



**EQUINOX
ENGINEERING, PLLC**

**CHURCH CHRIST COMMUNITY
141 Erwin Road
Chapel Hill, North Carolina**

**STORMWATER IMPACT
STATEMENT**



Prepared for:
Philip Post Engineering, Inc.
P.O. Box 4912
Chapel Hill, NC 27515
Firm License: C-347

Prepared By:
Equinox Engineering, PLLC
5030 Whitehorse Road
Hillsborough, NC 27278
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Project #: 401801
August 31, 2019

401801
08/31/2019

STORMWATER IMPACT STATEMENT

Christ Community Church

The site is located on the southwest corner of the Erwin Road/Old Oxford Road intersection at 141 Erwin Road. There will be road connections to both Erwin Road and Old Oxford Road. The 2.56 acre parcel is currently residential with a total of 9,690 square feet of impervious surface (8.69%). The parcel drains to the southwest and the post-construction impervious area will total 51,949 square feet (46.6%). The project consists of a new church building along with the associated sidewalks and parking.

To satisfy Town requirements, the post-construction runoff from the entire site for the 1, 2 and 25 year storms cannot exceed the pre-construction levels. Also, the Town requires 85% TSS removal from the post-development stormwater runoff. Water quality and quantity goals will be met using an underground 8 foot diameter CMP system. The water quality volume will be routed through Stormfilters by Contech with the filtered runoff being directed back into the outlet chamber for the detention structure. A weir wall with orifices and weirs releases the 1, 2 & 25-year storm events at or below pre-construction levels. This detention system satisfies the runoff reduction requirements for the entire site.

The outlet from the system will be connected to the storm system on the parcel to the south. At this time information on the location and elevation of the receiving structure is not available. Those items will be addressed in later revisions to the plans.

See attached plans, calculations and worksheets.

EQUINOX ENGINEERING, PLLC
5030 Whitehorse Road
Hillsborough, NC 27278
ernie.equinox@gmail.com 919-616-3451
Firm License: P-1983

JOB CHRIST COMMUNITY CHURCH 401801
SHEET NO. 1 OF _____
CALCULATED BY EGD DATE 03/09/2019
CHECKED BY _____ DATE _____
SCALE _____

SITE DATA:

PARCEL AREA = 111,640 SF = 2.56 AC

SOIL TYPES: CFB, CREEDMOOR FINE SANDY LOAM; HSG=C
WTC2, WHITE STORE CLAY LOAM; HSG=D
WSB, WHITE STORE LOAM; HSG=D

PRE-CONSTRUCTION COVER CONDITIONS:

IMPERVIOUS = 96,900 SF ; C = 0.96 ; 8.68%
LAWN = 379,350 SF ; C = 0.50
WOODED = 63,265 SF ; C = 0.40
LANDSCAPED = 7,500 SF ; C = 0.50

$$\text{COMPOSITE C} = \frac{96900}{111640} (0.96) + \frac{38685}{111640} (0.50) + \frac{63265}{111640} (0.40) = 0.48$$

PROPOSED COVER CONDITIONS:

IMPERVIOUS = 51,949 SF ; C = 0.96 ; 46.53%
LAWN/LANDSCAPED = 24,276 SF ; C = 0.50
WOODED = 35,415 SF ; C = 0.40

$$\text{COMPOSITE C} = \frac{51949}{111640} (0.96) + \frac{24276}{111640} (0.50) + \frac{35415}{111640} (0.40) = 0.68$$

$$\text{PRE } Q_1 = 0.48 (4.93 \frac{\text{IN}}{\text{HR}}) 2.56 \text{ AC} = 6.06 \text{ cfs}$$

$$\text{POST } Q_1 = 0.68 (4.93 \frac{\text{IN}}{\text{HR}}) 2.56 \text{ AC} = 8.58 \text{ cfs}$$

$$\text{PRE } Q_2 = 0.48 (5.81 \frac{\text{IN}}{\text{HR}}) 2.56 \text{ AC} = 7.14 \text{ cfs}$$

$$\text{POST } Q_2 = 0.68 (5.81 \frac{\text{IN}}{\text{HR}}) 2.56 \text{ AC} = 10.11 \text{ cfs}$$

$$\text{PRE } Q_{25} = 0.48 (8.11 \frac{\text{IN}}{\text{HR}}) 2.56 \text{ AC} = 9.97 \text{ cfs}$$

$$\text{POST } Q_{25} = 0.68 (8.11 \frac{\text{IN}}{\text{HR}}) 2.56 \text{ AC} = 14.12 \text{ cfs}$$

$$\text{PRE-CONSTRUCTION } R_v = 0.05 + 0.9(8.68\%) = 0.13$$

$$\text{POST-CONSTRUCTION } R_v = 0.05 + 0.9(46.53\%) = 0.47$$

$$2\text{-YR, 24-Hour RAINFALL DEPTH} = 3.58''$$

2-YR PRE-POST VOLUME CHANGE:

$$\text{VOLUME} = 3630(3.58'')(0.47 - 0.13)(2.56 \text{ AC.}) = 11312 \text{ cf}$$

TOTAL AREA ROUTED TO DETENTION/TREATMENT = 1.72 ACRES

IMPERVIOUS = 1.15 AC.; CN = 98, C = 0.96

LANDSCAPE/LAWN = 0.57 ACRES; CN = 86, C = 0.50

$$\text{COMPOSITE CN} = \frac{1.15}{1.72}(98) + \frac{0.57}{1.72}(86) = \underline{94}$$

$$\text{COMPOSITE C} = \frac{1.15}{1.72}(0.96) + \frac{0.57}{1.72}(0.50) = \underline{0.81}$$

POST-CONSTRUCTION RUNOFF TO DETENTION

$$Q_1 = 0.81(4.93 \text{ IN/HR}) 1.72 \text{ AC} = 6.87 \text{ cfs}$$

$$Q_2 = 0.81(5.81 \text{ IN/HR}) 1.72 \text{ AC} = 8.09 \text{ cfs}$$

$$Q_{25} = 0.81(8.11 \text{ IN/HR}) 1.72 \text{ AC} = 11.30 \text{ cfs}$$

ROUTING DATA:

$$S = \frac{1000}{94} - 10 = 0.64$$

$$Q_1^* = \frac{(2.15 - 0.2(0.64))^2}{2.15 + 0.8(0.64)} = 1.54''$$

= 60.5

$$T_{PI} = \frac{1.54''(1.72 \text{ AC})}{1.39(6.87 \text{ cfs})} \left(\frac{\text{ft}}{12''} \right) \left(\frac{43560 \text{ SF}}{\text{AC}} \right) \left(\frac{\text{MIN.}}{60 \text{ SEC}} \right) = 17 \text{ MINUTES}$$

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JOB _____
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CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

$$Q_2^* = \frac{(2.59 + 0.2(0.64))^2}{2.59 + 0.8(0.64)} = 2.38''$$

$$T_{P2} = \frac{2.38'' (1.72 \Delta c)}{1.39 (8.09 cfs)} 60.5 = 22 \text{ MIN.}$$

$$Q_{25}^* = \frac{(4.37 + 0.2(0.64))^2}{4.37 + 0.8(0.64)} = 4.14''$$

$$T_{P25} = \frac{4.14'' (1.72 \Delta c)}{1.39 (11.30 cfs)} 60.5 = 27 \text{ MINUTES}$$

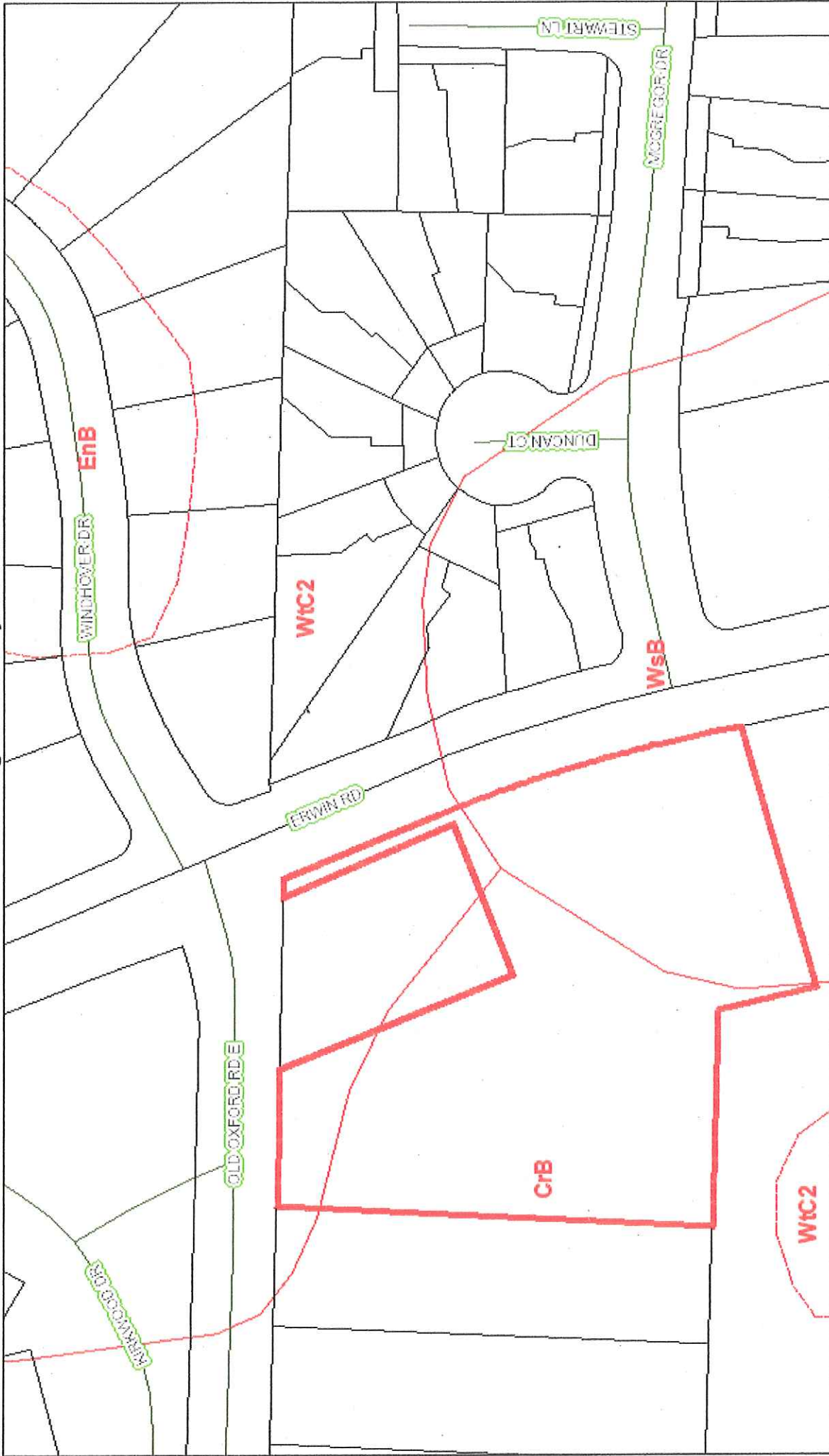
DISCHARGE SUMMARY FOR CHRIST COMMUNITY CHURCH

8/31/2019

	PRE-CONSTRUCTION (cfs)		POST-CONSTRUCTION WITHOUT DETENTION (cfs)		REQUIRED REDUCTIONS (cfs)		POST-CONSTRUCTION OUTFLOW WITH DETENTION (cfs)	
	1-YR	2-YR	1-YR	25-YR	1-YR	2-YR	1-YR	25-YR
ENTIRE SITE (cfs)	6.06	7.14	8.58	9.97	2.52	2.97	2.10	6.57

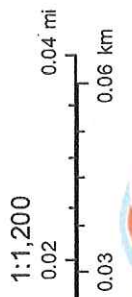
REDUCTIONS ACHIEVED (cfs)	
1-YR	25-YR
6.48	7.55
OK > 2.52	OK > 4.15

Orange County

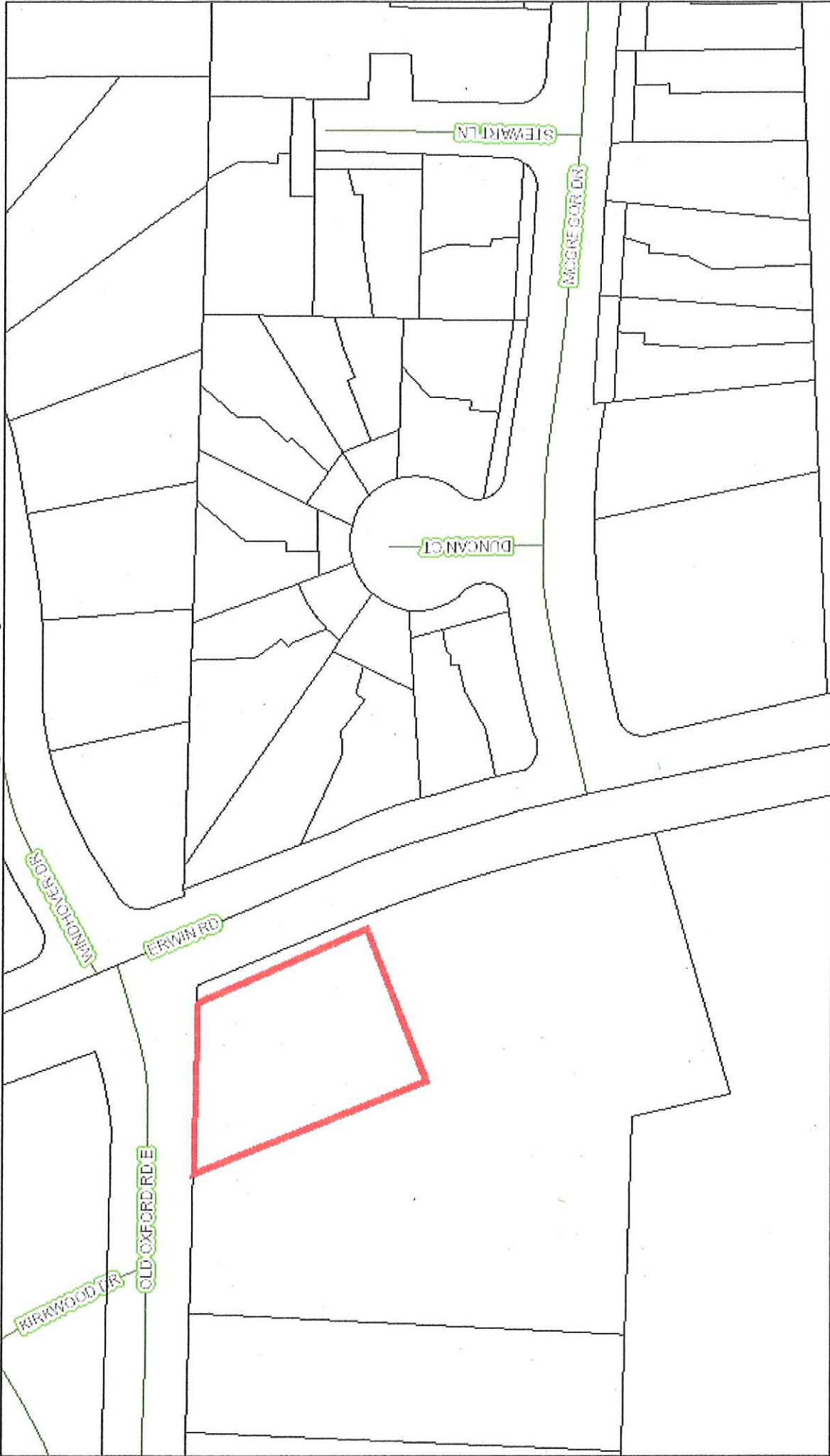


July 16, 2019 This map contains parcels prepared for the inventory of real property within Orange County, and is compiled from recorded deed, plats, and other public records and data. Users of this map are hereby notified that the aforementioned public primary information sources should be consulted for verification of the information contained on this map. The county and its mapping companies assume no legal responsibility for the information on this map.

PIN: 9799399116	SIZE: 2.309 A	BUILDING COUNT: 1
OWNER 1: MCFARLING DAVID H	DEED REF: 3635/414	LAND VALUE: \$150,600
OWNER 2:	RATECODE: 22	BLDG VALUE: \$16,100
ADDRESS 1: 2204 E OLD OXFORD RD	TOWNSHIP: CHAPEL HILL	USE VALUE: \$0
ADDRESS 2:	BLDG SQFT: 1056	TOTAL VALUE: \$166,700
CITY: CHAPEL HILL	YEAR BUILT: 1946	DATE SOLD: 9/24/2014
STATE, ZIP: NC 27514		TAX STAMPS:
LEGAL DESC: TR C HUGH MCFARLING P6174		



Orange County



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PIN: 9799490235

OWNER 1: MCFARLING DAVID H
 OWNER 2: JARRELL PATRICIA
 ADDRESS 1: 2206 OLD OXFORD RD EAST
 ADDRESS 2:
 CITY: CHAPEL HILL
 STATE, ZIP: NC 275145161
 LEGAL DESC: W/S MT MORIAH CH RD

SIZE: 0.53 A
 DEED REF: 2271/357
 RATECODE: 22
 TOWNSHIP: CHAPEL HILL
 BLDG SQFT: 1193
 YEAR BUILT: 1955

BUILDING COUNT: 1
 LAND VALUE: \$74,100
 BLDG VALUE: \$122,700
 USE VALUE: \$0
 TOTAL VALUE: \$196,800
 DATE SOLD: 5/30/2001
 TAX STAMPS: 180

1:1,200
 0 0.01 0.02 0.03 0.04 mi
 0 0.015 0.03 0.06 km

ORANGE COUNTY
 NORTH CAROLINA

Orange County

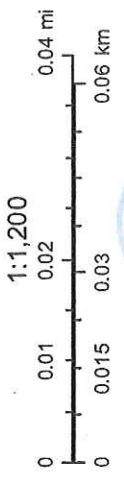


July 16, 2019

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PIN: 9799399116	OWNER 1: MCFARLING DAVID H	SIZE: 2.309 A	BUILDING COUNT: 1
OWNER 2:	DEED REF: 3635/414	LAND VALUE: \$150,600	LAND VALUE: \$150,600
ADDRESS 1: 2204 E OLD OXFORD RD	RATECODE: 22	BLDG_VALUE: \$16,100	BLDG_VALUE: \$16,100
ADDRESS 2:	TOWNSHIP: CHAPEL HILL	USE_VALUE: \$0	USE_VALUE: \$0
CITY: CHAPEL HILL	BLDG SQFT: 1056	TOTAL VALUE: \$166,700	TOTAL VALUE: \$166,700
STATE, ZIP: NC 27514	YEAR BUILT: 1946	DATE SOLD: 9/24/2014	DATE SOLD: 9/24/2014
LEGAL DESC: TR C HUGH MCFARLING P6174	TAX STAMPS:		





Determining Number of Cartridges for Volume-Based Design in NC

Design Engineer:
Date

LRS
6/18/2019

Blue Cells = Input
Black Cells = Calculation

Site Information

Project Name	Christ Community Church
Project State	North Carolina
Project Location	Chapel Hill
Drainage Area, Ad	1.72 ac
Impervious Area, Ai	1.15 ac
Pervious Area, Ap	0.57
% Impervious	67%
Runoff Coefficient, Rv	0.65

Water Quality Volume Calculations

Design storm rainfall depth, Rd	1.0 in	
Water quality volume, WQV	4069.2 ft ³	=Ad*Rv*Rd*(43560/12)

Storage Component Calculations

Capture 75% of WQV	3051.9 ft ³	=0.75*WQV
Pretreatment credit (estimated or calculated), %pre	30%	

Mass loading calculations

Mean Annual Rainfall, P	46 in	
Agency required % removal	85%	
Percent Runoff Capture (% capture)	90%	
Mean Annual Runoff, V _i	168,466 ft ³	=P*Ad*Rv*(43560/12)*%capture
Event Mean Concentration of Pollutant, EMC	70.0 mg/l	(Suggestion: Use 60 for residential, 70 for Commercial, 100 for Industrial)
Annual Mass Load, M _{total}	735.74 lbs	=EMC*V _i *(28.3)*(0.000001)*(2.2046)

Filter System

Filtration brand	StormFilter
Cartridge height	27 in

Cartridge Quantity Calculation

Mass removed by pretreatment system, M _{pre}	221 lbs	=Mtotal * %removal
Mass load to filters after pretreatment, M _{pass1}	515 lbs	=Mtotal - Mpre
Estimate the required filter efficiency, E _{filter}	79%	=1+(%removal - 1)/(1 - %pre)
Mass to be captured by filters, M _{filter}	405 lbs	=Mpass1 * Efilter
Maximum Cartridge Flow rate, Q _{cart}	7.5 gpm	=q * (7.5 ft ² /cartridge)
Mass load per cartridge, M _{cart} (lbs)	54 lbs	=lookup mass load per cartridge
Number of Cartridges required, N _{mass}	8	=ROUNDUP(Mfilter/Mcart,0)
Maximum Treatment Capacity	0.13	=Nmass*(Qcart/449)

SUMMARY

Maximum Treatment Flow Rate, cfs	0.13
Cartridge Flow Rate, gpm	7.5
Number of Cartridges	8

Target Pollutant(s):	TSS
Media:	Perlite

PROJECT NAME: CHRIST COMMUNITY CHURCH
 PROJECT #: 401801
 File Name: CCCsd10YR
 Design Storm: 10-YEAR

DATE: 8/23/19
 EGD
 CALCULATED BY:

FLOWES AND VELOCITIES ARE BASED ON MANNING'S EQUATION.

STRUCTURE	AREA (sf)	AREA (ac)	C	I	Q	Qd	LENGTH	D(in.)	ELEVATION	LOW	DROP	SLOPE	n	Vfull	Qfull	Qd/Qfull	Approx. Velocity
CI-1	33622	0.77	0.81	7.22	4.51	4.51	5	18	307.10	307.05	0.05	1.00%	0.013	5.96	10.53	0.43	5.73
CI-2	33622	0.77	0.81	7.22	4.51	9.03	24	24	306.95	306.70	0.25	1.04%	0.013	7.37	23.15	0.39	6.90
JB-3	7680	0.18	0.96	7.22	1.22	1.22	95	15	315.00	306.70	8.30	8.74%	0.013	15.59	19.14	0.06	5.91
OUTLET CHAMBER	Q25 MAX. FLOW OUT OF DETENTION =				6.57	6.57	5	18	300.00	299.95	0.05	1.00%	0.013	5.96	10.53	0.62	6.26
JB-4									299.75								

CATCH BASIN DRAINS DIRECTLY INTO DETENTION SYSTEM
 JUNCTION BOX DRAINS DIRECTLY INTO DETENTION SYSTEM

LENGTH AND SLOPE OF OUTLET PIPE TO BE DETERMINED WHEN FURTHER INFORMATION ABOUT RECEIVING STRUCTURE IS MADE AVAILABLE

STORM DRAINAGE SCHEDULE
CHRIST COMMUNITY CHURCH

8/23/19

Design Storm: 10-YEAR

Note: Rim elevations are taken from the top of structure.

<u>STRUCTURE</u>	<u>RIM ELEV.</u>	<u>INV IN</u>	<u>INV OUT</u>	<u>LENGTH</u>	<u>SIZE</u>	<u>SLOPE</u>
CI-1	310.98		307.10	5	18 "	1.00%
CI-2	310.98	307.05	306.95	24	24 "	1.04%
DETENTION						
JB-3	319.90		315.00	95	15 "	8.74%
DETENTION						
OUTLET CHAMBER	313.75		300.00	5	18 "	1.00%
JB-4	313.30		299.75	TBD	18 "	TBD

LENGTH AND SLOPE OF OUTLET PIPE FROM JB-4 TO BE DETERMINED WHEN FURTHER INFORMATION ABOUT RECEIVING STRUCTURE IS MADE AVAILABLE

HYDRAULIC GRADE LINE AND HEADWATER DEPTH CALCULATIONS
 CHRIST COMMUNITY CHURCH
 8/23/19

Design Storm: 10-YEAR

Note: Throat opening is the opening at the flowline, not the rim of the structure.

Structure	Throat	D (in)	Q (cfs)	$\frac{HW}{D}$	HW (I. C.)	Starting Elevation	f	Kb	Ke	Kx	Frict Loss	Minor Loss	HW (O. C.)	Final HW	Diff (ft)
CI-1	310.48	18	4.51	0.69	308.14	308.31	0.028	0.7	0	0.35	0.01	0.11	308.43	308.43	2.05
CI-2	310.48	24	9.03	0.68	308.31	308.00	0.025	0	0.2	0.35	0.04	0.07	308.11	308.31	2.17
DETENTION															
JB-3	319.90	15	1.22	0.53	315.66	308.00	0.029	0	0	0.35	0.03	0.01	308.04	315.66	4.24
DETENTION															
OUTLET CHAMBER	313.75	18	6.57	0.90	301.35	TBD	0.028	0.3	0	0.35	0.02	0.14			
JB-4	313.30	18	6.57												

PROJECT NAME: CHRIST COMMUNITY CHURCH
 PROJECT #: 401801
 File Name: CCCsd25YR
 Design Storm: 25-YEAR

DATE: 8/23/19
 EGD
 CALCULATED BY:

FLOWS AND VELOCITIES ARE BASED ON MANNING'S EQUATION.

STRUCTURE	AREA (sf)	AREA (ac)	C	I	Q	Qd	LENGTH	D(in.)	ELEVATION	LOW	DROP	SLOPE	n	Vfull	Qfull	Qd/Qfull	Approx. Velocity	
CI-1	33622	0.77	0.81	8.19	5.12	5.12	5	18	307.10	307.05	0.05	1.00%	0.013	5.96	10.53	0.49	5.92	
CI-2	33622	0.77	0.81	8.19	5.12	10.24	24	24	306.95	306.70	0.25	1.04%	0.013	7.37	23.15	0.44	7.14	
CATCH BASIN DRAINS DIRECTLY INTO DETENTION SYSTEM																		
JB-3	7680	0.18	0.96	8.19	1.39	1.39	95	15	315.00	306.70	8.30	8.74%	0.013	15.59	19.14	0.07	6.45	
JUNCTION BOX DRAINS DIRECTLY INTO DETENTION SYSTEM																		
OUTLET CHAMBER	Q25 MAX. FLOW OUT OF DETENTION =				6.57	6.57	5	18	300.00	299.95	0.05	1.00%	0.013	5.96	10.53	0.62	6.26	
JB-4									299.75									
LENGTH AND SLOPE OF OUTLET PIPE TO BE DETERMINED WHEN FURTHER INFORMATION ABOUT RECEIVING STRUCTURE IS MADE AVAILABLE																		

STORM DRAINAGE SCHEDULE
CHRIST COMMUNITY CHURCH

8/23/19

Design Storm: 25-YEAR

Note: Rim elevations are taken from the top of structure.

<u>STRUCTURE</u>	<u>RIM ELEV.</u>	<u>INV IN</u>	<u>INV OUT</u>	<u>LENGTH</u>	<u>SIZE</u>	<u>SLOPE</u>
CI-1	310.98	307.10	307.10	5	18 "	1.00%
CI-2	310.98	307.05	306.95	24	24 "	1.04%
DETENTION						
JB-3	319.90	315.00	315.00	95	15 "	8.74%
DETENTION						
OUTLET CHAMBER	313.75	300.00	300.00	5	18 "	1.00%
JB-4	313.30	299.75	299.75	TBD	18 "	TBD

LENGTH AND SLOPE OF OUTLET PIPE FROM JB-4 TO BE DETERMINED WHEN FURTHER INFORMATION ABOUT RECEIVING STRUCTURE IS MADE AVAILABLE

HYDRAULIC GRADE LINE AND HEADWATER DEPTH CALCULATIONS
CHRIST COMMUNITY CHURCH
 8/23/19

Design Storm: 25-YEAR

Note: Throat opening is the opening at the flowline, not the rim of the structure.

Structure	Throat	D (in)	Q (cfs)	$\frac{HW}{D}$	HW (I.C.)	Starting Elevation	f	Kb	Ke	Kx	Fric Loss	Minor Loss	HW (O.C.)	Final HW	Diff (ft)
CI-1	310.48	18	5.12	0.74	308.21	308.41	0.028	0.7	0	0	0.01	0.14	308.56	308.56	1.92
CI-2	310.48	24	10.24	0.73	308.41	308.00	0.025	0	0.2	0.35	0.05	0.09	308.14	308.41	2.07
DETENTION															
JB-3	319.90	15	1.39	0.54	315.68	308.00	0.029	0	0	0.35	0.04	0.01	308.05	315.68	4.22
DETENTION															
OUTLET CHAMBER	313.75	18	6.57	0.90	301.35	TBD	0.028	0.3	0	0.35	0.02	0.14			
JB-4	313.30	18	6.57												



Round Pipe Stage Storage Table

Contech Engineered Solutions, LLC Engineer:
Date

Irs
8/23/2019

Site Information

Project Name
Project State
Project Location

Christ Community Church
NC
Chapel Hill

Enter Pipe I.D.= **96** in. Total Volume/LF **50.27** Total CMP Length= **243** ft.
Enter Desired Increment = **1** in. System Invert= **306.00** ft.

Inc Num	Water Level (in.)	Inc Area (sq. ft.)	Hyd Rad (ft.)	Top Width (ft.)	Volume (cf)	WS Elevation (ft.)
1	1	0.09	0.06	1.62	22	306.08
2	2	0.25	0.11	2.29	62	306.17
3	3	0.47	0.16	2.78	113	306.25
4	4	0.72	0.22	3.20	174	306.33
5	5	1.00	0.27	3.56	243	306.42
6	6	1.31	0.32	3.87	318	306.50
7	7	1.64	0.38	4.16	399	306.58
8	8	2.00	0.43	4.42	486	306.67
9	9	2.38	0.48	4.66	578	306.75
10	10	2.78	0.53	4.89	675	306.83
11	11	3.19	0.58	5.10	776	306.92
12	12	3.63	0.63	5.29	881	307.00
13	13	4.08	0.68	5.47	990	307.08
14	14	4.54	0.72	5.65	1103	307.17
15	15	5.02	0.77	5.81	1219	307.25
16	16	5.51	0.82	5.96	1338	307.33
17	17	6.01	0.86	6.11	1460	307.42
18	18	6.52	0.91	6.24	1585	307.50
19	19	7.05	0.96	6.37	1713	307.58
20	20	7.59	1.00	6.50	1844	307.67
21	21	8.13	1.04	6.61	1976	307.75
22	22	8.69	1.09	6.72	2111	307.83
23	23	9.25	1.13	6.83	2249	307.92
24	24	9.83	1.17	6.93	2388	308.00
25	25	10.41	1.21	7.02	2529	308.08
26	26	11.00	1.26	7.11	2672	308.17
27	27	11.59	1.30	7.19	2817	308.25
28	28	12.20	1.34	7.27	2964	308.33
29	29	12.81	1.38	7.35	3112	308.42
30	30	13.42	1.41	7.42	3261	308.50
31	31	14.04	1.45	7.48	3412	308.58
32	32	14.67	1.49	7.54	3564	308.67
33	33	15.30	1.53	7.60	3717	308.75
34	34	15.93	1.56	7.65	3872	308.83
35	35	16.57	1.60	7.70	4027	308.92
36	36	17.22	1.63	7.75	4184	309.00

WQV

These results are submitted to you as a guideline only, without liability on the part of CONTECH Construction Products Inc. for accuracy or suitability to any particular application, and are subject to your verification.

37	37	17.86	1.67	7.79	4341	309.08
38	38	18.51	1.70	7.82	4499	309.17
39	39	19.17	1.73	7.86	4658	309.25
40	40	19.82	1.77	7.89	4817	309.33
41	41	20.48	1.80	7.91	4977	309.42
42	42	21.14	1.83	7.94	5138	309.50
43	43	21.81	1.86	7.96	5299	309.58
44	44	22.47	1.89	7.97	5460	309.67
45	45	23.13	1.92	7.98	5622	309.75
46	46	23.80	1.95	7.99	5783	309.83
47	47	24.47	1.97	8.00	5945	309.92
48	48	25.13	2.00	8.00	6107	310.00
49	49	25.80	2.03	8.00	6269	310.08
50	50	26.47	2.05	7.99	6431	310.17
51	51	27.13	2.08	7.98	6593	310.25
52	52	27.80	2.10	7.97	6755	310.33
53	53	28.46	2.12	7.96	6916	310.42
54	54	29.12	2.15	7.94	7077	310.50
55	55	29.78	2.17	7.91	7237	310.58
56	56	30.44	2.19	7.89	7397	310.67
57	57	31.10	2.21	7.86	7557	310.75
58	58	31.75	2.23	7.82	7715	310.83
59	59	32.40	2.25	7.79	7874	310.92
60	60	33.05	2.27	7.75	8031	311.00
61	61	33.69	2.28	7.70	8187	311.08
62	62	34.33	2.30	7.65	8343	311.17
63	63	34.97	2.31	7.60	8497	311.25
64	64	35.60	2.33	7.54	8650	311.33
65	65	36.22	2.34	7.48	8803	311.42
66	66	36.85	2.36	7.42	8953	311.50
67	67	37.46	2.37	7.35	9103	311.58
68	68	38.07	2.38	7.27	9251	311.67
69	69	38.67	2.39	7.19	9397	311.75
70	70	39.27	2.40	7.11	9542	311.83
71	71	39.86	2.41	7.02	9685	311.92
72	72	40.44	2.41	6.93	9827	312.00
73	73	41.01	2.42	6.83	9966	312.08
74	74	41.58	2.42	6.72	10103	312.17
75	75	42.13	2.43	6.61	10238	312.25
76	76	42.68	2.43	6.50	10371	312.33
77	77	43.22	2.43	6.37	10501	312.42
78	78	43.74	2.43	6.24	10629	312.50
79	79	44.26	2.43	6.11	10754	312.58
80	80	44.76	2.43	5.96	10876	312.67
81	81	45.25	2.43	5.81	10996	312.75
82	82	45.73	2.42	5.65	11112	312.83
83	83	46.19	2.42	5.47	11224	312.92
84	84	46.64	2.41	5.29	11333	313.00
85	85	47.07	2.40	5.10	11438	313.08
86	86	47.49	2.39	4.89	11540	313.17
87	87	47.89	2.38	4.66	11636	313.25
88	88	48.26	2.36	4.42	11728	313.33
89	89	48.62	2.34	4.16	11815	313.42
90	90	48.96	2.32	3.87	11897	313.50
91	91	49.27	2.30	3.56	11972	313.58

These results are submitted to you as a guideline only, without liability on the part of CONTECH Construction Products Inc. for accuracy or suitability to any particular application, and are subject to your verification.

92	92	49.55	2.27	3.20	12040	313.67
93	93	49.80	2.23	2.78	12101	313.75
94	94	50.01	2.19	2.29	12153	313.83
95	95	50.18	2.14	1.62	12193	313.92
96	96	50.27	2.00	0.00	12215	314.00

These results are submitted to you as a guideline only, without liability on the part of CONTECH Construction Products Inc. for accuracy or suitability to any particular application, and are subject to your verification.

CHRIST COMMUNITY CHURCH
STAGE-STORAGE FOR 96" DIAMETER CIRCULAR PIPE
 8/23/2019

STAGE STORAGE CUMULATIVE STORAGE (cf) AT LENGTH OF:

STAGE (ft)	STORAGE (cf/ft)	CUMULATIVE STORAGE (cf)	Z
0.5	1.308	318	0.5
1.0	3.629	882	1.0
1.5	6.525	1586	1.5
2.0	9.824	2387	2.0
2.5	13.422	3262	2.5
3.0	17.219	4184	3.0
3.5	21.141	5137	3.5
4.0	25.133	6107	4.0
4.5	29.125	7077	4.5
5.0	33.046	8030	5.0
5.5	36.843	8953	5.5
6.0	40.435	9826	6.0
6.5	43.741	10629	6.5
7.0	46.637	11333	7.0
7.5	48.957	11897	7.5
8.0	50.266	12215	8.0

LINEAR REGRESSION ANALYSIS TO FIND Ks and b COMPONENTS OF STAGE-STORAGE FUNCTION

NOTE: COPY CUMULATIVE STORAGE FROM ABOVE FOR DESIRED LENGTH INTO CLIPBOARD AND PASTE INTO CUMULATIVE STORAGE COLUMN BELOW AT CORRESPONDING STAGE

S	Z	In S	In Z	Z Estimated	Difference
Cumulative Storage (cubic feet)	Stage (feet)			(feet)	(feet)
0	0.0				
318	0.5	5.762	-0.693	0.5	0.0
882	1.0	6.782	0.000	1.0	0.0
1586	1.5	7.369	0.405	1.5	0.0
2387	2.0	7.778	0.693	2.1	-0.1
3262	2.5	8.090	0.916	2.6	-0.1
4184	3.0	8.339	1.099	3.2	-0.2
5137	3.5	8.544	1.253	3.7	-0.2
6107	4.0	8.717	1.386	4.2	-0.2
7077	4.5	8.865	1.504	4.7	-0.2
8030	5.0	8.991	1.609	5.2	-0.2
8953	5.5	9.100	1.705	5.6	-0.1
9826	6.0	9.193	1.792	6.0	0.0
10629	6.5	9.271	1.872	6.4	0.1
11333	7.0	9.335	1.946	6.7	0.3
11897	7.5	9.384	2.015	7.0	0.5
12215	8.0	9.410	2.079	7.1	0.9

FROM LINEAR REGRESSION ANALYSIS:

6.809006 =INTERCEPT
 1.327109 =SLOPE

FOR THE SELECTED LENGTH: 243 LF

Ks = 906
 b = 1.33

Volume StormFilter Outflow & Orifice Calculation

Chapel Hill, NC

Input	Calculated
-------	------------

Project Name:	Christ Comm. Church	Date:	8/27/19
Contech No:	627,535	By:	lrs

Discharge flow rate from StormFilter:

Restrictor Disc Diameter (in)	0.443
Restrictor Disc Diameter (ft)	0.037

Restrictor Disk Calibration:

The Volume StormFilter restrictor disc is calibrated to flow at 7.5 gpm at 10 feet of head, or 1 gpm/sf or less for all cartridge sizes

Orifice Coefficient	0.61
Area of Restrictor Disc (sf)	0.0011
Head, h (ft)	10
Flow, Q (cfs)	0.017
Flow, Q (gpm)	7.5

$$Q = cA\sqrt{2Gh}$$

$$Q = (0.61) \left(\frac{0.037^2}{4} \pi \right) \sqrt{2(32.2)(10)}$$

$$Q = 0.017 \text{ cfs} = 7.5 \text{ GPM}$$

Christ Comm. Church Specific Data:

Max. Head, h, on Cartridges (ft)	8.5
Number of cartridges	8

During the worst-case scenario, there is 8.5 feet of head available on the orifice.

Flow Rate per Cartridge:

Flow, Q (cfs)	0.0153
Flow, Q (gpm)	6.86

$$Q = cA\sqrt{2Gh}$$

With 8.5 of head available, each cartridge will discharge 6.86 gpm, or 0.0153 cfs. Since 6.86 gpm is less than the 1 GPM/sf flow rate of 11.25 GPM for the 27-inch cartridge, the mass loading calculations are preserved and 8 cartridges are suitable for this site.

Total Unit Outflow:

Flow, Q (cfs) per cartridge	0.0153	
Flow, Q (cfs) total	0.1224	(Q = No. Cartridges x Flow per Cartridge)

With 8 cartridges, the total StormFilter discharge outflow rate is 0.1224 cfs during the worst-case scenario.

Equivalent Orifice Diameter:

The following equations back-calculate from the total worst-case StormFilter flow rate and head to determine an equivalent orifice diameter that can be used to represent the StormFilter when designed on a volume/mass basis.

Total Outflow (cfs)	0.1224
Orifice Coefficient	0.61
Max. Head on cartridges (ft)	8.5
Equivalent Diameter, D (ft)	0.104
Equivalent Diameter, D (in)	1.254

$$Q = cA\sqrt{2Gh}$$

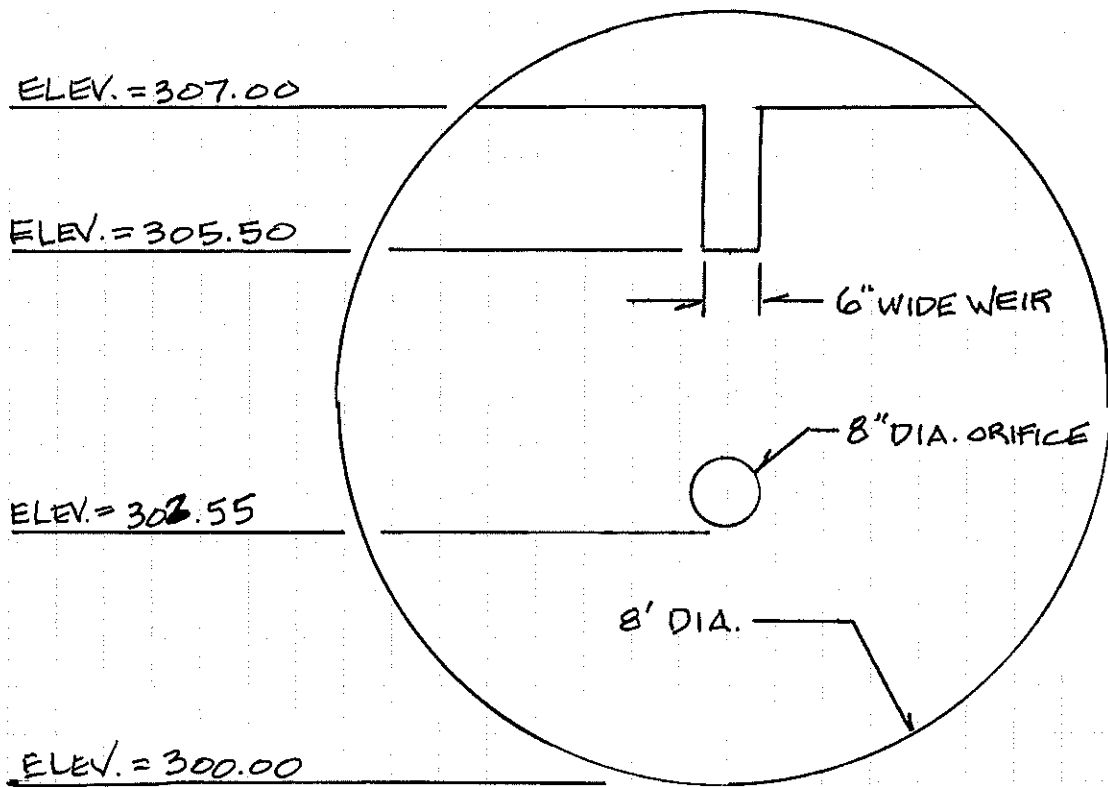
$$Q = (0.61)\left(\frac{D^2}{4}\pi\right)\sqrt{2(32.2)h}$$

$$D = \left(\frac{4Q}{(0.61)(\pi)(\sqrt{2(32.2)h})}\right)^{\frac{1}{2}}$$

This equivalent orifice, however, it not a physical orifice. It is simply a method for accounting for the flow through the Volume StormFilter in routing calculations when required.

EQUINOX ENGINEERING, PLLC
5030 Whitehorse Road
Hillsborough, NC 27278
ernie.equinox@gmail.com 919-616-3451
Firm License: P-1983

JOB _____
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____



WEIR PLATE DETAIL
NTS

CHRIST COMMUNITY CHURCH

8/23/2019

FILE NAME: CCCRouting1yr
YEAR STORM 1

ROUTING OF

RESULTS:

4.33 =MAX. STAGE (FEET)
2.10 =PEAK OUTFLOW (CFS)
6354 =MAX. STORAGE (CF)
0.00 =MAX. FLOW OVER WEIR (CFS)

Peak runoff for storm of interest (user input)
Time to peak (user input)
Calculated for use in hydrograph formulation

Qp= 6.87 cfs
Tp= 17 minutes
1.25*Tp= 21.25

dT= 1 minutes

Ks= 906
b= 1.33

N= 1
Cd= 0.6
D= 1.254 in.
Zi= 0 feet

N= 1
Cd= 0.6
D= 8.00 in.
Zi= 2.55 feet

Cw= 3.33
L= 0.5 feet
Zcr= 5.50 feet

TIME (min)	INFLOW (cfs)	STORAGE (cu ft)	STAGE (ft)	TOTAL OUTFLOW (cfs)	WEIR (cfs)	LOWER ORIFICE d>DIAMETER (cfs)	LOWER ORIFICE d<DIAMETER (cfs)	UPPER ORIFICE (cfs)	WEIR (cfs)	LOWER ORIFICE d>DIAMETER (cfs)	LOWER ORIFICE d<DIAMETER (cfs)	UPPER ORIFICE d>DIAMETER (cfs)	UPPER ORIFICE d<DIAMETER (cfs)
0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.1	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.2	4	4	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.5	17	17	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.9	48	48	0.11	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00
5	1.4	101	101	0.19	0.02	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00
6	1.9	182	182	0.30	0.02	0.02	0.02	0.00	0.00	0.02	0.02	0.00	0.00
7	2.5	295	295	0.43	0.03	0.03	0.03	0.00	0.00	0.03	0.03	0.00	0.00
8	3.1	443	443	0.58	0.03	0.03	0.03	0.00	0.00	0.03	0.03	0.00	0.00
9	3.7	628	628	0.76	0.03	0.03	0.03	0.00	0.00	0.03	0.03	0.00	0.00
10	4.4	851	851	0.95	0.04	0.04	0.04	0.00	0.00	0.04	0.04	0.00	0.00
11	5.0	1111	1111	1.17	0.04	0.04	0.04	0.00	0.00	0.04	0.04	0.00	0.00
12	5.5	1406	1406	1.39	0.05	0.05	0.05	0.00	0.00	0.05	0.05	0.00	0.00
13	6.0	1733	1733	1.63	0.05	0.05	0.05	0.00	0.00	0.05	0.05	0.00	0.00
14	6.4	2089	2089	1.87	0.06	0.06	0.06	0.00	0.00	0.06	0.06	0.00	0.00
15	6.6	2466	2466	2.12	0.06	0.06	0.06	0.00	0.00	0.06	0.06	0.00	0.00
16	6.8	2861	2861	2.37	0.06	0.06	0.06	0.00	0.00	0.06	0.06	0.00	0.00
17	6.9	3266	3266	2.62	0.10	0.07	0.07	0.03	0.03	0.07	0.07	0.00	0.03
18	6.8	3672	3672	2.86	0.38	0.07	0.07	0.31	0.31	0.07	0.07	0.00	0.31
19	6.6	4058	4058	3.09	0.78	0.07	0.07	0.70	0.70	0.07	0.07	0.00	0.70
20	6.4	4410	4410	3.29	1.14	0.07	0.07	1.07	1.07	0.07	0.07	0.00	1.07
21	6.0	4723	4723	3.46	1.35	0.08	0.08	1.27	1.27	0.08	0.08	0.00	1.27
22	5.5	5000	5000	3.61	1.51	0.08	0.08	1.43	1.43	0.08	0.08	0.00	1.43

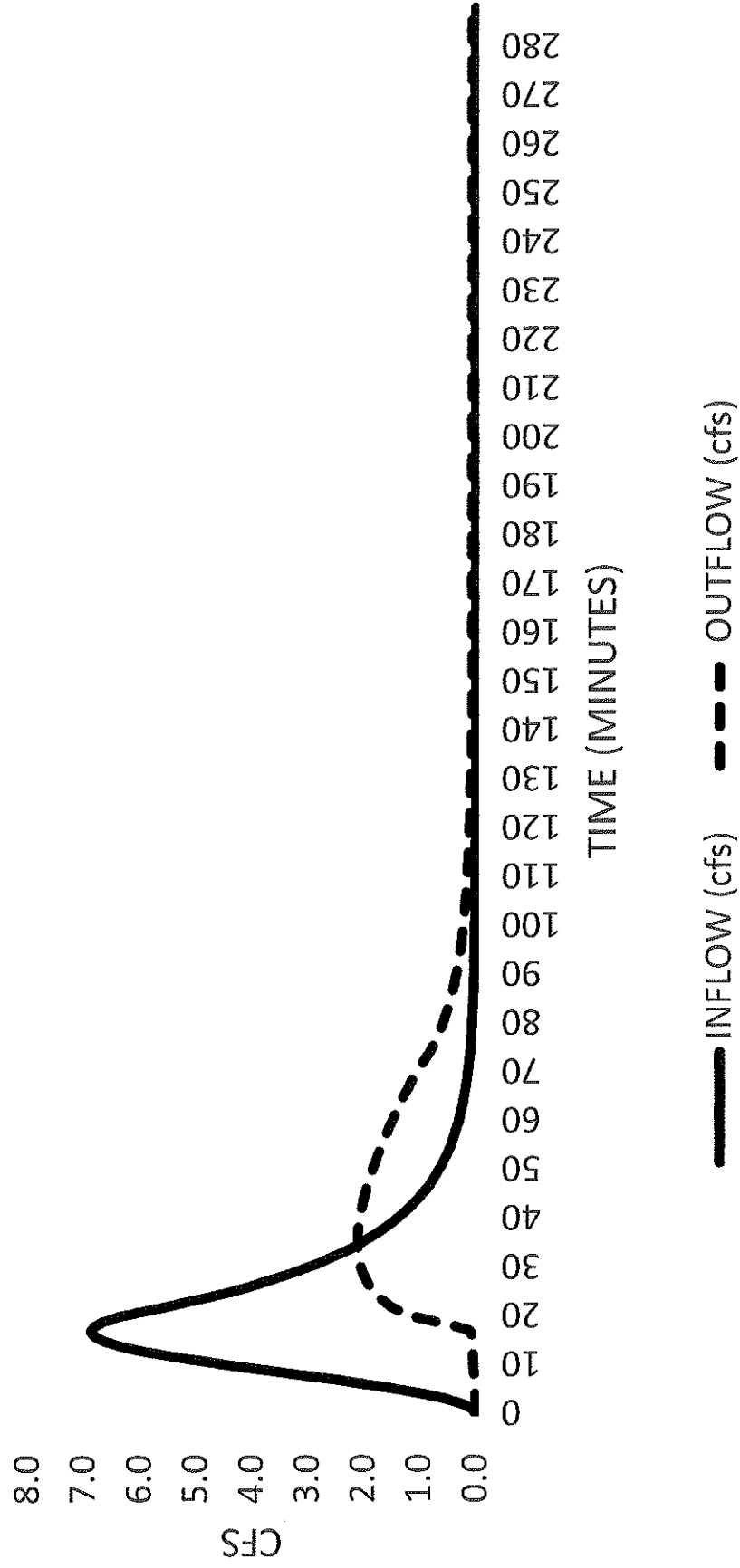
23	5.1	5242	3.74	1.64	0.08	1.56	0.00	0.08	2.03	1.56	2.33
24	4.8	5452	3.86	1.73	0.08	1.65	0.00	0.08	2.12	1.65	2.66
25	4.4	5634	3.95	1.82	0.08	1.73	0.00	0.08	2.20	1.73	2.96
26	4.1	5789	4.03	1.88	0.08	1.80	0.00	0.08	2.27	1.80	3.23
27	3.8	5921	4.10	1.94	0.08	1.85	0.00	0.08	2.33	1.85	3.45
28	3.5	6032	4.16	1.98	0.08	1.90	0.00	0.08	2.37	1.90	3.65
29	3.2	6124	4.21	2.01	0.08	1.93	0.00	0.08	2.42	1.93	3.81
30	3.0	6198	4.25	2.04	0.08	1.96	0.00	0.08	2.45	1.96	3.94
31	2.8	6255	4.27	2.06	0.08	1.98	0.00	0.08	2.47	1.98	4.04
32	2.6	6299	4.30	2.08	0.08	2.00	0.00	0.08	2.49	2.00	4.12
33	2.4	6329	4.31	2.09	0.09	2.01	0.00	0.09	2.51	2.01	4.18
34	2.2	6347	4.32	2.10	0.09	2.01	0.00	0.09	2.51	2.01	4.21
35	2.1	6354	4.33	2.10	0.09	2.02	0.00	0.09	2.52	2.02	4.22
36	1.9	6351	4.32	2.10	0.09	2.01	0.00	0.09	2.52	2.01	4.22
37	1.8	6339	4.32	2.09	0.09	2.01	0.00	0.09	2.51	2.01	4.20
38	1.6	6319	4.31	2.09	0.09	2.00	0.00	0.09	2.50	2.00	4.16
39	1.5	6291	4.29	2.08	0.08	1.99	0.00	0.08	2.49	1.99	4.11
40	1.4	6257	4.28	2.06	0.08	1.98	0.00	0.08	2.47	1.98	4.05
41	1.3	6217	4.26	2.05	0.08	1.97	0.00	0.08	2.46	1.97	3.98
42	1.2	6172	4.23	2.03	0.08	1.95	0.00	0.08	2.44	1.95	3.90
43	1.1	6122	4.21	2.01	0.08	1.93	0.00	0.08	2.41	1.93	3.81
44	1.0	6068	4.18	1.99	0.08	1.91	0.00	0.08	2.39	1.91	3.71
45	1.0	6010	4.15	1.97	0.08	1.89	0.00	0.08	2.36	1.89	3.61
46	0.9	5949	4.12	1.95	0.08	1.86	0.00	0.08	2.34	1.86	3.50
47	0.8	5886	4.08	1.92	0.08	1.84	0.00	0.08	2.31	1.84	3.39
48	0.8	5820	4.05	1.89	0.08	1.81	0.00	0.08	2.28	1.81	3.28
49	0.7	5752	4.01	1.87	0.08	1.78	0.00	0.08	2.25	1.78	3.16
50	0.7	5682	3.98	1.84	0.08	1.75	0.00	0.08	2.22	1.75	3.04
51	0.6	5611	3.94	1.81	0.08	1.72	0.00	0.08	2.19	1.72	2.92
52	0.6	5539	3.90	1.77	0.08	1.69	0.00	0.08	2.16	1.69	2.80
53	0.5	5466	3.86	1.74	0.08	1.66	0.00	0.08	2.12	1.66	2.68
54	0.5	5392	3.82	1.71	0.08	1.63	0.00	0.08	2.09	1.63	2.57
55	0.4	5319	3.78	1.67	0.08	1.59	0.00	0.08	2.06	1.59	2.45
56	0.4	5245	3.74	1.64	0.08	1.56	0.00	0.08	2.03	1.56	2.33
57	0.4	5172	3.71	1.60	0.08	1.52	0.00	0.08	2.00	1.52	2.22
58	0.4	5098	3.67	1.56	0.08	1.48	0.00	0.08	1.96	1.48	2.10
59	0.3	5026	3.63	1.52	0.08	1.45	0.00	0.08	1.93	1.45	1.99
60	0.3	4954	3.59	1.49	0.08	1.41	0.00	0.08	1.90	1.41	1.89
61	0.3	4883	3.55	1.45	0.08	1.37	0.00	0.08	1.87	1.37	1.78
62	0.3	4813	3.51	1.41	0.08	1.33	0.00	0.08	1.84	1.33	1.68
63	0.2	4745	3.47	1.36	0.08	1.29	0.00	0.08	1.81	1.29	1.58
64	0.2	4677	3.44	1.32	0.08	1.25	0.00	0.08	1.78	1.25	1.49
65	0.2	4611	3.40	1.28	0.08	1.20	0.00	0.08	1.75	1.20	1.40
66	0.2	4547	3.36	1.24	0.08	1.16	0.00	0.08	1.73	1.16	1.31
67	0.2	4484	3.33	1.19	0.07	1.12	0.00	0.07	1.70	1.12	1.23
68	0.2	4423	3.29	1.15	0.07	1.08	0.00	0.07	1.67	1.08	1.15
69	0.2	4364	3.26	1.11	0.07	1.03	0.00	0.07	1.65	1.03	1.07
70	0.1	4307	3.23	1.06	0.07	0.99	0.00	0.07	1.62	0.99	1.00
71	0.1	4252	3.20	1.00	0.07	0.93	0.00	0.07	1.60	0.93	0.93
72	0.1	4199	3.17	0.94	0.07	0.87	0.00	0.07	1.58	0.87	0.87
73	0.1	4150	3.14	0.88	0.07	0.81	0.00	0.07	1.56	0.81	0.81
74	0.1	4104	3.11	0.83	0.07	0.76	0.00	0.07	1.54	0.76	0.76
75	0.1	4060	3.09	0.78	0.07	0.71	0.00	0.07	1.52	0.71	0.71
76	0.1	4020	3.07	0.73	0.07	0.66	0.00	0.07	1.50	0.66	0.66
77	0.1	3981	3.04	0.69	0.07	0.62	0.00	0.07	1.49	0.62	0.62
78	0.1	3945	3.02	0.65	0.07	0.58	0.00	0.07	1.47	0.58	0.58

79	0.1	3910	3.00	0.61	0.07	0.54	0.00	0.07	1.46	0.00	0.54
80	0.1	3877	2.98	0.58	0.07	0.51	0.00	0.07	1.44	0.00	0.51
81	0.1	3847	2.97	0.55	0.07	0.48	0.00	0.07	1.43	0.00	0.48
82	0.1	3817	2.95	0.52	0.07	0.45	0.00	0.07	1.42	0.00	0.45
83	0.1	3789	2.93	0.49	0.07	0.42	0.00	0.07	1.41	0.00	0.42
84	0.0	3763	2.92	0.47	0.07	0.40	0.00	0.07	1.39	0.00	0.40
85	0.0	3738	2.90	0.44	0.07	0.37	0.00	0.07	1.38	0.00	0.37
86	0.0	3714	2.89	0.42	0.07	0.35	0.00	0.07	1.37	0.00	0.35
87	0.0	3691	2.88	0.40	0.07	0.33	0.00	0.07	1.36	0.00	0.33
88	0.0	3670	2.86	0.38	0.07	0.31	0.00	0.07	1.36	0.00	0.31
89	0.0	3649	2.85	0.36	0.07	0.29	0.00	0.07	1.35	0.00	0.29
90	0.0	3629	2.84	0.35	0.07	0.28	0.00	0.07	1.34	0.00	0.28
91	0.0	3610	2.83	0.33	0.07	0.26	0.00	0.07	1.33	0.00	0.26
92	0.0	3592	2.82	0.31	0.07	0.25	0.00	0.07	1.32	0.00	0.25
93	0.0	3575	2.81	0.30	0.07	0.23	0.00	0.07	1.32	0.00	0.23
94	0.0	3558	2.80	0.29	0.07	0.22	0.00	0.07	1.31	0.00	0.22
95	0.0	3542	2.79	0.27	0.07	0.21	0.00	0.07	1.30	0.00	0.21
96	0.0	3527	2.78	0.26	0.07	0.20	0.00	0.07	1.30	0.00	0.20
97	0.0	3512	2.77	0.25	0.07	0.18	0.00	0.07	1.29	0.00	0.18
98	0.0	3498	2.76	0.24	0.07	0.17	0.00	0.07	1.28	0.00	0.17
99	0.0	3485	2.75	0.23	0.07	0.16	0.00	0.07	1.28	0.00	0.16
100	0.0	3472	2.75	0.22	0.07	0.15	0.00	0.07	1.27	0.00	0.15
101	0.0	3459	2.74	0.21	0.07	0.15	0.00	0.07	1.27	0.00	0.15
102	0.0	3447	2.73	0.21	0.07	0.14	0.00	0.07	1.26	0.00	0.14
103	0.0	3436	2.72	0.20	0.07	0.13	0.00	0.07	1.26	0.00	0.13
104	0.0	3425	2.72	0.19	0.07	0.12	0.00	0.07	1.25	0.00	0.12
105	0.0	3414	2.71	0.18	0.07	0.12	0.00	0.07	1.25	0.00	0.12
106	0.0	3403	2.71	0.18	0.07	0.11	0.00	0.07	1.25	0.00	0.11
107	0.0	3393	2.70	0.17	0.07	0.10	0.00	0.07	1.24	0.00	0.10
108	0.0	3384	2.69	0.16	0.07	0.10	0.00	0.07	1.24	0.00	0.10
109	0.0	3374	2.69	0.16	0.07	0.09	0.00	0.07	1.23	0.00	0.09
110	0.0	3365	2.68	0.15	0.07	0.09	0.00	0.07	1.23	0.00	0.09
111	0.0	3356	2.68	0.15	0.07	0.08	0.00	0.07	1.23	0.00	0.08
112	0.0	3348	2.67	0.14	0.07	0.08	0.00	0.07	1.22	0.00	0.08
113	0.0	3340	2.67	0.14	0.07	0.07	0.00	0.07	1.22	0.00	0.07
114	0.0	3332	2.66	0.13	0.07	0.07	0.00	0.07	1.22	0.00	0.07
115	0.0	3324	2.66	0.13	0.07	0.06	0.00	0.07	1.21	0.00	0.06
116	0.0	3317	2.65	0.13	0.07	0.06	0.00	0.07	1.21	0.00	0.06
117	0.0	3309	2.65	0.12	0.07	0.06	0.00	0.07	1.21	0.00	0.06
118	0.0	3302	2.64	0.12	0.07	0.05	0.00	0.07	1.20	0.00	0.05
119	0.0	3295	2.64	0.11	0.07	0.05	0.00	0.07	1.20	0.00	0.05
120	0.0	3289	2.64	0.11	0.07	0.05	0.00	0.07	1.20	0.00	0.05
121	0.0	3282	2.63	0.11	0.07	0.04	0.00	0.07	1.20	0.00	0.04
122	0.0	3276	2.63	0.11	0.07	0.04	0.00	0.07	1.19	0.00	0.04
123	0.0	3270	2.62	0.10	0.07	0.04	0.00	0.07	1.19	0.00	0.04
124	0.0	3264	2.62	0.10	0.07	0.03	0.00	0.07	1.19	0.00	0.03
125	0.0	3258	2.62	0.10	0.07	0.03	0.00	0.07	1.19	0.00	0.03
126	0.0	3252	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03
127	0.0	3247	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03
128	0.0	3241	2.61	0.09	0.07	0.02	0.00	0.07	1.18	0.00	0.02
129	0.0	3236	2.60	0.09	0.07	0.02	0.00	0.07	1.18	0.00	0.02
130	0.0	3231	2.60	0.09	0.07	0.02	0.00	0.07	1.17	0.00	0.02
131	0.0	3225	2.60	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02
132	0.0	3220	2.59	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02
133	0.0	3216	2.59	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02
134	0.0	3211	2.59	0.08	0.07	0.01	0.00	0.07	1.17	0.00	0.01

135	0.0	3206	2.59	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01
136	0.0	3201	2.58	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01
137	0.0	3197	2.58	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01
138	0.0	3192	2.58	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01
139	0.0	3188	2.58	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01
140	0.0	3184	2.57	0.07	0.07	0.01	0.00	0.07	1.15	0.00	0.01
141	0.0	3179	2.57	0.07	0.07	0.01	0.00	0.07	1.15	0.00	0.01
142	0.0	3175	2.57	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
143	0.0	3171	2.57	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
144	0.0	3167	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
145	0.0	3163	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
146	0.0	3159	2.56	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
147	0.0	3155	2.56	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
148	0.0	3151	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
149	0.0	3147	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
150	0.0	3143	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
151	0.0	3139	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
152	0.0	3136	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00
153	0.0	3132	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00
154	0.0	3128	2.54	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
155	0.0	3124	2.54	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
156	0.0	3120	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
157	0.0	3116	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
158	0.0	3112	2.53	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
159	0.0	3108	2.53	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
160	0.0	3104	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
161	0.0	3101	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
162	0.0	3097	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
163	0.0	3093	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
164	0.0	3089	2.51	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
165	0.0	3085	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
166	0.0	3081	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
167	0.0	3077	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
168	0.0	3073	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
169	0.0	3070	2.50	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
170	0.0	3066	2.50	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
171	0.0	3062	2.50	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
172	0.0	3058	2.50	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
173	0.0	3054	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
174	0.0	3050	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
175	0.0	3046	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
176	0.0	3043	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
177	0.0	3039	2.48	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
178	0.0	3035	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
179	0.0	3031	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
180	0.0	3027	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
181	0.0	3023	2.47	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
182	0.0	3019	2.47	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
183	0.0	3016	2.47	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
184	0.0	3012	2.47	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
185	0.0	3008	2.47	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
186	0.0	3004	2.46	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
187	0.0	3000	2.46	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
188	0.0	2996	2.46	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
189	0.0	2993	2.46	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
190	0.0	2989	2.45	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00

247	0.0	2773	2.32	0.06	0.06	0.00	0.00	0.06	0.99	0.00	0.00
248	0.0	2770	2.32	0.06	0.06	0.00	0.00	0.06	0.99	0.00	0.00
249	0.0	2766	2.31	0.06	0.06	0.00	0.00	0.06	0.99	0.00	0.00
250	0.0	2762	2.31	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
251	0.0	2758	2.31	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
252	0.0	2755	2.31	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
253	0.0	2751	2.31	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
254	0.0	2747	2.30	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
255	0.0	2744	2.30	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
256	0.0	2740	2.30	0.06	0.06	0.00	0.00	0.06	0.98	0.00	0.00
257	0.0	2736	2.30	0.06	0.06	0.00	0.00	0.06	0.97	0.00	0.00
258	0.0	2732	2.29	0.06	0.06	0.00	0.00	0.06	0.97	0.00	0.00
259	0.0	2729	2.29	0.06	0.06	0.00	0.00	0.06	0.97	0.00	0.00
260	0.0	2725	2.29	0.06	0.06	0.00	0.00	0.06	0.97	0.00	0.00
261	0.0	2721	2.29	0.06	0.06	0.00	0.00	0.06	0.97	0.00	0.00
262	0.0	2718	2.28	0.06	0.06	0.00	0.00	0.06	0.97	0.00	0.00
263	0.0	2714	2.28	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
264	0.0	2710	2.28	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
265	0.0	2707	2.28	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
266	0.0	2703	2.27	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
267	0.0	2699	2.27	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
268	0.0	2695	2.27	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
269	0.0	2692	2.27	0.06	0.06	0.00	0.00	0.06	0.96	0.00	0.00
270	0.0	2688	2.27	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
271	0.0	2684	2.26	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
272	0.0	2681	2.26	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
273	0.0	2677	2.26	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
274	0.0	2673	2.26	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
275	0.0	2670	2.25	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
276	0.0	2666	2.25	0.06	0.06	0.00	0.00	0.06	0.95	0.00	0.00
277	0.0	2662	2.25	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
278	0.0	2659	2.25	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
279	0.0	2655	2.24	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
280	0.0	2651	2.24	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
281	0.0	2648	2.24	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
282	0.0	2644	2.24	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
283	0.0	2640	2.24	0.06	0.06	0.00	0.00	0.06	0.94	0.00	0.00
284	0.0	2637	2.23	0.06	0.06	0.00	0.00	0.06	0.93	0.00	0.00
285	0.0	2633	2.23	0.06	0.06	0.00	0.00	0.06	0.93	0.00	0.00
286	0.0	2629	2.23	0.06	0.06	0.00	0.00	0.06	0.93	0.00	0.00
287	0.0	2626	2.23	0.06	0.06	0.00	0.00	0.06	0.93	0.00	0.00
288	0.0	2622	2.22	0.06	0.06	0.00	0.00	0.06	0.93	0.00	0.00

1-YEAR HYDROGRAPHS



CHRIST COMMUNITY CHURCH

8/23/2019

FILE NAME: CCCRouting2yr
2
YEAR STORM

ROUTING OF

RESULTS:

=MAX. STAGE (FEET) 5.50
=PEAK OUTFLOW (CFS) 2.81
=MAX. STORAGE (CF) 8756
=MAX. FLOW OVER WEIR (CFS) 0.00

Qp= 8.09 cfs
Tp= 22 minutes
1.25*Tp= 27.5
Peak runoff for storm of interest (user input)
Time to peak (user input)
Calculated for use in hydrograph formulation

dT= 1 minutes
Hydrograph time increment (user input)

Ks= 906
b= 1.33
Component of stage-storage function (user input)
Component of stage-storage function (user input)

N= 1
Cd= 0.6
D= 1.254 in.
Zi= 0 feet
Number of outlets (user input)
Coefficient of Discharge for outlet (user input)
D/12+Zi= 0.10
Stage of outlet activation (user input)

N= 1
Cd= 0.6
D= 8.00 in.
Zi= 2.55 feet
Number of outlets (user input)
Coefficient of Discharge for outlet (user input)
D/12+Zi= 3.22
Stage of outlet activation (user input)

Cw= 3.33
L= 0.5 feet
Zcr= 5.50 feet
Weir coefficient (user input)
Weir length (user input)
Weir height (user input)

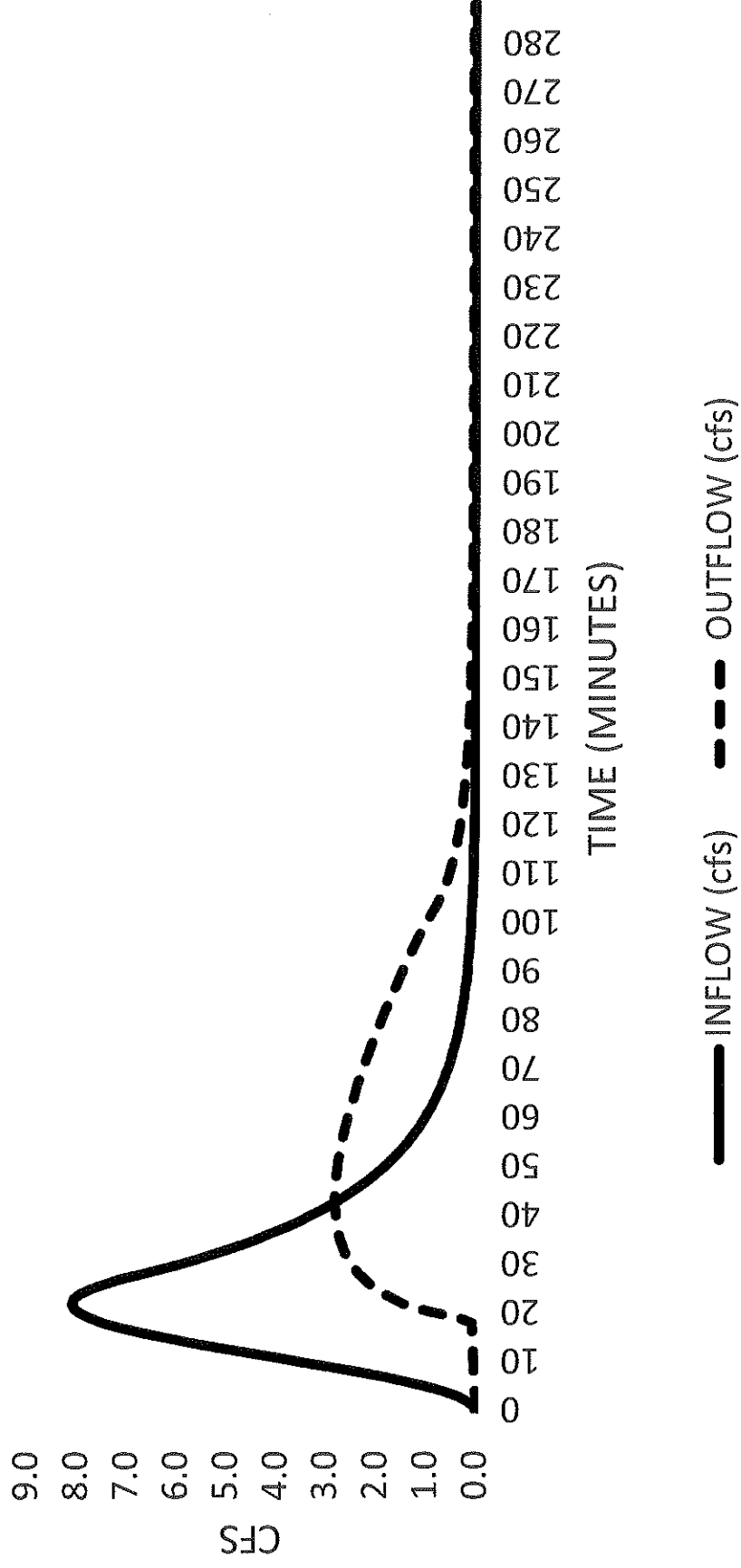
TIME (min)	INFLOW (cfs)	STORAGE (cu ft)	STAGE (ft)	TOTAL OUTFLOW (cfs)	WEIR (cfs)	LOWER ORIFICE d<DIAMETER (cfs)	LOWER ORIFICE d>DIAMETER (cfs)	UPPER ORIFICE d<DIAMETER (cfs)	UPPER ORIFICE d>DIAMETER (cfs)
0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
1	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
2	0.2	2	0.01	0.00	0.00	0.00	0.00	0.00	0.00
3	0.4	12	0.04	0.00	0.00	0.00	0.00	0.00	0.00
4	0.6	34	0.08	0.01	0.00	0.00	0.00	0.00	0.00
5	1.0	72	0.15	0.01	0.00	0.00	0.00	0.00	0.00
6	1.4	131	0.23	0.02	0.00	0.00	0.00	0.00	0.00
7	1.9	213	0.34	0.02	0.00	0.00	0.00	0.00	0.00
8	2.4	323	0.46	0.03	0.00	0.00	0.00	0.00	0.00
9	2.9	463	0.60	0.03	0.00	0.00	0.00	0.00	0.00
10	3.5	636	0.77	0.03	0.00	0.00	0.00	0.00	0.00
11	4.0	842	0.95	0.04	0.00	0.00	0.00	0.00	0.00
12	4.6	1082	1.14	0.04	0.00	0.00	0.00	0.00	0.00
13	5.2	1356	1.35	0.05	0.00	0.00	0.00	0.00	0.00
14	5.7	1664	1.58	0.05	0.00	0.00	0.00	0.00	0.00
15	6.2	2005	1.82	0.05	0.00	0.00	0.00	0.00	0.00
16	6.7	2375	2.06	0.06	0.00	0.00	0.00	0.00	0.00
17	7.1	2773	2.32	0.06	0.00	0.00	0.00	0.00	0.00
18	7.4	3195	2.58	0.07	0.00	0.00	0.00	0.00	0.00
19	7.7	3637	2.84	0.07	0.00	0.00	0.00	0.00	0.00
20	7.9	4079	3.10	0.07	0.00	0.00	0.00	0.00	0.00
21	8.0	4507	3.34	1.21	0.00	0.00	0.00	1.71	1.26
22	8.1	4917	3.57	1.46	0.00	0.00	0.00	1.89	1.39

23	8.0	5315	3.78	1.87	0.08	1.59	0.00	0.08	2.06	1.59	2.44
24	7.9	5697	3.98	1.84	0.08	1.76	0.00	0.08	2.23	1.76	3.07
25	7.7	6063	4.18	1.99	0.08	1.91	0.00	0.08	2.39	1.91	3.70
26	7.5	6407	4.35	2.12	0.09	2.03	0.00	0.09	2.54	2.03	4.32
27	7.1	6727	4.51	2.23	0.09	2.14	0.00	0.09	2.69	2.14	4.92
28	6.7	7019	4.66	2.33	0.09	2.24	0.00	0.09	2.82	2.24	5.48
29	6.3	7282	4.79	2.41	0.09	2.32	0.00	0.09	2.94	2.32	6.00
30	6.0	7518	4.91	2.48	0.09	2.39	0.00	0.09	3.04	2.39	6.47
31	5.6	7727	5.01	2.54	0.09	2.45	0.00	0.09	3.14	2.45	6.89
32	5.3	7912	5.10	2.59	0.09	2.50	0.00	0.09	3.22	2.50	7.27
33	5.0	8074	5.18	2.64	0.09	2.54	0.00	0.09	3.30	2.54	7.61
34	4.7	8216	5.25	2.67	0.09	2.58	0.00	0.09	3.36	2.58	7.91
35	4.4	8338	5.31	2.71	0.09	2.61	0.00	0.09	3.42	2.61	8.17
36	4.2	8442	5.36	2.73	0.09	2.64	0.00	0.09	3.47	2.64	8.39
37	3.9	8529	5.40	2.76	0.10	2.66	0.00	0.10	3.51	2.66	8.58
38	3.7	8600	5.43	2.77	0.10	2.68	0.00	0.10	3.54	2.68	8.73
39	3.5	8657	5.46	2.79	0.10	2.69	0.00	0.10	3.57	2.69	8.85
40	3.3	8700	5.48	2.80	0.10	2.70	0.00	0.10	3.59	2.70	8.95
41	3.1	8730	5.49	2.81	0.10	2.71	0.00	0.10	3.60	2.71	9.01
42	2.9	8748	5.50	2.81	0.10	2.72	0.00	0.10	3.61	2.72	9.05
43	2.8	8756	5.50	2.81	0.10	2.72	0.00	0.10	3.61	2.72	9.07
44	2.6	8753	5.50	2.81	0.10	2.72	0.00	0.10	3.61	2.72	9.06
45	2.5	8741	5.50	2.81	0.10	2.71	0.00	0.10	3.60	2.71	9.04
46	2.3	8719	5.49	2.80	0.10	2.71	0.00	0.10	3.60	2.71	8.99
47	2.2	8690	5.47	2.80	0.10	2.70	0.00	0.10	3.58	2.70	8.93
48	2.1	8654	5.46	2.79	0.10	2.69	0.00	0.10	3.57	2.69	8.85
49	1.9	8610	5.44	2.78	0.10	2.68	0.00	0.10	3.55	2.68	8.75
50	1.8	8560	5.41	2.76	0.10	2.67	0.00	0.10	3.52	2.67	8.64
51	1.7	8504	5.38	2.75	0.10	2.65	0.00	0.10	3.50	2.65	8.52
52	1.6	8442	5.36	2.73	0.09	2.64	0.00	0.09	3.47	2.64	8.39
53	1.5	8376	5.32	2.72	0.09	2.62	0.00	0.09	3.44	2.62	8.25
54	1.4	8305	5.29	2.70	0.09	2.60	0.00	0.09	3.41	2.60	8.10
55	1.4	8229	5.25	2.68	0.09	2.58	0.00	0.09	3.37	2.58	7.94
56	1.3	8150	5.22	2.66	0.09	2.56	0.00	0.09	3.33	2.56	7.77
57	1.2	8068	5.18	2.63	0.09	2.54	0.00	0.09	3.30	2.54	7.60
58	1.1	7982	5.13	2.61	0.09	2.52	0.00	0.09	3.26	2.52	7.42
59	1.1	7894	5.09	2.59	0.09	2.49	0.00	0.09	3.22	2.49	7.24
60	1.0	7804	5.05	2.56	0.09	2.47	0.00	0.09	3.17	2.47	7.05
61	1.0	7711	5.00	2.53	0.09	2.44	0.00	0.09	3.13	2.44	6.86
62	0.9	7616	4.96	2.51	0.09	2.42	0.00	0.09	3.09	2.42	6.67
63	0.8	7519	4.91	2.48	0.09	2.39	0.00	0.09	3.04	2.39	6.47
64	0.8	7422	4.86	2.45	0.09	2.36	0.00	0.09	3.00	2.36	6.27
65	0.8	7323	4.81	2.42	0.09	2.33	0.00	0.09	2.95	2.33	6.08
66	0.7	7223	4.76	2.39	0.09	2.30	0.00	0.09	2.91	2.30	5.88
67	0.7	7122	4.71	2.36	0.09	2.27	0.00	0.09	2.86	2.27	5.68
68	0.6	7020	4.66	2.33	0.09	2.24	0.00	0.09	2.82	2.24	5.48
69	0.6	6919	4.61	2.29	0.09	2.21	0.00	0.09	2.77	2.21	5.28
70	0.6	6817	4.56	2.26	0.09	2.17	0.00	0.09	2.73	2.17	5.09
71	0.5	6715	4.51	2.23	0.09	2.14	0.00	0.09	2.68	2.14	4.90
72	0.5	6613	4.46	2.19	0.09	2.11	0.00	0.09	2.63	2.11	4.70
73	0.5	6511	4.41	2.16	0.09	2.07	0.00	0.09	2.59	2.07	4.51
74	0.4	6410	4.35	2.12	0.09	2.04	0.00	0.09	2.54	2.04	4.33
75	0.4	6310	4.30	2.08	0.09	2.00	0.00	0.09	2.50	2.00	4.14
76	0.4	6210	4.25	2.05	0.08	1.96	0.00	0.08	2.45	1.96	3.96
77	0.4	6110	4.20	2.01	0.08	1.93	0.00	0.08	2.41	1.93	3.78
78	0.3	6012	4.15	1.97	0.08	1.89	0.00	0.08	2.37	1.89	3.61

79	0.3	5915	4.10	1.93	0.06	1.85	0.00	0.08	2.32	1.85	3.44
80	0.3	5819	4.05	1.89	0.06	1.81	0.00	0.08	2.28	1.81	3.28
81	0.3	5724	4.00	1.85	0.08	1.77	0.00	0.08	2.24	1.77	3.11
82	0.3	5630	3.95	1.81	0.08	1.73	0.00	0.08	2.20	1.73	2.96
83	0.3	5538	3.90	1.77	0.08	1.69	0.00	0.08	2.16	1.69	2.80
84	0.2	5447	3.85	1.73	0.08	1.65	0.00	0.08	2.12	1.65	2.65
85	0.2	5358	3.80	1.69	0.08	1.61	0.00	0.08	2.08	1.61	2.51
86	0.2	5270	3.75	1.65	0.08	1.57	0.00	0.08	2.04	1.57	2.37
87	0.2	5184	3.71	1.61	0.08	1.53	0.00	0.08	2.00	1.53	2.24
88	0.2	5100	3.67	1.56	0.08	1.49	0.00	0.08	1.97	1.49	2.11
89	0.2	5018	3.62	1.52	0.08	1.44	0.00	0.08	1.93	1.44	1.98
90	0.2	4938	3.58	1.48	0.08	1.40	0.00	0.08	1.89	1.40	1.86
91	0.2	4859	3.54	1.43	0.08	1.36	0.00	0.08	1.86	1.36	1.75
92	0.2	4783	3.49	1.39	0.08	1.31	0.00	0.08	1.83	1.31	1.64
93	0.1	4709	3.45	1.34	0.08	1.27	0.00	0.08	1.80	1.27	1.53
94	0.1	4637	3.41	1.30	0.08	1.22	0.00	0.08	1.77	1.22	1.43
95	0.1	4568	3.37	1.25	0.08	1.18	0.00	0.08	1.74	1.18	1.34
96	0.1	4500	3.34	1.21	0.07	1.13	0.00	0.07	1.71	1.13	1.25
97	0.1	4435	3.30	1.16	0.07	1.08	0.00	0.07	1.68	1.08	1.16
98	0.1	4372	3.27	1.11	0.07	1.04	0.00	0.07	1.65	1.04	1.09
99	0.1	4312	3.23	1.06	0.07	0.99	0.00	0.07	1.63	0.99	1.01
100	0.1	4254	3.20	1.01	0.07	0.93	0.00	0.07	1.60	0.93	0.93
101	0.1	4200	3.17	0.94	0.07	0.87	0.00	0.07	1.58	0.87	0.87
102	0.1	4149	3.14	0.88	0.07	0.81	0.00	0.07	1.56	0.81	0.81
103	0.1	4101	3.11	0.82	0.07	0.75	0.00	0.07	1.54	0.75	0.75
104	0.1	4056	3.09	0.77	0.07	0.70	0.00	0.07	1.52	0.70	0.70
105	0.1	4014	3.06	0.73	0.07	0.66	0.00	0.07	1.50	0.66	0.66
106	0.1	3975	3.04	0.68	0.07	0.61	0.00	0.07	1.48	0.61	0.61
107	0.1	3938	3.02	0.64	0.07	0.57	0.00	0.07	1.47	0.57	0.57
108	0.1	3903	3.00	0.61	0.07	0.54	0.00	0.07	1.45	0.54	0.54
109	0.1	3870	2.98	0.57	0.07	0.50	0.00	0.07	1.44	0.50	0.50
110	0.1	3839	2.96	0.54	0.07	0.47	0.00	0.07	1.43	0.47	0.47
111	0.0	3810	2.94	0.51	0.07	0.44	0.00	0.07	1.41	0.44	0.44
112	0.0	3782	2.93	0.49	0.07	0.42	0.00	0.07	1.40	0.42	0.42
113	0.0	3756	2.91	0.46	0.07	0.39	0.00	0.07	1.39	0.39	0.39
114	0.0	3731	2.90	0.44	0.07	0.37	0.00	0.07	1.38	0.37	0.37
115	0.0	3707	2.88	0.41	0.07	0.35	0.00	0.07	1.37	0.35	0.35
116	0.0	3685	2.87	0.39	0.07	0.33	0.00	0.07	1.36	0.33	0.33
117	0.0	3663	2.86	0.38	0.07	0.31	0.00	0.07	1.35	0.31	0.31
118	0.0	3643	2.85	0.36	0.07	0.29	0.00	0.07	1.34	0.29	0.29
119	0.0	3623	2.84	0.34	0.07	0.27	0.00	0.07	1.34	0.27	0.27
120	0.0	3605	2.82	0.33	0.07	0.26	0.00	0.07	1.33	0.26	0.26
121	0.0	3587	2.81	0.31	0.07	0.24	0.00	0.07	1.32	0.24	0.24
122	0.0	3570	2.80	0.30	0.07	0.23	0.00	0.07	1.31	0.23	0.23
123	0.0	3554	2.79	0.28	0.07	0.22	0.00	0.07	1.31	0.22	0.22
124	0.0	3538	2.79	0.27	0.07	0.20	0.00	0.07	1.30	0.20	0.20
125	0.0	3523	2.78	0.26	0.07	0.19	0.00	0.07	1.29	0.19	0.19
126	0.0	3509	2.77	0.25	0.07	0.18	0.00	0.07	1.29	0.18	0.18
127	0.0	3495	2.76	0.24	0.07	0.17	0.00	0.07	1.28	0.17	0.17
128	0.0	3482	2.75	0.23	0.07	0.16	0.00	0.07	1.28	0.16	0.16
129	0.0	3469	2.74	0.22	0.07	0.15	0.00	0.07	1.27	0.15	0.15
130	0.0	3457	2.74	0.21	0.07	0.14	0.00	0.07	1.27	0.14	0.14
131	0.0	3445	2.73	0.20	0.07	0.14	0.00	0.07	1.26	0.14	0.14
132	0.0	3434	2.72	0.20	0.07	0.13	0.00	0.07	1.26	0.13	0.13
133	0.0	3423	2.72	0.19	0.07	0.12	0.00	0.07	1.25	0.12	0.12
134	0.0	3413	2.71	0.18	0.07	0.11	0.00	0.07	1.25	0.11	0.11

135	0.0	3402	2.70	0.18	0.07	0.11	0.00	0.07	1.24	0.00	0.11	0.00	0.11
136	0.0	3393	2.70	0.17	0.07	0.10	0.00	0.07	1.24	0.00	0.10	0.00	0.10
137	0.0	3383	2.69	0.16	0.07	0.10	0.00	0.07	1.24	0.00	0.10	0.00	0.10
138	0.0	3374	2.69	0.16	0.07	0.09	0.00	0.07	1.23	0.00	0.09	0.00	0.09
139	0.0	3365	2.68	0.15	0.07	0.09	0.00	0.07	1.23	0.00	0.09	0.00	0.09
140	0.0	3356	2.68	0.15	0.07	0.08	0.00	0.07	1.23	0.00	0.08	0.00	0.08
141	0.0	3348	2.67	0.14	0.07	0.08	0.00	0.07	1.22	0.00	0.08	0.00	0.08
142	0.0	3340	2.67	0.14	0.07	0.07	0.00	0.07	1.22	0.00	0.07	0.00	0.07
143	0.0	3332	2.66	0.13	0.07	0.07	0.00	0.07	1.22	0.00	0.07	0.00	0.07
144	0.0	3325	2.66	0.13	0.07	0.06	0.00	0.07	1.21	0.00	0.06	0.00	0.06
145	0.0	3317	2.65	0.13	0.07	0.06	0.00	0.07	1.21	0.00	0.06	0.00	0.06
146	0.0	3310	2.65	0.12	0.07	0.06	0.00	0.07	1.21	0.00	0.06	0.00	0.06
147	0.0	3303	2.64	0.12	0.07	0.05	0.00	0.07	1.20	0.00	0.05	0.00	0.05
148	0.0	3296	2.64	0.12	0.07	0.05	0.00	0.07	1.20	0.00	0.05	0.00	0.05
149	0.0	3290	2.64	0.11	0.07	0.05	0.00	0.07	1.20	0.00	0.05	0.00	0.05
150	0.0	3283	2.63	0.11	0.07	0.04	0.00	0.07	1.20	0.00	0.04	0.00	0.04
151	0.0	3277	2.63	0.11	0.07	0.04	0.00	0.07	1.19	0.00	0.04	0.00	0.04
152	0.0	3271	2.63	0.10	0.07	0.04	0.00	0.07	1.19	0.00	0.04	0.00	0.04
153	0.0	3265	2.62	0.10	0.07	0.03	0.00	0.07	1.19	0.00	0.03	0.00	0.03
154	0.0	3259	2.62	0.10	0.07	0.03	0.00	0.07	1.19	0.00	0.03	0.00	0.03
155	0.0	3254	2.62	0.10	0.07	0.03	0.00	0.07	1.18	0.00	0.03	0.00	0.03
156	0.0	3248	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03	0.00	0.03
157	0.0	3243	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03	0.00	0.03
158	0.0	3238	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03	0.00	0.03
159	0.0	3232	2.60	0.09	0.07	0.02	0.00	0.07	1.17	0.00	0.02	0.00	0.02
160	0.0	3227	2.60	0.09	0.07	0.02	0.00	0.07	1.17	0.00	0.02	0.00	0.02
161	0.0	3222	2.60	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02	0.00	0.02
162	0.0	3218	2.59	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02	0.00	0.02
163	0.0	3213	2.59	0.08	0.07	0.01	0.00	0.07	1.17	0.00	0.01	0.00	0.01
164	0.0	3208	2.59	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01	0.00	0.01
165	0.0	3204	2.58	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01	0.00	0.01
166	0.0	3199	2.58	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01	0.00	0.01
167	0.0	3195	2.58	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01	0.00	0.01
168	0.0	3190	2.58	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01	0.00	0.01
169	0.0	3186	2.57	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01	0.00	0.01
170	0.0	3182	2.57	0.07	0.07	0.01	0.00	0.07	1.15	0.00	0.01	0.00	0.01
171	0.0	3178	2.57	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00	0.00	0.00
172	0.0	3173	2.57	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00	0.00	0.00
173	0.0	3169	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00	0.00	0.00
174	0.0	3165	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00	0.00	0.00
175	0.0	3161	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00	0.00	0.00
176	0.0	3157	2.56	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00	0.00	0.00
177	0.0	3154	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00	0.00	0.00
178	0.0	3150	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00	0.00	0.00
179	0.0	3146	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00	0.00	0.00
180	0.0	3142	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00	0.00	0.00
181	0.0	3138	2.54	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00	0.00	0.00
182	0.0	3134	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00	0.00	0.00
183	0.0	3130	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00	0.00	0.00
184	0.0	3127	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00	0.00	0.00
185	0.0	3123	2.54	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00	0.00	0.00
186	0.0	3119	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00	0.00	0.00
187	0.0	3115	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00	0.00	0.00
188	0.0	3111	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00	0.00	0.00
189	0.0	3107	2.53	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00	0.00	0.00
190	0.0	3103	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00	0.00	0.00

2-YEAR HYDROGRAPHS



CHRIST COMMUNITY CHURCH

8/23/2019

FILE NAME: CCCRouting25yr
25 YEAR STORM

ROUTING OF

RESULTS:
=MAX. STAGE (FEET) 7.00
=PEAK OUTFLOW (CFS) 6.57
=MAX. STORAGE (CF) 12054
=MAX. FLOW OVER WEIR (CFS) 3.06

Peak runoff for storm of interest (user input)
Time to peak (user input)
Calculated for use in hydrograph formulation

Qp= 11.30 cfs
Tp= 27 minutes
1.25*Tp= 33.75

dT= 1 minutes Hydrograph time increment (user input)

Ks= 906 Component of stage-storage function (user input)
b= 1.33 Component of stage-storage function (user input)

N= 1 Number of outlets (user input)
Cd= 0.6 Coefficient of Discharge for outlet (user input) **LOWER ORIFICE INPUT**
D= 1.254 in. D/12+Zl= 0.10
Zl= 0 feet Stage of outlet activation (user input)

N= 1 Number of outlets (user input)
Cd= 0.6 Coefficient of Discharge for outlet (user input) **UPPER ORIFICE INPUT**
D= 8.00 in. D/12+Zl= 3.22
Zl= 2.55 feet Stage of outlet activation (user input)

Cw= 3.33 Weir coefficient (user input) **WEIR INPUT**
L= 0.5 feet Weir length (user input)
Zcr= 5.50 feet Weir height (user input)

TIME (min)	INFLOW (cfs)	STORAGE (cu ft)	STAGE (ft)	TOTAL OUTFLOW (cfs)	LOWER ORIFICE (cfs)	UPPER ORIFICE (cfs)	WEIR (cfs)	LOWER ORIFICE d>DIAMETER (cfs)	LOWER ORIFICE d<DIAMETER (cfs)	UPPER ORIFICE d>DIAMETER (cfs)	UPPER ORIFICE d<DIAMETER (cfs)
0	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.2	0	2	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.3	11	11	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.6	32	32	0.08	0.01	0.00	0.00	0.00	0.01	0.00	0.00
5	0.9	67	67	0.14	0.01	0.00	0.00	0.00	0.01	0.00	0.00
6	1.3	122	122	0.22	0.02	0.02	0.00	0.02	0.03	0.00	0.00
7	1.8	201	201	0.32	0.02	0.02	0.00	0.02	0.05	0.00	0.00
8	2.3	306	306	0.44	0.03	0.03	0.00	0.03	0.08	0.00	0.00
9	2.8	440	440	0.58	0.03	0.03	0.00	0.03	0.12	0.00	0.00
10	3.4	608	608	0.74	0.03	0.03	0.00	0.03	0.18	0.00	0.00
11	4.0	810	810	0.92	0.04	0.04	0.00	0.04	0.25	0.00	0.00
12	4.7	1050	1050	1.12	0.04	0.04	0.00	0.04	0.33	0.00	0.00
13	5.3	1327	1327	1.33	0.05	0.05	0.00	0.05	0.43	0.00	0.00
14	6.0	1643	1643	1.56	0.05	0.05	0.00	0.05	0.55	0.00	0.00
15	6.6	1999	1999	1.81	0.05	0.05	0.00	0.05	0.68	0.00	0.00
16	7.3	2393	2393	2.08	0.06	0.06	0.00	0.06	0.84	0.00	0.00
17	7.9	2825	2825	2.35	0.06	0.06	0.00	0.06	1.01	0.00	0.00
18	8.5	3295	3295	2.64	0.07	0.07	0.05	0.07	1.20	0.00	0.05
19	9.0	3796	3796	2.94	0.50	0.43	0.00	0.00	1.41	0.00	0.43
20	9.5	4307	4307	3.23	1.06	0.07	0.99	0.00	1.62	0.00	1.00
21	10.0	4815	4815	3.51	1.41	0.08	1.33	0.00	1.84	0.00	1.68
22	10.4	5329	5329	3.79	1.68	0.08	1.50	0.00	2.06	0.00	2.46

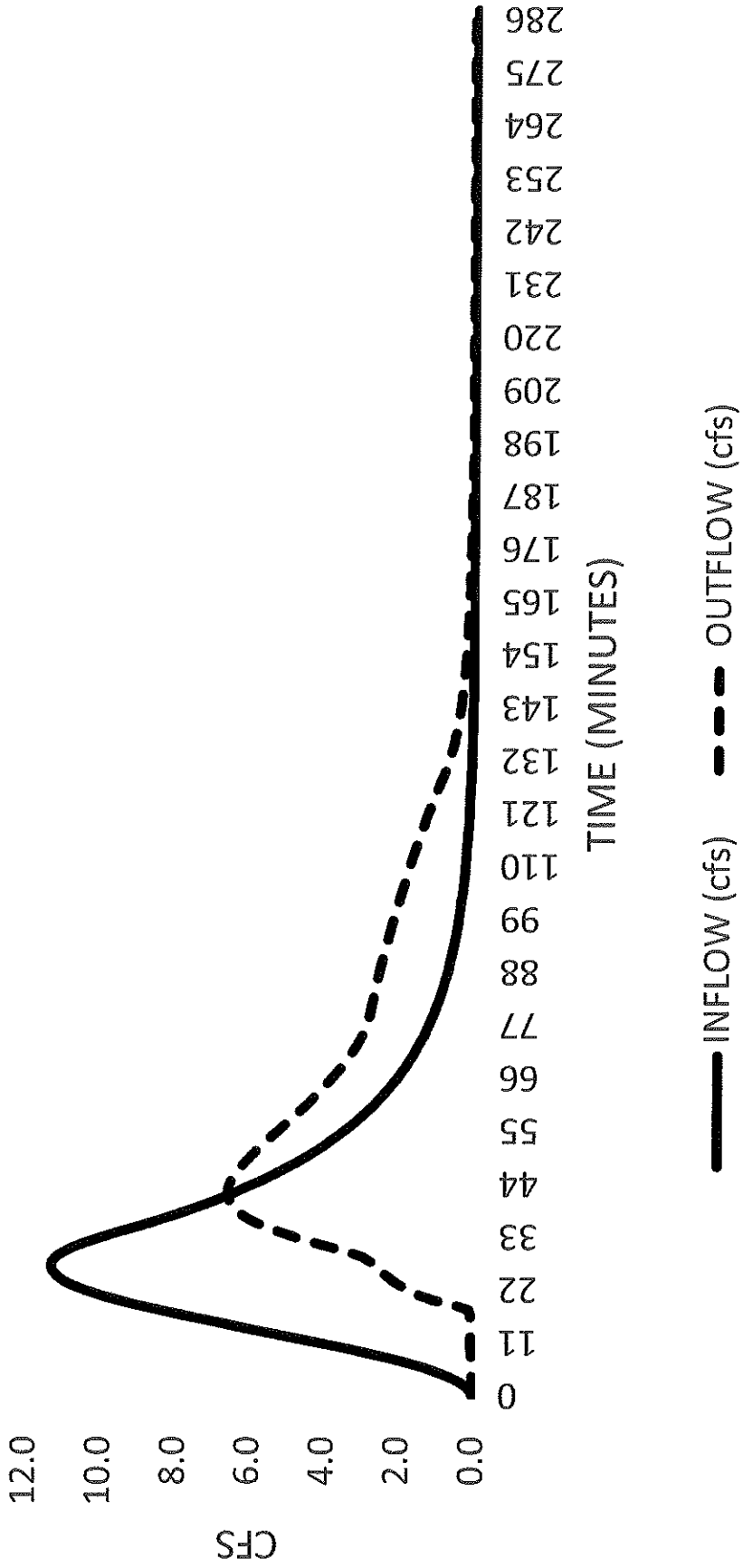
23	10.7	5850	4.06	1.91	0.08	1.82	0.00	0.08	2.29	1.82	3.33
24	11.0	6378	4.34	2.11	0.09	2.02	0.00	0.09	2.53	2.02	4.27
25	11.1	6908	4.61	2.29	0.09	2.20	0.00	0.09	2.77	2.20	5.26
26	11.3	7440	4.87	2.46	0.09	2.37	0.00	0.09	3.01	2.37	6.31
27	11.3	7968	5.13	2.61	0.09	2.51	0.00	0.09	3.25	2.51	7.39
28	11.3	8490	5.38	2.75	0.10	2.65	0.00	0.10	3.49	2.65	8.49
29	11.1	9001	5.62	2.94	0.10	2.78	0.07	0.10	3.73	2.78	9.60
30	11.0	9493	5.85	3.13	0.10	2.89	0.34	0.10	3.96	2.89	10.70
31	10.7	9951	6.06	3.79	0.10	2.99	0.70	0.10	4.18	2.99	11.74
32	10.4	10366	6.25	4.26	0.10	3.08	1.08	0.10	4.37	3.08	12.71
33	10.0	10732	6.42	4.71	0.10	3.15	1.46	0.10	4.55	3.15	13.57
34	9.5	11049	6.56	5.13	0.11	3.22	1.81	0.11	4.70	3.22	14.32
35	9.1	11313	6.67	5.49	0.11	3.27	2.12	0.11	4.83	3.27	14.96
36	8.7	11529	6.77	5.80	0.11	3.31	2.38	0.11	4.93	3.31	15.48
37	8.3	11701	6.85	6.05	0.11	3.34	2.60	0.11	5.01	3.34	15.90
38	7.9	11834	6.90	6.24	0.11	3.36	2.77	0.11	5.08	3.36	16.22
39	7.5	11932	6.95	6.39	0.11	3.38	2.90	0.11	5.12	3.38	16.46
40	7.1	11998	6.98	6.49	0.11	3.39	2.99	0.11	5.16	3.39	16.63
41	6.8	12038	6.99	6.55	0.11	3.40	3.04	0.11	5.18	3.40	16.72
42	6.5	12054	7.00	6.57	0.11	3.40	3.06	0.11	5.18	3.40	16.76
43	6.2	12049	7.00	6.57	0.11	3.40	3.05	0.11	5.18	3.40	16.75
44	5.9	12026	6.99	6.53	0.11	3.40	3.02	0.11	5.17	3.40	16.69
45	5.6	11988	6.97	6.47	0.11	3.39	2.97	0.11	5.15	3.39	16.60
46	5.4	11937	6.95	6.40	0.11	3.38	2.90	0.11	5.13	3.38	16.47
47	5.1	11874	6.92	6.30	0.11	3.37	2.82	0.11	5.10	3.37	16.32
48	4.9	11802	6.89	6.20	0.11	3.36	2.73	0.11	5.06	3.36	16.14
49	4.6	11722	6.85	6.08	0.11	3.34	2.63	0.11	5.02	3.34	15.95
50	4.4	11636	6.82	5.95	0.11	3.33	2.52	0.11	4.98	3.33	15.74
51	4.2	11543	6.78	5.82	0.11	3.31	2.40	0.11	4.94	3.31	15.51
52	4.0	11447	6.73	5.68	0.11	3.29	2.28	0.11	4.89	3.29	15.28
53	3.8	11347	6.69	5.54	0.11	3.27	2.16	0.11	4.84	3.27	15.04
54	3.6	11244	6.64	5.40	0.11	3.25	2.04	0.11	4.79	3.25	14.79
55	3.5	11139	6.60	5.25	0.11	3.23	1.91	0.11	4.74	3.23	14.54
56	3.3	11032	6.55	5.11	0.11	3.21	1.79	0.11	4.69	3.21	14.28
57	3.2	10924	6.50	4.96	0.10	3.19	1.67	0.10	4.64	3.19	14.02
58	3.0	10815	6.45	4.82	0.10	3.17	1.55	0.10	4.59	3.17	13.76
59	2.9	10706	6.40	4.68	0.10	3.15	1.43	0.10	4.54	3.15	13.51
60	2.7	10597	6.35	4.54	0.10	3.13	1.31	0.10	4.48	3.13	13.25
61	2.6	10488	6.30	4.41	0.10	3.10	1.20	0.10	4.43	3.10	12.99
62	2.5	10380	6.26	4.28	0.10	3.08	1.09	0.10	4.38	3.08	12.74
63	2.4	10272	6.21	4.15	0.10	3.06	0.99	0.10	4.33	3.06	12.49
64	2.3	10164	6.16	4.03	0.10	3.04	0.89	0.10	4.28	3.04	12.24
65	2.1	10058	6.11	3.91	0.10	3.01	0.79	0.10	4.23	3.01	11.99
66	2.0	9952	6.06	3.79	0.10	2.99	0.70	0.10	4.18	2.99	11.75
67	1.9	9847	6.01	3.68	0.10	2.97	0.61	0.10	4.13	2.97	11.51
68	1.9	9743	5.97	3.57	0.10	2.95	0.53	0.10	4.08	2.95	11.27
69	1.8	9640	5.92	3.47	0.10	2.92	0.45	0.10	4.03	2.92	11.03
70	1.7	9538	5.87	3.37	0.10	2.90	0.38	0.10	3.98	2.90	10.80
71	1.6	9436	5.82	3.28	0.10	2.88	0.31	0.10	3.93	2.88	10.57
72	1.5	9336	5.78	3.20	0.10	2.85	0.24	0.10	3.89	2.85	10.35
73	1.5	9236	5.73	3.11	0.10	2.83	0.18	0.10	3.84	2.83	10.13
74	1.4	9137	5.68	3.04	0.10	2.81	0.13	0.10	3.79	2.81	9.91
75	1.3	9038	5.64	2.97	0.10	2.78	0.08	0.10	3.75	2.78	9.69
76	1.3	8939	5.59	2.90	0.10	2.76	0.05	0.10	3.70	2.76	9.47
77	1.2	8841	5.54	2.85	0.10	2.74	0.02	0.10	3.65	2.74	9.25
78	1.1	8742	5.50	2.81	0.10	2.71	0.00	0.10	3.61	2.71	9.04

79	1.1	8642	5.45	2.78	0.10	2.69	0.00	0.10	3.56	2.69	8.82
80	1.0	8541	5.40	2.76	0.10	2.66	0.00	0.10	3.51	2.66	8.60
81	1.0	8438	5.35	2.73	0.09	2.64	0.00	0.09	3.47	2.64	8.38
82	0.9	8334	5.30	2.71	0.09	2.61	0.00	0.09	3.42	2.61	8.16
83	0.9	8228	5.25	2.68	0.09	2.58	0.00	0.09	3.37	2.58	7.94
84	0.9	8121	5.20	2.65	0.09	2.56	0.00	0.09	3.32	2.56	7.71
85	0.8	8014	5.15	2.62	0.09	2.53	0.00	0.09	3.27	2.53	7.49
86	0.8	7906	5.10	2.59	0.09	2.50	0.00	0.09	3.22	2.50	7.26
87	0.7	7797	5.05	2.56	0.09	2.47	0.00	0.09	3.17	2.47	7.04
88	0.7	7688	4.99	2.53	0.09	2.44	0.00	0.09	3.12	2.44	6.81
89	0.7	7579	4.94	2.50	0.09	2.41	0.00	0.09	3.07	2.41	6.59
90	0.6	7470	4.89	2.46	0.09	2.37	0.00	0.09	3.02	2.37	6.37
91	0.6	7361	4.83	2.43	0.09	2.34	0.00	0.09	2.97	2.34	6.15
92	0.6	7252	4.78	2.40	0.09	2.31	0.00	0.09	2.92	2.31	5.94
93	0.6	7143	4.72	2.37	0.09	2.28	0.00	0.09	2.87	2.28	5.72
94	0.5	7034	4.67	2.33	0.09	2.24	0.00	0.09	2.82	2.24	5.51
95	0.5	6926	4.62	2.30	0.09	2.21	0.00	0.09	2.78	2.21	5.30
96	0.5	6819	4.56	2.26	0.09	2.17	0.00	0.09	2.73	2.17	5.09
97	0.5	6712	4.51	2.23	0.09	2.14	0.00	0.09	2.68	2.14	4.89
98	0.4	6606	4.45	2.19	0.09	2.10	0.00	0.09	2.63	2.10	4.69
99	0.4	6501	4.40	2.15	0.09	2.07	0.00	0.09	2.58	2.07	4.49
100	0.4	6397	4.35	2.12	0.09	2.03	0.00	0.09	2.54	2.03	4.30
101	0.4	6294	4.29	2.08	0.08	1.99	0.00	0.08	2.49	1.99	4.11
102	0.4	6192	4.24	2.04	0.08	1.96	0.00	0.08	2.45	1.96	3.93
103	0.3	6091	4.19	2.00	0.08	1.92	0.00	0.08	2.40	1.92	3.75
104	0.3	5992	4.14	1.96	0.08	1.88	0.00	0.08	2.36	1.88	3.58
105	0.3	5893	4.09	1.92	0.08	1.84	0.00	0.08	2.31	1.84	3.40
106	0.3	5797	4.04	1.88	0.08	1.80	0.00	0.08	2.27	1.80	3.24
107	0.3	5702	3.99	1.84	0.08	1.76	0.00	0.08	2.23	1.76	3.08
108	0.3	5608	3.94	1.80	0.08	1.72	0.00	0.08	2.19	1.72	2.92
109	0.3	5516	3.89	1.76	0.08	1.68	0.00	0.08	2.15	1.68	2.77
110	0.2	5425	3.84	1.72	0.08	1.64	0.00	0.08	2.11	1.64	2.62
111	0.2	5337	3.79	1.68	0.08	1.60	0.00	0.08	2.07	1.60	2.48
112	0.2	5250	3.75	1.64	0.08	1.56	0.00	0.08	2.03	1.56	2.34
113	0.2	5165	3.70	1.60	0.08	1.52	0.00	0.08	1.99	1.52	2.21
114	0.2	5082	3.66	1.55	0.08	1.48	0.00	0.08	1.96	1.48	2.08
115	0.2	5001	3.61	1.51	0.08	1.43	0.00	0.08	1.92	1.43	1.96
116	0.2	4922	3.57	1.47	0.08	1.39	0.00	0.08	1.89	1.39	1.84
117	0.2	4845	3.53	1.42	0.08	1.35	0.00	0.08	1.85	1.35	1.73
118	0.2	4770	3.48	1.38	0.08	1.30	0.00	0.08	1.82	1.30	1.62
119	0.2	4697	3.45	1.34	0.08	1.26	0.00	0.08	1.79	1.26	1.52
120	0.2	4627	3.41	1.29	0.08	1.21	0.00	0.08	1.76	1.21	1.42
121	0.1	4558	3.37	1.25	0.08	1.17	0.00	0.08	1.73	1.17	1.32
122	0.1	4492	3.33	1.20	0.07	1.13	0.00	0.07	1.70	1.13	1.24
123	0.1	4429	3.30	1.15	0.07	1.08	0.00	0.07	1.68	1.08	1.15
124	0.1	4367	3.26	1.11	0.07	1.03	0.00	0.07	1.65	1.03	1.07
125	0.1	4308	3.23	1.06	0.07	0.99	0.00	0.07	1.62	0.99	1.00
126	0.1	4252	3.20	1.00	0.07	0.93	0.00	0.07	1.60	0.93	0.93
127	0.1	4198	3.17	0.94	0.07	0.87	0.00	0.07	1.58	0.87	0.87
128	0.1	4149	3.14	0.88	0.07	0.81	0.00	0.07	1.56	0.81	0.81
129	0.1	4102	3.11	0.83	0.07	0.75	0.00	0.07	1.54	0.75	0.75
130	0.1	4058	3.09	0.78	0.07	0.70	0.00	0.07	1.52	0.70	0.70
131	0.1	4017	3.06	0.73	0.07	0.66	0.00	0.07	1.50	0.66	0.66
132	0.1	3979	3.04	0.69	0.07	0.62	0.00	0.07	1.49	0.62	0.62
133	0.1	3943	3.02	0.65	0.07	0.58	0.00	0.07	1.47	0.58	0.58
134	0.1	3909	3.00	0.61	0.07	0.54	0.00	0.07	1.46	0.54	0.54

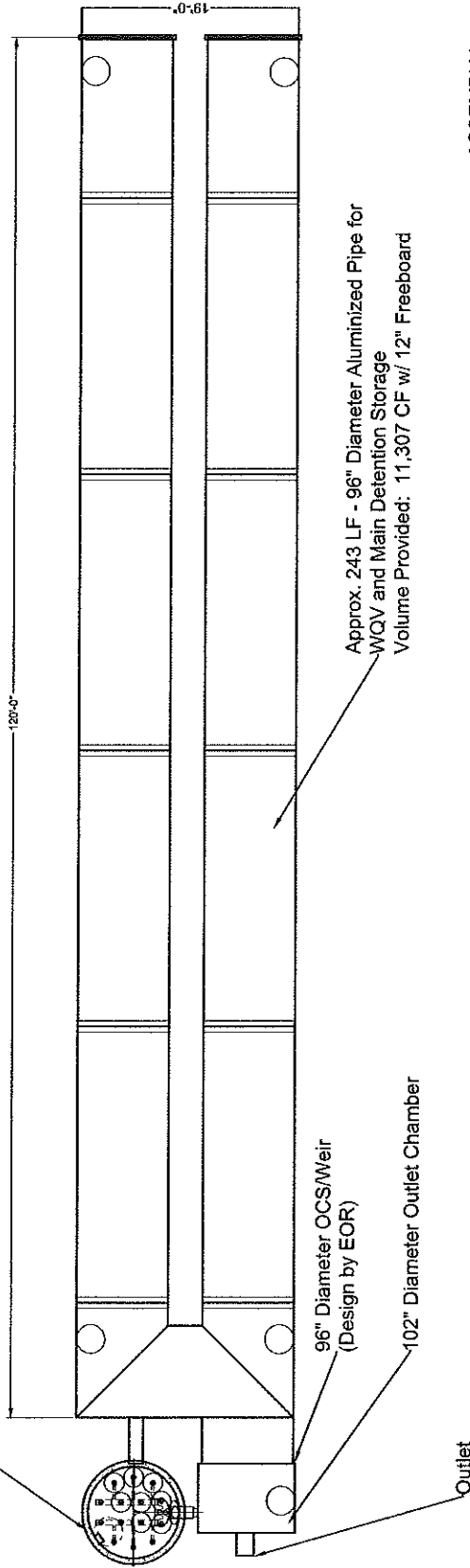
135	0.1	3877	2.98	0.58	0.07	0.51	0.00	0.07	1.44	0.00	0.51
136	0.1	3846	2.97	0.55	0.07	0.48	0.00	0.07	1.43	0.00	0.48
137	0.1	3818	2.95	0.52	0.07	0.45	0.00	0.07	1.42	0.00	0.45
138	0.1	3790	2.93	0.49	0.07	0.42	0.00	0.07	1.41	0.00	0.42
139	0.1	3765	2.92	0.47	0.07	0.40	0.00	0.07	1.40	0.00	0.40
140	0.1	3740	2.90	0.45	0.07	0.38	0.00	0.07	1.39	0.00	0.38
141	0.1	3717	2.89	0.42	0.07	0.35	0.00	0.07	1.38	0.00	0.35
142	0.1	3695	2.88	0.40	0.07	0.33	0.00	0.07	1.37	0.00	0.33
143	0.1	3674	2.86	0.38	0.07	0.32	0.00	0.07	1.36	0.00	0.32
144	0.0	3654	2.85	0.37	0.07	0.30	0.00	0.07	1.35	0.00	0.30
145	0.0	3634	2.84	0.35	0.07	0.28	0.00	0.07	1.34	0.00	0.28
146	0.0	3616	2.83	0.33	0.07	0.27	0.00	0.07	1.33	0.00	0.27
147	0.0	3599	2.82	0.32	0.07	0.25	0.00	0.07	1.32	0.00	0.25
148	0.0	3582	2.81	0.31	0.07	0.24	0.00	0.07	1.32	0.00	0.24
149	0.0	3566	2.80	0.29	0.07	0.23	0.00	0.07	1.31	0.00	0.23
150	0.0	3551	2.79	0.28	0.07	0.21	0.00	0.07	1.31	0.00	0.21
151	0.0	3536	2.78	0.27	0.07	0.20	0.00	0.07	1.30	0.00	0.20
152	0.0	3522	2.78	0.26	0.07	0.19	0.00	0.07	1.29	0.00	0.19
153	0.0	3508	2.77	0.25	0.07	0.18	0.00	0.07	1.29	0.00	0.18
154	0.0	3495	2.76	0.24	0.07	0.17	0.00	0.07	1.28	0.00	0.17
155	0.0	3482	2.75	0.23	0.07	0.16	0.00	0.07	1.28	0.00	0.16
156	0.0	3470	2.74	0.22	0.07	0.15	0.00	0.07	1.27	0.00	0.15
157	0.0	3459	2.74	0.21	0.07	0.15	0.00	0.07	1.27	0.00	0.15
158	0.0	3447	2.73	0.21	0.07	0.14	0.00	0.07	1.26	0.00	0.14
159	0.0	3437	2.72	0.20	0.07	0.13	0.00	0.07	1.26	0.00	0.13
160	0.0	3426	2.72	0.19	0.07	0.12	0.00	0.07	1.25	0.00	0.12
161	0.0	3416	2.71	0.18	0.07	0.12	0.00	0.07	1.25	0.00	0.12
162	0.0	3406	2.71	0.18	0.07	0.11	0.00	0.07	1.25	0.00	0.11
163	0.0	3397	2.70	0.17	0.07	0.10	0.00	0.07	1.24	0.00	0.10
164	0.0	3387	2.70	0.17	0.07	0.10	0.00	0.07	1.24	0.00	0.10
165	0.0	3379	2.69	0.16	0.07	0.09	0.00	0.07	1.23	0.00	0.09
166	0.0	3370	2.69	0.16	0.07	0.09	0.00	0.07	1.23	0.00	0.09
167	0.0	3362	2.68	0.15	0.07	0.08	0.00	0.07	1.23	0.00	0.08
168	0.0	3354	2.68	0.15	0.07	0.08	0.00	0.07	1.22	0.00	0.08
169	0.0	3346	2.67	0.14	0.07	0.07	0.00	0.07	1.22	0.00	0.07
170	0.0	3338	2.67	0.14	0.07	0.07	0.00	0.07	1.22	0.00	0.07
171	0.0	3331	2.66	0.13	0.07	0.07	0.00	0.07	1.22	0.00	0.07
172	0.0	3324	2.66	0.13	0.07	0.06	0.00	0.07	1.21	0.00	0.06
173	0.0	3317	2.65	0.13	0.07	0.06	0.00	0.07	1.21	0.00	0.06
174	0.0	3310	2.65	0.12	0.07	0.06	0.00	0.07	1.21	0.00	0.06
175	0.0	3303	2.64	0.12	0.07	0.05	0.00	0.07	1.20	0.00	0.05
176	0.0	3297	2.64	0.12	0.07	0.05	0.00	0.07	1.20	0.00	0.05
177	0.0	3290	2.64	0.11	0.07	0.05	0.00	0.07	1.20	0.00	0.05
178	0.0	3284	2.63	0.11	0.07	0.04	0.00	0.07	1.20	0.00	0.04
179	0.0	3278	2.63	0.11	0.07	0.04	0.00	0.07	1.19	0.00	0.04
180	0.0	3272	2.63	0.10	0.07	0.04	0.00	0.07	1.19	0.00	0.04
181	0.0	3267	2.62	0.10	0.07	0.04	0.00	0.07	1.19	0.00	0.04
182	0.0	3261	2.62	0.10	0.07	0.03	0.00	0.07	1.19	0.00	0.03
183	0.0	3256	2.62	0.10	0.07	0.03	0.00	0.07	1.18	0.00	0.03
184	0.0	3250	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03
185	0.0	3245	2.61	0.09	0.07	0.03	0.00	0.07	1.18	0.00	0.03
186	0.0	3240	2.61	0.09	0.07	0.02	0.00	0.07	1.18	0.00	0.02
187	0.0	3235	2.60	0.09	0.07	0.02	0.00	0.07	1.18	0.00	0.02
188	0.0	3230	2.60	0.09	0.07	0.02	0.00	0.07	1.17	0.00	0.02
189	0.0	3225	2.60	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02
190	0.0	3220	2.59	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02

191	0.0	3216	2.59	0.08	0.07	0.02	0.00	0.07	1.17	0.00	0.02
192	0.0	3211	2.59	0.08	0.07	0.01	0.00	0.07	1.17	0.00	0.01
193	0.0	3207	2.59	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01
194	0.0	3202	2.58	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01
195	0.0	3198	2.58	0.08	0.07	0.01	0.00	0.07	1.16	0.00	0.01
196	0.0	3194	2.58	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01
197	0.0	3189	2.58	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01
198	0.0	3185	2.57	0.07	0.07	0.01	0.00	0.07	1.16	0.00	0.01
199	0.0	3181	2.57	0.07	0.07	0.01	0.00	0.07	1.15	0.00	0.01
200	0.0	3177	2.57	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
201	0.0	3173	2.57	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
202	0.0	3169	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
203	0.0	3165	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
204	0.0	3161	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
205	0.0	3157	2.56	0.07	0.07	0.00	0.00	0.07	1.15	0.00	0.00
206	0.0	3154	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
207	0.0	3150	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
208	0.0	3146	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
209	0.0	3142	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
210	0.0	3138	2.55	0.07	0.07	0.00	0.00	0.07	1.14	0.00	0.00
211	0.0	3135	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00
212	0.0	3131	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00
213	0.0	3127	2.54	0.07	0.07	0.00	0.00	0.07	1.13	0.00	0.00
214	0.0	3123	2.54	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
215	0.0	3119	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
216	0.0	3116	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
217	0.0	3112	2.53	0.06	0.06	0.00	0.00	0.06	1.13	0.00	0.00
218	0.0	3108	2.53	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
219	0.0	3104	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
220	0.0	3100	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
221	0.0	3097	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
222	0.0	3093	2.52	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
223	0.0	3089	2.51	0.06	0.06	0.00	0.00	0.06	1.12	0.00	0.00
224	0.0	3085	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
225	0.0	3081	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
226	0.0	3078	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
227	0.0	3074	2.51	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
228	0.0	3070	2.50	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
229	0.0	3066	2.50	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
230	0.0	3062	2.50	0.06	0.06	0.00	0.00	0.06	1.11	0.00	0.00
231	0.0	3058	2.50	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
232	0.0	3055	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
233	0.0	3051	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
234	0.0	3047	2.49	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
235	0.0	3043	2.48	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
236	0.0	3039	2.48	0.06	0.06	0.00	0.00	0.06	1.10	0.00	0.00
237	0.0	3035	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
238	0.0	3032	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
239	0.0	3028	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
240	0.0	3024	2.48	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
241	0.0	3020	2.47	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
242	0.0	3016	2.47	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
243	0.0	3013	2.47	0.06	0.06	0.00	0.00	0.06	1.09	0.00	0.00
244	0.0	3009	2.47	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
245	0.0	3005	2.46	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00
246	0.0	3001	2.46	0.06	0.06	0.00	0.00	0.06	1.08	0.00	0.00

25-YEAR HYDROGRAPHS



96" Diameter Precast Storm Filter
w/ 8 ea - 27" Cartridges
Media: Perlite for TSS per MDC



Approx. 243 LF - 96" Diameter Aluminized Pipe for
WQV and Main Detention Storage
Volume Provided: 11,307 CF w/ 12" Freeboard

ASSEMBLY
SCALE: 1" = 10'

PROJECT SUMMARY

STORAGE SUMMARY

- STORAGE VOLUME REQUIRED 11,300 CF
- PIPE STORAGE = 11,307 CF W/ 12" FREEBOARD
- STRUCTURAL BACKFILL STORAGE = 0 CF
- TOTAL STORAGE PROVIDED = 11,307 CF

CALCULATION DETAILS

- LENGTH PER BARREL = 112 FT
- LENGTH PER HEADER = 19 FT
- LOADING = H20 & H25
- APPROX. CMP FOOTAGE = 243 FT

PIPE DETAILS

- DIAMETER = 96 IN
- CORRUGATION = 5" X 1" OR 3" X 1"
- GAGE = 14
- COATING = ALUMINIZED STEEL TYPE 2 (AL72)
- WALL TYPE = SOLID
- BARREL SPACING = 36 IN

BACKFILL DETAILS

- WIDTH AT ENDS = 24 IN
- ABOVE PIPE = 0 IN
- WIDTH AT SIDES = 24 IN
- BELOW PIPE = 0 IN

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR CONSTRUCTION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A588.
- ALL RISERS AND STUBS ARE 24" x 24" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE EXISTING SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PRELIMINARY DESIGN IS BASED UPON THE RESPONSIBILITY OF THE CONTRACTOR.
- THE PROJECT SHALL BE CONSTRUCTED UPON FINAL DESIGN.
- BE VERIFIED UPON FINAL DESIGN AND APPROVAL. TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.

NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL CODES OR REGULATIONS. THE CONTRACTOR SHALL CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

CONTECH ENGINEERED SOLUTIONS LLC
8925 Centro Pointe Dr., Suite 400, Wood Chester, OH 45899
900-338-1122 510-845-7000 813-645-7883 FAX
www.contechies.com

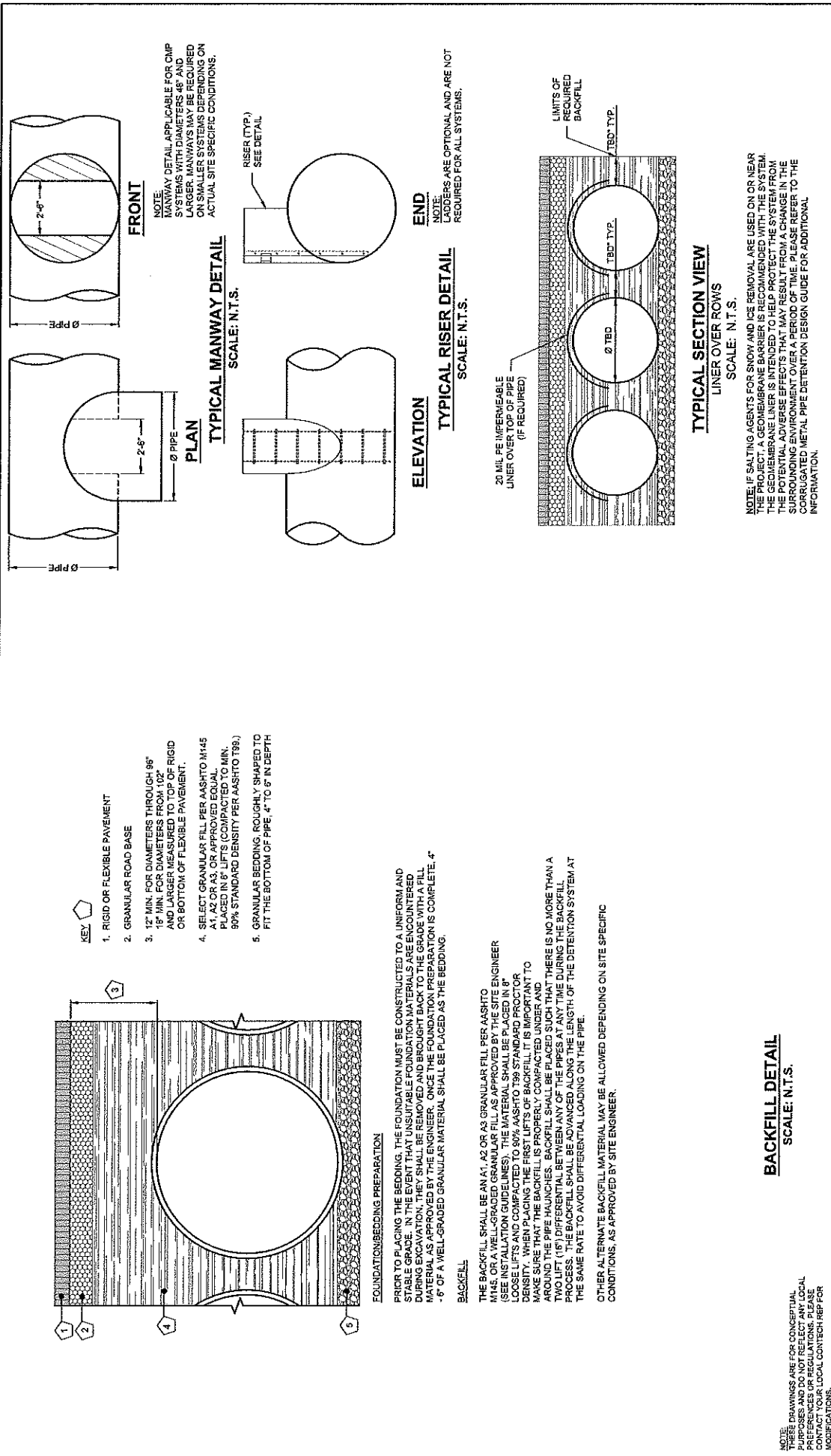
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CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

DYODS - 12323-1-0
PROJECT NAME: Christ Community Church
Chapel Hill, NC
DESCRIPTION: WQV + MAIN DETENTION

PROJECT No.	12323-1	DATE	8/23/2018
DESIGNED	0	DRAWN	
CHECKED		APPROVED	
DYODS		DYODS	
SHEET No.		SHEET No.	D1

NO.	DATE	REVISION DESCRIPTION



NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON ALL SIZES SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL
SCALE: N.T.S.

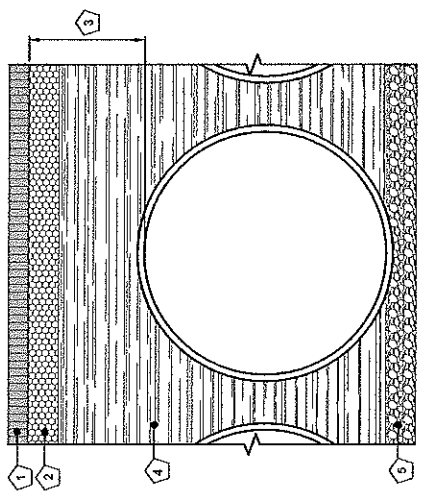
END
NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL
SCALE: N.T.S.

TYPICAL SECTION VIEW
LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

- KEY**
1. RIGID OR FLEXIBLE PAVEMENT
 2. GRANULAR ROAD BASE
 3. 12" MIN. FOR DIAMETERS THROUGH 96" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
 4. SELECT GRANULAR FILL PER AASHTO M145 TO BE PLACED IN LIFTS (COMPACT TO MIN. 98% STANDARD DENSITY PER AASHTO T99.)
 5. GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE. 4" TO 6" IN DEPTH



FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, 4" TO 6" OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

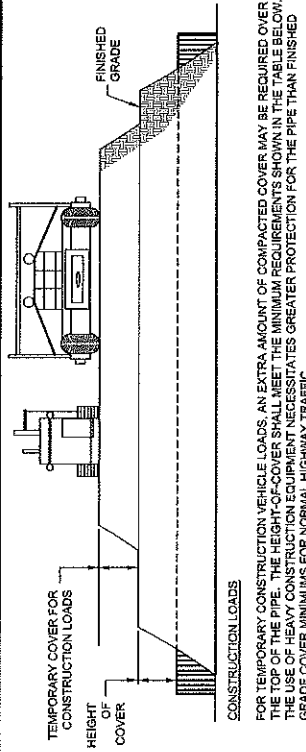
THE BACKFILL SHALL BE AN A1, A2 OR A3 GRANULAR FILL PER AASHTO M145, OR A WELL-GRADED GRANULAR FILL AS APPROVED BY THE SITE ENGINEER (SEE INSTALLATION GUIDELINES). THE MATERIAL SHALL BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. WHEN PLACING THE FIRST LIFTS OF BACKFILL, IT IS IMPORTANT TO AVOID THE PIPE BEING PROPERLY COMPACTED UNDER AND AROUND THE PIPE. THE BACKFILL SHALL BE PLACED IN LIFTS OF NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PRESS AND DURING THE BACKFILL PROCESS, THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

BACKFILL DETAIL
SCALE: N.T.S.

NOTE:
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8925 Centro Pointe Dr., Suite 400, West Chester, OH 45389 800-338-1122 513-645-7000 513-645-7863 FAX		PROJECT No.: 12323-1-0 DATE: 8/23/2019 REVISION: 0 DRAWN: DYODS CHECKED: DYODS APPROVED: DYODS SHEET No.: D2	
CONTECH ENGINEERED SOLUTIONS LLC www.conteches.com		DYODS DRAWING	
CONTECH ENGINEERED SOLUTIONS LLC		DYODS DRAWING	
PROJECT NAME: Christ Community Church Chapel Hill, NC		PROJECT No.: 12323-1-0	
DESCRIPTION: WQV + MAIN DETENTION		DATE:	
REVISION DESCRIPTION:		BY:	



CONSTRUCTION LOADS

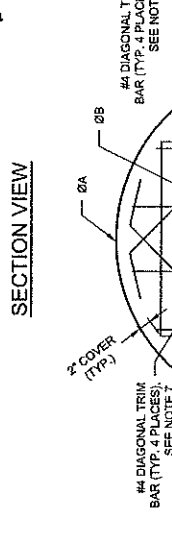
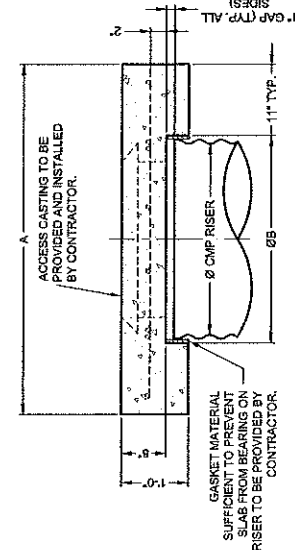
FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)		
	10-50	50-75	75-110
12-42	2.0	2.5	3.0
48-72	3.0	3.0	3.5
78-120	3.0	3.5	4.0
126-144	3.5	4.0	4.5

MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM
SCALE: N.T.S.

CONSTRUCTION LOADING DIAGRAM
SCALE: N.T.S.

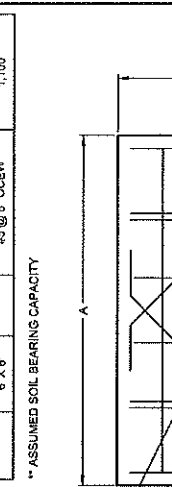


ROUND OPTION PLAN VIEW

REINFORCING TABLE

Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4"x4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-5" 4'-5" X 4'-5"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,630
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,880 1,350
42"	Ø 5'-6" 5'-5" X 5'-5"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



SQUARE OPTION PLAN VIEW

MANHOLE CAP DETAIL
SCALE: N.T.S.

- NOTES:
- DESIGN IN ACCORDANCE WITH AASHTO, 17TH EDITION.
 - DESIGN LOAD HS20.
 - EARTH COVER = 1" MAX.
 - CONCRETE STRENGTH = 3,500 PSI
 - REINFORCING STEEL = ASTM A615, GRADE 60.
 - PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED. HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
 - TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING. BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
 - PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
 - DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

TEMPORARY COVER FOR CONSTRUCTION LOADS. HEIGHT OF COVER. CONSTRUCTION LOADS. FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

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TEMPORARY COVER FOR CONSTRUCTION LOADS	HEIGHT OF COVER	CONSTRUCTION LOADS
10-50	10-0	2.0, 2.5, 3.0
50-75	10-0	3.0, 3.5, 4.0
75-110	10-0	3.0, 3.5, 4.0
110-150	10-0	3.5, 4.0, 4.5

CONSTRUCTION LOADING DIAGRAM
SCALE: N.T.S.

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CONTECH
CMP DETENTION SYSTEMS
CONTECH
DYODS
DRAWING

PROJECT NAME: Christ Community Church
Chapel Hill, NC
DESCRIPTION: WQV + MAIN DETENTION

DYODS - 12923-1-0

PROJECT No. 12923-1-0
DATE: 8/23/2019
REVISIONS: 0
DRAWN BY: DYODS
CHECKED BY: DYODS
APPROVED BY: DYODS

SHEET NO.: D3

CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS MUST FOLLOW THE CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS SYSTEMS, INC. STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL CONTECH SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADEQUATE BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE SETTLEMENT OF SAND FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM. SAND FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM, SHOULD BE REMOVED FROM THE STRUCTURAL FILL MATERIAL. IS NOT COMPATIBLE WITH THE MODEL. IN THESE CASES, AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN THESE CASES, USING STIFF REINFORCING GEOSGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

BEDDING

A 4 TO 6-INCH THICK, WELL-GRADED, GRANULAR MATERIAL IS THE PREFERRED PIPE BEDDING. IF CONSTRUCTION EQUIPMENT WILL OPERATE FOR AN EXTENDED PERIOD OF TIME ON THE BEDDING, USE EITHER AN ENGINEERING FABRIC OR A STIFF GEOSGRID TO ENSURE THE BASE MATERIAL MAINTAINS ITS INTEGRITY.

USING AN OPEN-GRADED BEDDING MATERIAL IS ACCEPTABLE; HOWEVER, AN ENGINEERING FABRIC SEPARATOR IS REQUIRED BETWEEN THE BASE AND THE SUBGRADE.

GRADE THE BASE TO A SMOOTH, UNIFORM GRADE TO ALLOW FOR THE PROPER PLACEMENT OF THE PIPE.

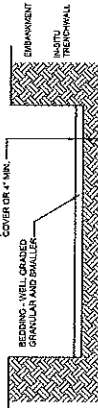
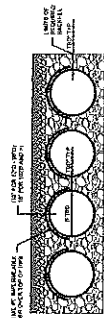


Table with 3 columns: MARK, DATE, REVISION/DESCRIPTION

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS ARE USED AT THE PROJECT SITE, AND USE HIS/HER BEST JUDGMENT TO DETERMINE IF ANY, AND IF SO, WHICH AGENTS ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



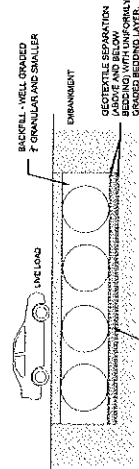
IN-SITU TRENCH WALL

IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHARES AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES, THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.

BACKFILL MATERIAL

TYPICALLY, THE BEST BACKFILL MATERIAL IS AN ANGULAR, WELL-GRADED, OPEN-GRADED FILL MEETING THE REQUIREMENTS OF AASHTO A-1, A-2 OR A-3. IN SOME CASES, IT MAY BE DESIRABLE TO USE A UNIFORMLY GRADED MATERIAL FOR THE BACKFILL BEHIND THE PIPES. THIS TYPE OF MATERIAL IS EASIER TO PLACE UNDER THE HANDS OF THE PIPE AND REQUIRES LITTLE COMPACTIVE EFFORT, DEPENDING ON THE BEARING CAPACITY. A SEPARATION GEOTEXTILE MIGHT BE REQUIRED ABOVE AND BELOW THESE INITIAL LIFTS.

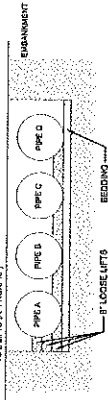


OPEN-GRADED FILL IS TYPICALLY NOT USED BEYOND THE INITIAL 18- TO 24-INCHES BECAUSE THIS TYPE OF FILL OFTEN DOES NOT PROVIDE ADEQUATE CONTAINING RESTRAINT TO THE PIPES. IF A UNIFORMLY GRADED MATERIAL (PARTICLES ALL ONE SIZE) IS USED, INSTALL A GEOTEXTILE SEPARATION FABRIC TO PREVENT THE MIGRATION OF FINES INTO THE BACKFILL.

BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM OR FLOWABLE FILL) WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. WORK CLOSELY WITH THE LOCAL CONTECH SALES ENGINEER REGARDING THE SPECIAL INSTALLATION TECHNIQUES REQUIRED WHEN USING CLSM.

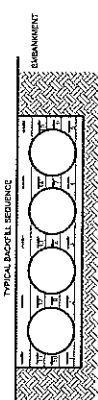
BACKFILL PLACEMENT

PLACE BACKFILL IN 6-INCH LOOSE LIFTS AND COMPACT TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

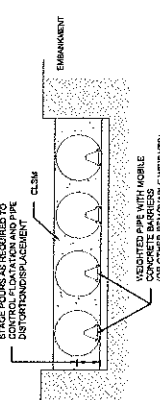


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR TRACK LOADERS WITH LONG REACHES MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR PROTECTIVE BACKFILL IS REACHED TO THE END OF THE RECENTLY PLACED LIFT, ADVANCE THE EQUIPMENT AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 6- TO 10- FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

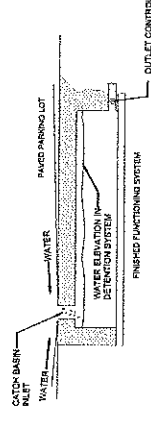


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION, CAUSING FLOATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES TO HELP MITIGATE POTENTIAL PROBLEMS. IT IS BEST TO START THE INSTANTLY TO ALLOW DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, QUARTERLY INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS. IN CLIMATE WHERE SNOW REMAINS THROUGHOUT OPERATIONS TAKE PLACE AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM.

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION INDICATES ACCUMULATED SEDIMENT OR TRASH IS CLOSING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE MAINTAINED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEALED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESSIBLE INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL OSHA REGULATIONS REGARDING CONFINED SPACE ENTRY AND OTHER PRECAUTIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DEICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIER WHEN THERE IS AN EASY WAY OF ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

Table with 3 columns: PROJECT NO., SHEET NO., DATE. PROJECT NO: 12323-1, SHEET NO: 0, DATE: 8/23/2019. PROJECT NAME: Christ Community Church Chapel Hill, NC. DESCRIPTION: WQV + MAIN DETENTION. D4

CONTECH ENGINEERED SOLUTIONS LLC. CMP DETENTION SYSTEMS. DYODS DRAWING. CONTECH DYODS. 8025 Central Expressway, Suite 400, West Chester, OH 45389. 900-386-1122, 515-645-7000, 515-645-7895 FAX.

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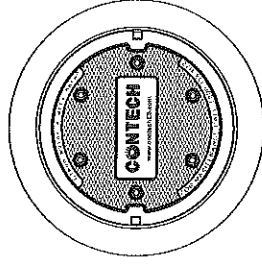
STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (14). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 14 CARTRIDGES. UP-STREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION	18" (456 mm)	27" (686 mm)	36" (914 mm)	48" (1219 mm)
CARTRIDGE HEIGHT	18" (456 mm)	27" (686 mm)	36" (914 mm)	48" (1219 mm)
RECOMMENDED HYDRAULIC DROP (H)	3.05' (930 mm)	3.05' (930 mm)	3.05' (930 mm)	3.05' (930 mm)
SPECIFIC FLOW RATE (gpm/sq ft) [L/s/m ²]	2.1 (30)	1.67 (1.08)	1.0 (65)	2.1 (30)
CARTRIDGE FLOW RATE (gpm) [L/s]	22.5 (1.42)	16.79 (1.19)	11.25 (0.71)	22.5 (1.42)
* 1.67 gpm/sq ft [1.08 L/s/m ²] SPECIFIC FLOW RATE IS APPROVED WITH PROSPHOSORB® (PSORB) MEDIA ONLY	10 (0.63)	7.5 (0.44)	5.0 (0.32)	10 (0.63)

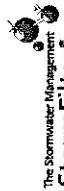
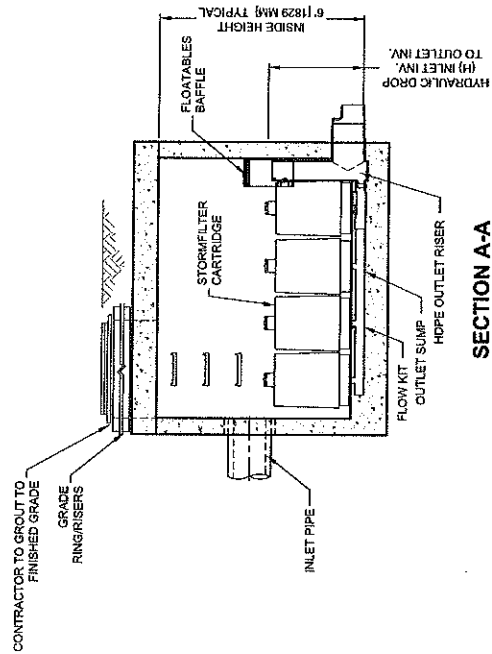
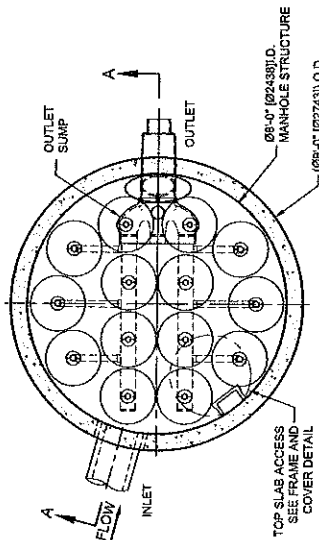
SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (GAL/L)	*
PEAK FLOW RATE (GAL/L)	*
RETURN PERIOD OF PEAK FLOW (YR)	*
CARTRIDGE HEIGHT (SEE TABLE ABOVE)	*
NUMBER OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (PERLITE, ZPG, PSORB)	*
PIPE DATA	T.E. MATERIAL DIAMETER
INLET PIPE #1	*
INLET PIPE #2	*
OUTLET PIPE	*
RM ELEVATION	*
ANTI-FLOTATION BALLAST	WIDTH HEIGHT
NOTES/SPECIAL REQUIREMENTS:	*
* PER ENGINEER OF RECORD	



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

- #### GENERAL NOTES
- CONTECH PROVIDES ALL MATERIALS UNLESS NOTED OTHERWISE.
 - DIMENSIONS MARKED WITH () ARE PRESENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
 - FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.conteches.com
 - STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
 - STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0 - 5' (1524 mm) AND GROUNDWATER ELEVATION AT OR BELOW THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL BE ASHTO M318 AND BE CAST WITH THE CONTECH LOGO.
 - INLET AND OUTLET PIPES SHALL BE 12" (305 mm) DIA. UNLESS OTHERWISE NOTED. PASSIVE SIPHON ACTUATED RADIAL FLOW, AND SELF-CLEANING. CASTINGS SHALL BE 7" (178 mm) DIA. UNLESS OTHERWISE NOTED. FILTER MEDIA SHALL BE 20-40 MESH PERLITE.
 - SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (L/S/M²) DIVIDED BY THE FILTER CONTACT SURFACE AREA (64 ft²/m²).
 - STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-845 AND ASHTO LOAD FACTOR DESIGN METHOD.
- #### INSTALLATION NOTES
- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
 - CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
 - CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLY STRUCTURE.
 - CONTRACTOR TO PROVIDE AND INSTALL COVER (INLET PIPE).
 - CONTRACTOR TO PROVIDE AND INSTALL COVER (OUTLET PIPE).
 - CONTRACTOR TO PROVIDE AND INSTALL COVER (INLET PIPE).
 - CONTRACTOR TO PROVIDE AND INSTALL COVER (OUTLET PIPE).
 - CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.



The Stormwater Management
StormFilter
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING
PATENT RIGHTS: U.S. PATENT NO. 8,594,088; U.S. PATENT NO. 8,594,089;
U.S. PATENT NO. 8,594,090; U.S. PATENT NO. 8,594,091; U.S. PATENT NO. 8,594,092

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SFMH96
STORMFILTER
STANDARD DETAIL