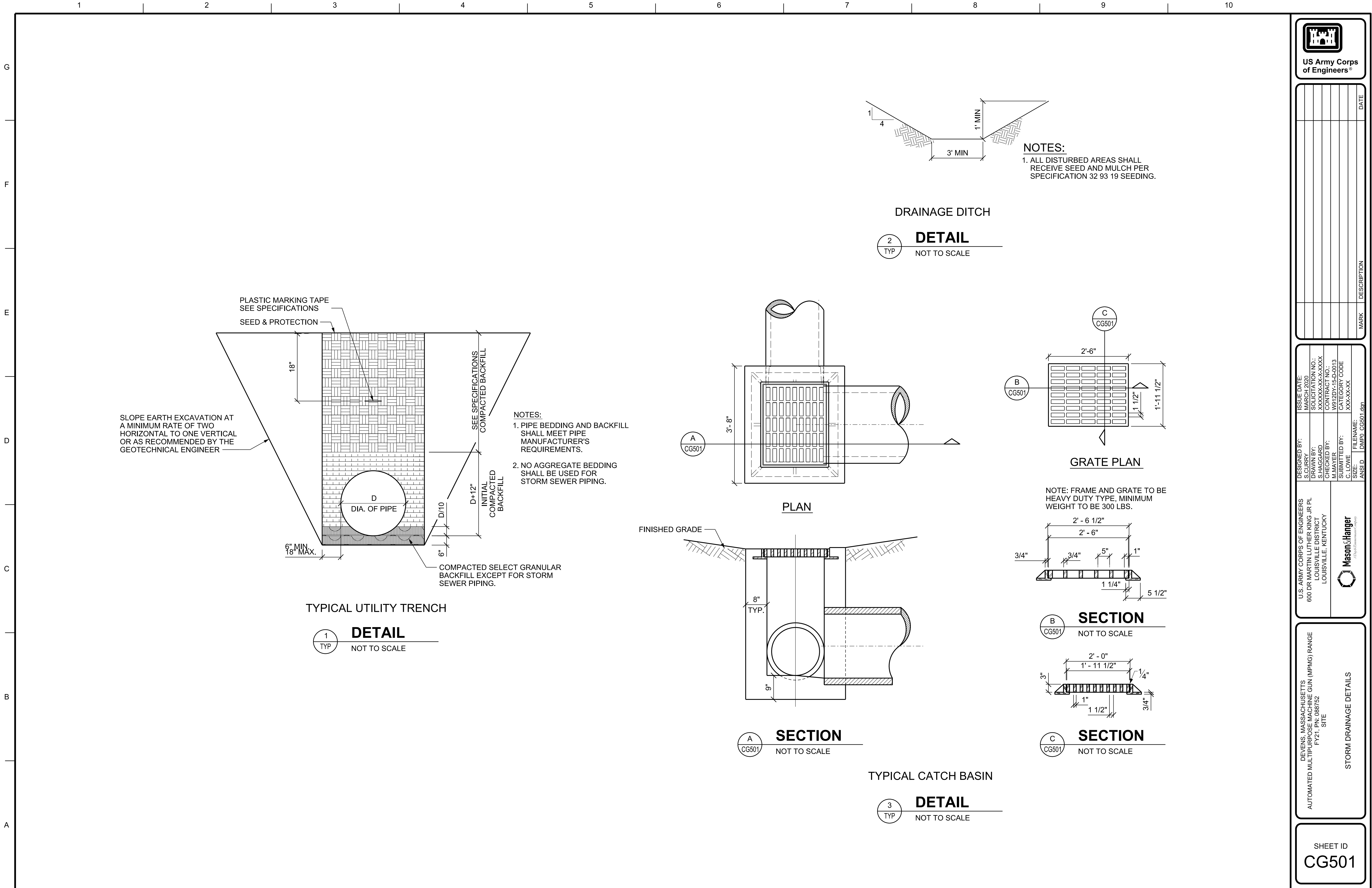


P:\Projects\01531403 CAD_BIM\Sheets\05_Civil\DMPO_CG501.dgn
28-FEB-2020
07:23



[illegible]

 Mason's Hanger <i>Heavy Construction Hardware</i>	DESIGNED BY: U.S. ARMY CORPS OF ENGINEERS 600 DR MARTIN LUTHER KING JR PL LOUISVILLE DISTRICT LOUISVILLE, KENTUCKY		ISSUE DATE: MARCH 2020 SOLICITATION NO.: XXXXXX-XX-XXXX CONTRACT NO.: 912D0154-50013 COUNTRY CODE: XXXX-XX	
	DRAWN BY: S. HARGARD CHECKED BY: W. R. HARGARD SUBMITTED BY: C. LOWIE		FILENAME: DWIP01_CG5013.dwg ANS I.D.: DWIP01_CG5013.dwg	

DEVENS, MASSACHUSETTS
AUTOMATED MULTIPURPOSE MACHINE GUN (MPMG) RANGE
FY21, PN: 088752
SITE

SHEET ID
CG503

WATER SURFACE

EXISTING STREAM BED ELEVATION

ARTICULATING CONCRETE BLOCK

VOIDS TO BE FILLED WITH G.A.B.

REMOVAL AND REPLACEMENT OF EXISTING CREEK BED TO INSTALL ARTICULATING CONCRETE BLOCK MATS AT 1:1 SLOPE

3.5'

135°

EXISTING STREAM BED

NON-WOVEN GEOTEXTILE

135°

3.5'

1. ARTICULATED CONCRETE BLOCK (A.C.B.) WILL BE 4000 PSI CONCRETE.
2. ARTICULATED CONCRETE BLOCK MATS WILL EXTEND INTO THE CREEK BED AT A 1:1 SLOPE. MINIMUM DEPTH OF THE ARTICULATED CONCRETE BLOCK MAT TIE-INTO THE GROUND WILL BE NO LESS THAN 3.5 FEET.
3. ARTICULATED CONCRETE BLOCK MATS TOP SURFACE WILL MAINTAIN THE EXISTING STREAM BANK ELEVATION.
4. VOIDS BETWEEN THE ARTICULATED CONCRETE BLOCKS WILL BE FILLED WITH GRADED AGGREGATE BASE (G.A.B.) UNTIL NATURAL BED LOAD FILLS THE VOIDS.

EXISTING STREAM BED ELEVATION

WATER SURFACE

ARTICULATED CONCRETE BLOCK

VOIDS TO BE FILLED WITH G.A.B.

1.0'

1.0'

EXISTING STREAM BED

1.0' COMPACTED GRADED AGGREGATE BASE

NON-WOVEN GEOTEXTILE

1. ARTICULATED CONCRETE BLOCK (A.C.B.) WILL BE 4000 PSI CONCRETE.
2. ALL VOIDS BETWEEN A.C.B.'S WILL BE FILLED WITH COMPACTED G.A.B., EXCEPT WHERE A.C.B. IS LOCATED IN THE STREAM FLOW.
3. GRADE SHALL BE SET SO THAT THE SURFACE OF THE INSTALLED A.C.B. IS THE SAME AS THE EXISTING STREAM BED.
4. VOIDS BETWEEN THE ARTICULATED CONCRETE BLOCKS WILL BE FILLED WITH GRADED AGGREGATE BASE (G.A.B.) UNTIL NATURAL BED LOAD FILLS THE VOIDS.

BEGIN STONE HARDENED SERVICE ROAD

BEGIN ARTICULATED CONCRETE BLOCK LOW WATER CROSSING

ARTICULATED CONCRETE BLOCK

VOIDS TO BE FILLED WITH G.A.B.

6'

3.5'

135°

1.0'

NON-WOVEN GEOTEXTILE

1.0' COMPACTED G.A.B.

1. ARTICULATED CONCRETE BLOCK (A.C.B.) WILL BE 4000 PSI CONCRETE.
2. ALL VOIDS BETWEEN A.C.B.'S WILL BE FILLED WITH COMPACTED G.A.B.
3. G.A.B. UNDER A.C.B. WILL BE ONE FOOT THICK AND COMPACTED AS STATED IN SPECIFICATION 32 11 23 WITH A LAYER OF GEOTEXTILE UNDERNEATH.
4. G.A.B. AT STONE HARDENED SERVICE ROAD WILL BE 6" THICK AS SHOWN IN DRAWING.



STORM WATER DATA



NOAA Atlas 14, Volume 10, Version 3
Location name: Lancaster, Massachusetts, USA*
Latitude: 42.5064°, Longitude: -71.6463°
Elevation: 240.36 ft**
* source: ESRI Maps
** source: USGS



Precipitation - Inches

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

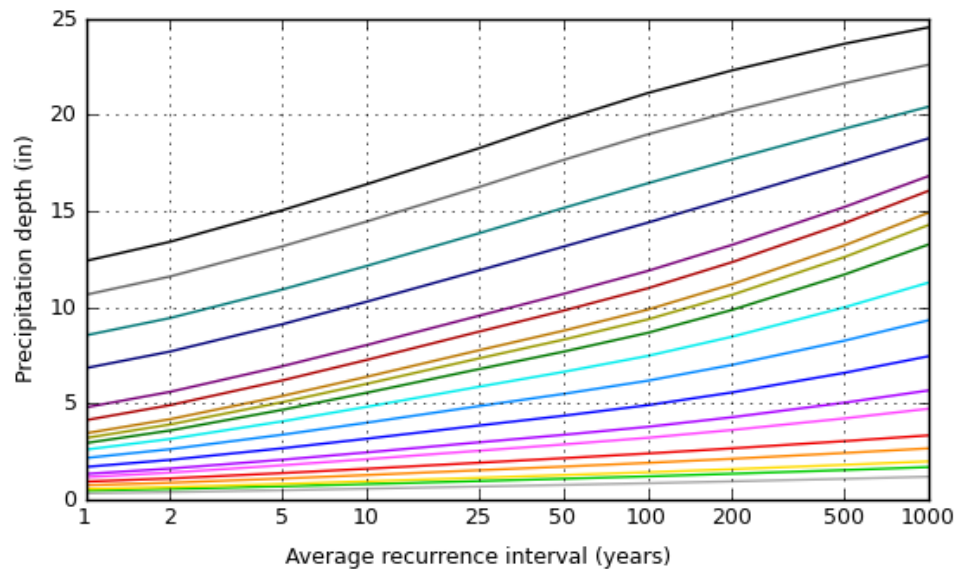
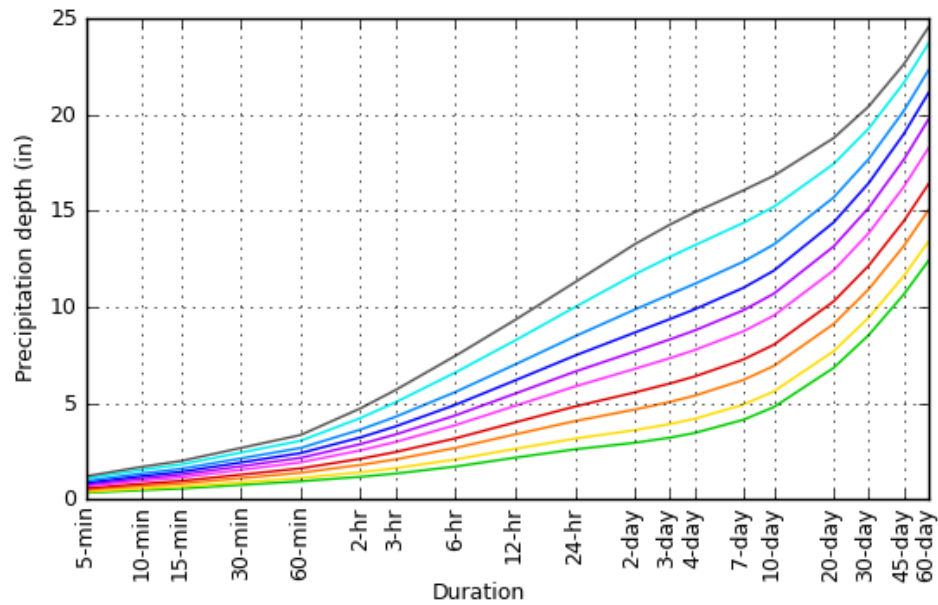
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.335 (0.260-0.420)	0.394 (0.306-0.496)	0.491 (0.380-0.619)	0.572 (0.440-0.725)	0.684 (0.510-0.899)	0.768 (0.561-1.03)	0.856 (0.606-1.18)	0.952 (0.641-1.34)	1.09 (0.705-1.58)	1.20 (0.757-1.77)
10-min	0.474 (0.369-0.595)	0.558 (0.434-0.702)	0.696 (0.538-0.878)	0.811 (0.625-1.03)	0.969 (0.722-1.27)	1.09 (0.795-1.46)	1.21 (0.859-1.67)	1.35 (0.909-1.90)	1.54 (0.998-2.24)	1.69 (1.07-2.50)
15-min	0.558 (0.434-0.701)	0.657 (0.510-0.826)	0.819 (0.635-1.03)	0.954 (0.734-1.21)	1.14 (0.850-1.50)	1.28 (0.935-1.71)	1.43 (1.01-1.97)	1.59 (1.07-2.23)	1.81 (1.17-2.63)	1.99 (1.26-2.95)
30-min	0.749 (0.583-0.941)	0.882 (0.686-1.11)	1.10 (0.852-1.39)	1.28 (0.986-1.62)	1.53 (1.14-2.01)	1.72 (1.25-2.30)	1.91 (1.36-2.64)	2.13 (1.43-3.00)	2.43 (1.57-3.52)	2.67 (1.69-3.94)
60-min	0.940 (0.732-1.18)	1.11 (0.861-1.39)	1.38 (1.07-1.74)	1.61 (1.24-2.04)	1.92 (1.43-2.52)	2.16 (1.57-2.88)	2.40 (1.70-3.31)	2.67 (1.80-3.76)	3.04 (1.97-4.42)	3.34 (2.12-4.94)
2-hr	1.17 (0.920-1.46)	1.41 (1.10-1.75)	1.79 (1.40-2.24)	2.11 (1.64-2.65)	2.54 (1.92-3.33)	2.87 (2.12-3.83)	3.22 (2.31-4.45)	3.62 (2.45-5.07)	4.22 (2.75-6.09)	4.73 (3.00-6.94)
3-hr	1.34 (1.06-1.66)	1.62 (1.28-2.01)	2.08 (1.63-2.59)	2.46 (1.92-3.07)	2.98 (2.26-3.89)	3.37 (2.50-4.49)	3.79 (2.74-5.23)	4.29 (2.91-5.98)	5.04 (3.29-7.24)	5.68 (3.62-8.30)
6-hr	1.70 (1.36-2.10)	2.07 (1.65-2.55)	2.67 (2.12-3.30)	3.17 (2.50-3.93)	3.85 (2.95-5.00)	4.36 (3.27-5.77)	4.91 (3.58-6.75)	5.58 (3.80-7.72)	6.59 (4.31-9.40)	7.46 (4.76-10.8)
12-hr	2.17 (1.74-2.64)	2.63 (2.11-3.21)	3.38 (2.71-4.14)	4.00 (3.18-4.93)	4.86 (3.74-6.25)	5.50 (4.15-7.21)	6.18 (4.54-8.43)	7.01 (4.81-9.63)	8.26 (5.43-11.7)	9.32 (5.98-13.4)
24-hr	2.60 (2.11-3.15)	3.16 (2.56-3.83)	4.07 (3.29-4.95)	4.83 (3.88-5.90)	5.87 (4.56-7.49)	6.64 (5.05-8.65)	7.47 (5.52-10.1)	8.47 (5.84-11.6)	9.99 (6.60-14.1)	11.3 (7.27-16.1)
2-day	2.94 (2.42-3.53)	3.60 (2.95-4.32)	4.67 (3.81-5.63)	5.56 (4.51-6.73)	6.78 (5.32-8.59)	7.69 (5.90-9.95)	8.67 (6.46-11.7)	9.87 (6.84-13.4)	11.7 (7.76-16.3)	13.3 (8.57-18.8)
3-day	3.21 (2.65-3.83)	3.91 (3.23-4.68)	5.06 (4.16-6.08)	6.02 (4.91-7.26)	7.34 (5.78-9.25)	8.31 (6.41-10.7)	9.37 (7.00-12.5)	10.6 (7.40-14.4)	12.6 (8.38-17.5)	14.3 (9.25-20.2)
4-day	3.45 (2.86-4.11)	4.19 (3.47-4.99)	5.39 (4.45-6.44)	6.39 (5.23-7.67)	7.76 (6.13-9.74)	8.78 (6.78-11.3)	9.88 (7.40-13.2)	11.2 (7.81-15.0)	13.2 (8.80-18.3)	14.9 (9.68-21.0)
7-day	4.13 (3.45-4.89)	4.91 (4.11-5.82)	6.20 (5.16-7.36)	7.26 (6.00-8.67)	8.73 (6.94-10.9)	9.82 (7.62-12.5)	11.0 (8.24-14.5)	12.3 (8.65-16.5)	14.4 (9.61-19.8)	16.1 (10.4-22.5)
10-day	4.80 (4.03-5.65)	5.61 (4.71-6.61)	6.93 (5.80-8.20)	8.04 (6.67-9.55)	9.55 (7.62-11.8)	10.7 (8.32-13.5)	11.9 (8.92-15.5)	13.2 (9.32-17.6)	15.2 (10.2-20.8)	16.8 (11.0-23.5)
20-day	6.84 (5.81-7.98)	7.70 (6.53-9.00)	9.12 (7.70-10.7)	10.3 (8.63-12.1)	11.9 (9.57-14.5)	13.1 (10.3-16.3)	14.4 (10.8-18.4)	15.7 (11.1-20.7)	17.4 (11.8-23.7)	18.8 (12.3-26.0)
30-day	8.54 (7.30-9.92)	9.44 (8.06-11.0)	10.9 (9.28-12.7)	12.1 (10.3-14.2)	13.8 (11.2-16.7)	15.2 (11.9-18.6)	16.4 (12.3-20.8)	17.7 (12.6-23.1)	19.3 (13.1-26.1)	20.4 (13.4-28.2)
45-day	10.6 (9.16-12.3)	11.6 (9.97-13.4)	13.2 (11.3-15.3)	14.5 (12.3-16.9)	16.2 (13.2-19.5)	17.7 (13.9-21.5)	19.0 (14.2-23.7)	20.2 (14.5-26.3)	21.6 (14.7-29.1)	22.6 (14.9-31.1)
60-day	12.4 (10.7-14.3)	13.4 (11.6-15.5)	15.0 (12.9-17.4)	16.4 (14.0-19.1)	18.3 (14.9-21.8)	19.8 (15.6-24.0)	21.1 (15.9-26.3)	22.3 (16.0-28.9)	23.7 (16.2-31.8)	24.5 (16.3-33.6)
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.										

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 42.5064°, Longitude: -71.6463°



Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.02 (3.12-5.04)	4.73 (3.67-5.95)	5.89 (4.56-7.43)	6.86 (5.28-8.70)	8.21 (6.12-10.8)	9.22 (6.73-12.3)	10.3 (7.27-14.2)	11.4 (7.69-16.1)	13.0 (8.46-18.9)	14.3 (9.08-21.2)
10-min	2.84 (2.21-3.57)	3.35 (2.60-4.21)	4.18 (3.23-5.27)	4.87 (3.75-6.17)	5.81 (4.33-7.64)	6.53 (4.77-8.74)	7.28 (5.15-10.0)	8.09 (5.45-11.4)	9.24 (5.99-13.4)	10.2 (6.43-15.0)
15-min	2.23 (1.74-2.80)	2.63 (2.04-3.30)	3.28 (2.54-4.13)	3.82 (2.94-4.84)	4.56 (3.40-5.99)	5.12 (3.74-6.86)	5.70 (4.04-7.87)	6.34 (4.27-8.94)	7.24 (4.70-10.5)	7.97 (5.04-11.8)
30-min	1.50 (1.17-1.88)	1.76 (1.37-2.22)	2.20 (1.70-2.78)	2.56 (1.97-3.25)	3.06 (2.28-4.02)	3.44 (2.51-4.60)	3.83 (2.71-5.28)	4.25 (2.87-5.99)	4.85 (3.15-7.05)	5.33 (3.38-7.88)
60-min	0.940 (0.732-1.18)	1.11 (0.861-1.39)	1.38 (1.07-1.74)	1.61 (1.24-2.04)	1.92 (1.43-2.52)	2.16 (1.57-2.88)	2.40 (1.70-3.31)	2.67 (1.80-3.76)	3.04 (1.97-4.42)	3.34 (2.12-4.94)
2-hr	0.586 (0.460-0.730)	0.702 (0.551-0.876)	0.894 (0.699-1.12)	1.05 (0.818-1.32)	1.27 (0.958-1.66)	1.43 (1.06-1.92)	1.61 (1.16-2.22)	1.81 (1.23-2.54)	2.11 (1.37-3.05)	2.36 (1.50-3.47)
3-hr	0.446 (0.352-0.553)	0.539 (0.425-0.669)	0.691 (0.543-0.861)	0.818 (0.639-1.02)	0.992 (0.752-1.30)	1.12 (0.833-1.50)	1.26 (0.912-1.74)	1.43 (0.968-1.99)	1.68 (1.09-2.41)	1.89 (1.20-2.76)
6-hr	0.284 (0.227-0.350)	0.346 (0.275-0.426)	0.446 (0.354-0.551)	0.529 (0.417-0.657)	0.643 (0.492-0.834)	0.728 (0.546-0.964)	0.820 (0.598-1.13)	0.931 (0.635-1.29)	1.10 (0.720-1.57)	1.25 (0.796-1.81)
12-hr	0.180 (0.145-0.219)	0.218 (0.175-0.266)	0.280 (0.225-0.343)	0.332 (0.264-0.409)	0.403 (0.311-0.519)	0.456 (0.344-0.599)	0.513 (0.376-0.699)	0.582 (0.399-0.799)	0.685 (0.451-0.971)	0.774 (0.497-1.12)
24-hr	0.108 (0.088-0.131)	0.132 (0.107-0.159)	0.170 (0.137-0.206)	0.201 (0.162-0.246)	0.244 (0.190-0.312)	0.277 (0.210-0.360)	0.311 (0.230-0.421)	0.353 (0.243-0.482)	0.416 (0.275-0.585)	0.470 (0.303-0.673)
2-day	0.061 (0.050-0.074)	0.075 (0.061-0.090)	0.097 (0.079-0.117)	0.116 (0.094-0.140)	0.141 (0.111-0.179)	0.160 (0.123-0.207)	0.181 (0.135-0.243)	0.205 (0.142-0.278)	0.244 (0.162-0.340)	0.276 (0.179-0.392)
3-day	0.045 (0.037-0.053)	0.054 (0.045-0.065)	0.070 (0.058-0.084)	0.084 (0.068-0.101)	0.102 (0.080-0.128)	0.115 (0.089-0.149)	0.130 (0.097-0.174)	0.148 (0.103-0.199)	0.175 (0.116-0.243)	0.198 (0.128-0.280)
4-day	0.036 (0.030-0.043)	0.044 (0.036-0.052)	0.056 (0.046-0.067)	0.067 (0.055-0.080)	0.081 (0.064-0.101)	0.091 (0.071-0.117)	0.103 (0.077-0.137)	0.117 (0.081-0.157)	0.138 (0.092-0.191)	0.155 (0.101-0.219)
7-day	0.025 (0.021-0.029)	0.029 (0.024-0.035)	0.037 (0.031-0.044)	0.043 (0.036-0.052)	0.052 (0.041-0.065)	0.058 (0.045-0.074)	0.065 (0.049-0.086)	0.073 (0.052-0.098)	0.085 (0.057-0.118)	0.096 (0.062-0.134)
10-day	0.020 (0.017-0.024)	0.023 (0.020-0.028)	0.029 (0.024-0.034)	0.033 (0.028-0.040)	0.040 (0.032-0.049)	0.045 (0.035-0.056)	0.050 (0.037-0.065)	0.055 (0.039-0.073)	0.063 (0.043-0.087)	0.070 (0.046-0.098)
20-day	0.014 (0.012-0.017)	0.016 (0.014-0.019)	0.019 (0.016-0.022)	0.021 (0.018-0.025)	0.025 (0.020-0.030)	0.027 (0.021-0.034)	0.030 (0.022-0.038)	0.033 (0.023-0.043)	0.036 (0.025-0.049)	0.039 (0.026-0.054)
30-day	0.012 (0.010-0.014)	0.013 (0.011-0.015)	0.015 (0.013-0.018)	0.017 (0.014-0.020)	0.019 (0.016-0.023)	0.021 (0.016-0.026)	0.023 (0.017-0.029)	0.025 (0.017-0.032)	0.027 (0.018-0.036)	0.028 (0.019-0.039)
45-day	0.010 (0.008-0.011)	0.011 (0.009-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.015 (0.012-0.018)	0.016 (0.013-0.020)	0.018 (0.013-0.022)	0.019 (0.013-0.024)	0.020 (0.014-0.027)	0.021 (0.014-0.029)
60-day	0.009 (0.007-0.010)	0.009 (0.008-0.011)	0.010 (0.009-0.012)	0.011 (0.010-0.013)	0.013 (0.010-0.015)	0.014 (0.011-0.017)	0.015 (0.011-0.018)	0.015 (0.011-0.020)	0.016 (0.011-0.022)	0.017 (0.011-0.023)

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

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

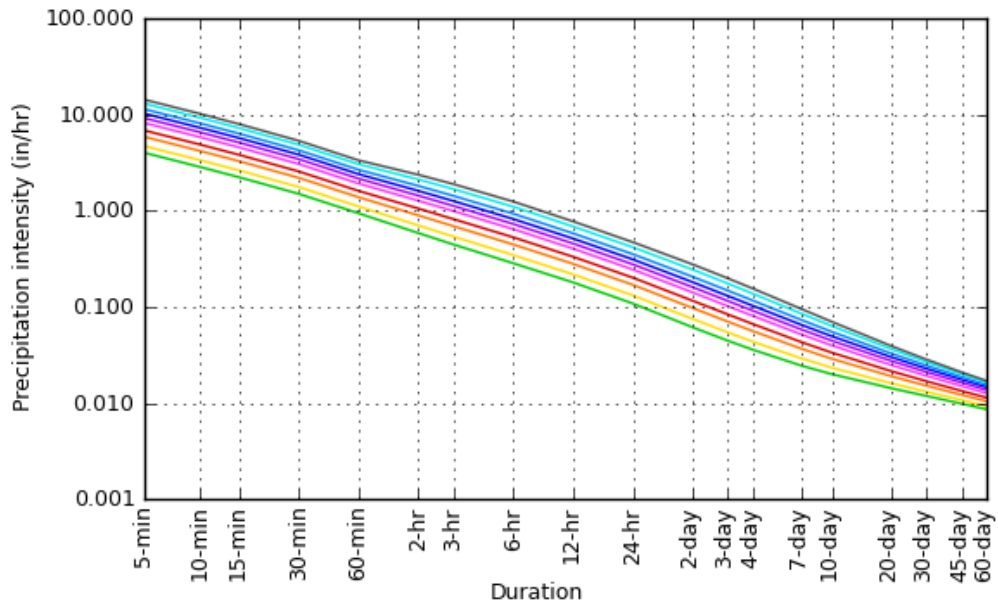
Please refer to NOAA Atlas 14 document for more information.

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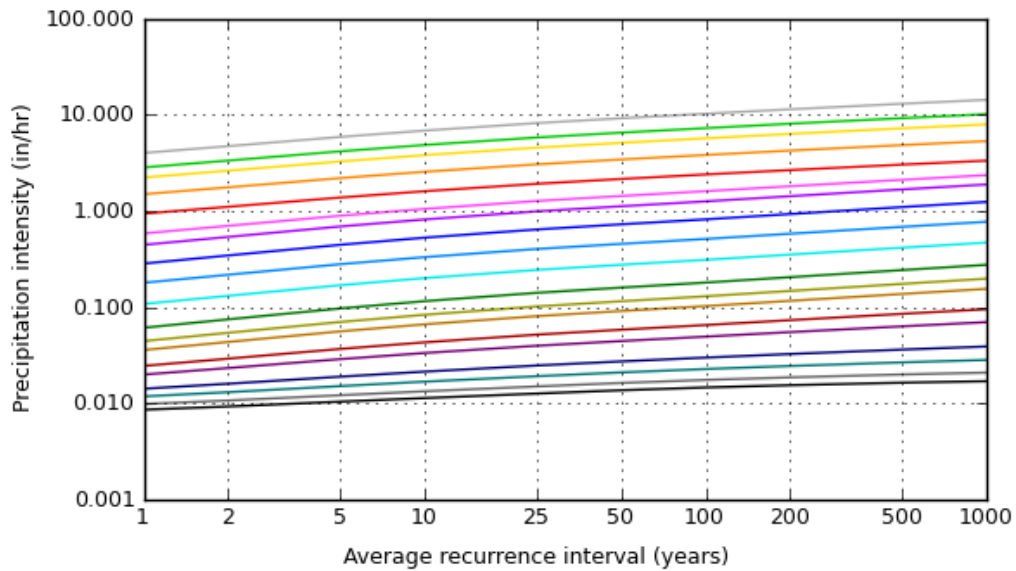
PF graphical

PDS-based intensity-duration-frequency (IDF) curves

Latitude: 42.5064°, Longitude: -71.6463°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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**PIPE CULVERT ANALYSIS
HW-1 TO HW-2**

Culvert HW1 - HW2

Invert Elev Dn (ft)	=	227.12
Pipe Length (ft)	=	72.96
Slope (%)	=	1.00
Invert Elev Up (ft)	=	227.85
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

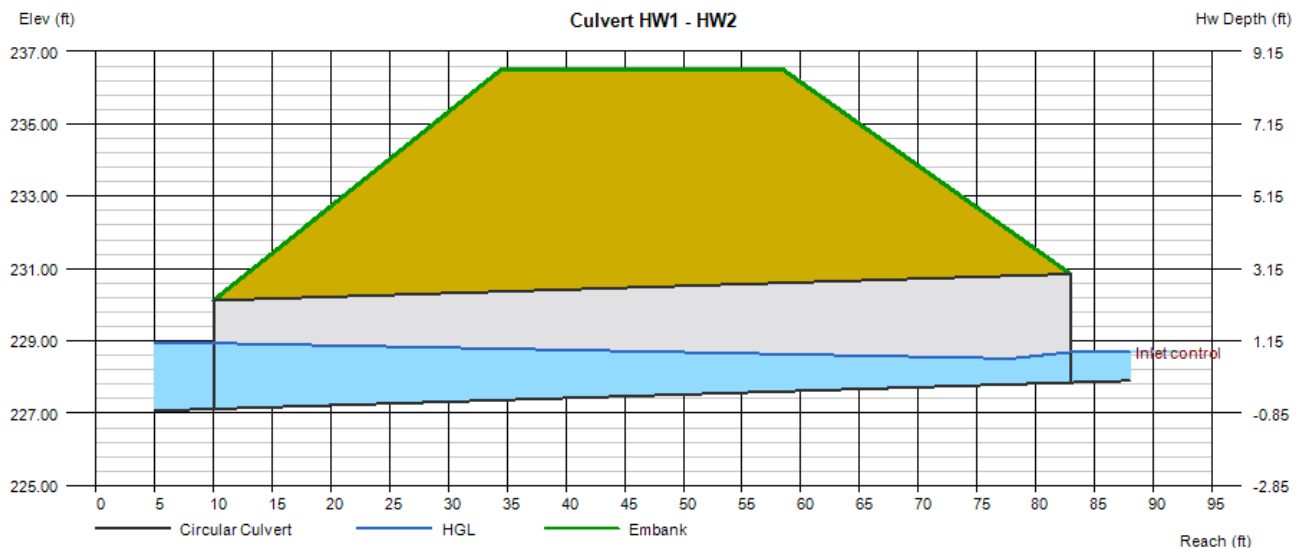
Top Elevation (ft) = 236.50
Top Width (ft) = 24.00
Crest Width (ft) = 24.00

Calculations

Qmin (cfs) = 4.10
Qmax (cfs) = 6.20
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs)	= 4.10
Qpipe (cfs)	= 4.10
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 0.92
Veloc Up (ft/s)	= 3.78
HGL Dn (ft)	= 228.94
HGL Up (ft)	= 228.48
Hw Elev (ft)	= 228.69
Hw/D (ft)	= 0.28
Flow Regime	= Inlet Control

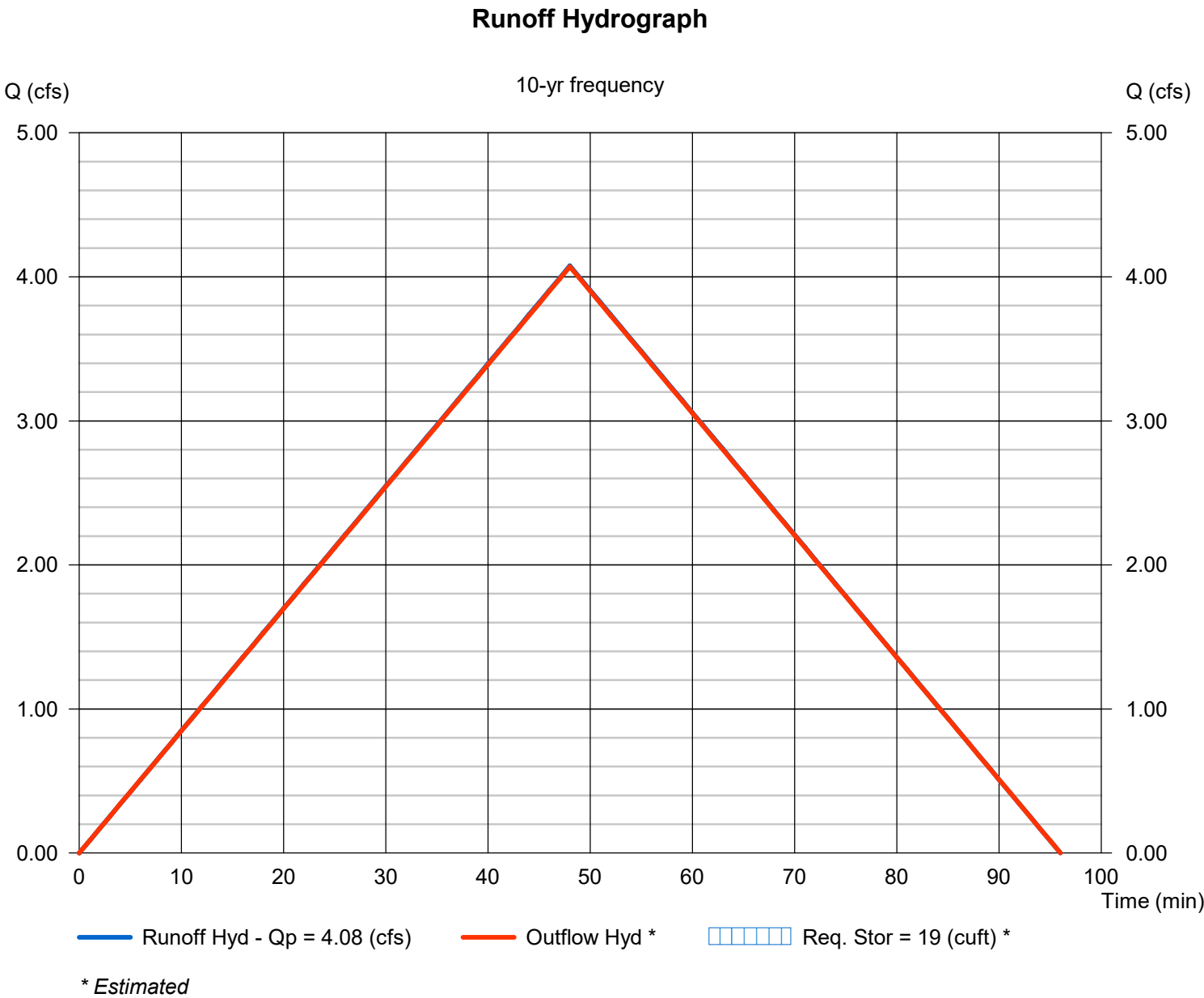


Hydrology Report

Culvert HW1 - HW2

Hydrograph type	= Rational	Peak discharge (cfs)	= 4.077
Storm frequency (yrs)	= 10	Time interval (min)	= 1
Drainage area (ac)	= 7.330	Runoff coeff. (C)	= 0.27
Rainfall Inten (in/hr)	= 2.060	Tc by User (min)	= 48
IDF Curve	= Devens IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 11,741 (cuft); 0.270 (acft)

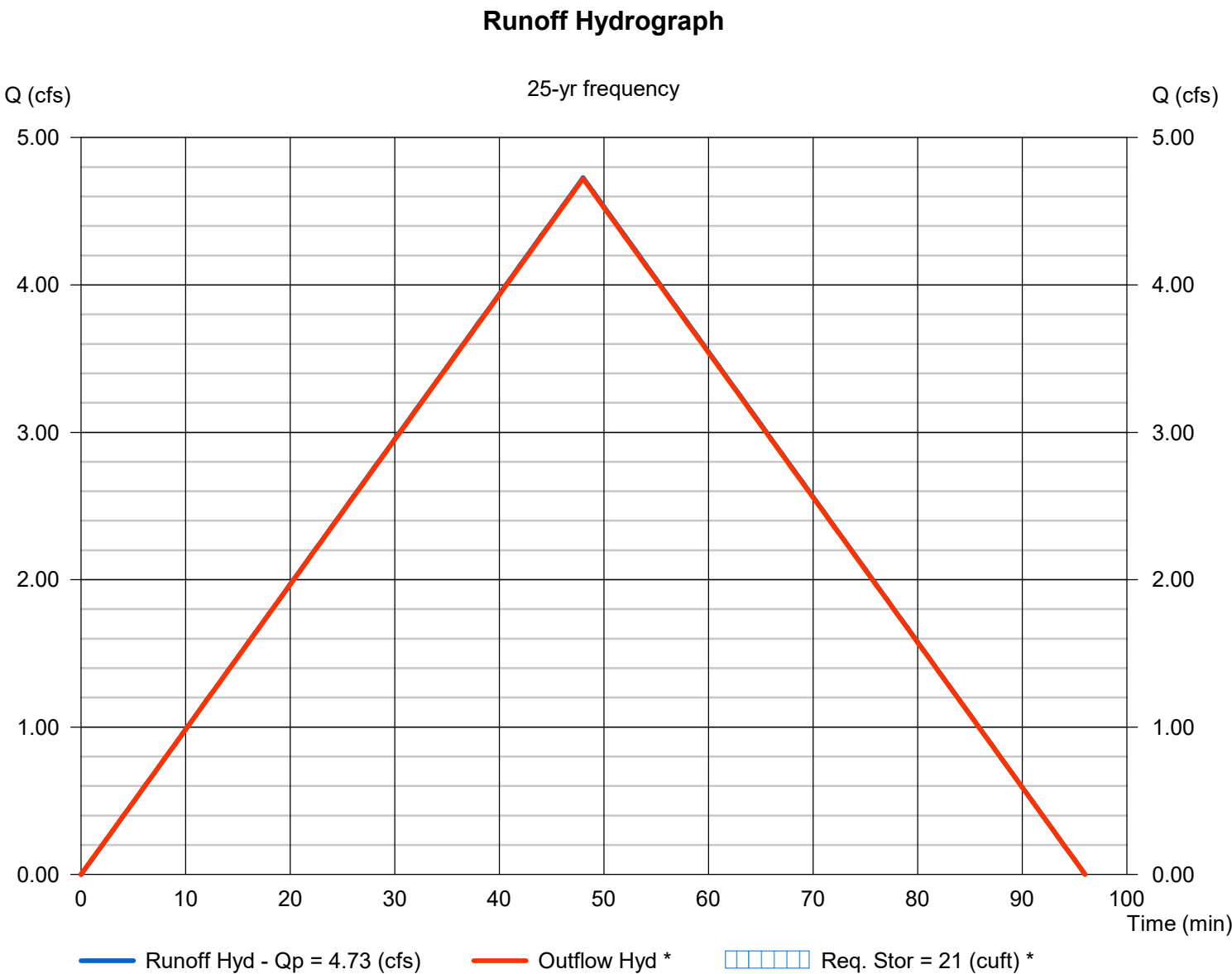


Hydrology Report

Culvert HW1 - HW2

Hydrograph type	= Rational	Peak discharge (cfs)	= 4.727
Storm frequency (yrs)	= 25	Time interval (min)	= 1
Drainage area (ac)	= 7.330	Runoff coeff. (C)	= 0.27
Rainfall Inten (in/hr)	= 2.389	Tc by User (min)	= 48
IDF Curve	= Devens IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 13,615 (cuft); 0.313 (acft)



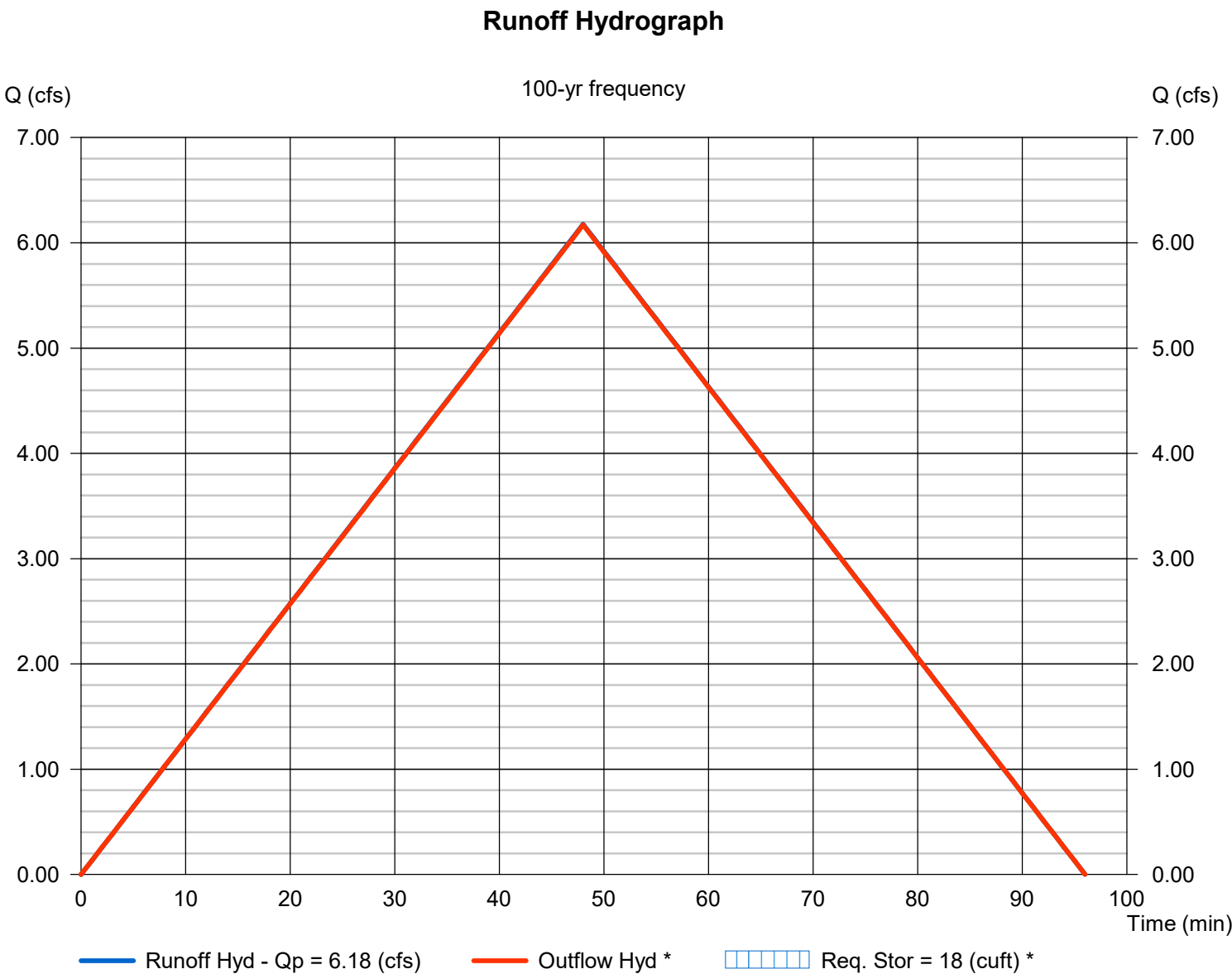
* Estimated

Hydrology Report

Culvert HW1 - HW2

Hydrograph type	= Rational	Peak discharge (cfs)	= 6.176
Storm frequency (yrs)	= 100	Time interval (min)	= 1
Drainage area (ac)	= 7.330	Runoff coeff. (C)	= 0.27
Rainfall Inten (in/hr)	= 3.121	Tc by User (min)	= 48
IDF Curve	= Devens IDF.IDF	Rec limb factor	= 1.00

Hydrograph Volume = 17,787 (cuft); 0.408 (acft)



* Estimated

PIPE SYSTEM ANALYSIS
CB-1 TO HW-9

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	CB1 to HW9	1.90	15	Cir	145.360	226.00	226.50	0.344	226.63	227.13	0.15	227.27	End	DropGrate
Project File: CB1 to HW9.stm									Number of lines: 1			Run Date: 5/11/2020		
NOTES: Return period = 100 Yrs.														

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	145.360	0.93	0.93	0.30	0.28	0.28	8.0	8.0	6.8	1.90	3.79	3.09	15	0.34	226.00	226.50	226.63	227.13	229.00	229.50	CB1 to HW9
Project File: CB1 to HW9.stm																Number of lines: 1				Run Date: 5/11/2020		
NOTES:Intensity = 23.79 / (Inlet time + 3.30) ^ 0.52; Return period =Yrs. 100 ; c = cir e = ellip b = box																						

Hydraulic Grade Line Computations

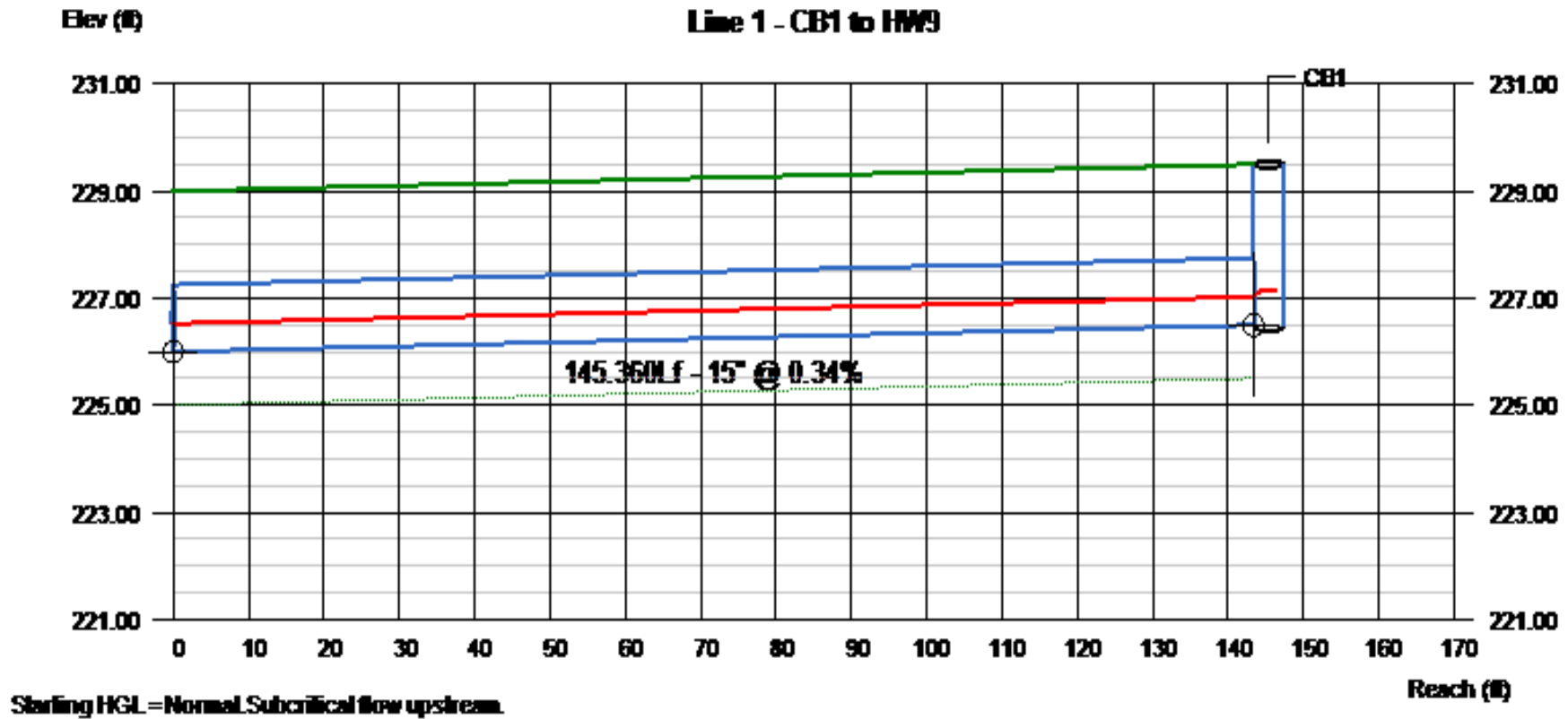
Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	15	1.90	226.00	226.63	0.63	0.62	3.09	0.15	226.77	0.344	145.36	226.50	227.13	0.63	0.61	3.09	0.15	227.27	0.344	0.344	0.500	1.00	0.15
Project File: CB1 to HW9.stm														Number of lines: 1					Run Date: 5/11/2020				
; c = cir e = ellip b = box																							

DRAINAGE AREA FOR CB-1

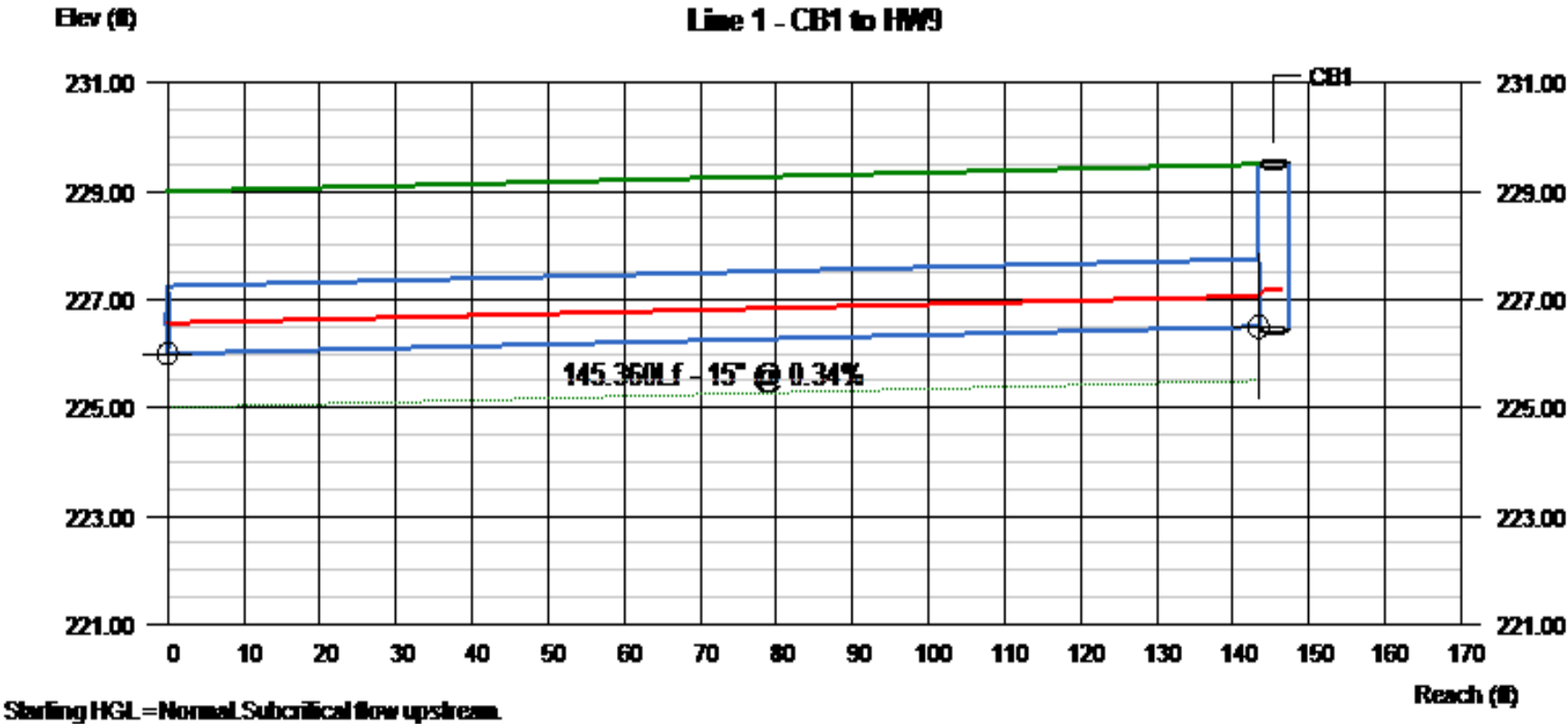
AREA = 0.93AC
TOC = 8MIN
C-FACTOR = 0.3



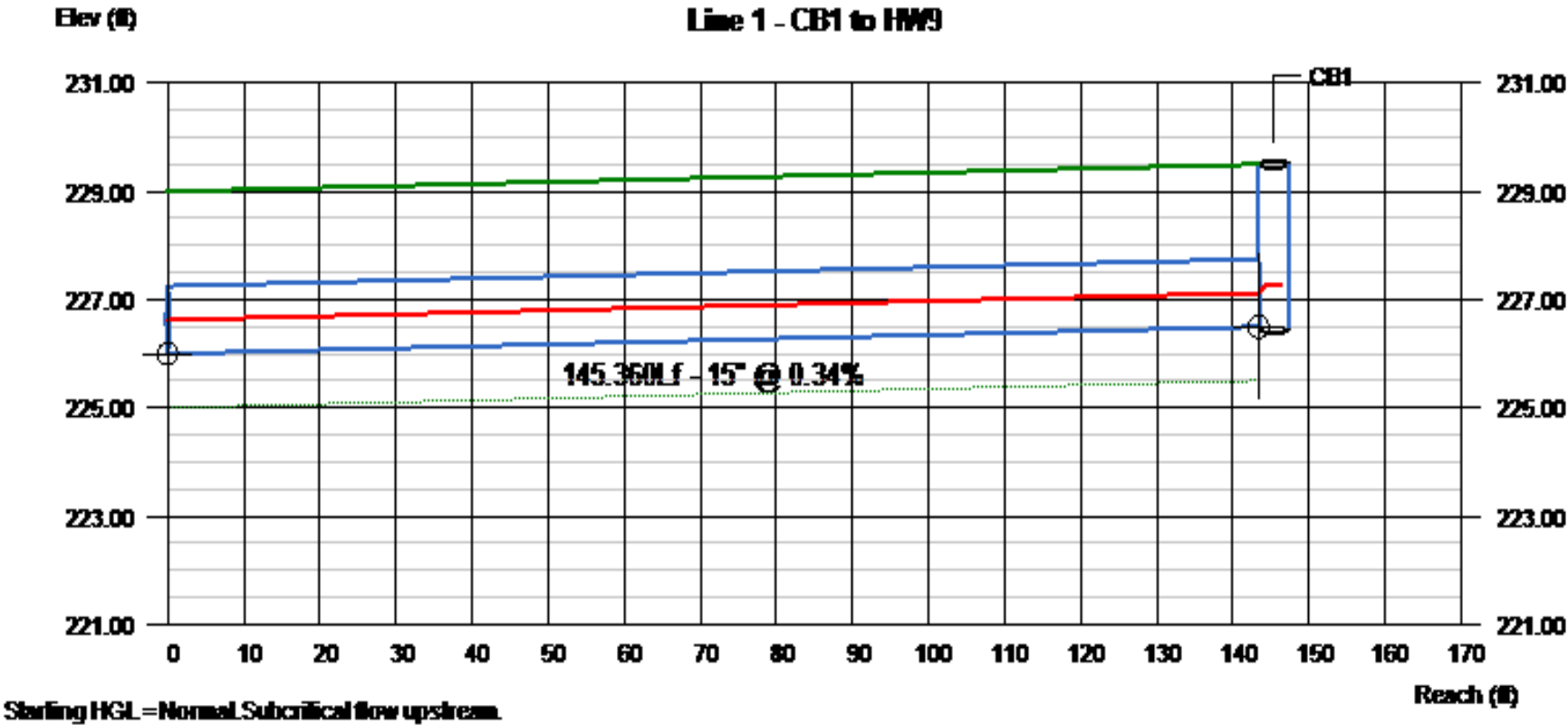
10-Yr Storm Return Period



25-Yr Storm Return Period



100-Yr Storm Return Period



EISA 438 LID PLANNING CALCULATIONS