

MaineDOT Culvert Hydrology Summary Sheet

Town: Columbia WIN (or Region): 21772.00

Route: Rt 1 Local Road Name:

Stream: No Name

Lat: 44.647 Long: 67.7531

Asset ID: XC-269581 Also Known As:

Existing Structure:

Watershed Area: 0.7 sq. mi. NWI Wetlands: 3.90 %

Wbf - calculated: 6.4 feet Wbf - measured (if known): feet

Q50: 129.9 cfs

Q100: 151.9 cfs

Preliminary Pipe Size*:

6' D emb 18"

* Note: this size may NOT meet fish passage regulatory requirements. Consult with ENV staff for guidance.

Comments:

By: LPO

Date: 6/7/2016

Revised:

ver: 5/12/2016

Project Name: Columbia xCulvert
 Stream Name:
 Bridge Name:
 Route No. Rt 1
 Analysis by: LPO

PIN: 21772
 PIN: Columbia
 Bridge No. XC-269581
 USGS Quad:
 Date: 6/20/2016

Lat Long
 44.647 67.75307

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

Enter data in blue cells only!

	km ²	mi ²	ac
A	1.81	0.70	448.0
W	0.07	0.0	17.5

P _c	599108.7	494543.2
County	York	
pptA	46.7	
SG	0.08	

A (km ²)	1.81
W (%)	3.90

Conf Lvl 0.67

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

NWI Wetlands % STORNWI

Worksheet prepared by:

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ver. 2016 Feb 05

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

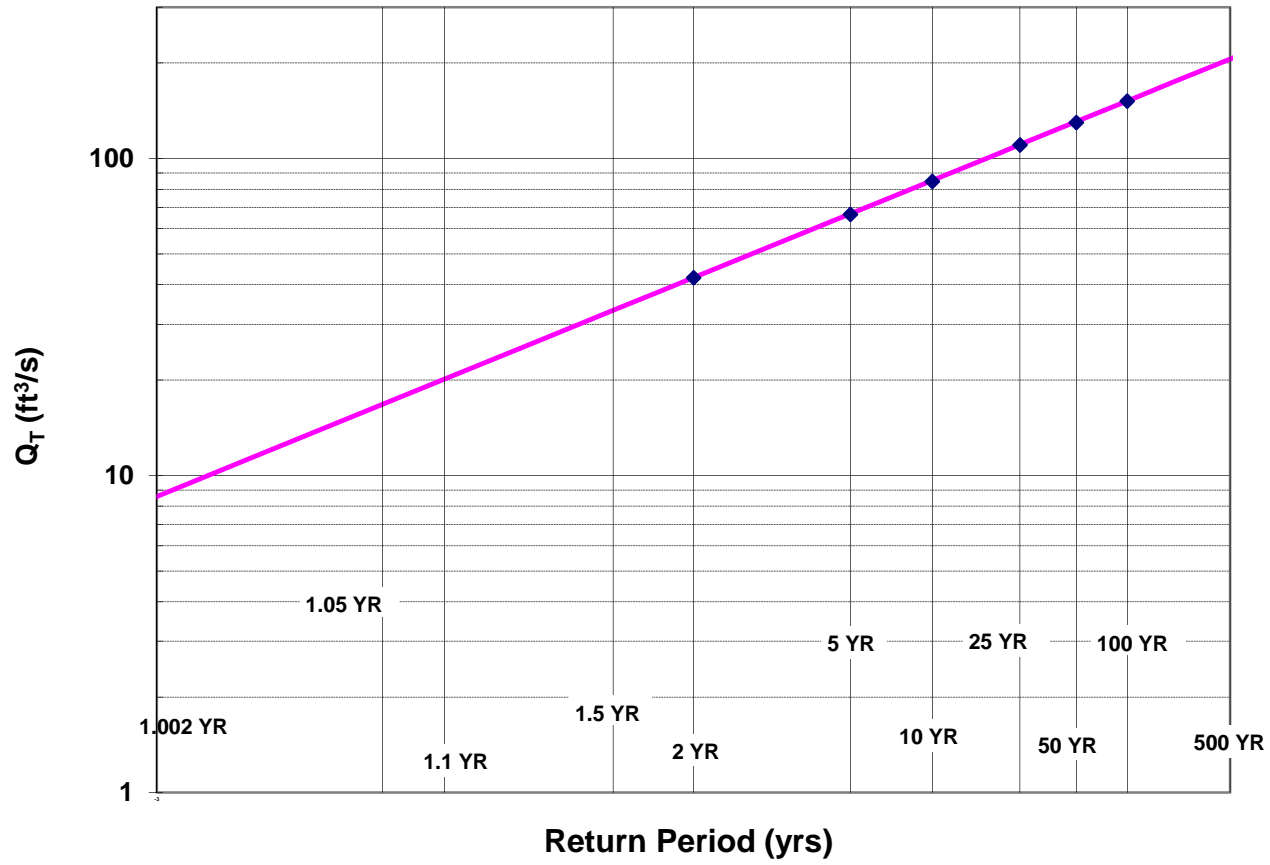
SIR 2015-4059, USGS, Augusta, ME

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

Ret Pd T (yr)	Peak Flow Estimate		
	Lower	Q _T (m ³ /s)	Upper
1.1		0.57	
2		1.19	
5		1.89	
10		2.40	
25		3.13	
50		3.68	
100		4.30	
500		5.84	

Q _T (ft ³ /s)
20.2
42.1
66.6
84.6
110.4
129.9
151.9
206.1

Log-Normal Probability Plot



Project Name: Columbia xCulvert
 Stream Name: 0
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 Route No. Rt 1
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PIN: 21772
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 USGS Quad:
 Date: 6/20/2016

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

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

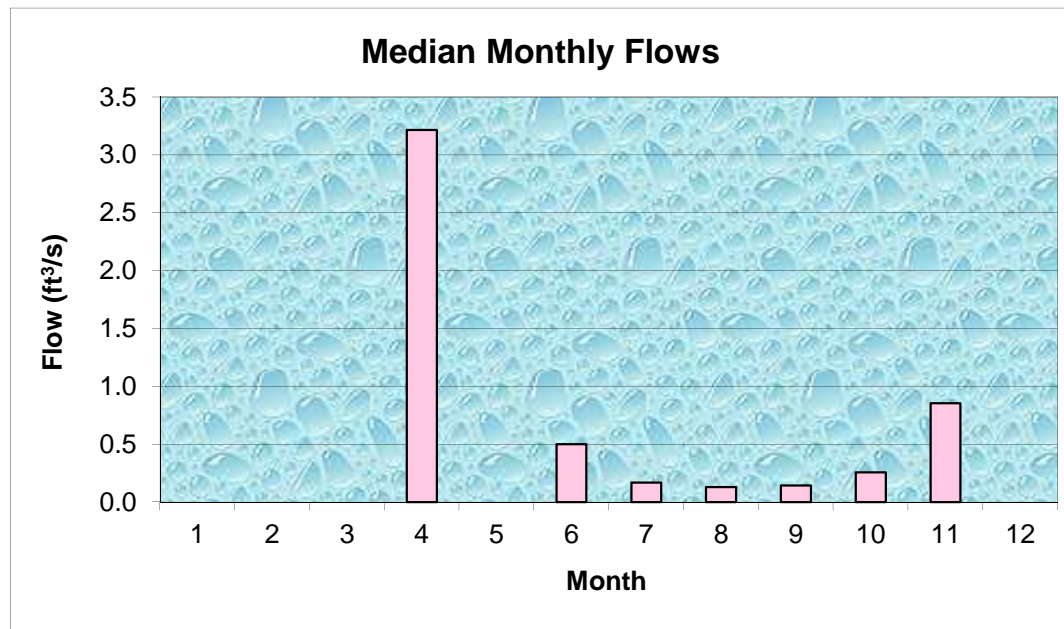
Value	Variable	Explanation
0.70	A	Area (mi ²)
599108.7	494543.2	P_c Watershed centroid (E,N; UTM; Zone 19; meters)
-2347.67	DIST	Distance from Coastal reference line (mi)
46.7	pptA	Mean Annual Precipitation (inches)
0.08	SG	Sand & Gravel Aquifer (decimal fraction of watershed area)

Month	Q_{median} (ft ³ /s)	(m ³ /s)
Jan	#NUM!	#NUM!
Feb	#NUM!	#NUM!
Mar	#NUM!	#NUM!
Apr	3.21	0.0911
May	#NUM!	#NUM!
Jun	0.50	0.0142
Jul	0.17	0.0048
Aug	0.13	0.0037
Sep	0.14	0.0041
Oct	0.26	0.0073
Nov	0.85	0.0242
Dec	#NUM!	#NUM!

Q_{bf}	3.6
ann avg	1.5
ann med	0.8
$Q_{1.002}$	8.6
$Q_{1.01}$	11.6
$Q_{1.05}$	16.8
Q_{bf}	13.4

assume v = 4ft/s

W_{bf}	6.4	estimated bankfull width (ft)
d_{bf}	0.5	estimated bankfull depth (ft)
A_{bf}	3.3	estimated bankfull flow area (ft ²)



References

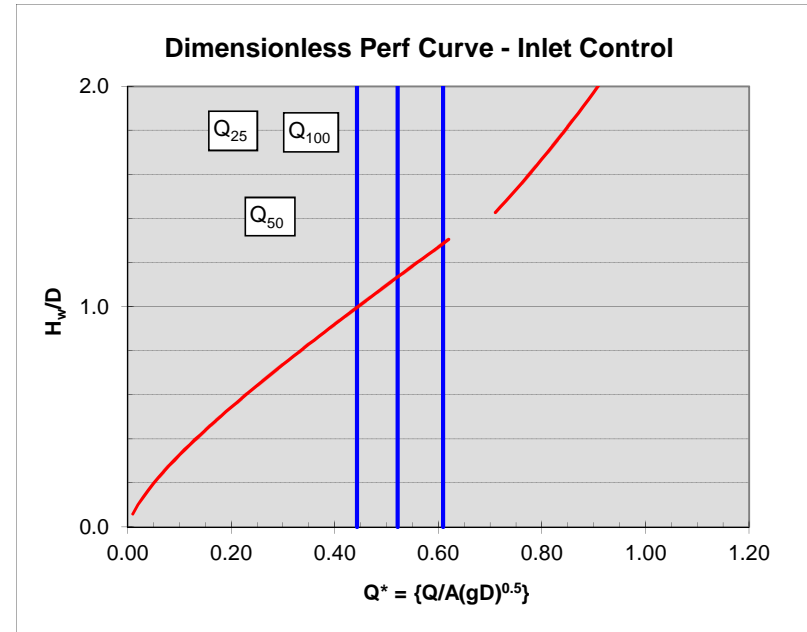
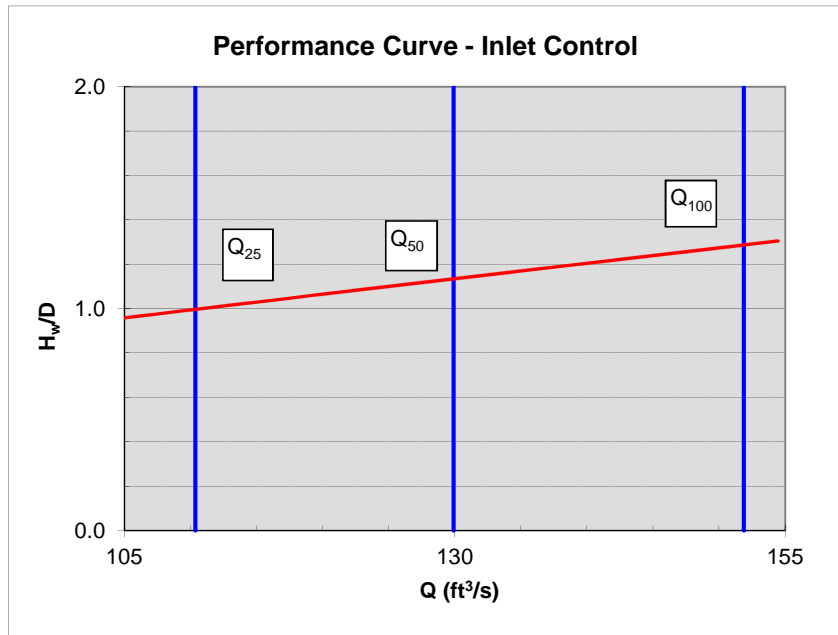
Dudley, R.W., 2004. Hydraulic Geometry Relations ..., SIR 2004-5042
 Dudley, R.W., 2004. Estimating Monthly Streamflows ... , SIR 2004-5026

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:	Round			
Type:	Circ CMP Proj	Q ₂₅	110.4	
D or R (ft)	5	Q ₅₀	129.9	trial D / R = 5.9
w (ft)	box width	Q ₁₀₀	151.9	trial w: BFW = 6.4
Slope (ft/ft)	0.02			
A (ft ²)	19.63			
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)





0 0.2 0.4mi

Scale: 1 : 36,112

Latitude: 44.66847

Longitude: -67.78811 SS

44.64700, -67.75307

StreamStats Version 3.0

Basin Characteristics Engaged Site Report

Date: Mon Jun 20, 2016 11:20:23 AM GMT-4
 Study Area: Maine
 NAD 1983 Latitude: 44.647 (44 38 49)
 NAD 1983 Longitude: -67.753 (-67 45 11)

Label	Value	Units	Definition
DRNAREA	0.7	square miles	Area that drains to a point on a stream
STORNWI	3.9	percent	Percentage of storage (combined water bodies and wetlands) from the National Wetlands Inventory
ELEV	73.1	feet	Mean Basin Elevation
PRECIP	50.1	inches	Mean Annual Precipitation
PRDECFEB90	13.2	inches	Basin average mean precipitation for December to February from PRISM 1961-1990
SANDGRAVAP	8.13	percent	Percentage of land surface underlain by sand and gravel aquifers
COASTDIST	32.1	miles	Shortest distance from the coastline to the basin centroid
CENTROIDX	599108.66	State plane coordinates	Basin centroid horizontal (x) location in state plane coordinates
CENTROIDY	4945435.2	State plane coordinates	Basin centroid vertical (y) location in state plane units
SANDGRAVAF	0.08	dimensionless	Fraction of land surface underlain by sand and gravel aquifers
LC11IMP	1.81	percent	Average percentage of impervious area determined from NLCD 2011 impervious dataset
LC11DEV	8.41	percent	Percentage of land-use from NLCD 2011 classes 21-24



StreamStats Version 3.0

Flow Statistics Ungaged Site Report

Date: Mon Jun 20, 2016 11:21:12 AM GMT-4
 Study Area: Maine
 NAD 1983 Latitude: 44.647 (44 38 49)
 NAD 1983 Longitude: -67.753 (-67 45 11)
 Drainage Area: 0.7 mi²

Regional Hydraulic Geometry Basin Characteristics			
100% Central and Coastal Bankfull 2004 5042 (0.7 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	0.7 (below min value 2.92)	2.92	298

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Regional Median Flows Basin Characteristics			
100% East Coast 2 Variable SIR 2004 5157 (0.7 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	0.7	0.04	73.2
Fraction of Sand and Gravel Aquifers (dimensionless)	0.08	0	0.706

Monthly Mean Flows Basin Characteristics			
100% Statewide Mean Monthly SIR 2004 5026 (0.7 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	0.7 (below min value 9.79)	9.79	1418
Fraction of Sand and Gravel Aquifers (dimensionless)	0.08	0	0.455
Mean Annual Precipitation (inches)	50.1 (above max value 47.9)	37.8	47.9
Distance From Coast To Basin Centroid (miles)	32.1 (below min value 42.7)	42.7	193

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Monthly Median Flows Basin Characteristics			
100% Statewide Median Monthly SIR 2004 5026 (0.7 mi ²)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max

		Min	Max
Drainage Area (square miles)	0.7 (below min value 9.79)	9.79	1418
Fraction of Sand and Gravel Aquifers (dimensionless)	0.08	0	0.455
Mean Annual Precipitation (inches)	50.1 (above max value 47.9)	37.8	47.9
Distance From Coast To Basin Centroid (miles)	32.1 (below min value 42.7)	42.7	193

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Peak Flow Basin Characteristics			
100% Statewide Peak Flow Full WRI 99 4008 (0.7 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	0.7 (below min value 0.93)	0.93	1653
Percentage of Storage from NWI (percent)	3.90	0.7	26.7

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Annual Flows Basin Characteristics			
100% Statewide Annual SIR 2004 5026 (0.7 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	0.7 (below min value 9.79)	9.79	1418
Fraction of Sand and Gravel Aquifers (dimensionless)	0.08	0	0.455
Basin Ave Precip Dec Feb PRISM 1990 (inches)	13.2 (above max value 12.6)	7.71	12.6

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Regional Hydraulic Geometry Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
BFFLOW	3.57	ft3/s				
BFWIDTH	6.37	ft				
BFDPTH	0.53	ft				
BFAREA	3.35	ft2				

<http://pubs.usgs.gov/sir/2004/5042/pdf/sir2004-5042.pdf> (<http://pubs.usgs.gov/sir/2004/5042/pdf/sir2004-5042.pdf>)
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

Regional Median Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max

AUGD50	0.1	ft3/s	33	
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<http://water.usgs.gov/pubs/sir/2004/5157/> (<http://water.usgs.gov/pubs/sir/2004/5157/>)
 Lombard_P. J._ 2004_ August Median Streamflow on Ungaged Streams in Eastern Coastal Maine: U.S. Geological Survey Scientific Investigations Report 2004-5157_ 15 p.

Monthly Mean Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
Q1	1.75	ft3/s				
Q2	1.85	ft3/s				
Q3	4.77	ft3/s				
Q4	4.26	ft3/s				
Q5	1.31	ft3/s				
Q6	0.95	ft3/s				
Q7	0.36	ft3/s				
Q8	0.28	ft3/s				
Q9	0.35	ft3/s				
Q10	0.82	ft3/s				
Q11	1.78	ft3/s				
Q12	2.29	ft3/s				

<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf> (<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf>)
 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.

Monthly Median Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
JAND50	1.02	ft3/s				
FEBD50	1.16	ft3/s				
MARD50	2.45	ft3/s				
APRD50	4	ft3/s				
MAYD50	0.89	ft3/s				
JUND50	0.5	ft3/s				
JULD50	0.17	ft3/s				
AUGD50	0.13	ft3/s				
SEPD50	0.14	ft3/s				
OCTD50	0.26	ft3/s				
NOVD50	0.85	ft3/s				
DECD50	1.42	ft3/s				

Peak Flow Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
PK2	49.5	ft3/s				
PK5	86.7	ft3/s				
PK10	117	ft3/s				
PK25	160	ft3/s				
PK50	195	ft3/s				
PK100	235	ft3/s				
PK500	338	ft3/s				

<http://me.water.usgs.gov/99-4008.pdf> (<http://me.water.usgs.gov/99-4008.pdf>)
 Hodgkins_G.A._1999_Estimating the Magnitude of Peak Flows for Streams in Maine for Selected Recurrence Intervals: U.S. Geological Survey Water-Resources Investigations Report 99-4008_45 p.

Annual Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
QA	1.63	ft3/s				
MEDAN	0.94	ft3/s				
M7D10Y	0.0242	ft3/s				

<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf> (<http://water.usgs.gov/pubs/sir/2004/5026/pdf/sir2004-5026.pdf>)
 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.

