

Drainage Computations

*for the Proposed Pool & Patio Improvements
at 23 Westfair Drive; Westport, CT*

May 27, 2020

Prepared for Michael & Whitney Dangelo

by Chappa Site Consulting, LLC

CLIENT: Michael & Whitney Dangelo

PROPERTY LOCATION: 23 Westfair Drive; Westport, CT

SOILS: The United States Department of Agriculture, Soil Conservation Service, Soil Survey of Fairfield County, Connecticut indicates that onsite upland soils are Charlton, (CfB) fine sandy loams. The onsite soils are a hydrological group "B" soil.

EXISTING CONDITIONS: The site presently contains a single family dwelling and a private drive that provides access from Westfair Drive. The dwelling is serviced by town sanitary sewer and public water supply. The area to be developed is comprised of level lawn & landscaping gardens.

PROPOSAL: The applicant is proposing to construct an in-ground swimming pool, outdoor kitchen, fireplace and patio area. The proposed swimming pool, patio, outdoor kitchen fireplace and equipment pad have an approximate impervious area of 1,252 s.f..

DRAINAGE: 3 - 8' long x 1.0' high x 4' wide precast concrete galleries 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



Nicholas A. Mariani, P.E. CT REG. NO. 29991

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3255 Fairfield Avenue; Bridgeport, CT 06605

<i>Client</i>	<i>Address</i>	<i>Project #</i>
Michael & Whitney Dangelo	23 Westfair Drive; Westport, CT	30284

1. Concrete Gallery & Stone Volume:

Nominal Gallery Dimension = 1.0' High x 4' Wide x 8' Long / Net Volume = 18.7 c.f.*

Calculate 40% Trap Rock Void Ratio:

Sides - (1.5' wide x 1.5' high x 8' long) x 2 sides = 36 x 0.40 = 14.4 c.f.

Bottom - (4.0' wide x 0.5' high x 8' long) = 16 x 0.40 = 6.4 c.f.

Total Trap Rock Void Volume per 8' section = 20.8

Total Gallery & Trap Rock Void Volume per 8' section = 18.7 cf + 20.8 c.f. = 39.5 c.f.

* Net Volume Taken from Town of Westport Storm Water Drainage Design Standards

2. Galleries Required for storage of first 1" of runoff:

A. New Impervious Area = 1,252 s.f.*

*(This is the area of the Proposed Pool, Patio, Outdoor Kitchen, Fireplace & Utility Pad Areas)

B. Volume of runoff from 1" of rainfall

= 1,252 s.f. x (1/12) = 104.33 c.f. - Use 105 c.f.

C. Volume Runoff/Gallery Capacity

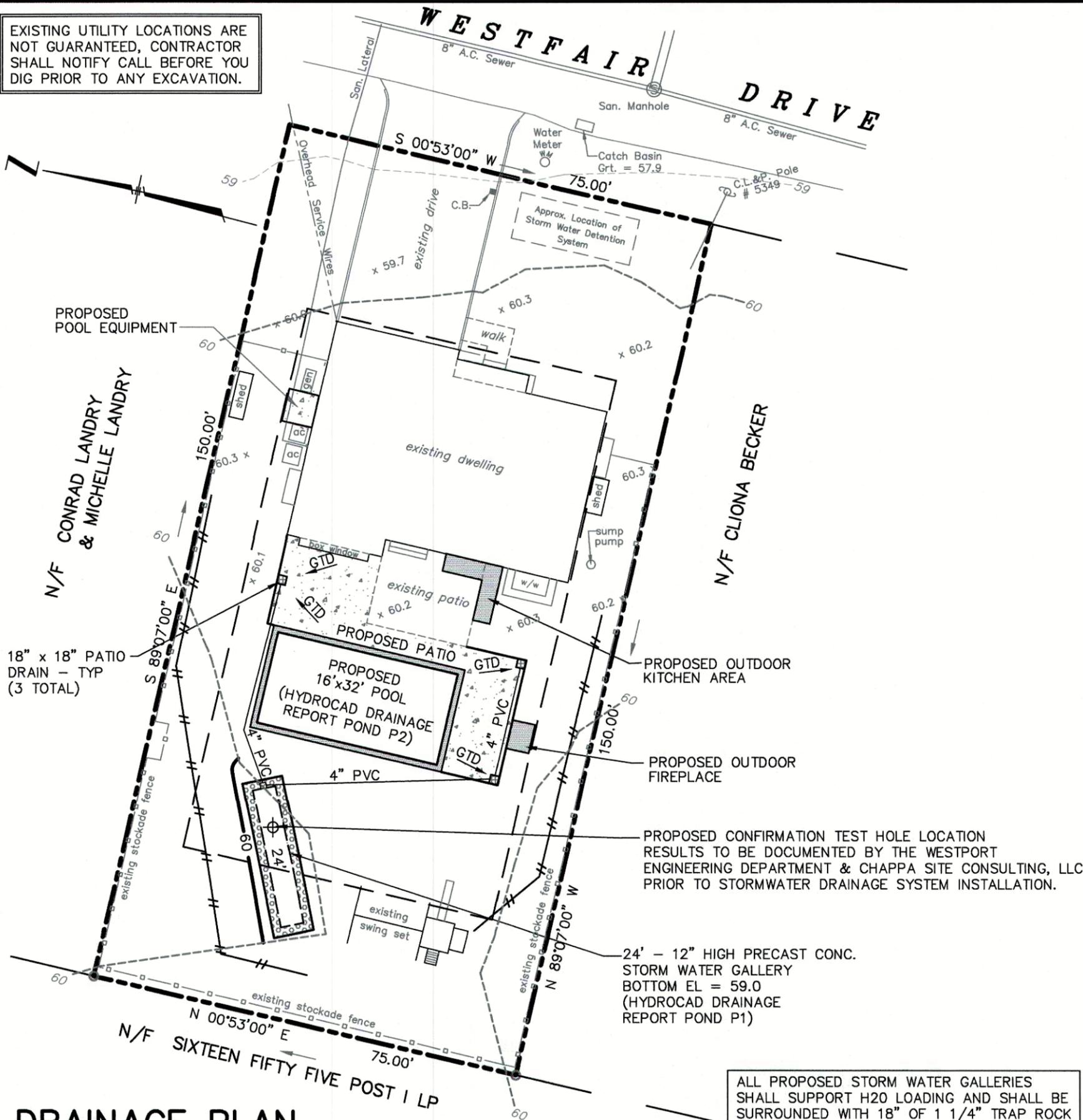
105 ÷ 39.5 c.f. = 2.66 galleries

Use 3 galleries or 24 l.f. of 1.0' H x 4' W Gallery

Conclusion:

3- 1.0' high x 4' wide x 8' long precast concrete gallery 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 event.

EXISTING UTILITY LOCATIONS ARE NOT GUARANTEED, CONTRACTOR SHALL NOTIFY CALL BEFORE YOU DIG PRIOR TO ANY EXCAVATION.



DRAINAGE PLAN
APPROXIMATE SCALE: 1" = 20'

ALL PROPOSED STORM WATER GALLERIES SHALL SUPPORT H2O LOADING AND SHALL BE SURROUNDED WITH 18" OF 1 1/4" TRAP ROCK SEE DETAIL

Test Pits

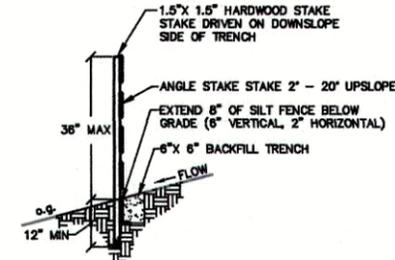
TEST PIT RESULTS TAKEN FROM DATA ON FILE AT THE WESTPORT ENGINEERING DEPARTMENT. TEST PIT PERFORMED AT 25 WESTFAIR DRIVE CHAPPA SITE CONSULTING DID NOT WITNESS TEST EXCAVATION/RESULTS.

AUGUST 20, 2015

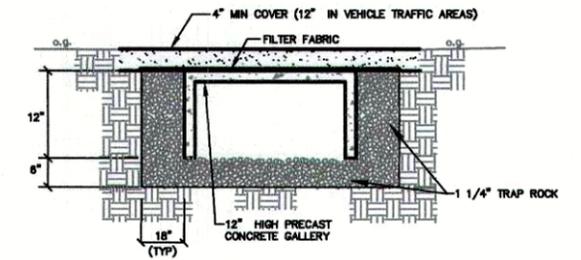
Test Pit #1

- 00 - 15" TOPSOIL
- 15 - 48" ORANGE/BROWN SILT SAND
- 48 - 72" BROWN SAND AND GRAVEL

- * NO GROUND WATER
- * MOTTLING AT 28"
- * NO LEDGE
- * ROOTS TO 28"



TYPICAL SILT FENCE
NO SCALE

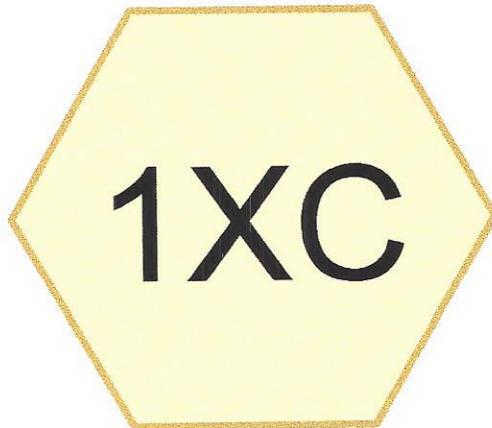


TYPICAL 12" HIGH PRECAST CONCRETE STORM WATER GALLERY
NO SCALE

GENERAL CONSTRUCTION NOTES:

1. ALL SITE CONSTRUCTION SHALL CONFORM TO THE TOWN OF WESTPORT STANDARDS SPECIFICATION. IN THE ABSENCE OF THE TOWN OF WESTPORT STANDARDS, REFER TO THE STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION FORM 814A, 1995.
2. SUBSURFACE STRUCTURES AND UTILITIES HAVE BEEN DETERMINED FROM EXISTING RECORDS AND ARE NOT GUARANTEED TO BE COMPLETE OR ACCURATE. INITIAL DETERMINATION OF UTILITY LOCATIONS SHALL INCLUDE BUT IS NOT LIMITED TO CONTACTING "CALL BEFORE YOU DIG". TO AVOID CONFLICT OF THE PROPOSED WORK AND EXISTING UTILITIES, THE CONTRACTOR SHALL LOCATE EXISTING UTILITIES BY EXCAVATING TEST HOLES. SHOULD THE CONTRACTOR DETERMINE THAT A CONFLICT EXISTS, HE SHALL PROMPTLY NOTIFY THE ENGINEER WHO WILL MAKE THE NECESSARY DESIGN ADJUSTMENTS.
3. ALL PRECAST CONCRETE GALLERIES SHALL SUPPORT H2O LOADING AND BE SO CERTIFIED BY THE MANUFACTURER.
4. EXISTING CONDITIONS INFORMATION TAKEN FROM A SURVEY PREPARED FOR MICHAEL D. DANGELO & WHITNEY T. DANGELO BY WALTER H. SKIDD, L.S.; FAIRFIELD, CT. DATED: MARCH 9, 2020; REV: APRIL 14, 2020.
5. THE CONTRACTOR/BUILDER SHALL BE RESPONSIBLE FOR DIRECTING THE PROPER VOLUME OF STORM WATER RUNOFF TO THE APPROPRIATE DRAINAGE DETENTION SYSTEM - SEE DRAINAGE COMPUTATIONS PREPARED BY CHAPPA SITE CONSULTING, LLC.

MICHAEL & WHITNEY DANGELO 23 WESTFAIR DRIVE; WESTPORT, CT	DATE 5/27/2020
PROPOSED DRAINAGE IMPROVEMENTS PLAN	SCALE AS SHOWN
DRAINAGE PLAN	PROJECT NO. 30284
	SHEET NO 1 of 1



**PROPOSED POOL,
PATIO, OUTDOOR
KITCHEN, FIREPLACE
AND UTILITY PAD
AREAS AS LAWN**



c30284XCONHYDPrepared by CHAPPA SITE CONSULTING, LLC
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,252	61	>75% Grass cover, Good, HSG B (1XC)
1,252	61	TOTAL AREA

c30284XCONHYD

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23 WESTFAIR DRIVE

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: PROPOSED POOL, PATIO, Runoff Area=1,252 sf 0.00% Impervious Runoff Depth>2.27"
Flow Length=95' Slope=0.0084 '/' Tc=13.1 min CN=61 Runoff=0.06 cfs 237 cf

Total Runoff Area = 1,252 sf Runoff Volume = 237 cf Average Runoff Depth = 2.27"
100.00% Pervious = 1,252 sf 0.00% Impervious = 0 sf

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Subcatchment 1XC: PROPOSED POOL, PATIO, OUTDOOR KITCHEN, FIREPLACE AND UTILITY PAD AREAS A

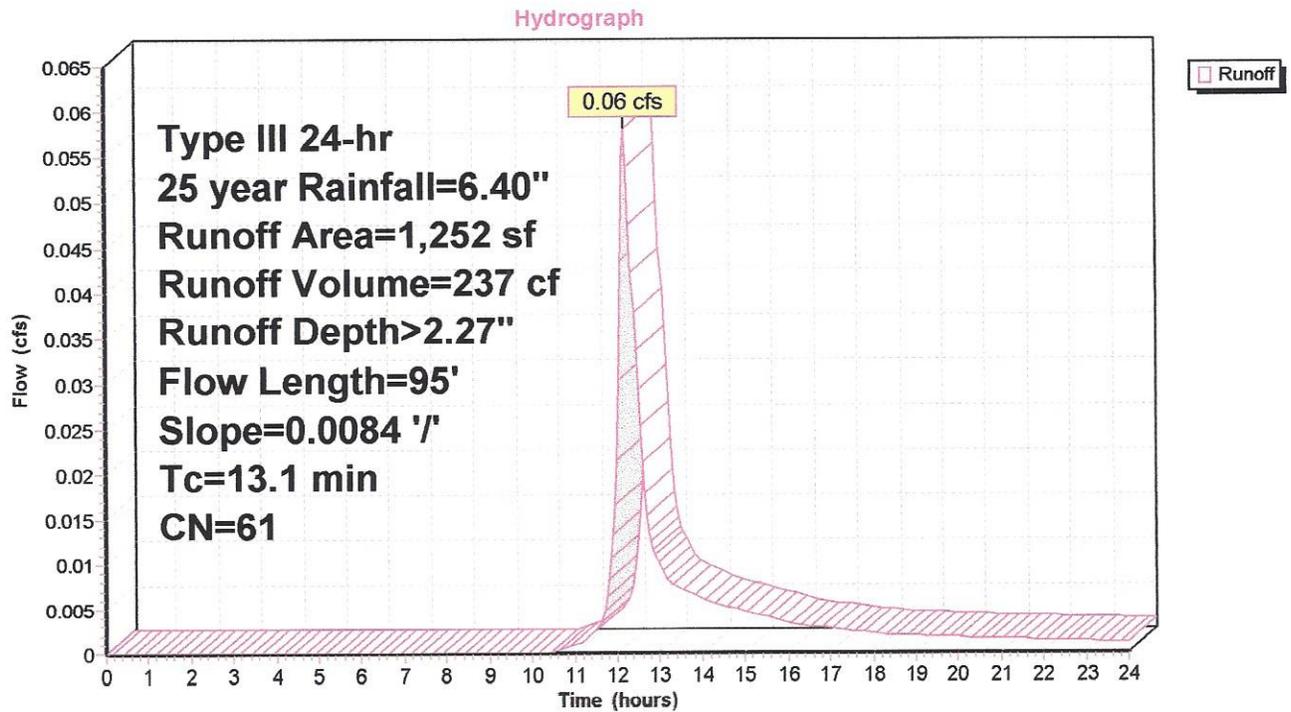
Runoff = 0.06 cfs @ 12.20 hrs, Volume= 237 cf, Depth> 2.27"

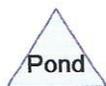
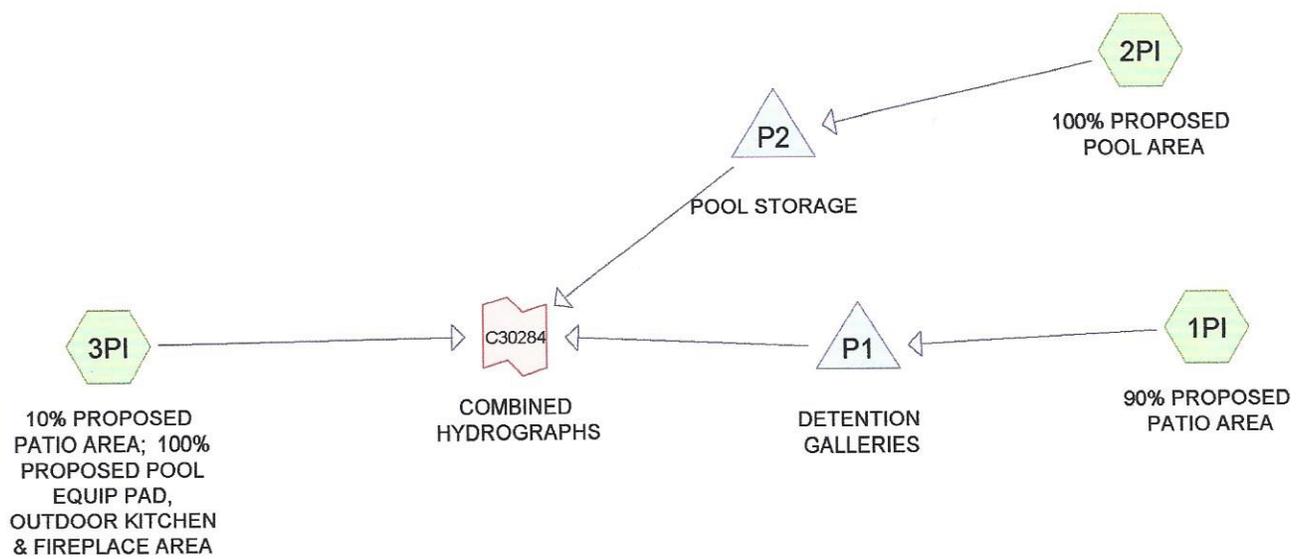
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.40"

Area (sf)	CN	Description
1,252	61	>75% Grass cover, Good, HSG B
1,252		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	95	0.0084	0.12		Sheet Flow, EXISTING LAWN Grass: Short n= 0.150 P2= 3.30"

Subcatchment 1XC: PROPOSED POOL, PATIO, OUTDOOR KITCHEN, FIREPLACE AND UTILITY PAD AREAS A





Routing Diagram for c30284-PROPHYD
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
64	98	10% PROPOSED PATIO AREA (3PI)
512	98	100% PROPOSED POOL AREA (2PI)
101	98	100% PROPOSED POOL EQUIP PAD, OUTDOOR KITCHED & FIREPLACE (3PI)
575	98	90% PROPOSED PATIO AREAS (1PI)
1,252	98	TOTAL AREA

c30284-PROPHYD

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23 WESTFAIR DRIVE
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: 90% PROPOSED PATIO	Runoff Area=575 sf 100.00% Impervious Runoff Depth>6.16" Tc=3.0 min CN=98 Runoff=0.09 cfs 295 cf
Subcatchment 2PI: 100% PROPOSED POOL	Runoff Area=512 sf 100.00% Impervious Runoff Depth>6.16" Tc=3.0 min CN=98 Runoff=0.08 cfs 263 cf
Subcatchment 3PI: 10% PROPOSED PATIO	Runoff Area=165 sf 100.00% Impervious Runoff Depth>6.16" Tc=3.0 min CN=98 Runoff=0.03 cfs 85 cf
Pond P1: DETENTION GALLERIES	Peak Elev=59.43' Storage=87 cf Inflow=0.09 cfs 295 cf Outflow=0.01 cfs 295 cf
Pond P2: POOL STORAGE	Peak Elev=0.33' Storage=169 cf Inflow=0.08 cfs 263 cf Outflow=0.04 cfs 186 cf
Link C30284: COMBINED HYDROGRAPHS	Inflow=0.04 cfs 271 cf Primary=0.04 cfs 271 cf

Total Runoff Area = 1,252 sf Runoff Volume = 643 cf Average Runoff Depth = 6.16"
0.00% Pervious = 0 sf 100.00% Impervious = 1,252 sf

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Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Subcatchment 1PI: 90% PROPOSED PATIO AREA

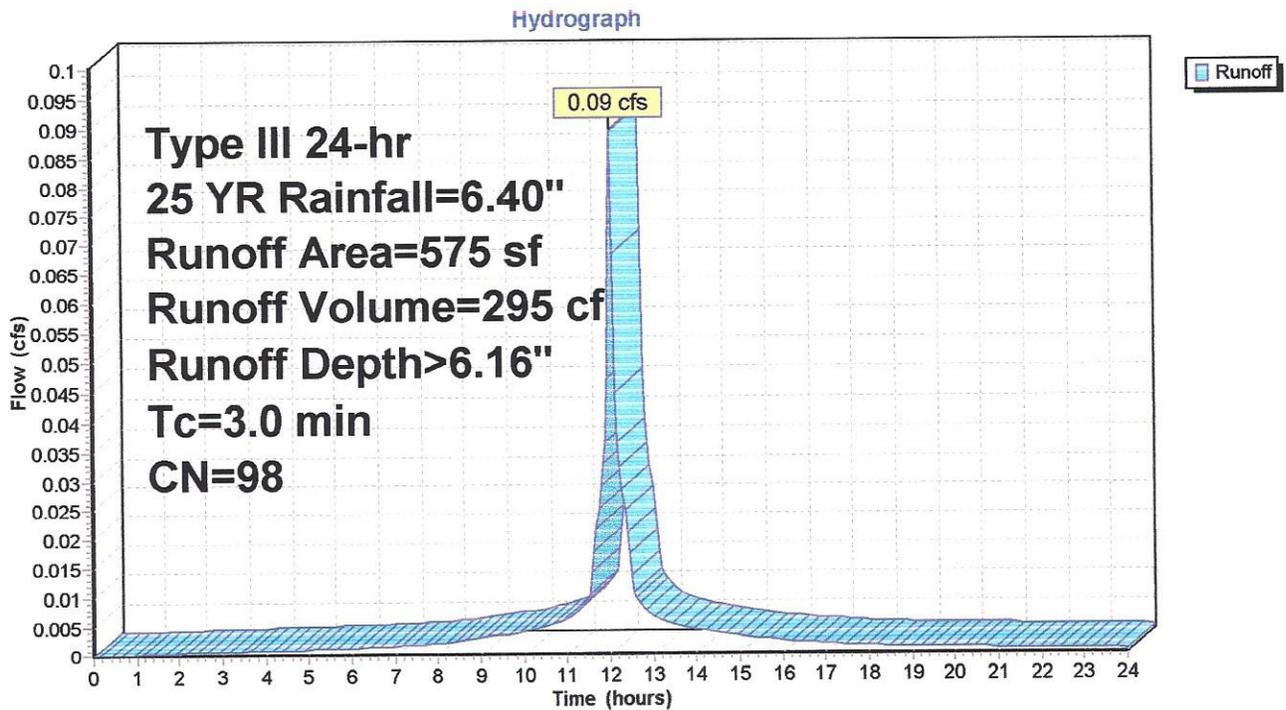
Runoff = 0.09 cfs @ 12.05 hrs, Volume= 295 cf, Depth> 6.16"

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
* 575	98	90% PROPOSED PATIO AREAS
575		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: 90% PROPOSED PATIO AREA



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 Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Subcatchment 2PI: 100% PROPOSED POOL AREA

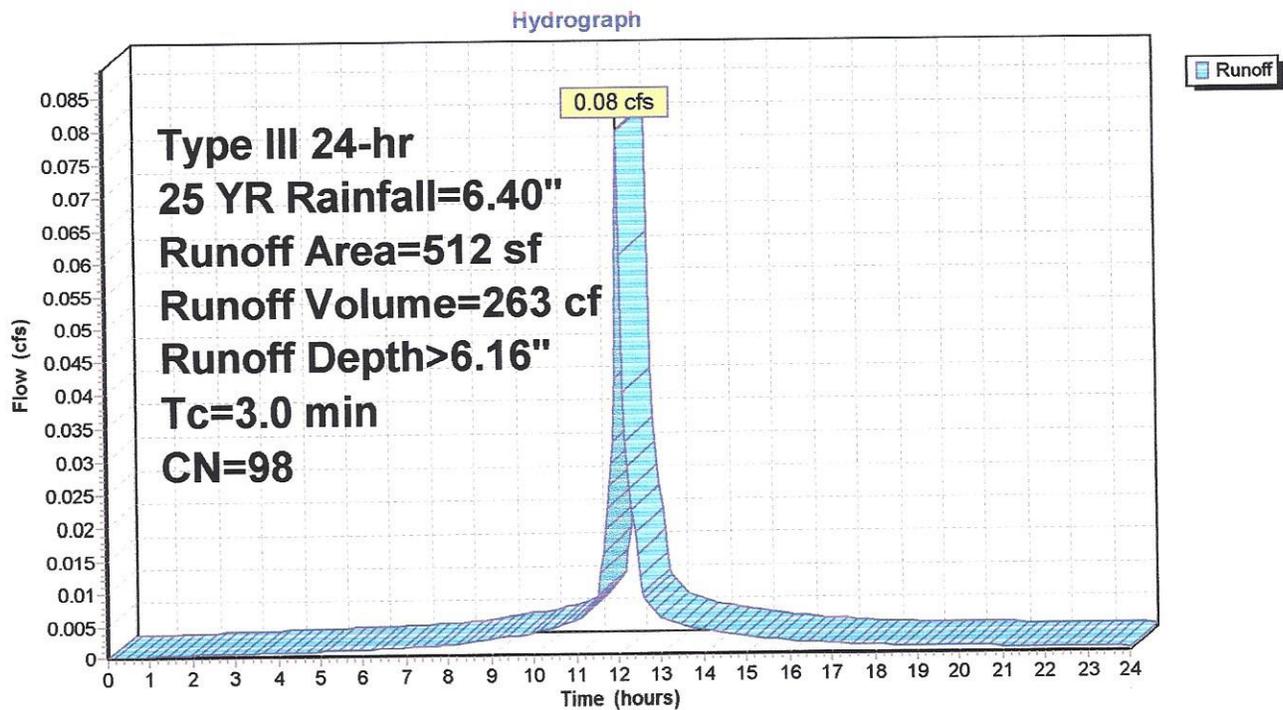
Runoff = 0.08 cfs @ 12.05 hrs, Volume= 263 cf, Depth> 6.16"

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
* 512	98	100% PROPOSED POOL AREA
512		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 POOL AREA



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Type III 24-hr 25 YR Rainfall=6.40"
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chment 3PI: 10% PROPOSED PATIO AREA; 100% PROPOSED POOL EQUIP PAD, OUTDOOR KITCHEN

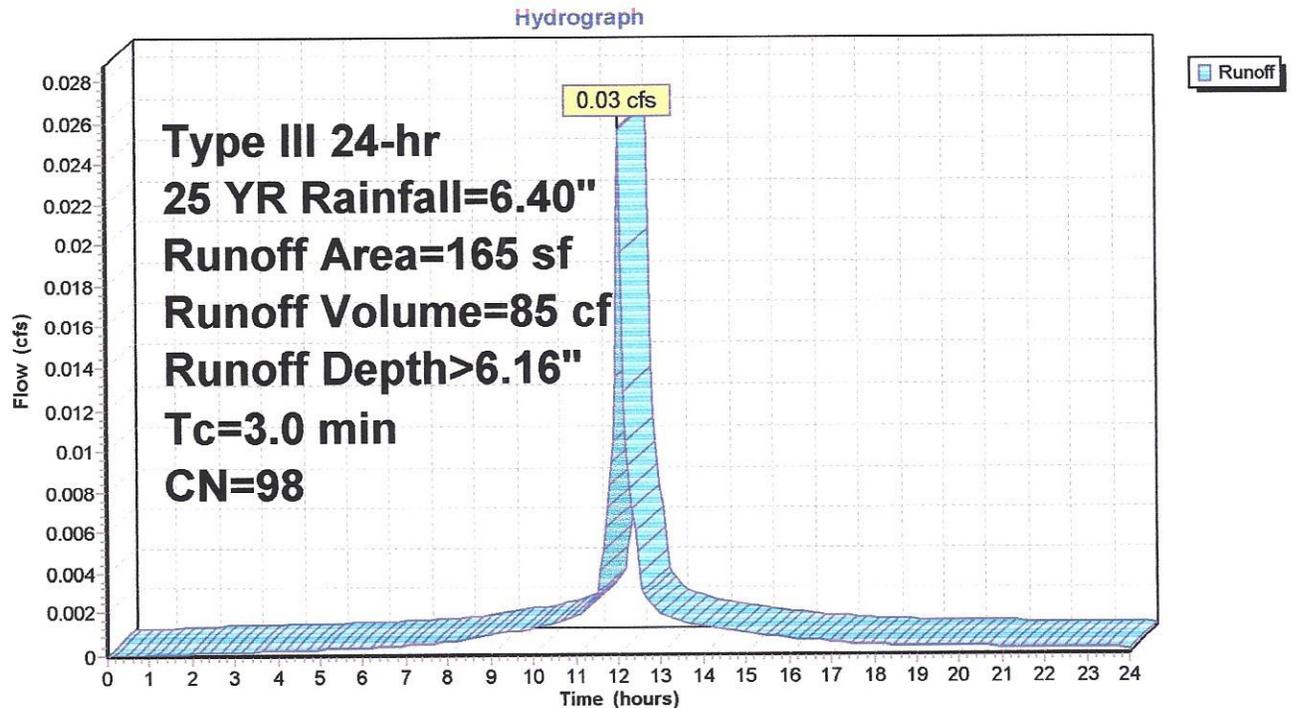
Runoff = 0.03 cfs @ 12.05 hrs, Volume= 85 cf, Depth> 6.16"

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
*	101	98	100% PROPOSED POOL EQUIP PAD, OUTDOOR KITCHED & FIREPLACE
*	64	98	10% PROPOSED PATIO AREA
	165	98	Weighted Average
	165		100.00% Impervious Area

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

t 3PI: 10% PROPOSED PATIO AREA; 100% PROPOSED POOL EQUIP PAD, OUTDOOR KITCHEN & FIRE



c30284-PROPHYD

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23 WESTFAIR DRIVE
Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Pond P1: DETENTION GALLERIES

Inflow Area = 575 sf, 100.00% Impervious, Inflow Depth > 6.16" for 25 YR event
Inflow = 0.09 cfs @ 12.05 hrs, Volume= 295 cf
Outflow = 0.01 cfs @ 12.54 hrs, Volume= 295 cf, Atten= 87%, Lag= 29.4 min
Discarded = 0.01 cfs @ 12.54 hrs, Volume= 295 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 59.43' @ 12.54 hrs Surf.Area= 189 sf Storage= 87 cf

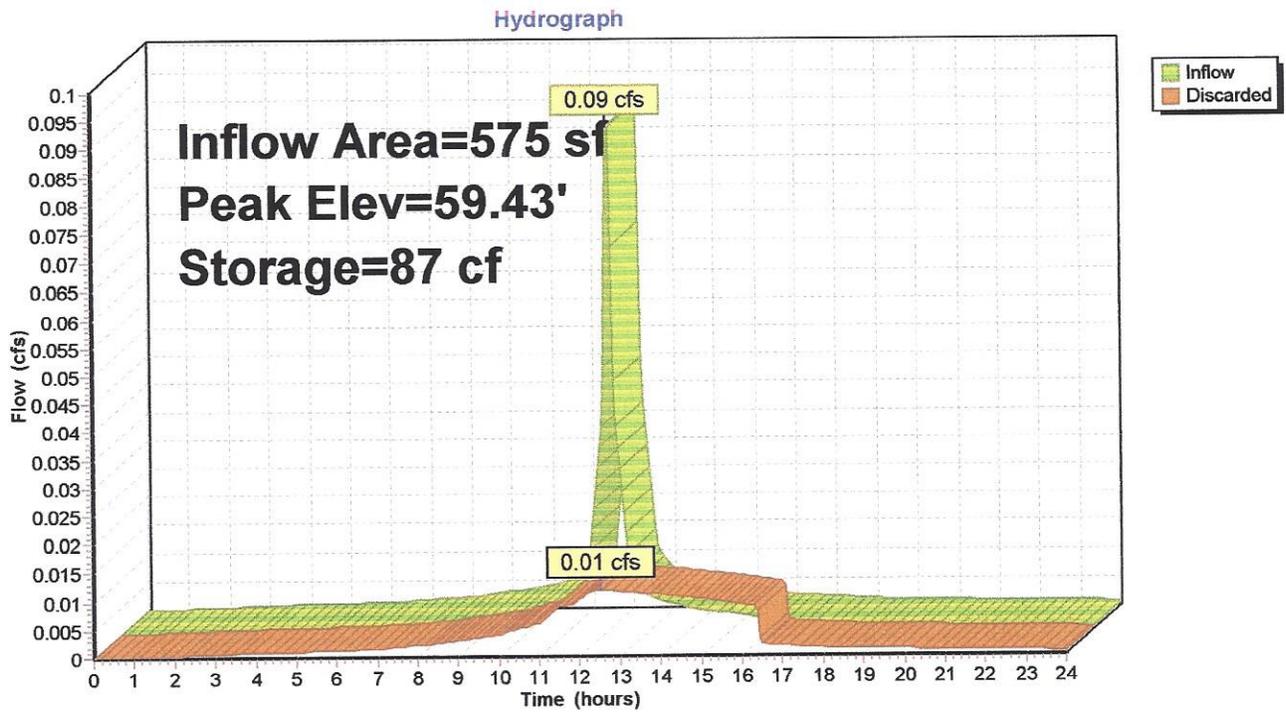
Plug-Flow detention time= 47.6 min calculated for 295 cf (100% of inflow)
Center-of-Mass det. time= 47.4 min (788.7 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	58.50'	76 cf	7.00'W x 27.00'L x 1.50'H Prismatic 284 cf Overall - 93 cf Embedded = 190 cf x 40.0% Voids
#2	59.00'	56 cf	Galley 4x8x1 x 3 Inside #1 Inside= 42.0"W x 9.0"H => 2.49 sf x 7.50'L = 18.7 cf Outside= 48.0"W x 12.0"H => 3.88 sf x 8.00'L = 31.0 cf
		132 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	58.50'	2.000 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.01 cfs @ 12.54 hrs HW=59.43' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Pond P1: DETENTION GALLERIES



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Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Pond P2: POOL STORAGE

Inflow Area = 512 sf, 100.00% Impervious, Inflow Depth > 6.16" for 25 YR event
Inflow = 0.08 cfs @ 12.05 hrs, Volume= 263 cf
Outflow = 0.04 cfs @ 12.37 hrs, Volume= 186 cf, Atten= 53%, Lag= 19.5 min
Primary = 0.04 cfs @ 12.37 hrs, Volume= 186 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 0.33' @ 12.35 hrs Surf.Area= 512 sf Storage= 169 cf

Plug-Flow detention time= 285.0 min calculated for 186 cf (71% of inflow)
Center-of-Mass det. time= 191.1 min (932.3 - 741.3)

Volume #1	Invert 0.00'	Avail.Storage 169 cf	Storage Description
Custom Stage Data (Prismatic) Listed below (Recalc)			

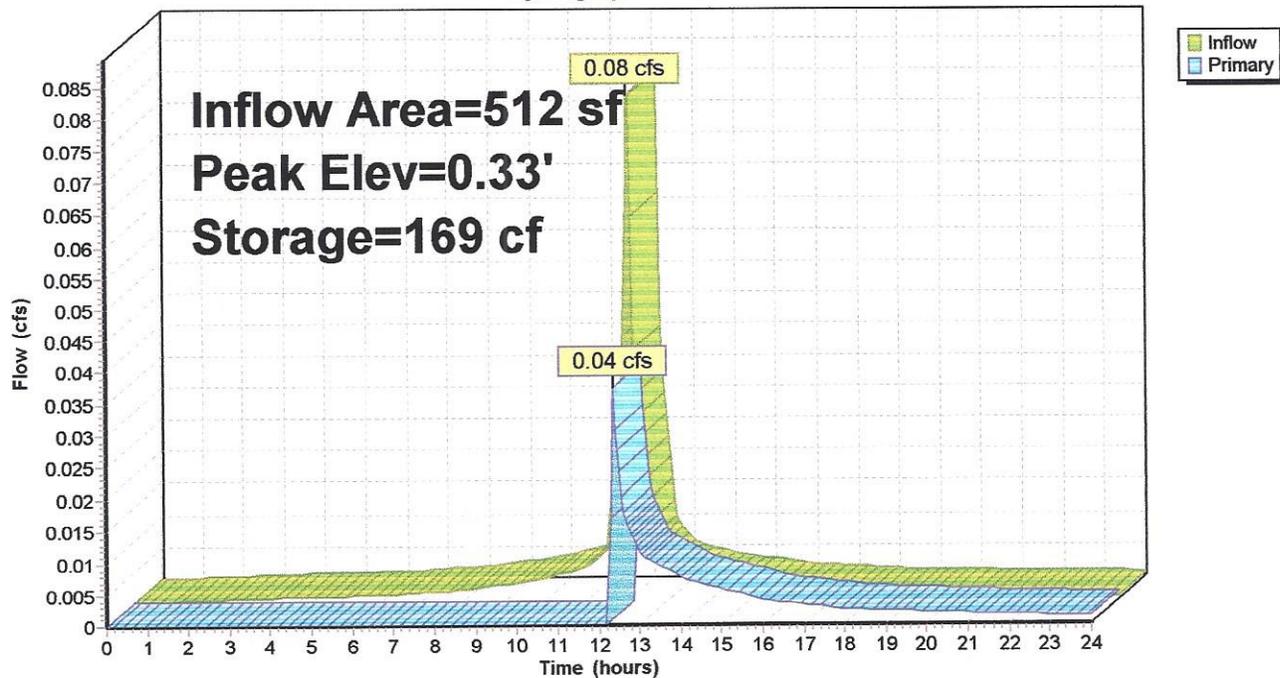
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	512	0	0
0.33	512	169	169

Device #1	Routing Primary	Invert 0.33'	Outlet Devices
96.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)			

Primary OutFlow Max=0.02 cfs @ 12.37 hrs HW=0.33' (Free Discharge)
↑=Sharp-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.14 fps)

Pond P2: POOL STORAGE

Hydrograph



c30284-PROPHYD

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Type III 24-hr 25 YR Rainfall=6.40"
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Summary for Link C30284: COMBINED HYDROGRAPHS

Inflow Area = 1,252 sf, 100.00% Impervious, Inflow Depth > 2.60" for 25 YR event
Inflow = 0.04 cfs @ 12.37 hrs, Volume= 271 cf
Primary = 0.04 cfs @ 12.37 hrs, Volume= 271 cf, Atten= 0%, Lag= 0.0 min

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

Link C30284: COMBINED HYDROGRAPHS

