

MDOT Hydraulic Report

WIN: 23032.00
 Town: Whitefield
 Route No. Rt 194
 Asset ID: 46459
 Lat: 44.1553 Long: -69.61409

Project Name: Whitefield 23032 LC 46459
 Stream Name: Trib to Sheepscot River
 Bridge Name:
 Analysis by: DFB
 Date: 11/30/2017

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

Enter data in blue cells only!

	km ²	mi ²	ac
A	3.63	1.40	896.0
W	0.25	0.1	60.6
P _c	451547	4890052	
County	Lincoln		
pptA	46.1		
SG	0.03		
A (km ²)	3.63		
W (%)	6.76		

Enter data in [mi²]

Watershed Area *DRNAREA*
 Wetlands area (by NWI)

watershed centroid (E, N; UTM 19N; meters)
choose county from drop-down menu
 mean annual precipitation (inches; by look-up)
 sand & gravel aquifer as decimal fraction of watershed A

Conf Lvl 0.67

NWI Wetlands % *STORNWI*

Worksheet prepared by:
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 ver. 2017 Jun. 09

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

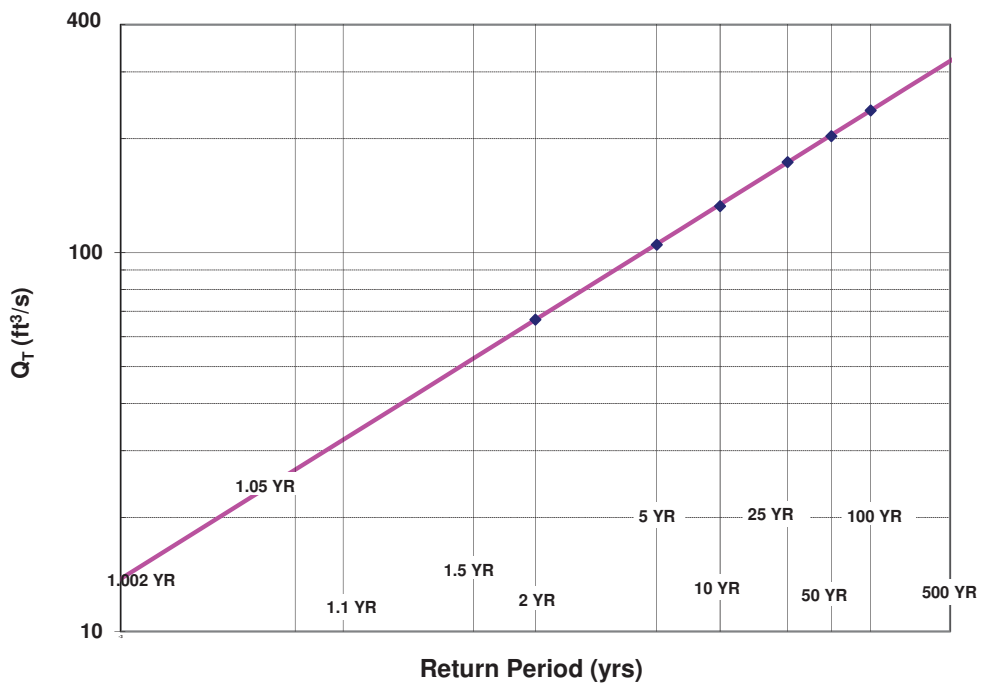
Lombard, P.J. & G.A. Hodgkins, 2015.
 Peak flow regression equations for small, ungaged streams in
 Maine - Comparing map-based to field-based variables
SIR 2015-4059, USGS, Augusta, ME

$$Q_T = b \times A^a \times 10^{-wW}$$

Ret Pd	Peak Flow Estimate		
T (yr)	Lower	Q _T (m ³ /s)	Upper
1.1		0.91	
2		1.89	
5		2.97	
10		3.76	
25		4.91	
50		5.75	
100		6.73	
500		9.09	

Q _T (ft ³ /s)
32.1
66.6
105.0
132.7
173.5
203.2
237.7
321.1

Log-Normal Probability Plot



WIN:	23032.00
Town:	Whitefield
Route No.:	Rt 194
Asset ID:	46459
Lat:	44.15528
Long:	-69.61409

Project Name:	Whitefield 23032 LC 46459
Stream Name:	Trib to Sheepscot River
Bridge Name:	0
Analysis by:	DFB
Date:	11/30/2017

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

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

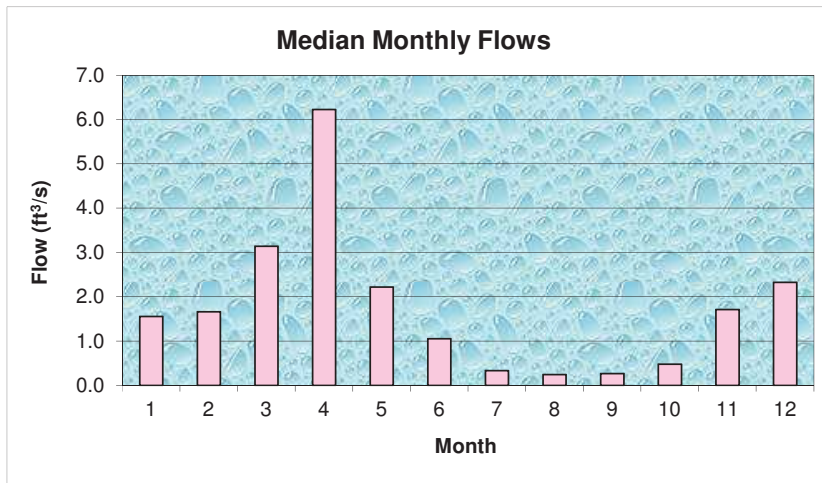
Value	Variable	Explanation
1.40	A	Area (mi ²)
451547.4	P _c	Watershed centroid (E,N; UTM; Zone 19; meters)
47.30	DIST	Distance from Coastal reference line (mi)
46.1	pptA	Mean Annual Precipitation (inches)
0.03	SG	Sand & Gravel Aquifer (decimal fraction of watershed area)

Month	Q _{median} (ft ³ /s)	(m ³ /s)
Jan	1.55	0.0440
Feb	1.66	0.0471
Mar	3.14	0.0891
Apr	6.23	0.1765
May	2.22	0.0630
Jun	1.05	0.0299
Jul	0.33	0.0095
Aug	0.25	0.0070
Sep	0.27	0.0076
Oct	0.48	0.0136
Nov	1.71	0.0485
Dec	2.32	0.0658

Q _{bf}	7.4
ann avg	3.0
ann med	1.5
Q _{1,002}	13.8
Q _{1,01}	18.6
Q _{1,05}	26.7
Q _{bf}	32.6

assume v = 4ft/s

W _{bf}	12.2	estimated bankfull width (ft)
d _{bf}	0.7	estimated bankfull depth (ft)
A _{bf}	6.1	estimated bankfull flow area (ft ²)



References

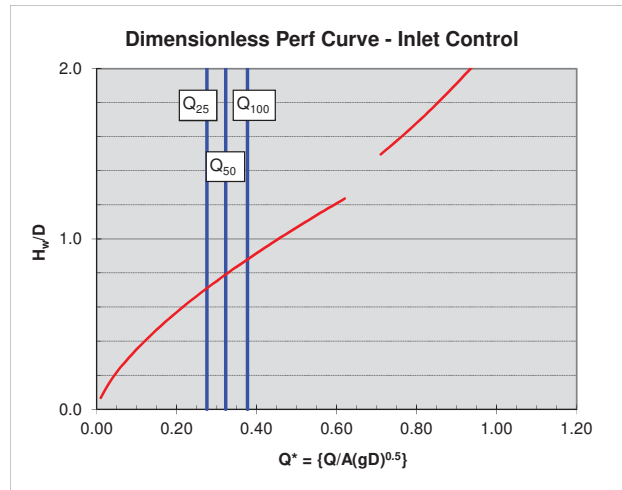
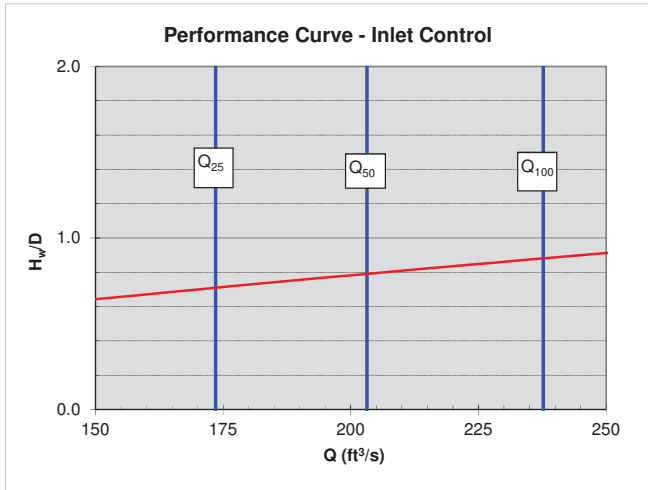
- Dudley, R.W., 2013. FY2013 Progress Report - Phase 1 ..., USFWS QRP Project
- Dudley, R.W., 2004. Estimating Monthly Streamflows ... , SIR 2004-5026

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

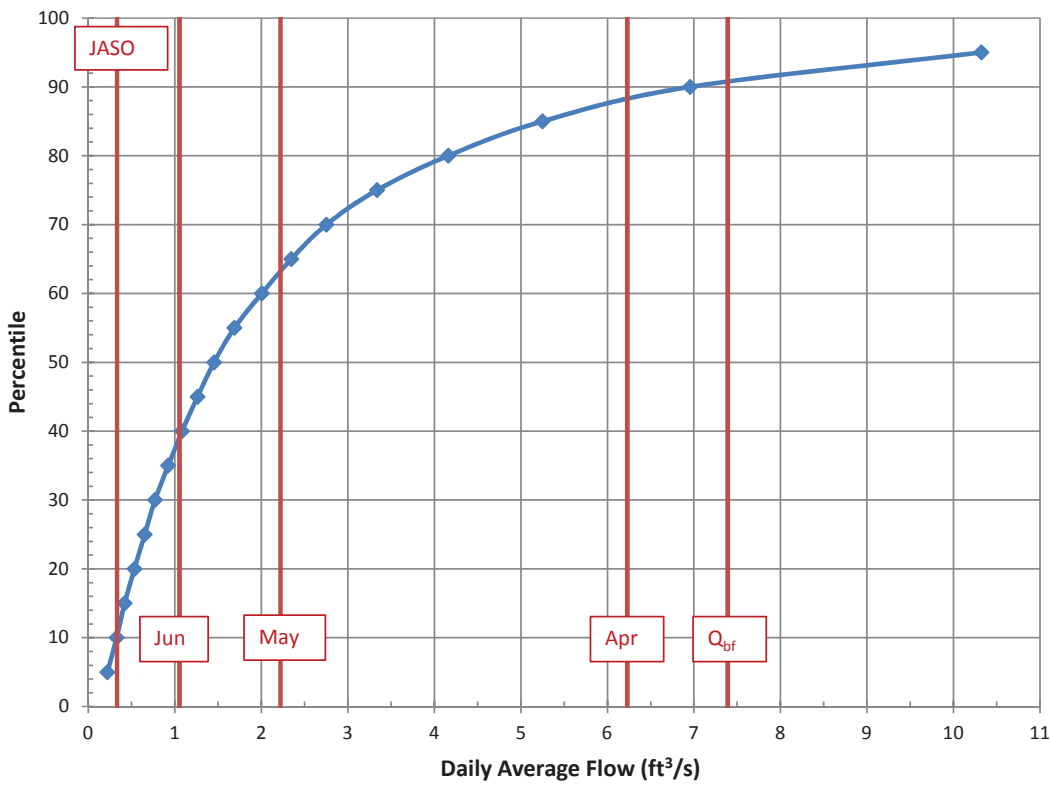
Preliminary Culvert Sizing - Round & Box Culverts

Shape:	Box			
Type:	Box 0 ww	Q ₂₅	173.5	
D or R (ft)	7	Q ₅₀	203.2	trial D / R = 6.9
w (ft)	6 box width	Q ₁₀₀	237.7	trial w: BFW = 12.2
Slope (ft/ft)	0.02			
A (ft ²)	42.00			
g (ft/s ²)	32.2			

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



Daily Average Flow Distribution



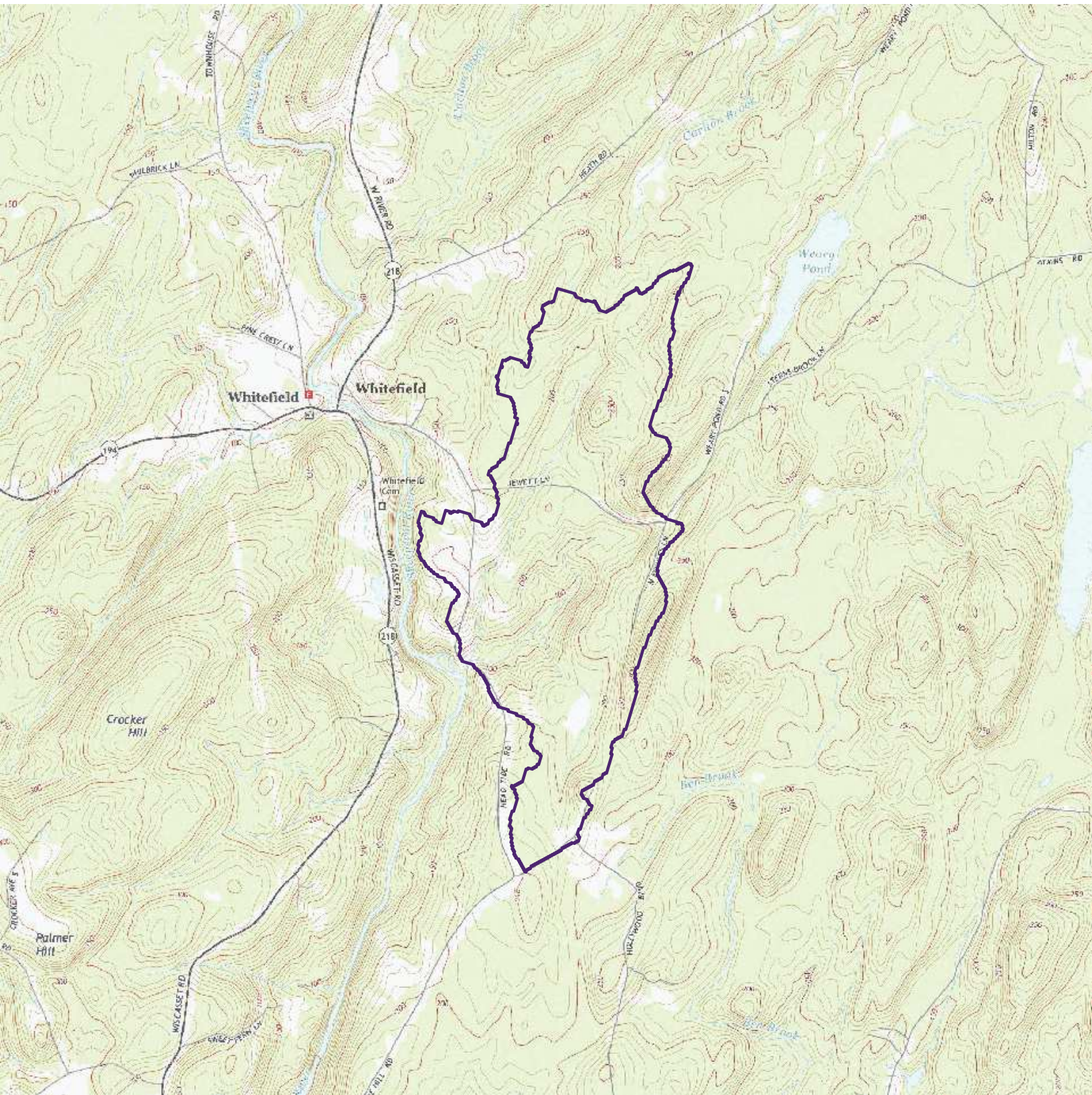
Daily Avg Flow Dist

$A_{ws} = (mi^2)$ 1.4

$Q (ft^3/s)$

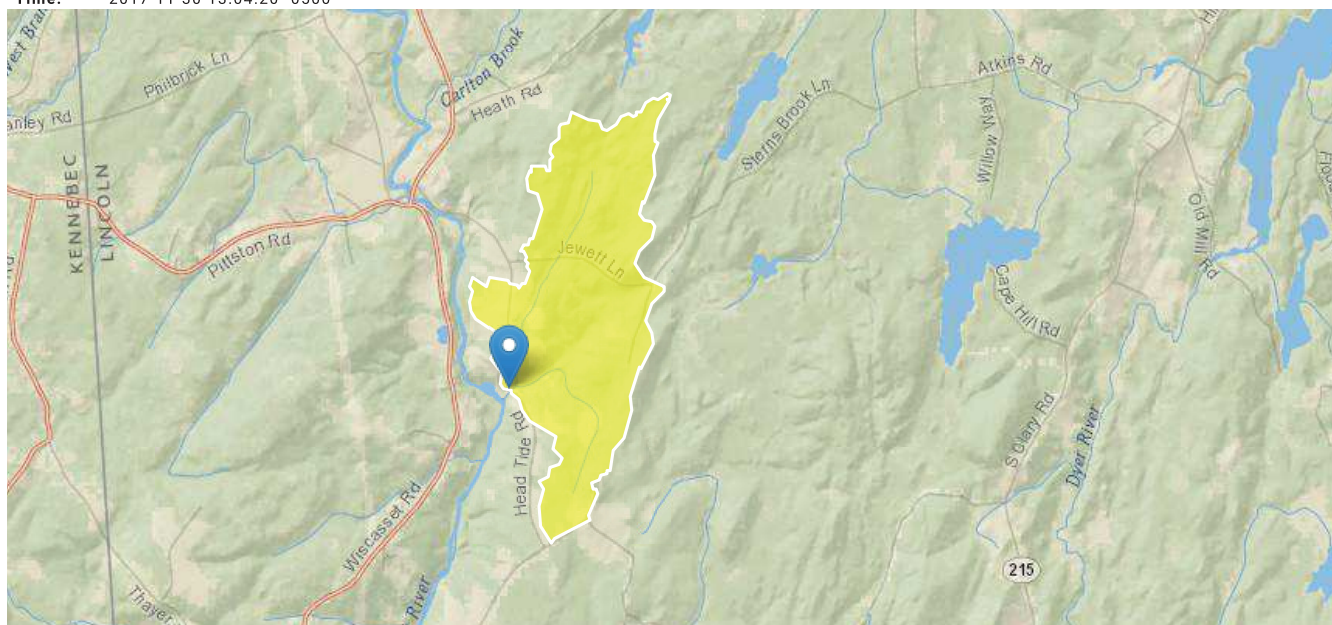
Pctl	Median	84 th pctl
5	0.22	0.35
10	0.33	0.49
15	0.42	0.61
20	0.53	0.75
25	0.65	0.87
30	0.77	0.99
35	0.92	1.14
40	1.08	1.31
45	1.26	1.48
50	1.45	1.75
55	1.69	2.03
60	2.01	2.39
65	2.35	2.78
70	2.75	3.24
75	3.34	3.90
80	4.16	4.65
85	5.25	5.96
90	6.95	8.01
95	10.32	12.46

Q_{bf}	7.4
$Q_{1.002}$	13.8
$Q_{1.1}$	32.1
Q_2	66.6



Whitefield 23032 Rt 194 LC 46459

Region ID: ME
 Workspace ID: ME20171130180401715000
 Clicked Point (Latitude, Longitude): 44.15528, -69.61403
 Time: 2017-11-30 13:04:20 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.4	square miles
STORNWI	Percentage of storage (combined water bodies and wetlands) from the Nationa Wetlands Inventory	6.76	percent

Parameter Code	Parameter Description	Value	Unit
SANDGRAVAF	Fraction of land surface underlain by sand and gravel aquifers	0.034	dimensionless
ELEV	Mean Basin Elevation	196.1	feet
BSLDEM10M	Mean basin slope computed from 10 m DEM	8.35	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	451547.41	
CENTROIDY	Basin centroid vertical (y) location in state plane units	4890052.04	
COASTDIST	Shortest distance from the coastline to the basin centroid	48	miles
ELEVMAX	Maximum basin elevation	341.4	feet
LC06WATER	Percent of open water, class 11, from NLCD 2006	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	4.35	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.45	percent
PRECIP	Mean Annual Precipitation	44.1	inches
SANDGRAVAP	Percentage of land surface underlain by sand and gravel aquifers	3.42	percent
STATSGOA	Percentage of area of Hydrologic Soil Type A from STATSGO	0	percent

Bankfull Statistics Parameters [Central and Coastal Bankfull 2004 5042]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.4	square miles	2.92	298

Bankfull Statistics Disclaimers [Central and Coastal Bankfull 2004 5042]

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

Bankfull Statistics Flow Report [Central and Coastal Bankfull 2004 5042]

Statistic	Value	Unit
Bankfull Streamflow	7.39	ft ³ /s
Bankfull Width	9.14	ft

Statistic	Value	Unit
Bankfull Depth	0.666	ft
Bankfull Area	6.08	ft ²

Bankfull Statistics Citations

Dudley, R.W., 2004, Hydraulic-Geometry Relations for Rivers in Coastal and Central Maine: U.S. Geological Survey Scientific Investigations Report 2004-5042, 30 p (<http://pubs.usgs.gov/sir/2004/5042/pdf/sir2004-5042.pdf>)

Peak-Flow Statistics Parameters [Statewide Peak Flow DA LT 12sqmi 2015 5049]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.4	square miles	0.31	12
STORNWI	Percentage of Storage from NWI	6.76	percent	0	22.2

Peak-Flow Statistics Flow Report [Statewide Peak Flow DA LT 12sqmi 2015 5049]

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

Statistic	Value	Unit	SEp
1.01 Year Peak Flood	19.9	ft ³ /s	38
2 Year Peak Flood	66.5	ft ³ /s	34
5 Year Peak Flood	105	ft ³ /s	35
10 Year Peak Flood	133	ft ³ /s	37
25 Year Peak Flood	173	ft ³ /s	39
50 Year Peak Flood	203	ft ³ /s	41
100 Year Peak Flood	238	ft ³ /s	42
250 Year Peak Flood	270	ft ³ /s	44
500 Year Peak Flood	321	ft ³ /s	47

Peak-Flow Statistics Citations

Lombard, P.J., and Hodgkins, G.A., 2015, Peak flow regression equations for small, ungaged streams in Maine— Comparing map-based to field-based variables: U.S. Geological Survey Scientific Investigations Report 2015-5049, 12 p. (<http://dx.doi.org/10.3133/sir20155049>)

Low-Flow Statistics Parameters [Statewide LowFlow SIR 2004 5026]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.4	square miles	9.79	1418
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0.034	dimensionless	0	0.455

Low-Flow Statistics Disclaimers [Statewide LowFlow SIR 2004 5026]

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

Low-Flow Statistics Flow Report [Statewide LowFlow SIR 2004 5026]

Statistic	Value	Unit
7 Day 10 Year Low Flow	0.0416	ft ³ /s

Low-Flow Statistics Citations

Dudley, R.W., 2004, Estimating Monthly, Annual, and Low 7-Day, 10-Year Streamflows for Ungaged Rivers in Maine: U.S. Geological Survey Scientific Investigations Report 2004-5026, 22 p. (<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf>)

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

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.4	square miles	14.9	1419
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0.034	dimensionless	0	0.212
ELEV	Mean Basin Elevation	196.1	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	0.0028	ft ³ /s
5 Percent Duration	0.0194	ft ³ /s
10 Percent Duration	0.0586	ft ³ /s
25 Percent Duration	0.351	ft ³ /s
50 Percent Duration	1.31	ft ³ /s
75 Percent Duration	3.4	ft ³ /s
90 Percent Duration	7.65	ft ³ /s
95 Percent Duration	12.1	ft ³ /s
99 Percent Duration	32.9	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 Parameters [Statewide Annual SIR 2015 5151]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.4	square miles	14.9	1419
SANDGRAVAF	Fraction of Sand and Gravel Aquifers	0.034	dimensionless	0	0.212
ELEV	Mean Basin Elevation	196.1	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
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11/30/2017

StreamStats

Statistic	Value	Unit
Mean Annual Flow	3.19	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>)