LBM Engineering, LLC
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CIVIL ENGINEERING - LAND DEVELOPMENT - SITE PLANS - STORMWATER MANAGEMENT

RECEIVED
LAND USE DEPARTMENT

July 6, 2018

Engineering Report
For Land Use Commissions Submittals
Eagles Landing Subdivision, 79 Vinegar Hill Road, Ledyard, Connecticut

EXISTING CONDITIONS: Reference is made to the following Plan Set: "Plan Showing Eagles Landing an Open Space Subdivision Property of Mr G 1, LLC, 79 Vinegar Hill Road, Ledyard, Connecticut" Scales as Shown July 2018 By Dieter & Gardner, Gales Ferry, CT. The property is located on the east side of Vinegar Hill Road approximately 1,500 feet south of the intersection of Vinegar Hill Road and Ash Drive The property is wooded. Less than one acre of the property, drains to Vinegar Hill Road via sheet flow The remaining portion of the property drains to the north, east and south.

METHODOLOGY: The Rational Method was used for analyzing runoff rates per Part III of the Town of Ledyard's *Ordinance Regulating the Management of Stormwater Runoff*. The descending leg of the hydrographs are increased by a factor of 2.5 to provide additional stormwater volume Intensity-Duration-Frequency (IDF) Curves were downloaded from the Northeast Regional Climate Center (NRCC) web site Calculations are attached to this report

STORMWATER MANAGEMENT: The proposed development will not change the existing drainage patterns. Only 3.5 acres of the 170 acre parcel drains to the road's piped storm drain A proposed detention/water quality basin is sized to effectively maintain the peak rates of runoff from the proposed road's drainage system for 2, 10 and 25-year rainfall events to at or below the pre-development rates There is a slight increase in the peak rate of runoff for the 100-year event. Discharge rate from the detention/water quality basin will be further reduced as it flows over 500 feet through wetlands and underbrush. The basin is designed to drain empty after each storm. The following table provides a comparison of computed peak rates of runoff from the piped system for undeveloped land versus the developed condition:

DESIGN STORM	UNDEVELOPED	DEVELOPED
2-YEAR	3.4 CFS	0.6 CFS
10-YEAR	5.1 CFS	4.1 CFS
25-YEAR	6.0 CFS	6.0 CFS
100-YEAR	7.7 CFS	8.7 CFS

WATER QUALITY. The proposed detention/water quality basin is to hold the Water Quality Volume (WQV) for 24 – 48 hours to settle out suspended solids from the proposed roadway's runoff. The CT D.E.E.P. 2004 Stormwater Quality Manual Paragraph 7.4.1 states. "In the northeastern U.S., the 90 percent rainfall event is equal to approximately one inch. which is consistent with the recommended WQV sizing criteria for Connecticut." Therefore, by treating one inch of runoff from the new road's drainage system, the proposal effectively improves the runoff from the property for 90 percent of all storm events

CONCLUSION: The proposed development will not have adverse effects on down-gradient properties and is in keeping with the policies and goals of the Ledyard Planning and Zoning Commission

Submitted by:
LBM Engineering, LLC

John R. Martucci, P.E.

STATE OF CONNECTICUT
JOHN R. MARTUCCI
19494
LICENSED PROFESSIONAL ENGINEER

Exhibit #3

PREPARED BY	DATE PREPARED	LBM Engineering, LLC	JOB NUMBER	PAGE NUMBER
JRM	6/2018	P.O. BOX 44		
CHECKED BY	DATE CHECKED	COLCHESTER, CONNECTICUT 06415	CLIENT NAME	DATE PREPARED
		TEL (860)-416-9809		
		EMAIL: JOHN@LBMENGINEERING.COM		

VINEGAR HILL SUBDIVISION LEDYARD

CB1 STA 12+50 LT

ROAD 250' x 14' = 3500 SF = 0.08 AC

ROOF & DRIVE 3000 SF x 2.5 = 7500 SF = 0.17 AC

OVERLAND 0.53 AC

0.78 AC

WEIGHTED C = [(0.25 x 0.9) + (0.53 x 0.3)] ÷ 0.78

= 0.49

CB2 STA 12+50 RT

ROAD 250 x 14' = 3500 SF = 0.08 AC

DRIVEWAY APRON 2 x 15' x 15' = 450 SF = 0.01 AC

OVERLAND = 0.08 AC

0.17 AC

WEIGHTED C = [(0.09 x 0.9) + (0.08 x 0.3)] ÷ 0.17

= 0.62

TO WETLAND ON LOT #16

ROOF & DRIVE (4 x 3000) + (12 x 160) = 0.32 AC

OVERLAND (FLAT) = 2.50 AC

PREPARED BY	DATE PREPARED	LBM Engineering, LLC	JOB NUMBER	PAGE NUMBER
JRM	6/2018	P.O. BOX 44		
CHECKED BY	DATE CHECKED	COLCHESTER, CONNECTICUT 06415	CLIENT NAME	REF. PAGE
		TEL. (860)-415-9809		
		EMAIL: JOHN@LBMENGINEERING.COM		

VINEGAR HILL SUBDIVISION - LEDYARD

CB 3

ROAD 450' × 14' ÷ 43560 — 0.14 Ac

ROOF & DRIVE [3000 + (160 × 12)] ÷ 43560 — 0.11 Ac

OVERLAND — 0.37 Ac

0.62 Ac

WEIGHTED C = [(0.25 × 0.9) + (0.37 × 0.3)] ÷ 0.62 = 0.54

CB4

ROAD 450 × 14 ÷ 43560 — 0.14 Ac

Roof & Drive 3000 SF — 0.07 Ac

OVERLAND — 0.26 Ac

0.47 Ac

WEIGHTED C = [(0.21 × 0.9) + (0.26 × 0.3)] ÷ 0.47 = 0.57

CB 5

ROAD — 0.14 Ac

Roof & Drive 3000 + (370 × 12) = 7440 — 0.17 Ac

OVERLAND — 0.69 Ac

1.00 Ac

WEIGHTED C = [(0.31 × 0.9) + (0.69 × 0.3)] ÷ 1 = 0.49

PREPARED BY	DATE PREPARED	LBM Engineering, LLC	JOB NUMBER	PAGE NUMBER
JRM	6/2018	P.O. BOX 44 COLCHESTER, CONNECTICUT 06415 TEL. (860)-416-9809 EMAIL: JOHN@LBMENGINEERING.COM		
CHECKED BY	DATE CHECKED		CLIENT NAME	TOTAL PAGES

VINEGAR HILL CORPORATION LANDYARD

CB 6

ROAD	0.14 AC
ROOF & DRIVE	0.02 AC
OVERLAND	0.05 AC
	0.21 AC TOTAL

WEIGHTED 'C' = [(0.16 x 0.9) + (0.05 x 0.3)] ÷ 0.21 = 0.75

TOTAL AREA TO THE SYSTEM

P26 3.25 AC x 0.3 (UNDEVELOPED) = 6.2 = 6.0 CFS

TOTAL AC

1.097 ÷ 3.25 AC = 0.46 DEVELOPED 'C'

PRE DEVELOPMENT FLOW FROM PIPED SYSTEM

	A	x	I	x	R	= Q	POST DEV @ VARIOUS
2YR	3.25	x	0.3	x	3.5 "/HR	= 3.4 CFS	0.6
10-YR					5.2	= 5.1	4.1
25-YR					6.7	= 6.0	6.0
100-YR					7.9	= 7.7	8.1

PROJECT: VINEGAR HILL SUBDIVISION
PROJECT NO:
TOWN: Ledyard
ROUTE:
LOCATION: N/A

DESIGNED BY: JRM DATE: 06/13/18
REV:
CHECKED BY: DATE:

GUTTER FLOW ANALYSIS - 25 YR STORM

Inlet ID	Inlet Station and Offset	Area in Acres (A)	Runoff Coeff (C)	Time to Inlet (min)	Rainfall Intensity (in/hr)	AC	Total AC	Q to Inlet (cfs)	Grade of Gutter (ft/ft) (S_L)	Cross Slope Of Shoulder (ft/ft) (S_x)	Depth of Flow in Gutter (ft)	Gutter Flow Width (ft)	Q Bypassing Inlet (cfs)	AC Bypassing Inlet	AC Entering Catch Basin	Inlet Type
PROPOSED ROAD LEFT GUTTER																
CB 1	12+50, LT	[illegible]	0.49	10	6.20	0.382	0.382	2.607	[illegible]	0.043	0.276	6.424	0.973	0.157	0.225	"C"
CB 6	17+10, LT	[illegible]	0.75	10	6.20	0.158	0.158	1.074	[illegible]	0.043	0.198	4.607	0.225	0.036	0.121	"C"
CB 4	14+60, LT	[illegible]	0.57	10	6.20	0.263	0.451	3.144	LOW PT	0.043						"C"
PROPOSED ROAD RIGHT GUTTER																
CB 2	12+50, RT	[illegible]	0.62	10	6.20	0.105	0.105	0.719	[illegible]	0.043	0.170	3.963	0.098	0.016	0.090	"C"
CB 5	17+10, RT	[illegible]	0.49	10	6.20	0.490	0.490	3.342	[illegible]	0.043	0.303	7.051	1.392	0.225	0.265	"C"
CB 3	14+60, RT	[illegible]	0.54	10	6.20	0.335	0.335	2.283	LOW PT	0.043						"C"

NOTES

LOW POINT ANALYSIS

INLET	Q TO INLET	PERIM	C WEIR	d WEIR	WIDTH	Q ORIFICE	
CB 4	3.144	5.020	3	0.352	8.18	0.140	0.3' DEEP - OK
CB 3	2.283	5.020	3	0.284	6.61	0.078	0.3' DEEP - OK

Notes:
1. Manning's n = 0.016 - asphalt
2. Tc = 5 minutes minimum for areas with full development
3. Tc = 10 minutes minimum for small areas with pavement and grass
4. For low points, generally do not allow Depth of Over Grate to exceed 0.4 feet

GRATE S	PERIM	AREA
[illegible]	5.00	3.13
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

STORM SEWER SYSTEM DESIGN
DRAINAGE SYSTEM

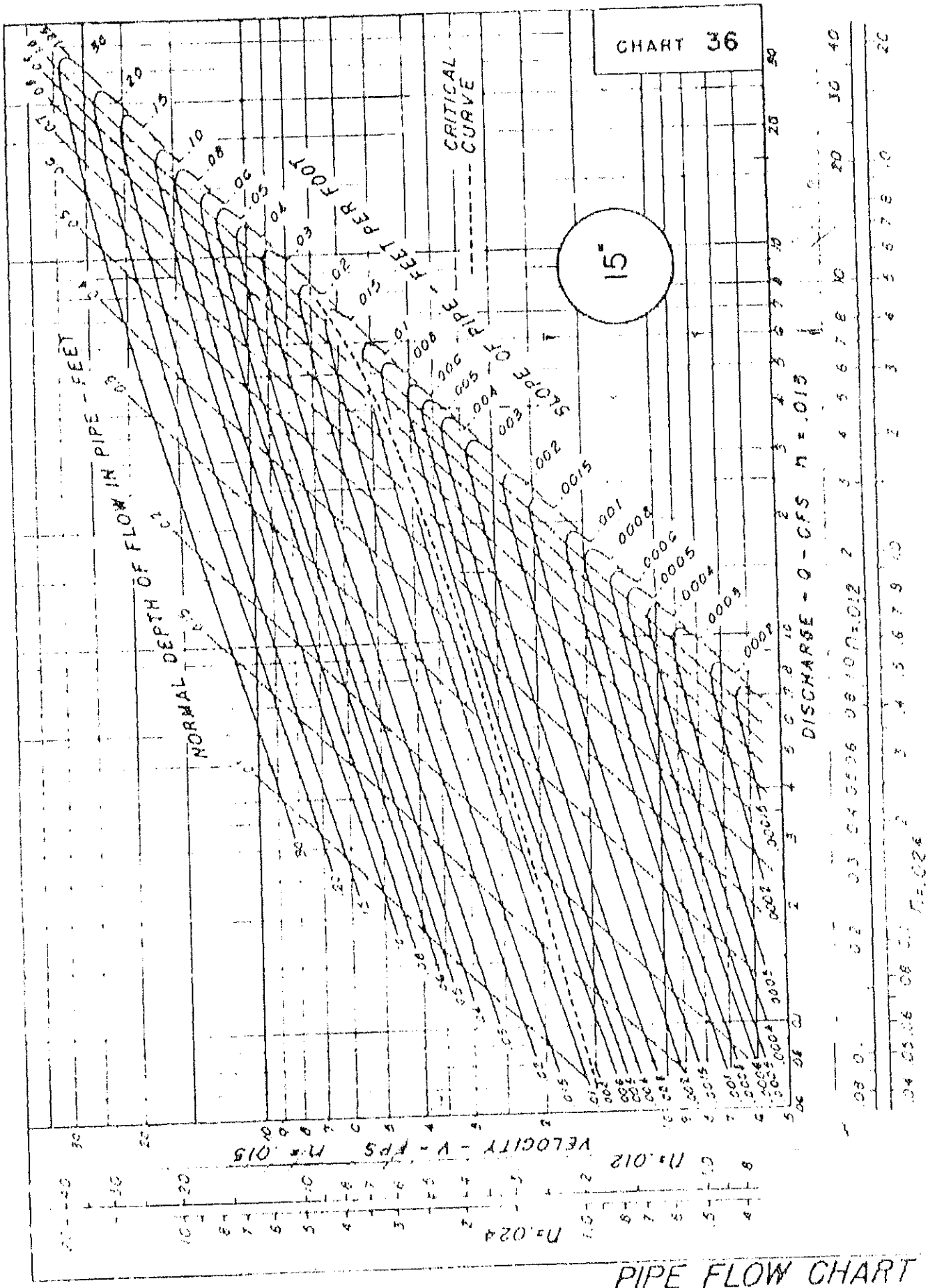
Client:
Project: VINEGAR HILL SUBDIVISION
Proj No
Return Period for Design: 25-YR

Prepared By JRM Date 06/17/18 Revised

Line Segment From	Line Segment To	Time to Inlet (min.)	Time in Pipe (min.)	Accumul Time (min.)	A x C Entering System	Sum of A x C in System	Rainfall Intensity R (in./hr.)	Q in System (c.f.s.)	Pipe Data Size (in.)	Length (ft.)	Slope (ft./ft.)	Avg Vel (f.p.s.)	Full Cap. (c.f.s.)	Headwater (ft.)	Manning "n"
CB 1 12+50 LT	CB 2 12+50 RT	10	0.07	10.0	0.225	0.225	6.2	1.40	15	22	0.010	5.0	6.99	0.40	0.012
CB 2 12+50 RT	CB 3 14+60 RT	10	0.64	10.1	0.09	0.315	6.2	1.95	15	192	0.010	5.0	6.99	0.60	0.012
CB 6 17+10 LT	CB 5 17+10 RT	10	0.09	10.0	0.121	0.121	6.2	0.75	15	22	0.010	4.0	6.99	0.40	0.012
CB 5 17+10 RT	CB 3 14+60 RT	10	0.69	10.1	0.265	0.386	6.2	2.39	15	250	0.010	6.0	6.99	0.50	0.012
CB 3 14+60 RT	CB 4 14+60 LT	10	0.05	10.8	0.335	1.036	6.2	6.42	15	22	0.010	7.0	6.99	1.00	0.012
CB 4 14+60 LT	OUTLET	10	0.50	10.8	0.461	1.497	6.2	9.28	18	300	0.026	10.0	18.34	2.00	0.012

Manning's "n" for HDPE and PC pipe = 0.012

NOTE ALL PIPES ARE BELOW FULL CAPACITY



PIPE FLOW CHART
15-INCH DIAMETER

NOAA Atlas 14, Volume 10, Version 2
Location name: Ledyard, Connecticut, USA*
Latitude: 41.4443°, Longitude: -72.0175°
Elevation: 304.37 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite
NOAA, National Weather Service, Silver Spring, Maryland

PF tabular | PF graphical | Maps & aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.341 (0.265-0.437)	0.408 (0.316-0.523)	0.517 (0.399-0.664)	0.608 (0.467-0.783)	0.732 (0.545-0.973)	0.828 (0.605-1.12)	0.924 (0.656-1.28)	1.05 (0.704-1.46)	1.21 (0.782-1.71)	1.33 (0.841-[illegible])
10-min	0.483 (0.375-0.619)	0.578 (0.448-0.740)	0.732 (0.566-0.941)	0.861 (0.661-1.11)	1.04 (0.772-1.38)	1.17 (0.856-1.58)	1.31 (0.930-1.82)	1.48 (0.997-2.08)	1.71 (1.11-2.45)	1.88 (1.19-2.74)
15-min	0.569 (0.441-0.725)	0.680 (0.527-0.871)	0.862 (0.665-1.11)	1.01 (0.778-1.31)	1.22 (0.909-1.62)	1.38 (1.01-1.86)	1.54 (1.09-2.13)	1.74 (1.17-2.44)	2.01 (1.30-2.88)	2.27 (1.45-[illegible])
30-min	0.802 (0.622-1.03)	0.959 (0.743-1.23)	1.21 (0.937-1.56)	1.43 (1.09-1.81)	1.72 (1.28-2.28)	1.94 (1.42-2.62)	2.17 (1.54-3.06)	2.45 (1.65-3.43)	2.83 (1.83-4.25)	3.12 (1.94-[illegible])
60-min	1.04 (0.804-1.33)	1.24 (0.958-1.58)	1.57 (1.21-2.01)	1.84 (1.41-2.37)	2.21 (1.65-2.94)	2.50 (1.83-3.38)	2.79 (1.98-3.87)	3.16 (2.13-4.42)	3.65 (2.36-5.23)	4.02 (2.5[illegible]-5.81)
2-hr	1.36 (1.07-1.73)	1.62 (1.27-2.06)	2.00 (1.60-2.62)	2.41 (1.87-3.08)	2.90 (2.18-3.83)	3.28 (2.41-4.39)	3.66 (2.62-5.04)	4.15 (2.80-5.76)	4.79 (3.12-6.81)	5.27 ([illegible])
3-hr	1.58 (1.24-2.00)	1.88 (1.46-2.48)	2.38 (1.86-3.02)	2.79 (2.17-3.55)	3.36 (2.53-4.41)	3.80 (2.83-5.06)	4.24 (3.04-5.80)	4.80 (3.26-6.63)	5.54 (3.62-7.84)	6.10 ([illegible])
6-hr	2.01 (1.59-2.54)	2.38 (1.89-2.99)	3.01 (2.37-3.77)	3.52 (2.76-4.43)	4.23 (3.21-5.50)	4.77 (3.56-6.30)	5.32 (3.84-7.22)	6.02 (4.11-8.26)	6.95 (4.56-9.7[illegible])	7.65 ([illegible])
12-hr	2.48 (1.98-3.07)	2.94 (2.39-3.65)	3.69 (2.94-4.59)	4.32 (3.42-5.39)	5.18 (3.97-6.68)	5.84 (4.38-7.65)	6.51 (4.74-8.77)	7.37 (5.06-10.0)	8.50 (5.51-11.9)	9.36 ([illegible])
24-hr	2.90 (2.34-3.57)	3.46 (2.79-4.25)	4.36 (3.51-5.38)	5.11 (4.09-6.33)	6.15 (4.75-7.87)	6.95 (5.26-9.03)	7.75 (5.69-10.4)	8.81 (6.09-11.9)	10.2 (6.78-14.2)	11.3 ([illegible])
2-day	3.25 (2.64-3.95)	3.90 (3.18-4.75)	4.97 (4.03-6.07)	5.87 (4.73-7.19)	7.09 (5.53-9.01)	8.04 (6.13-10.4)	8.98 (6.66-12.0)	10.3 (7.15-13.8)	12.0 (8.02-16.5)	13.4 ([illegible])
3-day	3.52 (2.88-4.26)	4.22 (3.46-5.12)	5.38 (4.39-6.54)	6.34 (5.14-7.73)	7.66 (6.00-9.68)	8.68 (6.66-11.2)	9.70 (7.22-12.9)	11.1 (7.76-14.8)	13.0 (8.78-17.8)	14.4 ([illegible])
4-day	3.77 (3.10-4.55)	4.51 (3.71-5.45)	5.73 (4.69-6.93)	6.73 (5.48-8.18)	8.12 (6.48-10.2)	9.19 ([illegible])	10.3 (7.68-13.5)	11.7 (8.21-15.8)	13.7 ([illegible])	15.2 ([illegible])
7-day	4.49 (3.72-5.38)	5.30 (4.39-6.35)	6.63 (5.46-7.95)	7.72 (6.33-9.31)	9.23 (7.30-11.5)	10.4 (8.04-13.2)	11.6 (8.66-15.1)	13.1 (9.22-17.3)	15.2 (10.2-20.6)	16.8 ([illegible])
10-day	5.21 (4.33-6.20)	6.05 (5.03-7.21)	7.44 (6.16-8.86)	8.59 (7.07-10.3)	10.2 (8.07-12.6)	11.4 (8.83-14.3)	12.6 (9.45-16.3)	14.2 (9.99-18.6)	16.2 (11.0-21.9)	17.8 ([illegible])
20-day	7.39 (6.22-8.72)	8.30 (6.97-9.80)	9.78 (8.18-11.6)	11.0 (9.15-13.1)	12.7 (10.1-15.5)	14.0 (10.9-17.4)	15.3 (11.5-19.4)	16.7 (11.9-21.7)	18.5 (12.6-24.7)	19.9 ([illegible])
30-day	9.21 (7.79-10.8)	10.2 (8.58-11.9)	11.7 (9.85-13.8)	13.0 (10.9-15.4)	14.8 (11.8-17.9)	16.1 (12.6-19.8)	17.5 (13.1-21.9)	18.7 (13.4-24.2)	20.4 (13.9-27.0)	21.6 ([illegible])
45-day	11.5 (9.74-13.4)	12.5 (10.6-14.5)	14.1 (11.9-16.5)	15.5 (13.0-18.2)	17.4 (14.0-20.9)	18.8 (14.7-22.9)	20.3 (15.2-25.1)	21.4 (15.3-27.5)	23.0 (15.6-30.[illegible])	23.9 ([illegible])
60-day	13.3 (11.4-15.5)	14.4 (12.3-16.7)	16.1 (13.7-18.8)	17.6 (14.8-20.6)	19.6 (15.8-23.4)	21.1 (16.6-25.5)	22.6 (17.0-27.9)	23.7 (17.3-30.3)	25.0 (17.2-33.0)	26.1 ([illegible])

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

COMPUTATIONS FOR	Project
WATER QUALITY FLOW / WATER QUALITY VOLUME	Made By:
VINEGAR HILL RD SUBDIVIDION	Date:
LEDYARD	Rev:
	Date:

IN SYSTEM TO BASIN

ConnDOT Drainage Manual Ch. 10 and Ch. 11, Appendix C

Contributing Basins	Wooded Area (acres)	Grass Area (acres)	Paved Area (acres)	Total Area (acres)
				6.2
Total	0	4.8	1.4	6.2

Equation 10.31 WQV = (1")(R)(A)/12 = 0.131 acre-feet or 5,699 cubic-feet

I = % of Impervious Cover = 23%
R = volumetric runoff coeff 0.05 + 0.009(I) = 0.2532
A = site area (acres) = 6.2 acres = 0.0097 miles^2

Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres)
Q = 0.2532258

CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)$^{0.5}$] = 88.0

P = design precipitation (1" for water quality storm) = 1 inch
Q = runoff depth (in watershed inches)

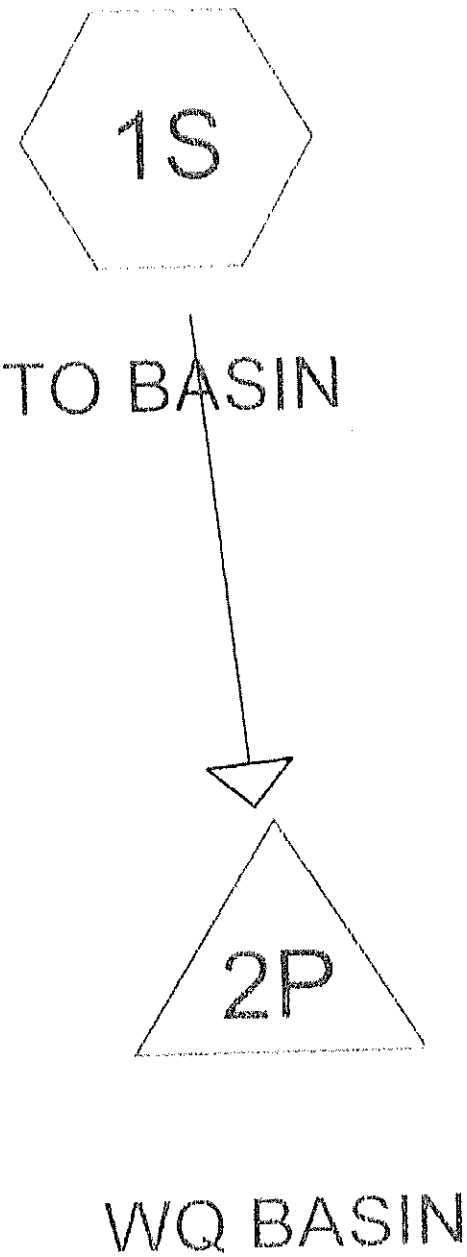
t_c 10 min
hours

From Table 4-1, Ia = Ia/P = 0.273

From Exhibit 4-III, q_u =

WQF = (qu)(A)(Q) = 1.23 cfs

TO POND 1



Subcat Reach Pond Link

Routing Diagram for VINEGAR HILL BASIN
Prepared by LBM Engineering LLC
HydroCAD® 10.00-22 s/n 09132 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment 1S: TO BASIN

Runoff = 5.17 cfs @ 0.17 hrs, Volume= 5.469 cf Depth= 0.46"

Runoff by Rational method, Rise/Fall=1.0/2.5 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-Ledyard 2-yr Duration=10 min, Inten=3.46 in/hr

Area (ac)	C	Description	Land Use
3.250	0.46	SYSTEM TO BASIN	
3.250		100.00% Pervious Area	

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

Summary for Pond 2P: WQ BASIN

Inflow Area = 141,570 sf, 0.00% Impervious, Inflow Depth = 0.46" for 2-yr event
Inflow = 5.17 cfs @ 0.17 hrs, Volume= 5.469 cf
Outflow = 0.59 cfs @ 0.54 hrs, Volume= 284 cf, Atten= 89%, Lag= 21.9 min
Primary = 0.59 cfs @ 0.54 hrs, Volume= 284 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 277.07' @ 0.54 hrs Surf.Area= 2.287 sf Storage= 5.332 cf

Plug-Flow detention time= 33.6 min calculated for 284 cf (5% of inflow)
Center-of-Mass det. time= 21.5 min (36.5 - 15.0)

Volume	Invert	Avail.Storage	Storage Description
#1	274.00'	7.823 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.00	1,120	0	0
276.00	1,965	3,085	3,085
277.00	2,234	2,100	5,185
278.00	3,042	2,638	7,823

Device	Routing	Invert	Outlet Devices
#1	Primary	277.00'	**15.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.59 cfs @ 0.54 hrs HW=277.06' (Free Discharge)
└─1=Broad-Crested Rectangular Weir (Weir Controls 0.59 cfs @ 0.60 fps)

Summary for Subcatchment 1S: TO BASIN

Runoff = 7.68 cfs @ 0.17 hrs, Volume= 8,128 cf, Depth= 0.69"

Runoff by Rational method, Rise/Fall=1.0/2.5 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-Ledyard 10-yr Duration=10 min, Inten=5.14 in/hr

Area (ac)	C	Description	Land Use
3.250	0.46	SYSTEM TO BASIN	
3.250		100.00% Pervious Area	

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

Summary for Pond 2P: WQ BASIN

Inflow Area = 141,570 sf, 0.00% Impervious, Inflow Depth = 0.69" for 10-yr event
Inflow = 7.68 cfs @ 0.17 hrs, Volume= 8,128 cf
Outflow = 4.14 cfs @ 0.36 hrs, Volume= 2,943 cf, Atten= 46%, Lag= 11.5 min
Primary = 4.14 cfs @ 0.36 hrs, Volume= 2,943 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 277.24' @ 0.36 hrs Surf.Area= 2,425 sf Storage= 5,736 cf

Plug-Flow detention time= 18.5 min calculated for 2,943 cf (36% of inflow)
Center-of-Mass det. time= 10.9 min (25.9 - 15.0)

Volume	Invert	Avail.Storage	Storage Description
#1	274.00'	7,823 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum Store (cubic-feet)
274.00	1,120	0	0
276.00	1,965	3,085	3,085
277.00	2,234	2,100	5,185
278.00	3,042	2,638	7,823

Device	Routing	Invert	Outlet Devices
#1	Primary	277.00'	15.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=4.13 cfs @ 0.36 hrs HW=277.24' (Free Discharge)
└─1=Broad-Crested Rectangular Weir (Weir Controls 4.13 cfs @ 1.16 fps)

Summary for Subcatchment 1S: TO BASIN

Runoff = 9.24 cfs @ 0.17 hrs, Volume= 9,780 cf, Depth= 0.83"

Runoff by Rational method, Rise/Fall=1.0/2.5 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-Ledyard 25-yr Duration=10 min, Inten=6.18 in/hr

Area (ac)	C	Description	Land Use
3.250	0.46	SYSTEM TO BASIN	
3.250		100.00% Pervious Area	

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

Summary for Pond 2P: WQ BASIN

Inflow Area = 141,570 sf, 0.00% Impervious, Inflow Depth = 0.83" for 25-yr event
Inflow = 9.24 cfs @ 0.17 hrs, Volume= 9,780 cf
Outflow = 5.96 cfs @ 0.32 hrs, Volume= 4,595 cf, Atten= 36%, Lag= 8.8 min
Primary = 5.96 cfs @ 0.32 hrs, Volume= 4,595 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 277.30' @ 0.32 hrs Surf.Area= 2,475 sf Storage= 5,887 cf

Plug-Flow detention time= 15.4 min calculated for 4,595 cf (47% of inflow)
Center-of-Mass det. time= 8.9 min (23.9 - 15.0)

Volume	Invert	Avail.Storage	Storage Description
#1	274.00'	7,823 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.00	1,120	0	0
276.00	1,965	3,085	3,085
277.00	2,234	2,100	5,185
278.00	3,042	2,638	7,823

Device	Routing	Invert	Outlet Devices
#1	Primary	277.00'	15.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=5.95 cfs @ 0.32 hrs HW=277.30' (Free Discharge)
└1=Broad-Crested Rectangular Weir (Weir Controls 5.95 cfs @ 1.33 fps)

Summary for Subcatchment 1S: TO BASIN

Runoff = 11.67 cfs @ 0.17 hrs, Volume= 12,343 cf, Depth= 1.05"

Runoff by Rational method, Rise/Fall=1.0/2.5 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
CT-Ledyard 100-yr Duration=10 min, Inten=7.80 in/hr

Area (ac)	C	Description	Land Use
3.250	0.46	SYSTEM TO BASIN	
3.250		100.00% Pervious Area	

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

Summary for Pond 2P: WQ BASIN

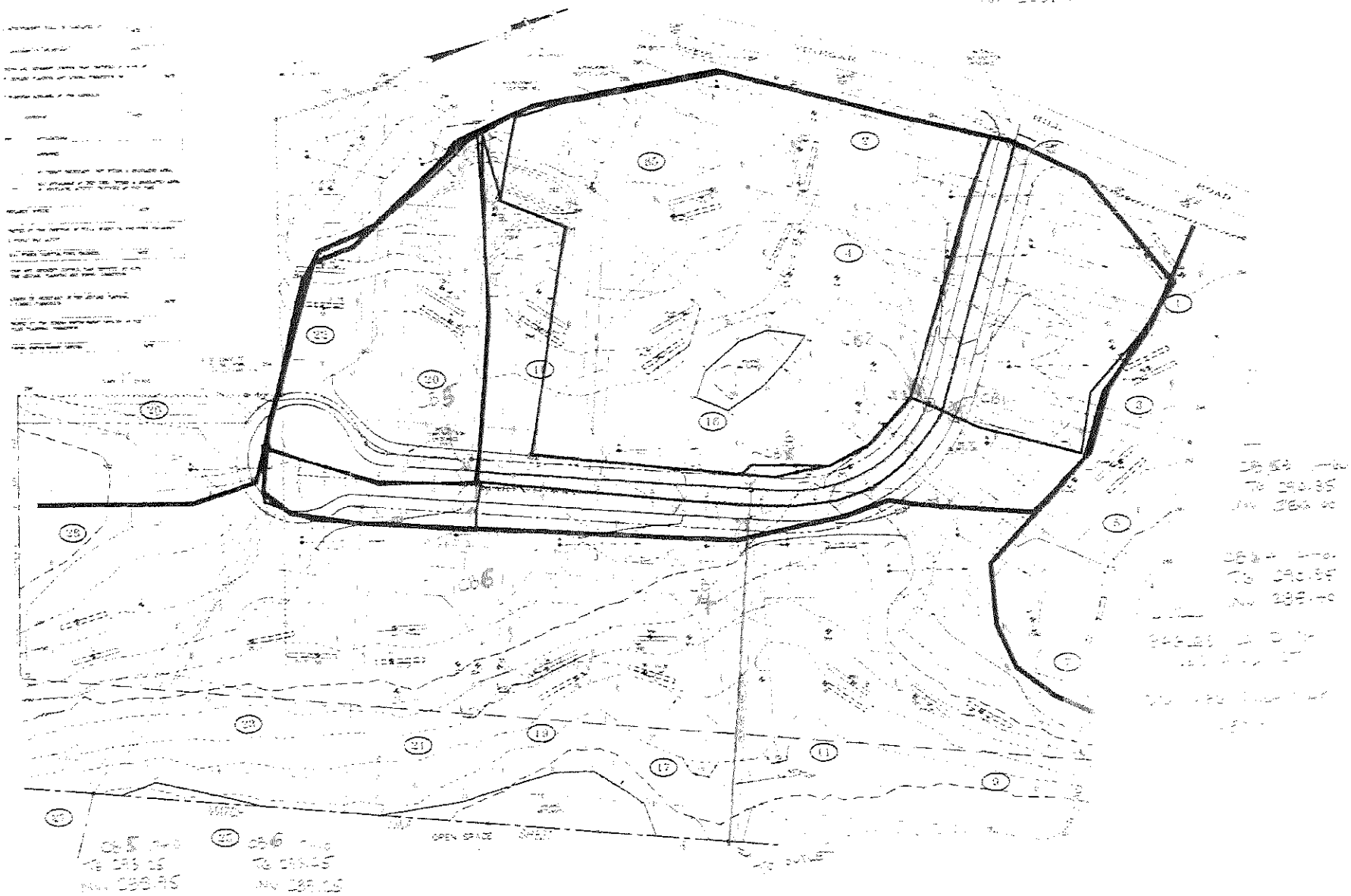
Inflow Area = 141,570 sf, 0.00% Impervious, Inflow Depth = 1.05" for 100-yr event
Inflow = 11.67 cfs @ 0.17 hrs, Volume= 12,343 cf
Outflow = 8.69 cfs @ 0.28 hrs, Volume= 7,158 cf, Atten= 25%, Lag= 6.3 min
Primary = 8.69 cfs @ 0.28 hrs, Volume= 7,158 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 277.38' @ 0.28 hrs Surf.Area= 2,539 sf Storage= 6,087 cf

Plug-Flow detention time= 12.5 min calculated for 7,158 cf (58% of inflow)
Center-of-Mass det. time= 7.1 min (22.1 - 15.0)

Volume	Invert	Avail.Storage	Storage Description
#1	274.00'	7,823 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
274.00	1,120	0	0
276.00	1,965	3,085	3,085
277.00	2,234	2,100	5,185
278.00	3,042	2,638	7,823

Device	Routing	Invert	Outlet Devices
#1	Primary	277.00'	15.0' long x 6.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=8.68 cfs @ 0.28 hrs HW=277.38' (Free Discharge)
↑—1=Broad-Crested Rectangular Weir (Weir Controls 8.68 cfs @ 1.53 fps)