Drainage Computations

for the Proposed Drive Expansion, Barbecue & Patio Improvements at 12 Hedley Farms Road; Westport, CT

February 10, 2020

Prepared for Christine Gould & Alexander Christon

by Chappa Site Consulting, LLC

CLIENT: Christine Gould & Alexander Christon

PROPERTY LOCATION: 12 Hedley Farms Road; Westport, CT

SOILS: The United States Department of Agriculture, Soil Conservation Service, Soil Survey of Fairfield County, Connecticut indicates that onsite upland soils are Hinkley, (HkB) gravely sandy loams. The onsite soil is a hydrological group "A" soil.

EXISTING CONDITIONS: The site presently contains a single family dwelling and a pool. The dwelling is serviced by a private sewage disposal system and public water supply. A private drive provide access from Hedley Farms Road. There is a kidney shaped pond with associated wetlands located on the property. The area to be developed is comprised of gentle sloping lawn.

PROPOSAL: The applicant is proposing to construct a barbecue, expand the existing drive and install two patios. The proposed barbecue, drive expansion, walk & patios have an approximate impervious area of 1,700 s.f..

DRAINAGE: 4 - 1.5' high x 4' wide x 8' long 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

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Client	*Address*	*Project #*
Christine Gould & Alexander Christon	12 Hedley Farms Road; Westport, CT	30216

1. Concrete Gallery & Stone Volume:

Nominal Gallery Dimension = 1.5' High x 4' Wide x 8' Long / Net Volume = 32.2 c.f.*

Calculate 40% Trap Rock Void Ratio:
Sides - (2.0' wide x 2.0' high x 8' long) x 2 sides = 64 x 0.40 = 25.6 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 = 32.0

Total Gallery & Trap Rock Void Volume per 8' section = 32.2 cf + 32.0 c.f. = **64.2 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 = **1,700 s.f.***

*(This is the area of the Proposed Drive Expansion, Walk, BBQ & Patios)

B. Volume of runoff from 1" of rainfall

= 1,700 s.f. x (1"/12" per ft) = 141.66 c.f. - **Use 142 c.f.**

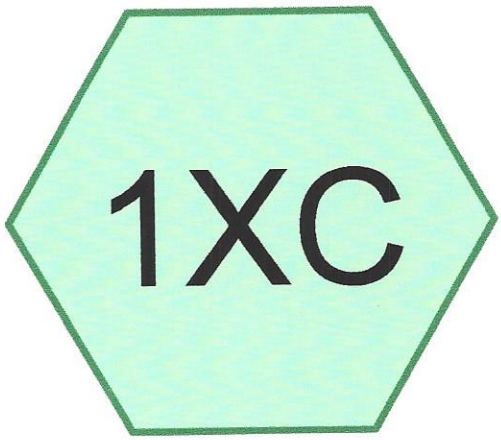
C. Volume Runoff/Gallery Capacity

142 c.f. ÷ 64.2 c.f. = **2.21 galleries**

Use 3 galleries or 24 l.f. of 1.5' H x 4' W Gallery

Conclusion:

3 - 1.5' high x 4' wide x 8' long precast concrete galleries will be more than sufficient to handle the first 1" of runoff from the proposed site development. However, in order to accommodate the additional runoff produced during a 25 year storm event **4 - 1.5' high x 4' wide x 8' long precast concrete galleries have been proposed.**



PROPOSED DRIVE EXPANSION, WALK, BBQ, & PATIO AREAS AS LAWN

Subcat Reach Pond Link

Routing Diagram for c30216XCONHYD
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,700	39	>75% Grass cover, Good, HSG A (1XC)
1,700	**39**	**TOTAL AREA**

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 DRIVE Runoff Area=1,700 sf 0.00% Impervious Runoff Depth>0.56"
Flow Length=140' Slope=0.0286 '/' Tc=10.9 min CN=39 Runoff=0.01 cfs 80 cf

Total Runoff Area = 1,700 sf Runoff Volume = 80 cf Average Runoff Depth = 0.56"
100.00% Pervious = 1,700 sf 0.00% Impervious = 0 sf

ımmary for Subcatchment 1XC: PROPOSED DRIVE EXPANSION, WALK, BBQ, & PATIO AREAS AS LAW

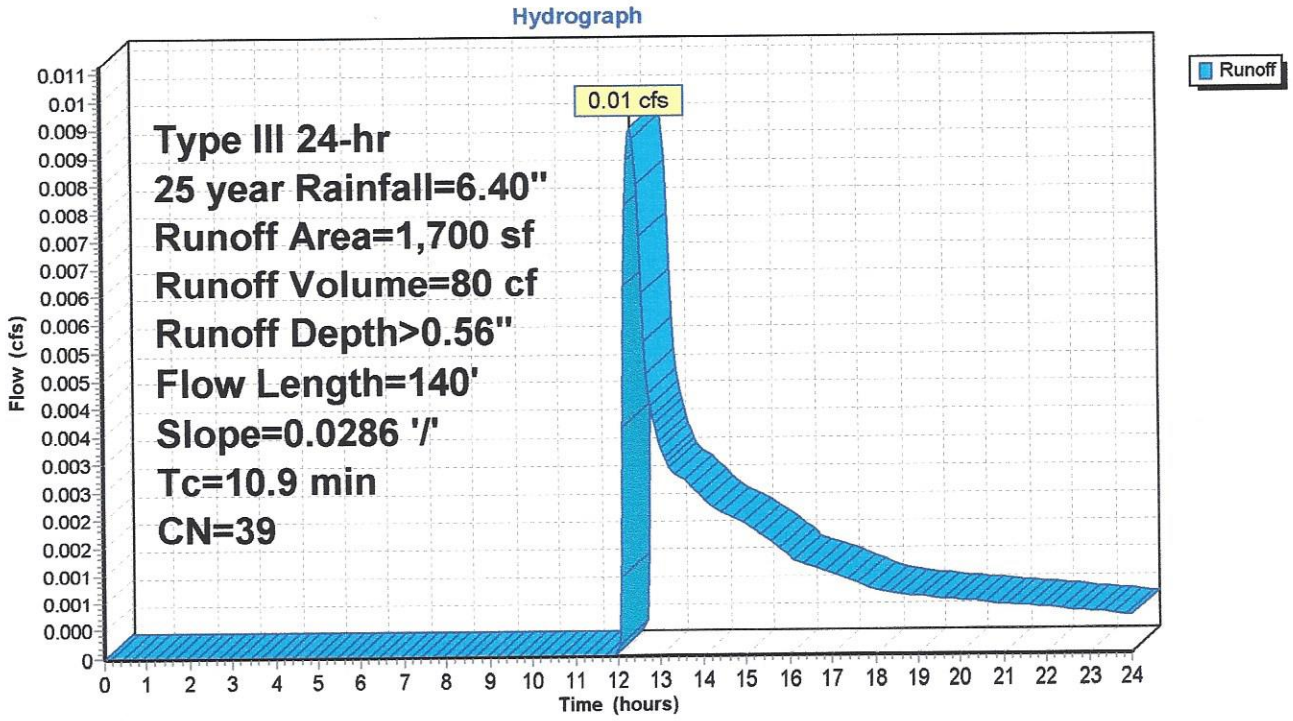
Runoff = 0.01 cfs @ 12.38 hrs, Volume= 80 cf, Depth> 0.56"

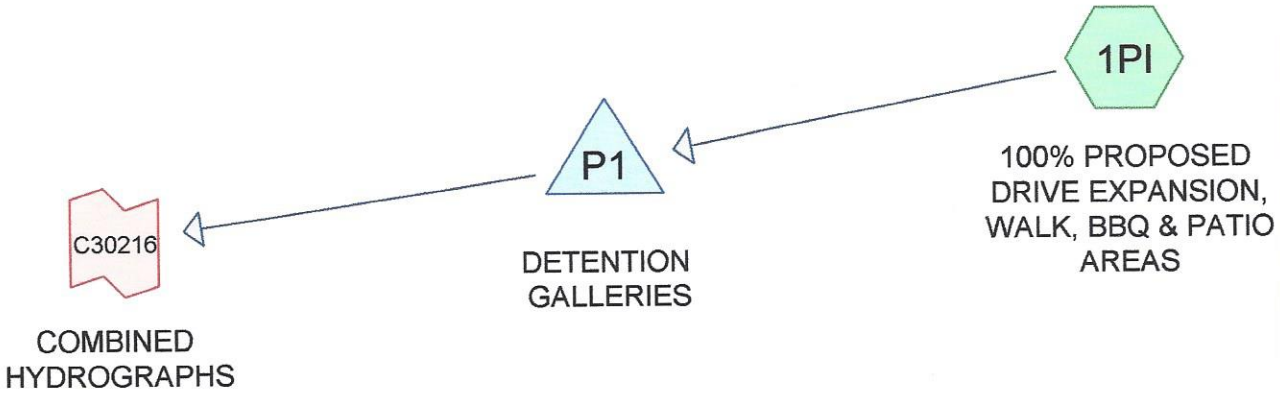
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.40"

Area (sf)	CN	Description
1,700	39	>75% Grass cover, Good, HSG A
1,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	140	0.0286	0.21		**Sheet Flow, EXISTING LAWN** Grass: Short n= 0.150 P2= 3.30"

Subcatchment 1XC: PROPOSED DRIVE EXPANSION, WALK, BBQ, & PATIO AREAS AS LAWN





Subcat Reach Pond Link

Routing Diagram for c30216-PROPHYD
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
425	98	100% PROPOSED BBQ & PATIO (1PI)
65	98	100% PROPOSED CHESS PATIO (1PI)
1,050	98	100% PROPOSED DRIVE EXPANSION AREA (1PI)
160	98	100% PROPOSED WALK AREA (1PI)
1,700	**98**	**TOTAL AREA**

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 DRIVE Runoff Area=1,700 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.26 cfs 873 cf

Pond P1: DETENTION GALLERIES Peak Elev=9.40' Storage=205 cf Inflow=0.26 cfs 873 cf
Outflow=0.05 cfs 873 cf

Link C30216: COMBINED HYDROGRAPHS
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,700 sf Runoff Volume = 873 cf Average Runoff Depth = 6.16"
0.00% Pervious = 0 sf 100.00% Impervious = 1,700 sf

c30216-PROPHYD
Prepared by CHAPPA SITE CONSULTING, LLC

Summary for Subcatchment 1PI: 100% PROPOSED DRIVE EXPANSION, WALK, BBQ & PATIO AREAS

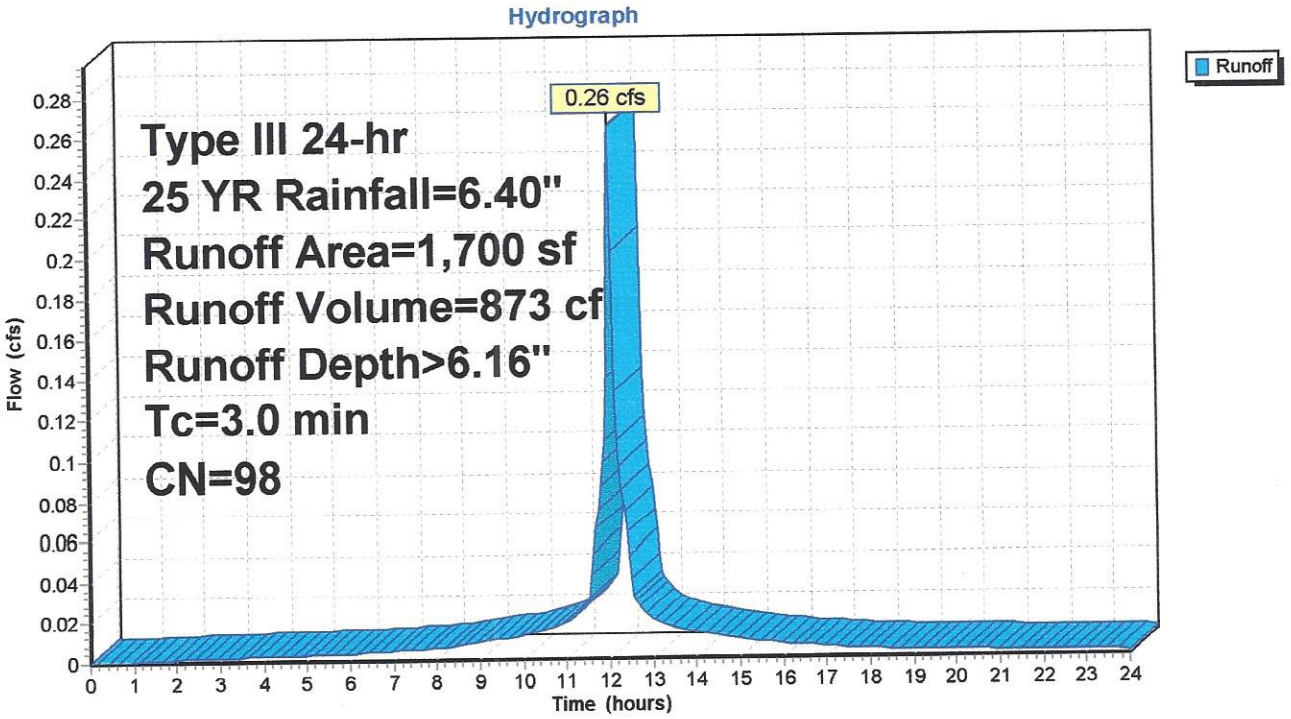
Runoff = 0.26 cfs @ 12.05 hrs, Volume= 873 cf, Depth> 6.16"

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
*	1,050	98	100% PROPOSED DRIVE EXPANSION AREA
*	160	98	100% PROPOSED WALK AREA
*	65	98	100% PROPOSED CHESS PATIO
*	425	98	100% PROPOSED BBQ & PATIO
	1,700	98	Weighted Average
	1,700		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 DRIVE EXPANSION, WALK, BBQ & PATIO AREAS



Summary for Pond P1: DETENTION GALLERIES

Inflow Area = 1,700 sf,100.00% Impervious, Inflow Depth > 6.16" for 25 YR event
Inflow = 0.26 cfs @ 12.05 hrs, Volume= 873 cf
Outflow = 0.05 cfs @ 12.45 hrs, Volume= 873 cf, Atten= 80%, Lag= 24.0 min
Discarded = 0.05 cfs @ 12.45 hrs, Volume= 873 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.40' @ 12.45 hrs Surf.Area= 280 sf Storage= 205 cf

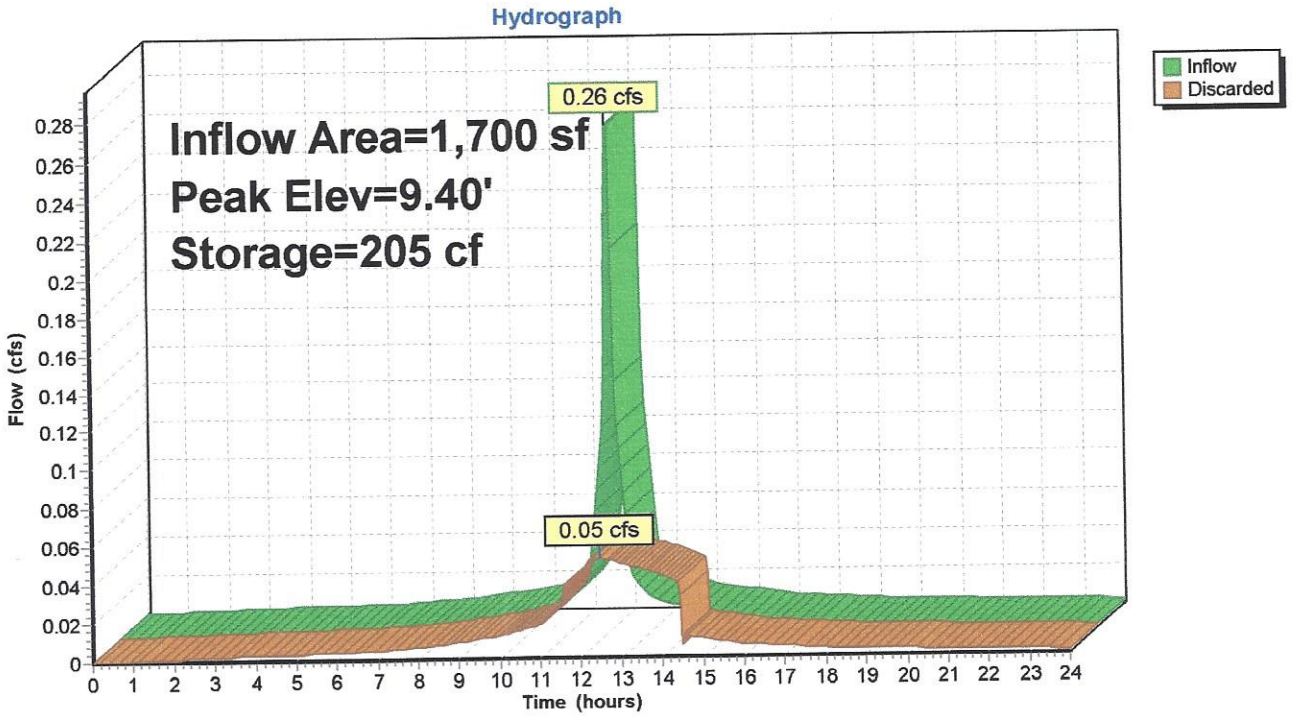
Plug-Flow detention time= 21.3 min calculated for 873 cf (100% of inflow)
Center-of-Mass det. time= 21.2 min (762.5 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	147 cf	**14.00'W x 20.00'L x 2.00'H Prismatoid** 560 cf Overall - 192 cf Embedded = 368 cf x 40.0% Voids
#2	8.50'	129 cf	**Galley 4x8x1.5** x 4 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf 2 Rows of 2 Chambers
		276 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.00'	**6.000 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 12.45 hrs HW=9.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond P1: DETENTION GALLERIES



Summary for Link C30216: COMBINED HYDROGRAPHS

Inflow Area = 1,700 sf,100.00% Impervious, Inflow Depth = 0.00" for 25 YR event
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

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

Link C30216: COMBINED HYDROGRAPHS