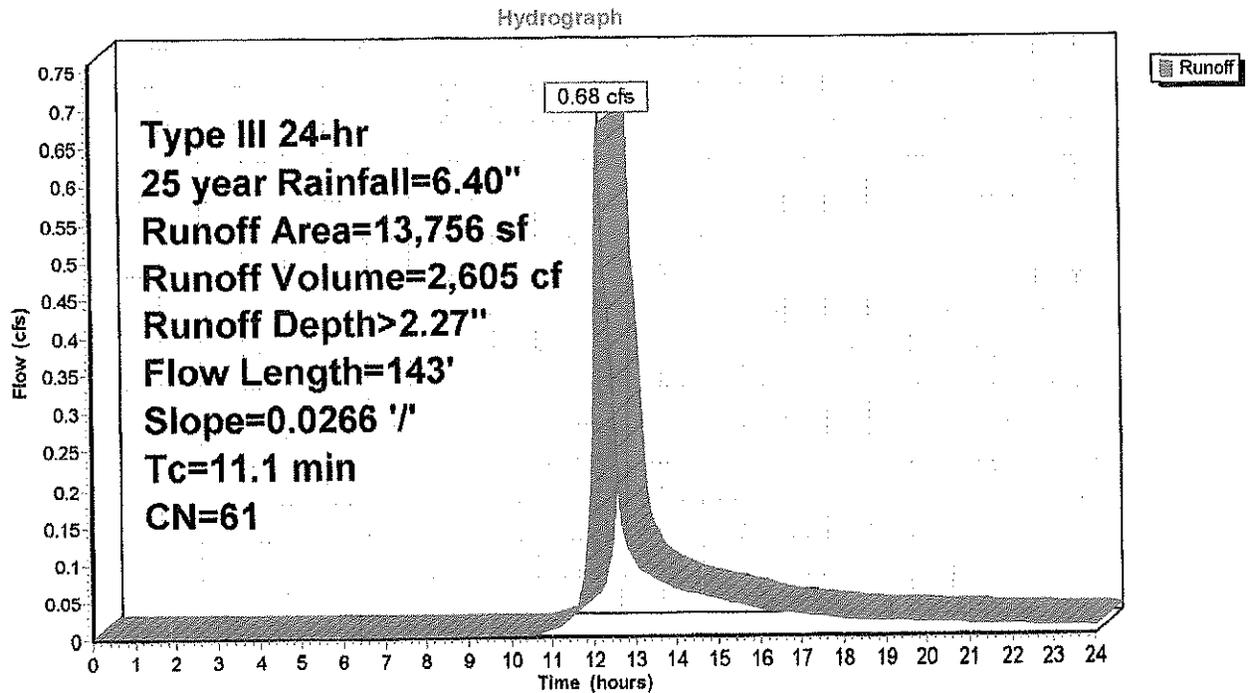
Runoff = 0.68 cfs @ 12.17 hrs, Volume= 2,605 cf, Depth> 2.27"

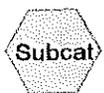
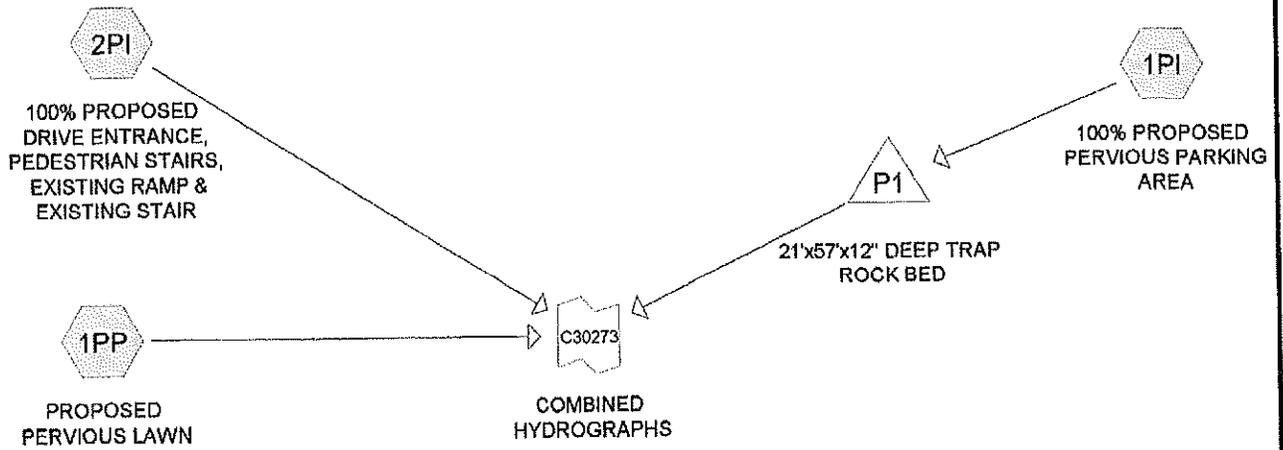
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.40"

Area (sf)	CN	Description
13,756	61	>75% Grass cover, Good, HSG B
13,756		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	143	0.0266	0.21		Sheet Flow, Existing Conditions Grass: Short n= 0.150 P2= 3.50"

Subcatchment 1XC: EXISTING UPLAND AREA





Routing Diagram for C30273-PROPHYD
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C30273-PROPHYD

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,185	98	100% PROPOSED PERVIOUS PARKING AREA (1PI)
25	98	100% EXISTING STEPS & RAMP AREA (2PI)
230	98	100% PROPOSED DRIVE ENTRANCE AREA (2PI)
100	98	100% PROPOSED PEDESTRIAN STEPS AREA (2PI)
12,216	61	>75% Grass cover, Good, HSG B (1PP)
13,756	65	TOTAL AREA

C30273-PROPHYD

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20 OWENOK PARK

Type III 24-hr 25 YR Rainfall=6.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 1PI: 100% PROPOSED Runoff Area=1,185 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.18 cfs 608 cf

Subcatchment 1PP: PROPOSED PERVIOUS Runoff Area=12,216 sf 0.00% Impervious Runoff Depth>2.27"
Flow Length=143' Slope=0.0266 1/100 Tc=11.1 min CN=61 Runoff=0.60 cfs 2,313 cf

Subcatchment 2PI: 100% PROPOSED DRIVE Runoff Area=355 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.06 cfs 182 cf

Pond P1: 21'x57'x12" DEEP TRAP ROCK BED Peak Elev=5.60' Storage=49 cf Inflow=0.18 cfs 608 cf
Outflow=0.08 cfs 608 cf

Link C30273: COMBINED HYDROGRAPHS Inflow=0.63 cfs 2,495 cf
Primary=0.63 cfs 2,495 cf

Total Runoff Area = 13,756 sf Runoff Volume = 3,104 cf Average Runoff Depth = 2.71"
88.80% Pervious = 12,216 sf 11.20% Impervious = 1,540 sf

C30273-PROPHYD

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Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Subcatchment 1PI: 100% PROPOSED PERVIOUS PARKING AREA

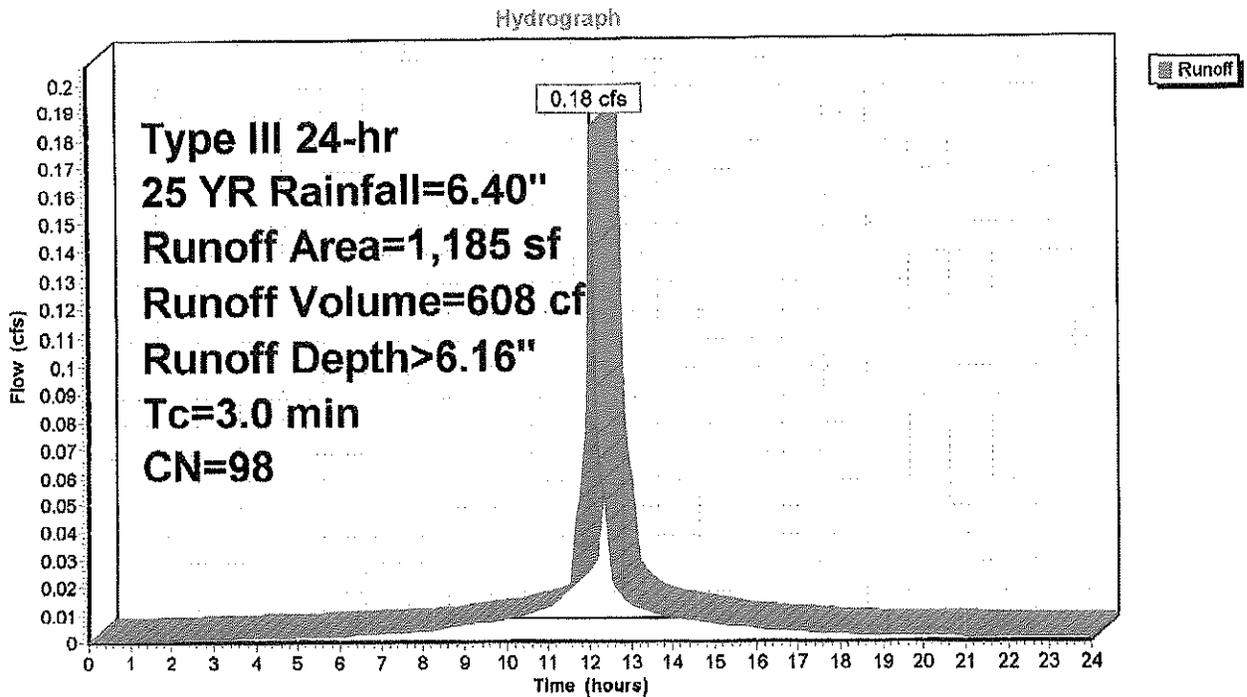
Runoff = 0.18 cfs @ 12.05 hrs, Volume= 608 cf, Depth> 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.40"

Area (sf)	CN	Description
* 1,185	98	100% PROPOSED PERVIOUS PARKING AREA
1,185		100.00% Impervious Area

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

Subcatchment 1PI: 100% PROPOSED PERVIOUS PARKING AREA



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20 OWENOKE PARK
Type III 24-hr 25 YR Rainfall=6.40"

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Summary for Subcatchment 1PP: PROPOSED PERVIOUS LAWN

Runoff = 0.60 cfs @ 12.17 hrs, Volume= 2,313 cf, Depth> 2.27"

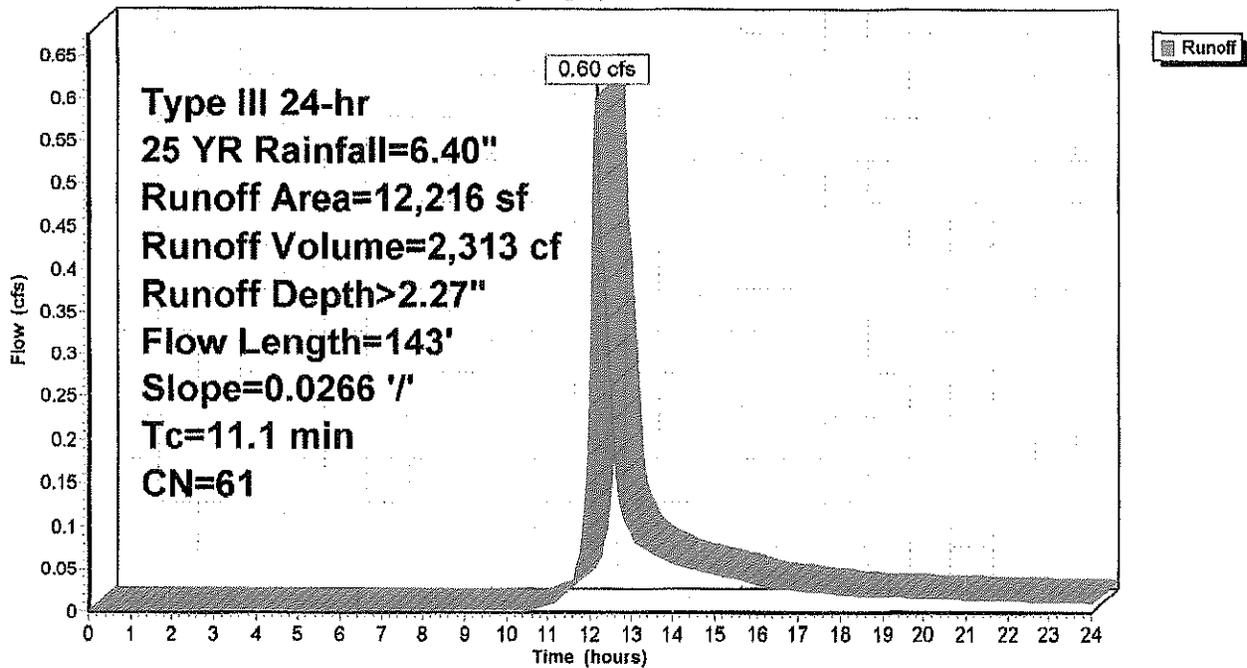
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.40"

Area (sf)	CN	Description
12,216	61	>75% Grass cover, Good, HSG B
12,216		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	143	0.0266	0.21		Sheet Flow, PROPOSED CONDITIONS Grass: Short n= 0.150 P2= 3.50"

Subcatchment 1PP: PROPOSED PERVIOUS LAWN

Hydrograph



C30273-PROPHYD

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 Type III 24-hr 25 YR Rainfall=6.40"
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Subcatchment 2PI: 100% PROPOSED DRIVE ENTRANCE, PEDESTRIAN STAIRS, EXISTING RAMP & EX

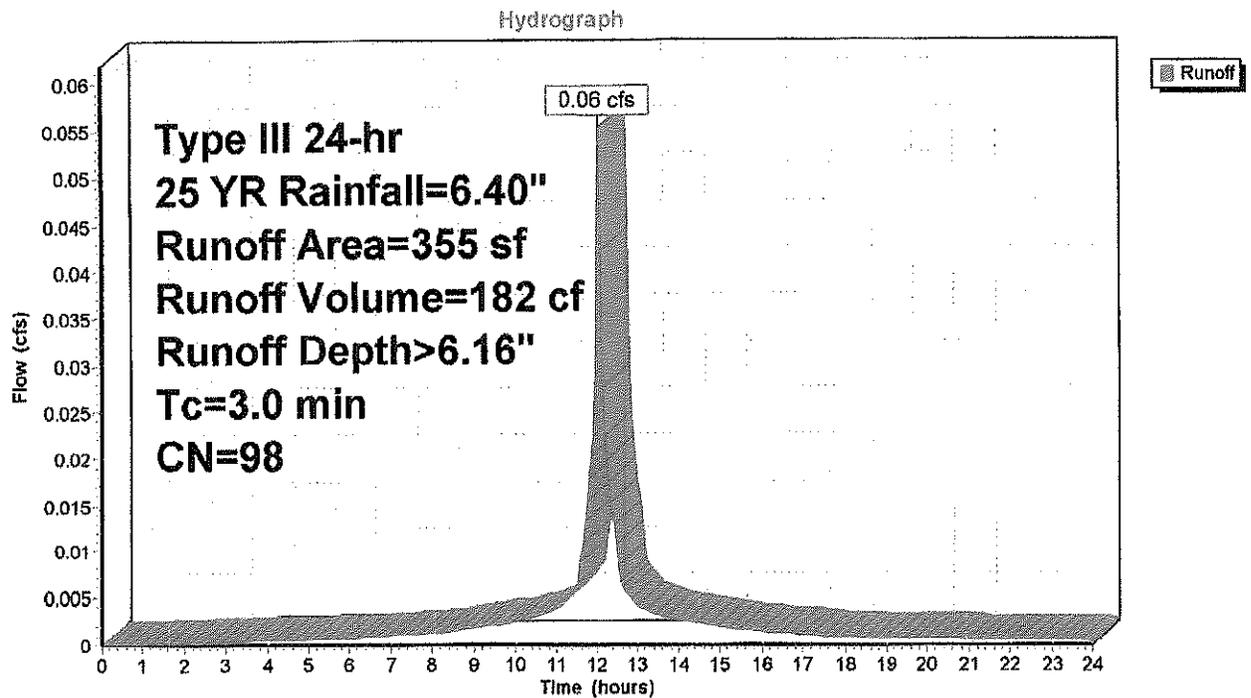
Runoff = 0.06 cfs @ 12.05 hrs, Volume= 182 cf, Depth> 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 YR Rainfall=6.40"

	Area (sf)	CN	Description
*	230	98	100% PROPOSED DRIVE ENTRANCE AREA
*	100	98	100% PROPOSED PEDESTRIAN STEPS AREA
*	25	98	100% EXISTING STEPS & RAMP AREA
	355	98	Weighted Average
	355		100.00% Impervious Area

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

Subcatchment 2PI: 100% PROPOSED DRIVE ENTRANCE, PEDESTRIAN STAIRS, EXISTING RAMP & EXISTING



C30273-PROPHYD

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20 OWENOKE PARK
Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Pond P1: 21'x57'x12" DEEP TRAP ROCK BED

Inflow Area = 1,185 sf, 100.00% Impervious, Inflow Depth > 6.16" for 25 YR event
Inflow = 0.18 cfs @ 12.05 hrs, Volume= 608 cf
Outflow = 0.08 cfs @ 12.17 hrs, Volume= 608 cf, Atten= 54%, Lag= 7.6 min
Discarded = 0.08 cfs @ 12.17 hrs, Volume= 608 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5.60' @ 12.17 hrs Surf.Area= 1,197 sf Storage= 49 cf

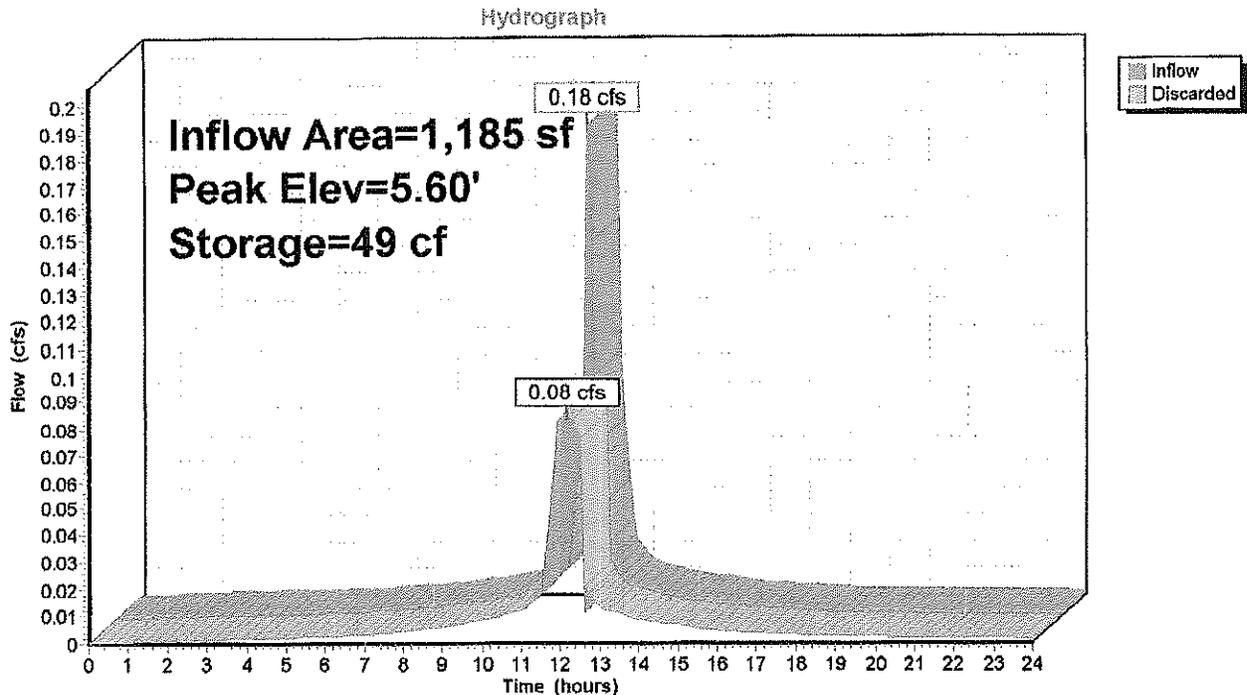
Plug-Flow detention time= 2.5 min calculated for 608 cf (100% of inflow)
Center-of-Mass det. time= 2.4 min (743.7 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	479 cf	21.00'W x 57.00'L x 1.00'H Prismatic 1,197 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	3.000 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.08 cfs @ 12.17 hrs HW=5.60' (Free Discharge)
↑=Exfiltration (Exfiltration Controls 0.08 cfs)

Pond P1: 21'x57'x12" DEEP TRAP ROCK BED



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20 OWENOK PARK
Type III 24-hr 25 YR Rainfall=6.40"

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Summary for Link C30273: COMBINED HYDROGRAPHS

Inflow Area = 13,756 sf, 11.20% Impervious, Inflow Depth > 2.18" for 25 YR event
Inflow = 0.63 cfs @ 12.16 hrs, Volume= 2,495 cf
Primary = 0.63 cfs @ 12.16 hrs, Volume= 2,495 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link C30273: COMBINED HYDROGRAPHS

