WIN:	26574.00	**Project Name:**	
Town:	Bar Harbor	**Stream Name:**	Cromwell Brook
Route No.	Ledgelawn Ave	**Bridge Name:**	Cromwell Brook #3
Asset ID:	452	**Analysis by:**	ajs
Lat:	44.37817 **Long:** -68.20669	**Date:**	8/11/2022

Peak Flow Calculations by USGS Regression Equations (Lombard/Hodgkins, 2021; Hodgkins, 1999 & Lombard/Hodgkins, 2015)

Enter data in blue cells only!

ver. 2021 Jan 01

	km^2	mi^2	ac	***Enter data in [mi^2]***
A	6.86	2.65	1696.0	Watershed Area *DRNAREA*
W	0.73	0.3	179.9	Wetlands area (by NWI)
P_c	562549	4912841		watershed centroid (E, N; UTM 19N; meters)
County	Hancock			*choose county from drop-down menu*

Worksheet prepared by:
Charles S. Hebson, PE
Environmental Office
Maine Dept. Transportation
Augusta, ME 04333-0016
207-557-1052
Charles.Hebson@maine.gov

Watershed Characteristics from StreamStats

STORNWI	10.61	NWI Wetlands %
SANDGRAVF	0.00	sand & gravel aquifer as decimal fraction of watershed A
ELEV	409.2	mean basin elevation (ft)
BSLDEM10M	24.5	mean basin slope (%)
COASTDIST	25.00	distance from the coast (mi)
ELEVMAX	1515	maximum basin elevation (ft)
LC06WATER	0.58	percent of drainage basin land cover as open water
PRECIP	50.3	mean annual precipitation
STATSGOA	4	mean basin percentage of hydrological soil group A

References:

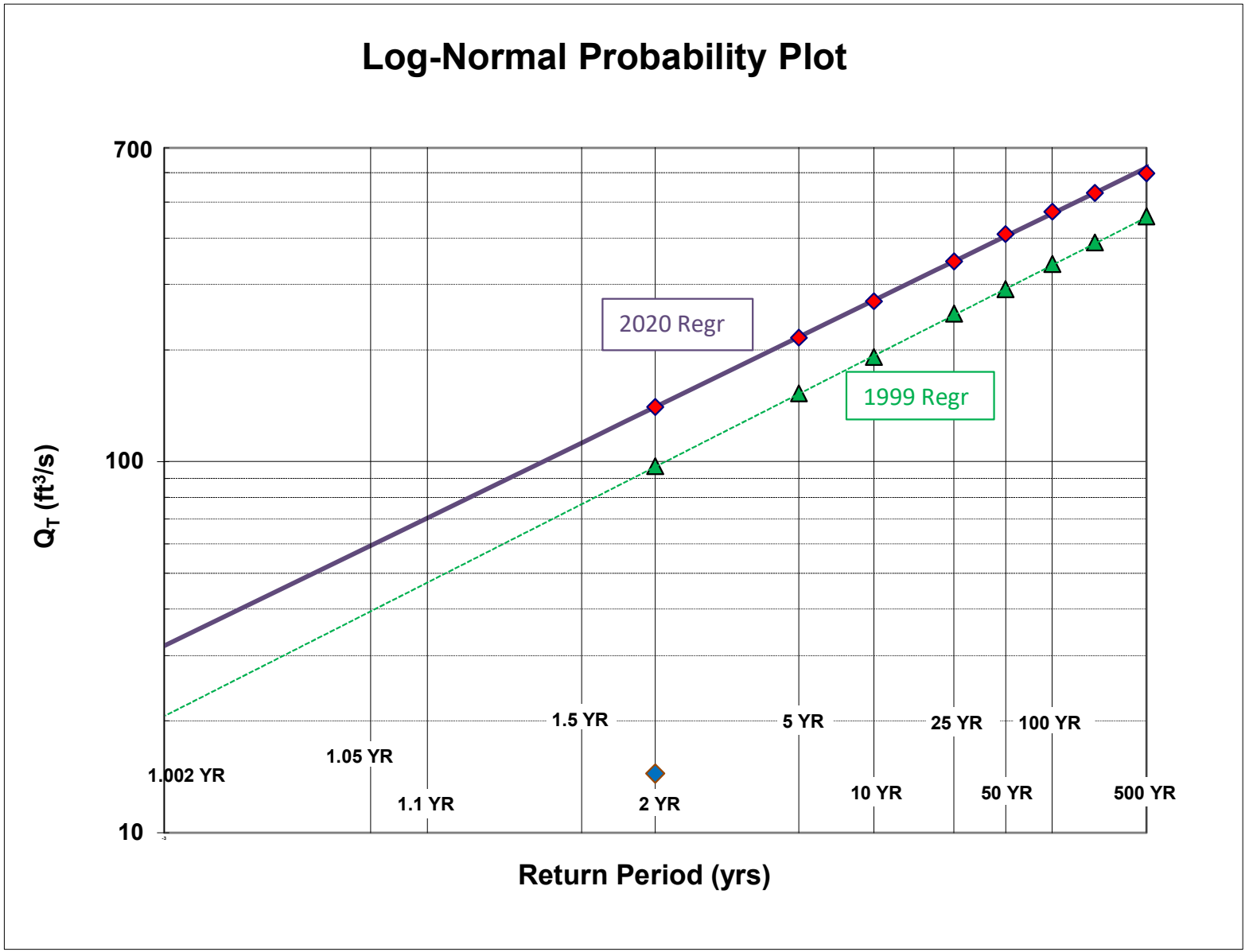
Hodgkins, G.A., 1999.
Estimating the magnitude of peak flows for streams in Maine for Selected Recurrence Intervals
WRIR 99-4008, USGS Augusta, ME

Lombard, P.J. & G.A. Hodgkins, 2015.
Peak flow regression equations for small, ungaged streams: in Maine: Comparing Map-Based to Field-Based Variables
SIR 2015-4059, USGS, Augusta, ME

Lombard, P.J. & G.A. Hodgkins, 2021.
Estimating Flood Magnitude and Frequency on Gaged and Ungaged Streams in Maine
SIR 2020-5092, USGS, Augusta, ME.

Ret Pd T (yr)	I24	Q_T (ft^3/s) *1999 / 2015*	Q_T (ft^3/s) *2021*	Q_T (ft^3/s) ***Design***
1.1			71	***70***
2	3.58	97	140	***140***
5	4.41	153	216	***215***
10	5.10	191	270	***270***
25	6.06	251	346	***345***
50	6.79	291	410	***410***
100	7.53	341	471	***470***
200	8.33	390	530	***530***
500	9.41	458	599	***600***

Instructions:
Enter values in blue cells only, watershed data from StreamStats
Copy I24 values from Stream Stats
Use results under "Design"
Check against gage data and FEMA studies if available
Questions? Check with ENV / Hydrology Section


Log-Normal Probability Plot
700
100
10
Q_T (ft^3/s)
2020 Regr
1999 Regr
1.002 YR
1.05 YR
1.1 YR
1.5 YR
2 YR
5 YR
10 YR
25 YR
50 YR
100 YR
500 YR
Return Period (yrs)

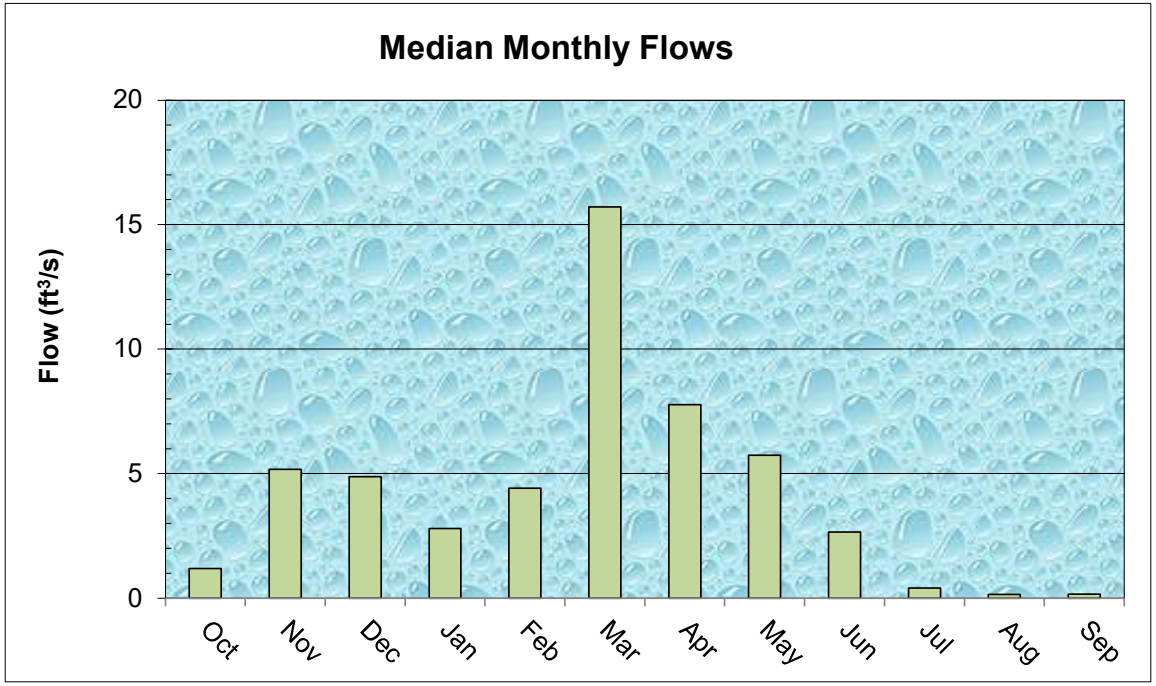
WIN:	26574.00	**Project Name:**	0
Town:	Bar Harbor	**Stream Name:**	Cromwell Brook
Route No.	Ledgelawn Ave	**Bridge Name:**	Cromwell Brook #3
Asset ID:	452	**Analysis by:**	ajs
Lat:	44.37817 **Long:** -68.20669	**Date:**	8/11/2022

DO NOT ENTER ANY DATA ON THIS PAGE; EVERYTHING IS CALCULATED

MAINE MONTHLY MEDIAN FLOWS and HYDRAULIC GEOMETRY BY USGS REGRESSION EQUATIONS (2004, 2013, 2015)

	Value	Variable	Explanation
	2.65	*A*	Area (mi^2)
562549.3	4912841	P_c	Watershed centroid (E,N; UTM; Zone 19; meters)
	25.20	*DIST*	Distance from Coastal reference line (mi)
	50.3	*pptA*	Mean Annual Precipitation (inches)
	0.00	*SG*	Sand & Gravel Aquifer (decimal fraction of watershed area)

Month	Q_{median} (ft3/s)	(m^3/s)
Jan	**2.80**	0.0792
Feb	**4.42**	0.1253
Mar	**15.71**	0.4453
Apr	**7.77**	0.2201
May	**5.74**	0.1628
Jun	**2.66**	0.0754
Jul	**0.40**	0.0113
Aug	**0.15**	0.0042
Sep	**0.16**	0.0047
Oct	**1.19**	0.0339
Nov	**5.17**	0.1465
Dec	**4.87**	0.1381



Q_{bf}	**14.4**	
ann avg	**6.0**	
ann med	**2.4**	
$Q_{1.002}$	**31.8**	
$Q_{1.01}$	**42.2**	
$Q_{1.05}$	**59.4**	
Q_{bf}	**53.2**	assume v = 4ft/s

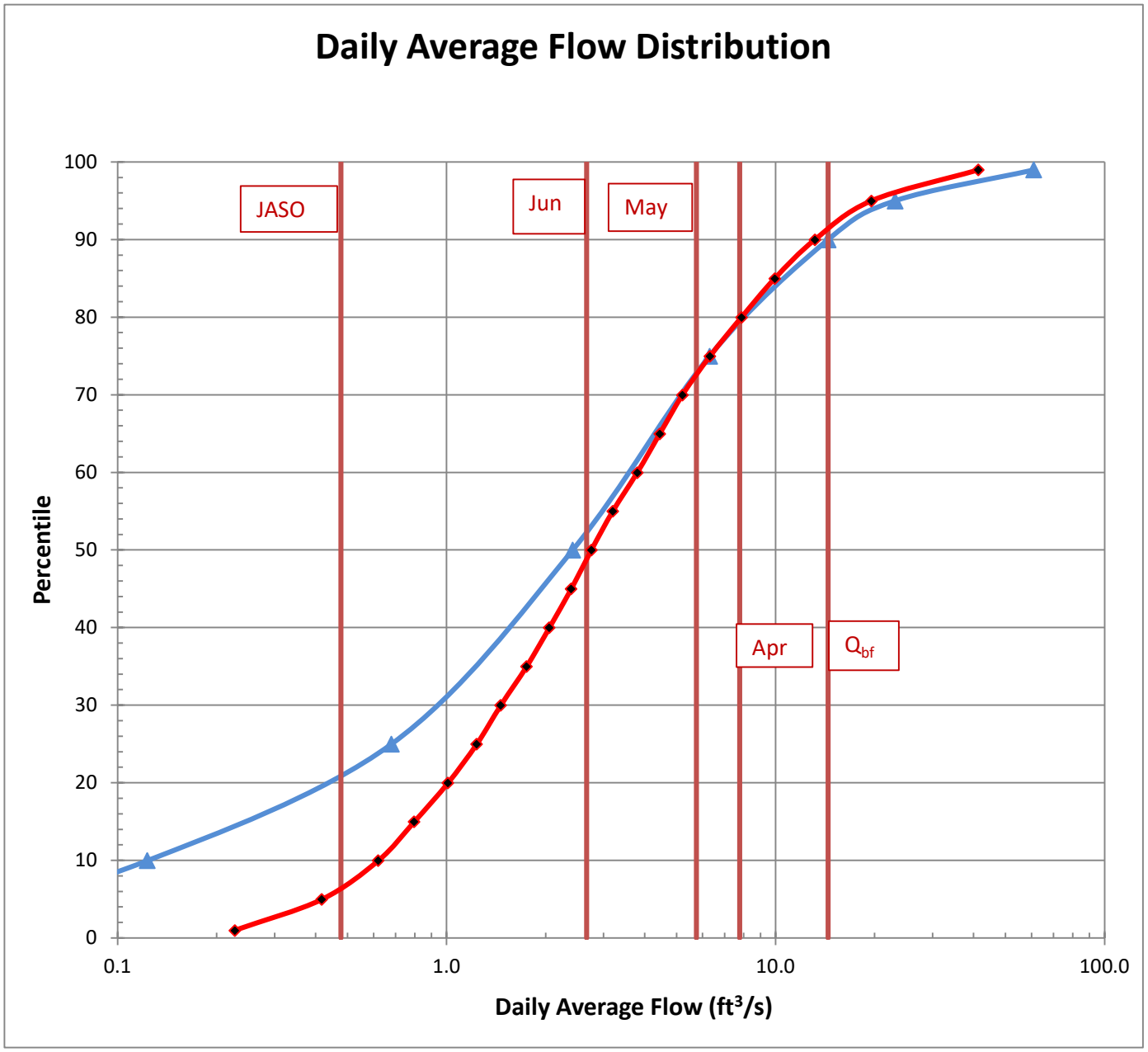
W_{bf}	**16.1**	estimated bankfull width (ft)
d_{bf}	**0.8**	estimated bankfull depth (ft)
A_{bf}	**10.5**	estimated bankfull flow area (ft^2)

References

Dudley, 2013. FY2013 Progress Report - Phase 1 …, USFWS QRP Project

Dudley, 2004. Estimating Monthly Streamflows … , SIR 2004-5026

Dudley, 2015. Regression Equations for Monthly & Annual Mean..., USGS SIR 2015-5151



Daily Avg Flow Dist

A_{ws} = (mi^2)	2.7

Q (ft^3/s)

Pctl	Median	84th pctl
1.00E-06	0.00	0.00
1	0.23	0.40
5	0.42	0.67
10	0.62	0.93
15	0.80	1.16
20	1.01	1.41
25	1.23	1.65
30	1.46	1.88
35	1.75	2.15
40	2.05	2.48
45	2.39	2.80
50	2.75	3.30
55	3.20	3.85
60	3.80	4.51
65	4.44	5.26
70	5.21	6.14
75	6.32	7.38
80	7.88	8.81
85	9.94	11.29
90	13.16	15.16
95	19.54	23.58
99	41.32	54.39

Q_{bf}	14.4
$Q_{1.002}$	31.8
$Q_{1.1}$	70.5
Q_2	140.4

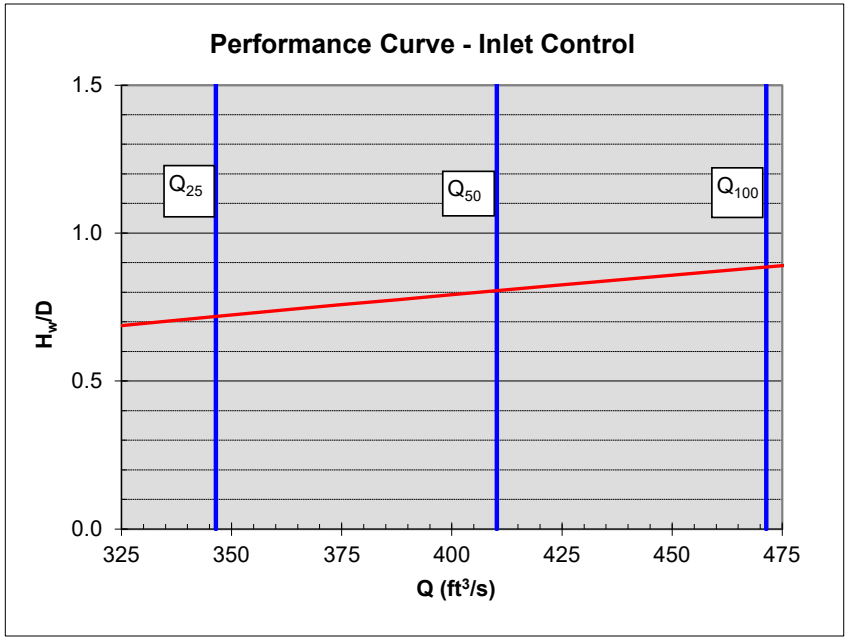
NOTE: ***This page is for preliminary sizing only.***
Final design should be done with HY8 or HDS-5

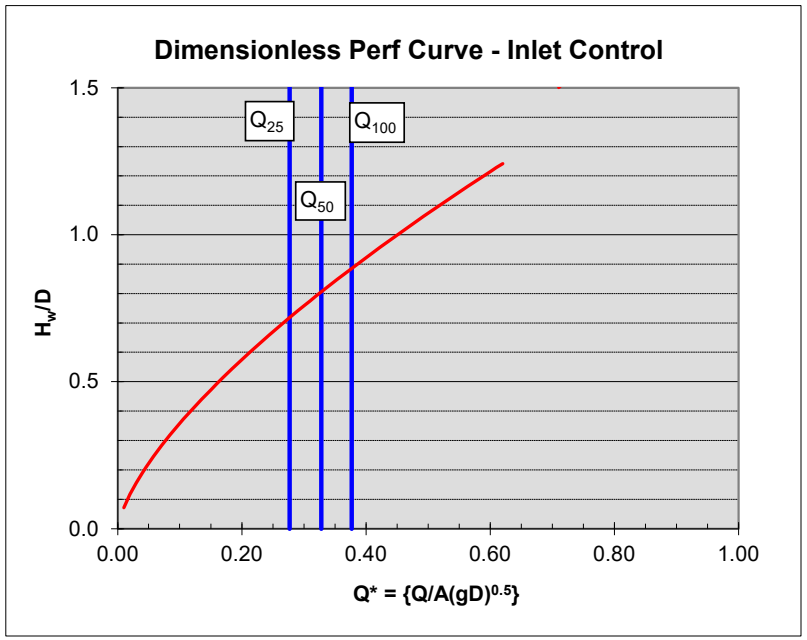
Note:
culvert dimensions are for open flow area; adjust for lost capacity due to embedding / backfilling (min {2' / 25% rise} embedment)
Finish analysis with HY-8

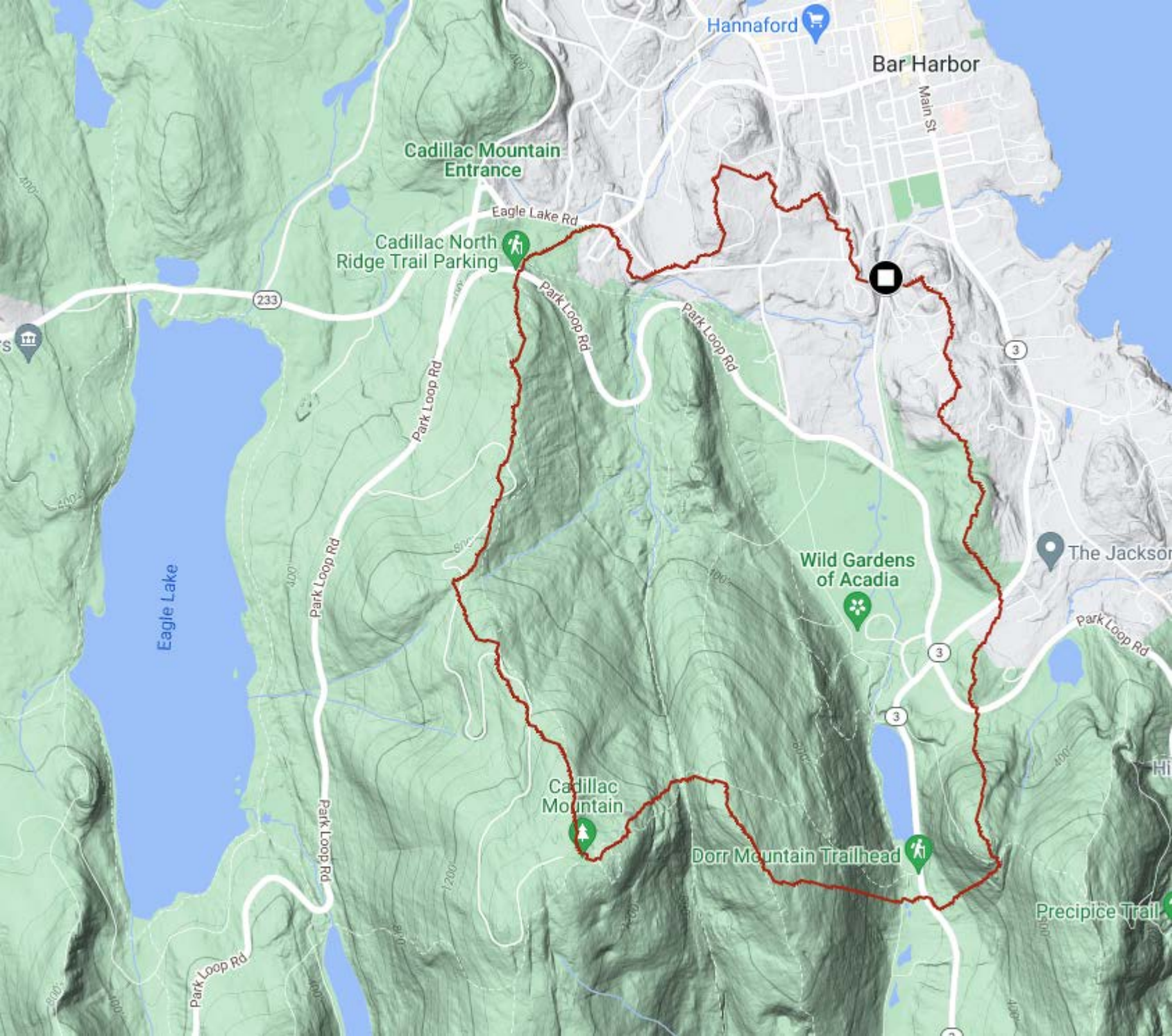
Preliminary Culvert Sizing - Round & Box Culverts

Choose shape and inlet type by pull-down menu in green cells

Shape:	Box					
Inlet Type:	Box 0 ww		Q_{25}	346.4		
D or R (ft)	6	*diam / rise*	Q_{50}	410.2	trial D / R =	9.2
w (ft)	*15*	*box span*	Q_{100}	471.4	trial w: BFW =	16.1
Slope (ft/ft)	0.01					
A (ft^2)	90.00					
g (ft/s^2)	32.2					

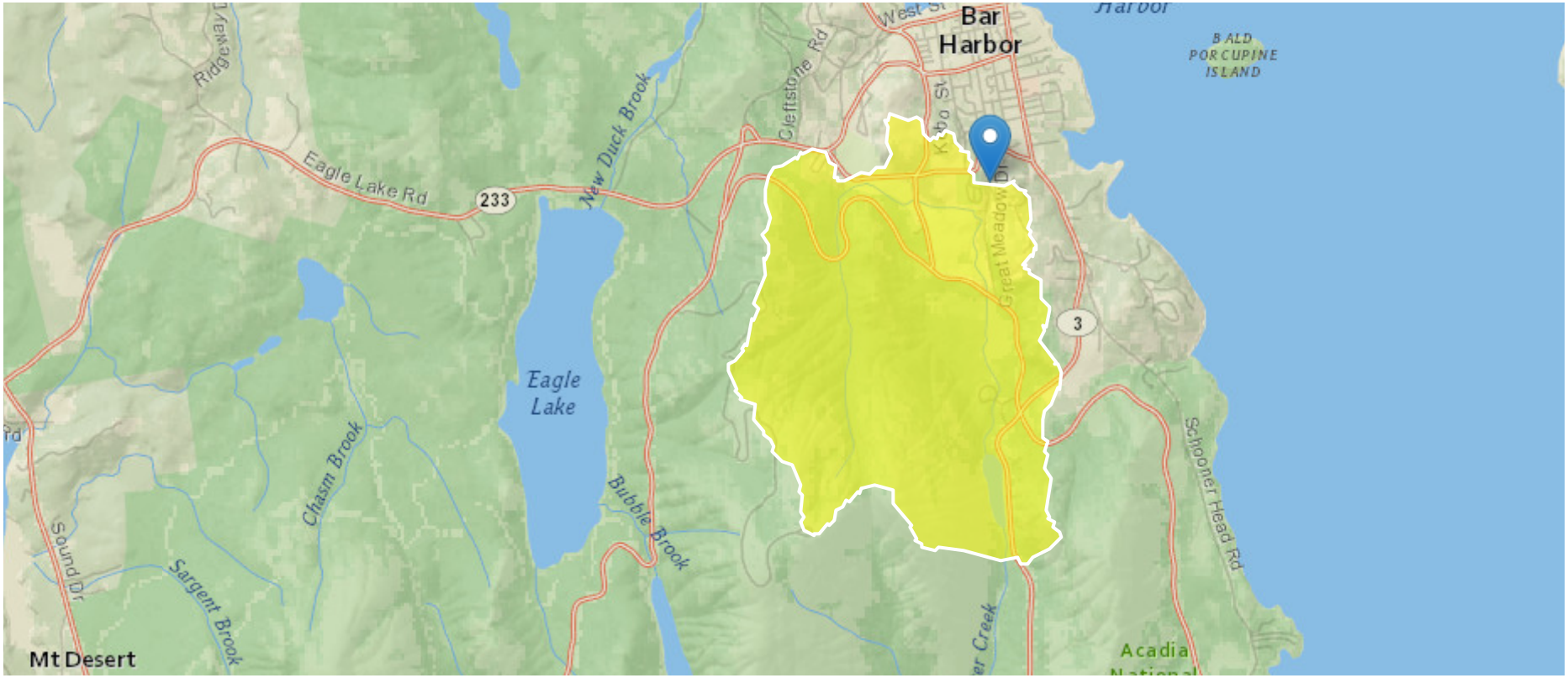





Hannaford
Bar Harbor
Main St
Cadillac Mountain Entrance
Eagle Lake Rd
Cadillac North Ridge Trail Parking
233
Park Loop Rd
Eagle Lake
Wild Gardens of Acadia
The Jackson
Cadillac Mountain
Dorr Mountain Trailhead
Precipice Trail
3

Bar Harbor 26574 Cromwell Brook #3 Bridge #0452

Region ID: ME
Workspace ID: ME20220810153157327000
Clicked Point (Latitude, Longitude): 44.37812, -68.20652
Time: 2022-08-10 11:32:20 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	24.5	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	562549.34	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	4912841.22	meters
COASTDIST	Shortest distance from the coastline to the basin centroid	25	miles
DRNAREA	Area that drains to a point on a stream	2.65	square miles
ELEV	Mean Basin Elevation	409.2	feet
ELEVMAX	Maximum basin elevation	1515	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	7.53	inches
I24H10Y	Maximum 24-hour precipitation that occurs on average once in 10 years	5.1	inches
I24H200Y	Maximum 24-hour precipitation that occurs on average once in 200 years	8.33	inches
I24H25Y	Maximum 24-hour precipitation that occurs on average once in 25 years	6.06	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	3.58	inches
I24H500Y	Maximum 24-hour precipitation that occurs on average once in 500 years	9.41	inches
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	6.79	inches
I24H5Y	Maximum 24-hour precipitation that occurs on average once in 5 years	4.41	inches
JULAVPRE	Mean July Precipitation	3.55	inches
LC06WATER	Percent of open water, class 11, from NLCD 2006	0.58	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	11.2	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.51	percent
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	0	percent

Parameter Code	Parameter Description	Value	Unit
PRDECFEB90	Basin average mean precipitation for December to February from PRISM 1961-1990	14.5	inches
PRECIP	Mean Annual Precipitation	50.3	inches
SANDGRAVAF	Fraction of land surface underlain by sand and gravel aquifers	0	dimensionless
SANDGRAVAP	Percentage of land surface underlain by sand and gravel aquifers	0	percent
STATSGOA	Percentage of area of Hydrologic Soil Type A from STATSGO	4	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	11.187	percent
STORNWI	Percentage of strorage (combined water bodies and wetlands) from the Nationa Wetlands Inventory	10.61	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide multiparameter peakflows SIR 2020 5092]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.65	square miles	0.26	5680
I24H2Y	24 Hour 2 Year Precipitation	3.58	inches	1.92	4.17
STORAGE	Percent Storage	11.187	percent	0	29.4
I24H5Y	24 Hour 5 Year Precipitation	4.41	inches	2.48	5.38
I24H10Y	24 Hour 10 Year Precipitation	5.1	inches	2.84	6.38
I24H25Y	24 Hour 25 Year Precipitation	6.06	inches	3.3	7.75
I24H50Y	24 Hour 50 Year Precipitation	6.79	inches	3.65	8.79

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
I24H100Y	24 Hour 100 Year Precipitation	7.53	inches	3.99	9.88
I24H200Y	24 Hour 200 YearPrecipitation	8.33	inches	5.26	11.1
I24H500Y	24 Hour 500 Year Precipitation	9.41	inches	5.95	13.1

Peak-Flow Statistics Flow Report [Statewide multiparameter peakflows SIR 2020 5092]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIl	PIu	ASEp
50-percent AEP flood	136	ft^3/s	72.4	255	39.1
20-percent AEP flood	210	ft^3/s	114	388	38.1
10-percent AEP flood	264	ft^3/s	141	494	38.9
4-percent AEP flood	338	ft^3/s	178	640	39.9
2-percent AEP flood	398	ft^3/s	207	766	39.7
1-percent AEP flood	458	ft^3/s	239	877	40.7
0.5-percent AEP flood	516	ft^3/s	261	1020	42.8
0.2-percent AEP flood	582	ft^3/s	291	1170	43.8

Peak-Flow Statistics Citations

Lombard, P.J., and Hodgkins, G.A.,2020, Estimating flood magnitude and frequency on gaged and ungaged streams in Maine: U.S. Geological Survey Scientific Investigations Report 2020–5092, 56 p. (https://doi.org/10.3133/sir20205092)

Flow-Duration Statistics

Flow-Duration Statistics Parameters [Statewide Annual SIR 2015 5151]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.65	square miles	14.9	1419
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0	dimensionless	0	0.212
ELEV	Mean Basin Elevation	409.2	feet	239	2120

Flow-Duration Statistics Disclaimers [Statewide Annual SIR 2015 5151]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Flow-Duration Statistics Flow Report [Statewide Annual SIR 2015 5151]

Statistic	Value	Unit
1 Percent Duration	0.00616	ft^3/s
5 Percent Duration	0.042	ft^3/s
10 Percent Duration	0.123	ft^3/s
25 Percent Duration	0.679	ft^3/s
50 Percent Duration	2.41	ft^3/s
75 Percent Duration	6.3	ft^3/s
90 Percent Duration	14.4	ft^3/s
95 Percent Duration	23.1	ft^3/s
99 Percent Duration	60.9	ft^3/s

Flow-Duration Statistics Citations

Dudley, R.W.,2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015–5151, 35 p. (http://dx.doi.org/10.3133/sir20155151)

Annual Flow Statistics

Annual Flow Statistics Parameters [Statewide Annual SIR 2015 5151]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.65	square miles	14.9	1419
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0	dimensionless	0	0.212
ELEV	Mean Basin Elevation	409.2	feet	239	2120

Annual Flow Statistics Disclaimers [Statewide Annual SIR 2015 5151]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Annual Flow Statistics Flow Report [Statewide Annual SIR 2015 5151]

Statistic	Value	Unit
Mean Annual Flow	5.97	ft^3/s

Annual Flow Statistics Citations

Dudley, R.W.,2015, Regression equations for monthly and annual mean and selected percentile streamflows for ungaged rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2015–5151, 35 p. (http://dx.doi.org/10.3133/sir20155151)