



Title: Loading Calculations
 Project #: 174840035
 Prepared By: GKK
 Date: 2/28/2018

Revised By: GKK
 Date: 2/10/2020
 Checked By:
 Date:

NEWTOWN TOWNSHIP NPDES PRP SEDIMENT LOADING CALCULATIONS

Note: All calculated areas are based on areas derived from GIS data sets projected in Pennsylvania State Plane South NAD83, US Survey Foot.

Approach to calculating the PRP Loading:

1. Determine Township MS4 Drainage Area within the Darby Creek and Crum Creek watersheds.
2. Remove/Parse State Road right-of-ways and portions of open water within each Drainage Area.
3. Calculate the Zoning, Parcel and Township Road area within each Drainage Area.
4. Determine the Township owned Open Space and undeveloped areas for areas which do drain to the MS4 for each zoning district based on aerial imagery and Delaware County parcel description information.
5. Calculate impervious area and pervious area for remaining area based on maximum allowable impervious for each zoning district. For Township Road Right-of-Ways, the impervious coverage is assumed to be 75% and pervious coverage to be 25%. Township owned properties (including parks with improvements such as playgrounds, paved walking paths, and baseball fields) impervious coverage is assumed based on the Zoning district and is not included in Open Space/Undeveloped.
6. Calculate sediment and nutrient loading based on PADEP Simplified method for the impervious developed, pervious developed, and undeveloped areas.
7. Calculate sediment loading reduction from installed BMP's within the MS4 and each watershed.
8. Subtract loading reduction from installed BMP's to determine final sediment and nutrient loading for each watershed.
9. Determine BMP's to be implemented to account for 10% reduction requirement.

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 Township Area Per PennDOT Municipalities Boundary = 281,652,507 sq. ft

 or 10.103 sq. mi

Properties with Private Roadways and Storm Sewers	Total	46,061,382 sf
Melmark	2,811,205	sf
Episcopal Academy	5,540,758	sf
Liseter	16,524,771	sf
BPG	9,496,898	sf
Marville Joyfor	6,130,750	sf
Terrazza / Muirwood	1,755,724	sf
Dunwoody	3,801,276	sf

Portions of properties with Private Roadways and Storm Sewers are included in the Township MS4 area when the runoff mixes with Township MS4 runoff.



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CRUM CREEK WATERSHED AREA

Township area within Crum Creek Watershed	167,527,578	sq. ft	
Areas outside MS4 Outfall Drainage Areas	98,422,602	sq. ft	r
Township MS4 Drainage Area within Crum Creek Watershed	69,104,976	sq. ft	r
Parsed Area from MS4 Drainage Area	3,535,853	sq. ft	r
Open Space	9,555,538	sq. ft	
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Impervious Developed, Area	24,047,466	sq. ft	
Pervious Developed, Area	31,966,119	sq. ft	
Non Developed Area	9,555,538	sq. ft	

Crum Creek PRP Sediment Loading Calculations

Land Cover	Area		TN		TP		TSS	
	(sf)	(ac)	#/ac/yr	lb/yr	#/ac/yr	lb/yr	#/ac/yr	lb/yr
Undeveloped Area	9,555,538	219.36	10	2,193.65	0.33	72.39	234.6	51,463.02
Impervious Developed	24,047,466	552.05	23.06	12,730.36	2.28	1,258.68	1839	1,015,227.06
Pervious Developed	31,966,119	733.84	20.72	15,205.19	0.84	616.43	264.96	194,438.54
Subtotal	65,569,124	1,505.26		30,129.20		1,947.50		1,261,128.62
Pollutants Removed By Existing BMPs				217.87		59.85		53,616.77
Total				29,911.33		1,887.65		1,207,511.85

Pollutants of Concern for Crum Creek:

Pathogens
Siltation

Required 10% Reduction due to Siltation: 120,751.2 lb/year TSS

BMP to Reduce Siltation

BMP Name	BMP Effectiveness			BMP Area	Pollutant Removal
	TN	TP	Sediment		
Stream Restoration	0.075 lb/ft/yr	0.068 lb/ft/yr	44.88 lb/ft/yr	2700 lf	121,176 lb/yr
Tree Planting	10%	15%	20%	500 Trees	1,839 lb/yr
Rain Gardens / Bioretention	80%	85%	90%	2 imp. ac.	3,310 lb/yr
Total TSS Reduction					126,325



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DARBY CREEK WATERSHED AREA

Township area within Darby Creek Watershed	114,124,929	sq. ft	
Areas outside MS4 Outfall Drainage Areas	37,676,578	sq. ft	r
Township MS4 Drainage Area within Darby Creek Watershed	76,448,351	sq. ft	r
Parsed Area from MS4 Drainage Area	2,603,797	sq. ft	r
Open Space	1,997,495	sq. ft	
Impervious Developed, Area	25,939,416	sq. ft	
Pervious Developed, Area	45,766,056	sq. ft	
Non Developed Area	1,997,495	sq. ft	

Darby Creek PRP Sediment Loading Calculations

Land Cover	Area		TN		TP		TSS	
	(sf)	(ac)	#/ac/yr	lb/yr	#/ac/yr	lb/yr	#/ac/yr	lb/yr
Undeveloped Area	1,997,495	45.86	10	458.56	0.33	15.13	234.6	10,757.86
Impervious Developed	25,939,416	595.49	23.06	13,731.93	2.28	1,357.71	1839	1,095,100.71
Pervious Developed	45,766,056	1,050.64	20.72	21,769.35	0.84	882.54	264.96	278,378.65
Subtotal	73,702,967	1,691.99		35,959.84		2,255.38		1,384,237.22
Pollutants Removed By Existing BMPs				296.12		67.20		72,922.14
Total				35,663.72		2,188.18		1,311,315.08

Pollutants of Concern for Darby Creek:

Pathogens
Siltation
PCBs

Required 10% Reduction due to Siltation: 131,131.51 lb/year TSS

BMP to Reduce Siltation

BMP Name	BMP Effectiveness			BMP Area	Pollutant Removal
	TN	TP	Sediment		
Stream Restoration	0.075 lb/ft/yr	0.068 lb/ft/yr	44.88 lb/ft/yr	2925 lf	131,274 lb/yr
Tree Planting	10%	15%	20%	500 Trees	1,839 lb/yr
Rain Gardens / Bioretention	80%	85%	90%	2 imp. ac.	3,310 lb/yr
Total TSS Reduction					136,423

CRUM CREEK

ZONING DISTRICT	MS4 Drainage Area	Parsed Area		Open Space		Total Parcel Area	Net PRP Area	Township/ Private Road	PRP Residential Area	PRP Commercial /Non-Res. Area	PRP Industrial Area	Building Area, Maximum	Paved	Allowed Per Zoning			PRP Areas			Gross (lbs./yr.)			BMP Removal (lbs./yr.)			Net (lbs./yr.)					
		Total	State Road ROW	TWP	Private									Total Impervious, Maximum	Non-Residential, Maximum Impervious	Open Space, Minimum	Impervious Developed, Area	Pervious Developed, Area	Non Developed, Area	Suspended Solids	Nitrogen Loading	Phosphorus Loading	Suspended Solids	Nitrogen Loading	Phosphorus Loading	Suspended Solids	Nitrogen Loading	Phosphorus Loading			
RESIDENTIAL																															
R1	25,262,279	1,203,815	1,203,086		4,589,666	21,224,278	19,378,389	2,834,916	16,543,474	90,409		15%		25%		50%		6,307,260	13,161,539	4,589,666	371,052.98	10,653.10	618.71	1,137.68	4.67	1.26	369,915.29	10,648.43	617.44		
R1A	2,264,313	57,628	57,628	79,188	108,419	2,110,692	2,019,079	95,993	1,923,085			15%		25%		50%		552,766	1,466,312	187,607	33,265.92	1,033.17	58.63	546.65	2.16	0.61	32,719.27	1,031.00	58.02		
R2	5,327,767	392,713	392,713	16,060	218,148	4,309,713	4,700,845	764,103	3,768,990	167,753		15%		30%		50%		1,787,650	2,913,195	234,208	94,451.67	2,385.83	151.52	890.29	3.53	0.99	93,561.38	2,382.30	150.53		
R3	12,913,243	425,556	425,556	22,667	250,907	10,338,686	10,574,425	2,149,001	8,425,424	1,639,688		20%		40%		50%		5,801,764	6,412,349	273,574	285,414.17	6,184.30	429.40	6,990.93	27.72	7.76	278,423.23	6,156.59	421.64		
R4	741,761			397,836	303,229	741,760	40,696	1	40,694			15%	30%	45%		40%		18,314	22,382	701,066	4,685.01	181.28	6.70				4,685.01	181.28	6.70		
R4A	1,441,725	89	89			1,441,725	1,441,636	73,641	1,367,995			15%	30%	45%		40%		670,829	770,808	-	33,009.34	721.77	49.98				33,009.34	721.77	49.98		
R5	39,687				39,586	39,687		0	101			20%		40%				40	60	39,586	215.26	9.14	0.30				215.26	9.14	0.30		
A												20%																			
A-O	2,269,555	107,536	107,536		48,516	2,123,464	2,113,503	38,555	2,074,948					50%		10%		1,066,390	1,047,113	48,516	51,650.97	1,073.74	76.38	27,433.26	108.63	30.43	24,217.72	965.11	45.94		
PRD	8,809,707	118,320	118,320		2,211,160	7,903,214	6,480,227	890,283	4,422,701	1,167,243		30%		60%				4,021,679	2,458,548	2,211,160	196,648.81	3,806.08	274.66	1,893.68	7.50	2.10	194,755.13	3,798.58	272.56		
COMMERCIAL																															
O	397,535	64,568	64,568			319,177	332,966	13,789	319,177			70%		70%		30%		233,766	99,200	-	10,472.44	170.94	14.15				10,472.44	170.94	14.15		
C-1	3,158,363	461,341	461,341		37,057	2,467,976	2,659,965	229,046	2,430,919			70%		70%				1,873,428	786,537	37,057	84,075.49	1,374.40	113.51	8,331.76	38.06	9.53	75,743.73	1,336.34	103.98		
C-2	874,291	221,531	221,531		652,638	652,760	122		122			25%		25%		15%		31	92	652,638	3,516.75	149.88	4.95				3,516.75	149.88	4.95		
C-2 Lifestyle	120,238	6,967	6,967		113,271	113,271	[0]		[0]			20%		20%		25%		[0]	[0]	113,271	610.04	26.00	0.86				610.04	26.00	0.86		
INDUSTRIAL																															
I	140,430	45,428	45,428			84,587	95,001	10,414				40%	25%	65%				62,792	32,209	-	2,846.86	48.56	3.91	944.92	3.74	1.05	1,901.94	44.82	2.86		
SU-1	3,882,679	243,451	243,451		230,609	2,947,612	3,408,619	691,616				30%	30%	30%				1,333,813	2,074,806	230,609	70,172.71	1,745.96	111.57	634.79	2.80	0.78	69,537.93	1,743.16	110.79		
SU-2	1,461,402	186,909	186,909	236,581		1,262,114	1,037,913	12,380				30%	30%	30%				316,945	720,968	236,581	19,040.20	565.04	32.28	4,812.81	19.06	5.34	14,227.39	545.98	26.95		
Total	69,104,976	3,535,853	3,535,124	752,332	8,803,206	58,080,716	54,283,388	7,803,738	38,567,412	5,815,312	3,827,124							24,047,466.33	31,966,119.44	9,555,537.81	1,261,128.62	30,129.20	1,947.50	53,616.77	217.87	59.85	1,207,511.85	29,911.33	1,887.65		

	TSS	TN	TP
Impervious Developed	1839	23.06	2.28
Pervious Developed	264.96	20.72	0.84
Undeveloped	234.6	10	0.33

Note:
The PRD Overlay Zoning District increases the maximum allowable impervious coverage of the underlying Zoning District. For areas within a PRD, the areas have been subtracted from the underlying zoning district to eliminate double counting of the area.

