

APPENDIX 2.2 -- Toms Creek Flow Comparison



By: MGB Date: 09/07/18 Subject: Impact on Tom's Creek Flow Sheet No.: 1 of 4
Chkd. By: RTF Date: 9/14/2018 Charmian Mine - North Tract Proj. No.: 152596A

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**TOM'S CREEK POST CONSTRUCTION FLOW
NORTH TRACT PUBLIC REVIEW COMMENTS
CHARMIAN MINE - NORTHERN TRACT
SPECIALTY GRANULES, LLC
ADAMS COUNTY, PENNSYLVANIA**

PURPOSE

The purpose of these calculations is to evaluate the runoff and flow conditions in Toms Creek considering development of the proposed Northern Tract quarry at Charmian Plant in Adams County, Pennsylvania. Using TR-55 methodology, the runoff conditions in Toms Creek will be determined for pre-development and post-development conditions for comparison.



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TOM'S CREEK BASE FLOW

The runoff of the proposed construction area will be evaluated using the TR-55 method and the equation below.

Average Annual Rainfall = 42.5 in. approximately (Refer to Reference 2)

$$\text{Runoff, } Q = (P - I_a)^2 / [(P - I_a) + S]$$

Assuming $I_a = 0.2S$,

$$Q = (P - 0.2S)^2 / (P + 0.8S) \text{ where,}$$

P = rainfall, in.

S = potential maximum retention after runoff begins, in. = $1000 / CN - 10$

Existing Conditions Watershed

The following is a summary of the existing watershed condition at the portion of Toms Creek adjacent the proposed quarry. The point of analysis for this watershed comparison is depicted on the attached site plan. The watershed characteristics presented below were obtained from Reference 3 (Refer to Attachment 1).

Total Watershed = 3,078.40 acres

Watershed Area	Cover Type	HSG	Curve Number	
			AMC II	AMC III ¹
2924.48	Woods-Forest	B	58	76.4
30.78	Urban	B	92	97.1
123.14	Pasture-Grassland	B	61	78.7

Total Area = 3078.4

Composite Curve Number (Weighted Average) = 58.5 (AMC II)

$Q_{\text{runoff}} = 35.02$ in. (surface runoff flowing away from the site)
 Runoff Volume = $3.91E+08$ cubic feet per year
 $2.93E+09$ gallons per year



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Proposed Conditions Watershed

The following is a summary of the proposed watershed condition which includes a portion of the watershed, forested area of Northern Tract, being re-distributed to Miney Branch and away from the proximal portion of Toms Creek.

Re-distributed Watershed = 91 acres
 Total Watershed = 2,987.4 acres

Watershed Area	Cover Type	HSG	Curve Number	
			AMC II	AMC III ¹
2833.5	Woods-Forest	B	58	76.4
30.784	Urban	B	92	97.1
123.1	Pasture-Grassland	B	61	78.7

Total Area = 2987.4

Composite Curve Number (Weighted Average) = 58.5 (AMC II)

$Q_{\text{runoff}} = 35.02$ in. (surface runoff flowing away from the site)
 Runoff Volume = $3.8E+08$ cubic feet per year
 $2.84E+09$ gallons per year

Existing and Proposed Summary

SUMMARY		
	Existing	Proposed
Estimated Tributary Area (Acres)	3,078.40	2,987.4
Change in Tributary Area (%)	1.5	
Calculated Average, Annual Flow (gpm)	5,569	5,405
Change in Runoff Volume (%)	1.5	

Notes:

1. The average annual flow was determined by distributing the average annual runoff over the amount of time in one year.



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REFERENCES

- 1) Introduction to Hydraulics and Hydrology with Applications for Stormwater Management - 2nd Edition, Gribbin, John E., Delmar - A Division of Thomson Learning, 2002.
- 2) National Climatic Data Center (NCDC) - <http://www.worldclimate.com/cgi-bin/data.pl?ref=N39W077+2200+362537C>, September 2018.
- 3) USGS Stream Stats - <https://streamstats.usgs.gov/ss/>, September 2018

ATTACHMENT #1

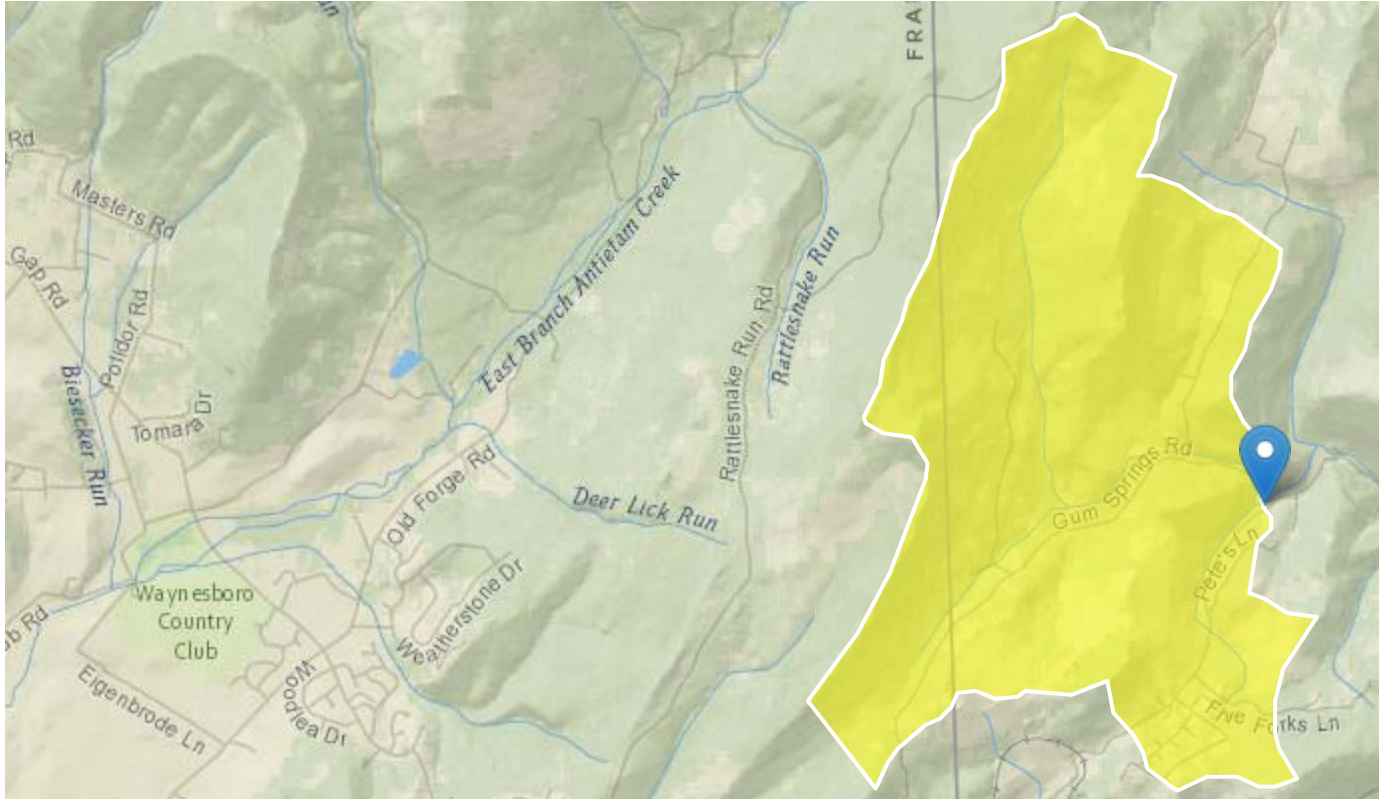
StreamStats Report

Region ID: PA

Workspace ID: PA20180914183911074000

Clicked Point (Latitude, Longitude): 39.76773, -77.43402

Time: 2018-09-14 14:39:29 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	4.82	square miles
PRECIP	Mean Annual Precipitation	43	inches
CARBON	Percentage of area of carbonate rock	0	percent
FOREST	Percentage of area covered by forest	95	percent
URBAN	Percentage of basin with urban development	1	percent

Base Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.82	square miles	2.26	1720
PRECIP	Mean Annual Precipitation	43	inches	33.1	50.4
CARBON	Percent Carbonate	0	percent	0	99
FOREST	Percent Forest	95	percent	5.1	100
URBAN	Percent Urban	1	percent	0	89

Base Flow Statistics Flow Report [Statewide Mean and Base Flow]

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

Statistic	Value	Unit	SE	SEp
Base Flow 10 Year Recurrence Interval	3.5	ft ³ /s	21	21
Base Flow 25 Year Recurrence Interval	3.14	ft ³ /s	21	21
Base Flow 50 Year Recurrence Interval	2.93	ft ³ /s	23	23

Base Flow Statistics Citations

Stuckey, M.H.,2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p. (<http://pubs.usgs.gov/sir/2006/5130/>)

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Application Version: 4.2.1

