RADNOR TOWNSHIP

POLLUTANT REDUCTION PLAN

Board of Commissioners

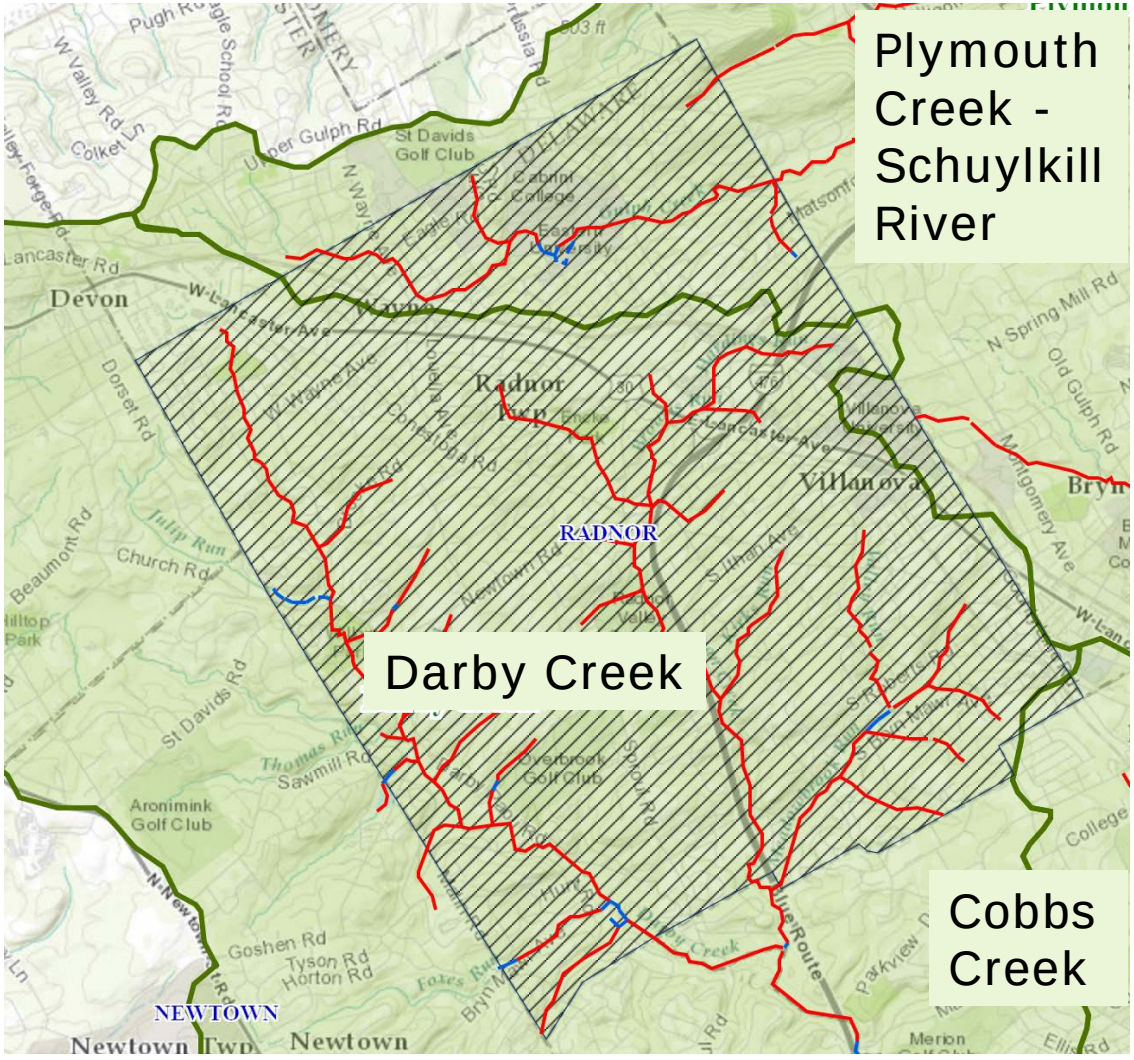
August 14, 2017

MELIORA DESIGN | CIVIL ENGINEERS

WHAT HAS CHANGED IN THE 2018 PERMIT?

Pollution Reduction Plan

- Required for local waters impaired by sediment or nutrients (nitrogen or phosphorus)
- Three drainage areas (*or Hydrologic Unit Code HUC 12 areas in the terminology of the US Geologic Survey*



WHAT DOES A PRP INVOLVE?

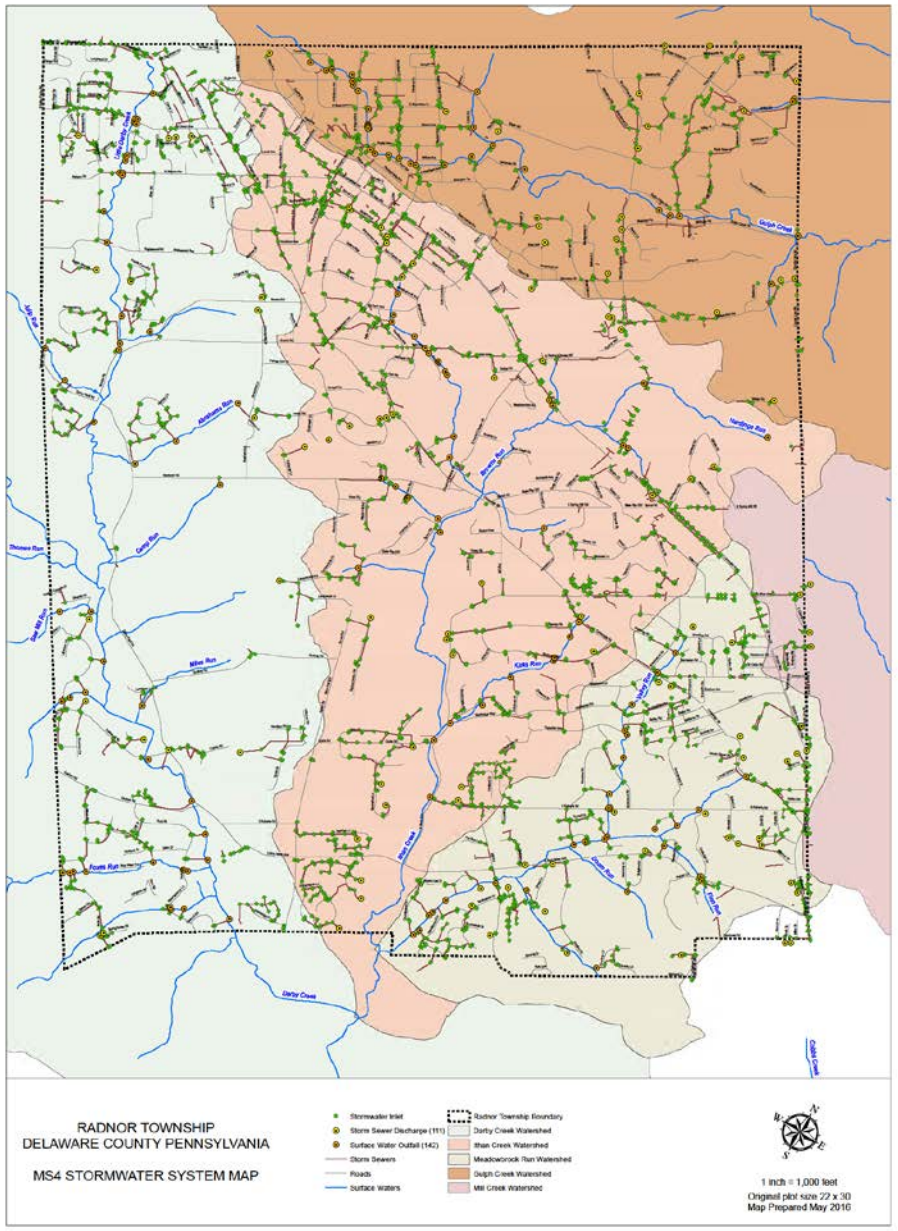
- Radnor must **estimate the pollutant load** from all areas that drain to a storm sewer
    - Pounds per year
- In each stream segment
    - Quantify pollutant load
    - **Identify Best Management Practices** to reduce the load per PaDEP guidelines
    - Reduce by 10% sediment, nutrients
- **Implement BMPs** within 5 years

New Built projects, retrofits, ordinance changes

Existing BMP projects can reduce load

PRP REQUIREMENTS

1. Map storm sewers and outfalls
2. Calculate pollutant load to each stream (focus on sediment)
3. Identify specific BMP projects and locations
4. Estimate the pollutant load reduction for each BMP project
5. Meet 10% Reduction: sediment
6. Implement projects within 5-year permit term
7. Maintenance



Pollutant Loads, Required Reduction

HUC 12	Waterway	Impervious (ac)	Pervious (ac)	Total Area (ac)	Impervious Sediment Load (lbs/yr)	Pervious Sediment Load (lbs/yr)	Total Load (lbs/yr)	Existing BMP (lbs/yr)	Net Load (lbs/yr)	Required 10% Reduction (lbs/yr)
Cobbs Creek Basin 020402020504	Cobbs Creek	12.8	11.5	24.3	23,546	3,045	26,591	0	26,591	2659.1
Plymouth Creek – Schuylkill River Basin 020402031007	Gulph Creek	186.1	504.0	690.2	342,307	133,553	475,860	147	475,713	47571.3
	Mill Creek	45.3	45.7	91.0	83,319	12,120	95,439	0	95,439	9543.9
Darby Creek Basin 020402020505	Saw Mill Run	3.9	8.9	12.9	7,243	2,370	9,614	0	9,614	961.4
	Browns Run	50.1	105.0	155.1	92,145	27,826	119,971	0	119,971	11997.1
	Abrahams Run	9.2	23.9	33.2	16,966	6,339	23,305	0	23,305	2330.5
	Miles Run	7.2	63.4	70.7	13,318	16,808	30,126	326	29,800	2980
	Glennbrook	14.2	13.0	27.2	26,098	3,435	29,533	0	29,533	2953.3
	Kirks Run	55.0	163.6	218.6	101,187	43,345	144,532	7,576	136,956	13695.6
	Meadowbrook Run	80.7	189.3	270.0	148,437	50,155	198,593	11,525	187,068	18706.8
	Little Darby Creek	147.2	217.6	364.8	270,706	57,650	328,356	4,464	323,892	32389.2
	Van Lear's Run	11.7	38.6	50.3	21,482	10,222	31,704	0	31,704	3170.4
	Darby Creek	47.6	178.3	225.9	87,509	47,251	134,760	0	134,760	13476
	Valley Run	95.7	146.2	242.0	176,050	38,746	214,796	0	214,796	21479.6
	Ithan Creek	367.2	813.6	1,180.8	675,350	215,562	890,912	20,617	870,295	87029.5
	Hardings Run	127.4	66.8	194.2	234,216	17,701	251,917	0	251,917	25191.7
	Foxes Run	18.6	71.9	90.5	34,258	19,042	53,300	0	53,300	5330
	Camp Run	3.76	14.12	17.89	6,923	3,742	10,665	0	10,665	1066.5
	Finn Run	14.67	39.43	54.10	26,975	10,447	37,423	0	37,423	3742.3
	Doom Run	0.69	1.24	1.92	1,263	327	1,590	0	1,590	159
	Wigwam Run	2.3	14.2	16.4	4,195	3,753	7,948	0	7,948	794.8
	TOTAL						3,116,935	44,655	3,072,280	307,228

PRP REQUIREMENTS

1. Map storm sewers and outfalls
2. Calculate pollutant load to each stream (focus on sediment)
3. **Identify specific BMP projects and locations**
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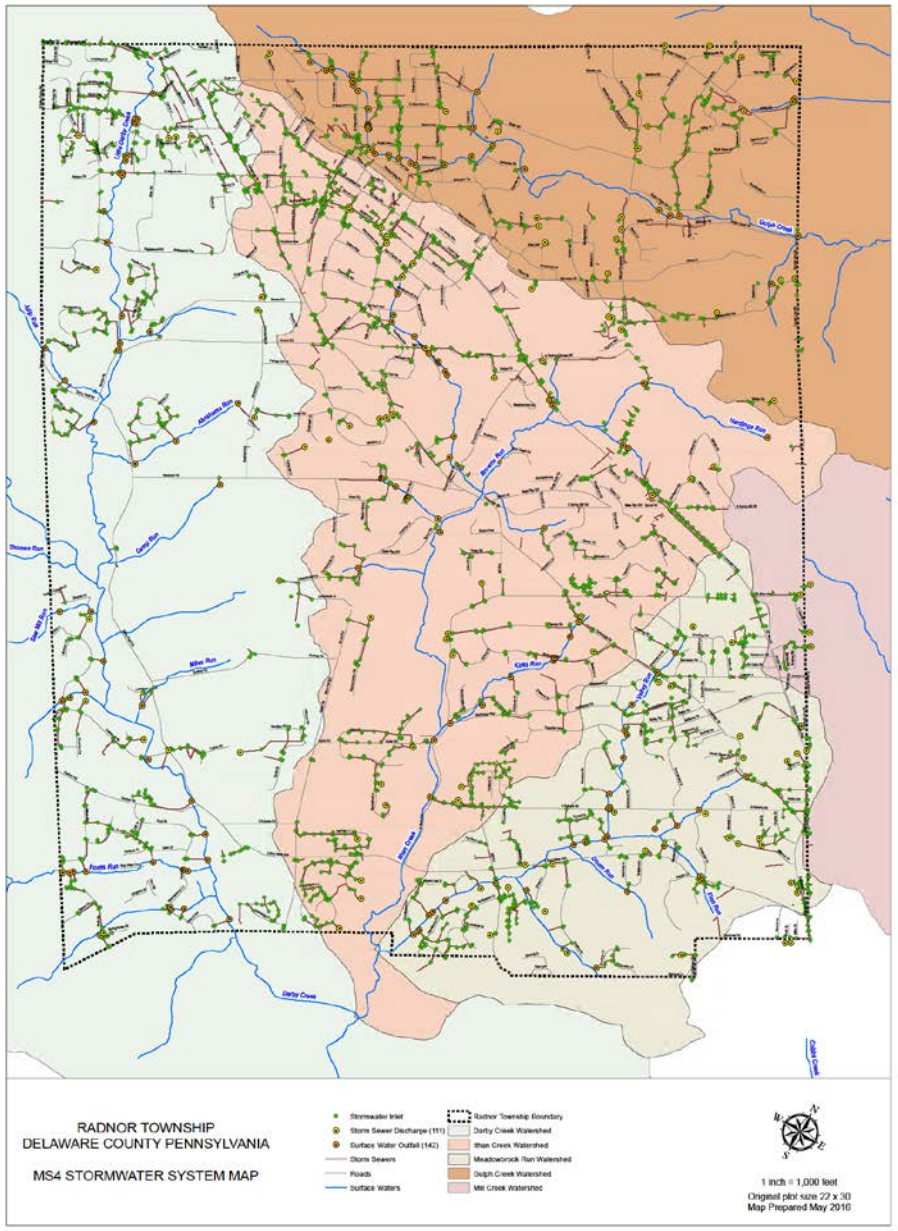


DIFFERENT BMPs HAVE DIFFERENT VALUES

Calculated as “percent reduction” sediment load

Stream Channel Restoration

- 44.88 Pounds / foot / year

Treatment

- Detention: 10%
- Extended detention 60%
- Retrofit existing basins

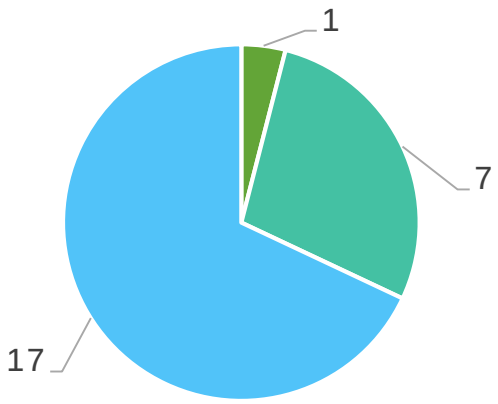
Infiltration

- Porous pavement 85 %
- Bioretention B soils 90%

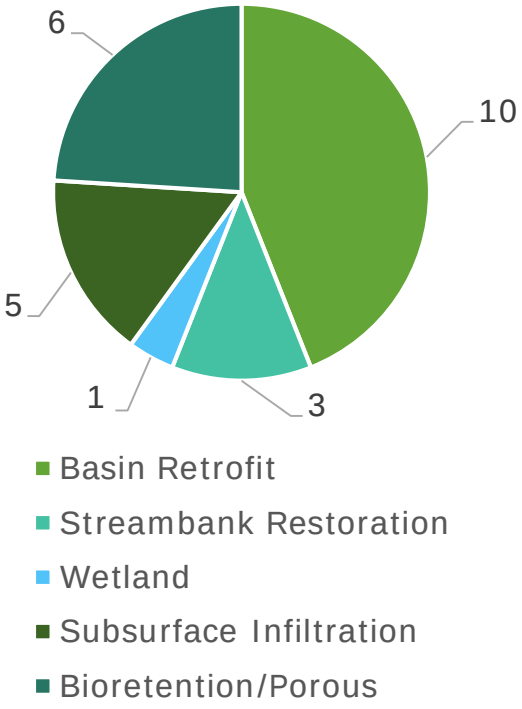
PROPOSED BMP SUMMARY: 25 Total

124% Pollutant Load Reduction

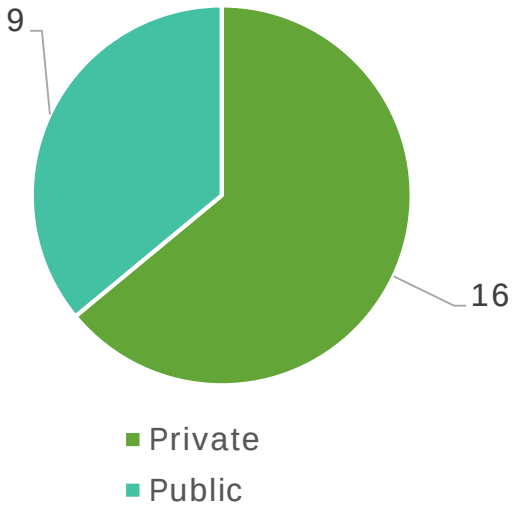
Number of BMPs



Type of BMP



Ownership of BMPs



POLLUTANT REDUCTION PLAN DRAFT

Summary of Results

HUC 12	Waterway	Total Load (lbs/yr)	Existing BMP (lbs/yr)	Required Reduction (lbs/yr)	BMP Load Reduction (lbs/yr)	Reduction %	HUC 12 Reduction %
Cobbs Creek (HUC: 020402020504)	Cobbs Creek	26,591	0	2659.1	8,948	34	34
Plymouth Creek – Schuylkill River (HUC: 020402031007)	Gulph Creek	475,860	147	47571.3	68,563	14	12
	Mill Creek	95,439	0	9543.9	0	0	
Darby Creek (HUC: 020402020505)	Saw Mill Run	9,614	0	961.4	0	0	14
	Browns Run	119,971	0	11997.1	0	0	
	Abrahams Run	23,305	0	2330.5	0	0	
	Miles Run	30,126	326	2980	0	0	
	Glennbrook	29,533	0	2953.3	0	0	
	Kirks Run	144,532	7,576	13695.6	10,500	7	
	Meadowbrook Run	198,593	11,525	18706.8	23,824	12	
	Little Darby Creek	328,356	4,464	32389.2	92,447	28	
	Van Lear's Run	31,704	0	3170.4	0	0	
	Darby Creek	134,760	0	13476	0	0	
	Valley Run	214,796	0	21479.6	0	0	
	Ithan Creek	890,912	20,617	87029.5	188,385	21	
	Hardings Run	251,917	0	25191.7	40,182	16	
	Foxes Run	53,300	0	5330	0	0	
	Camp Run	10,665	0	1066.5	0	0	
	Finn Run	37,423	0	3742.3	0	0	
	Doom Run	1,590	0	159	0	0	
	Wigwam Run	7,948	0	794.8	0	0	
Total		3,116,935	44,655	307,280	432,849	14	

PRP REQUIREMENTS

1. Map storm sewers and outfalls
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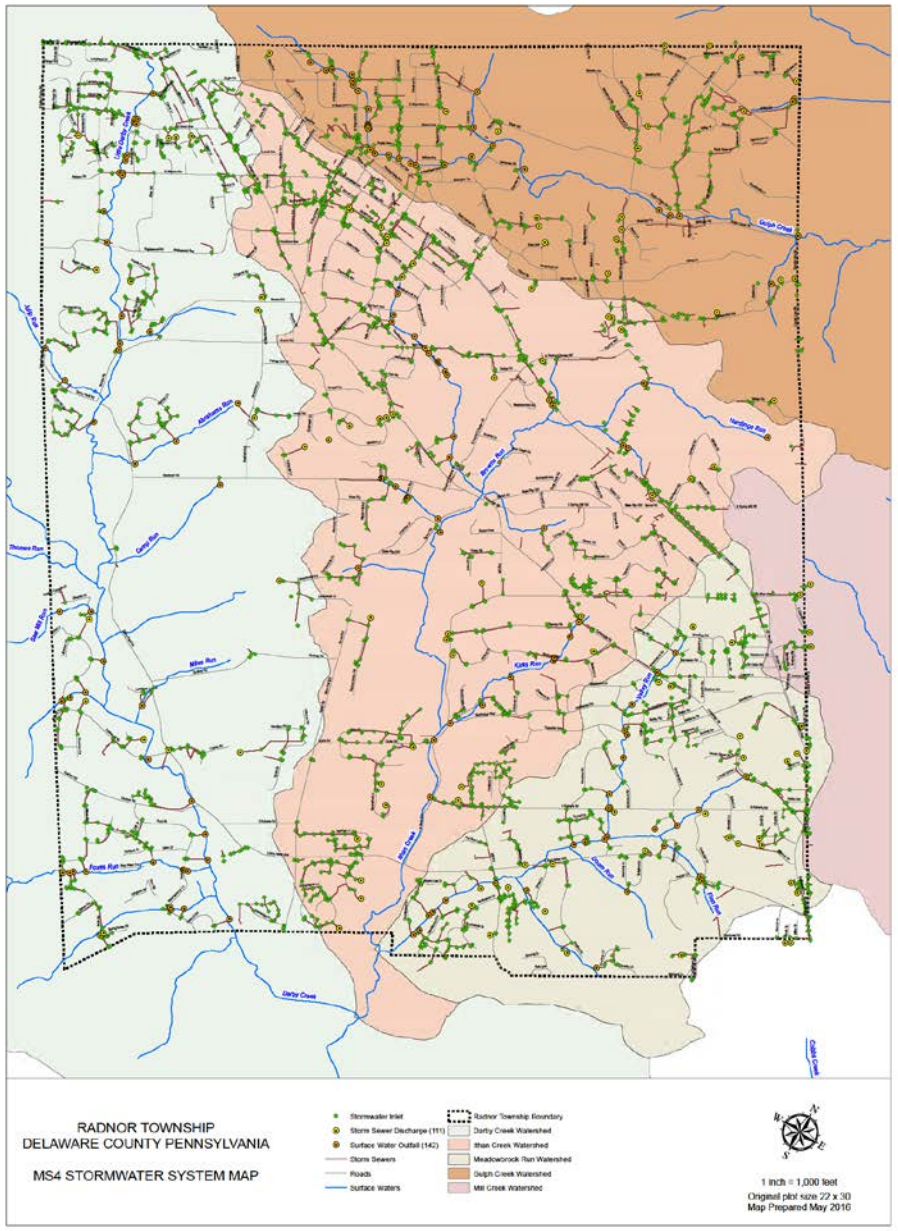


NEXT STEPS: SELECT PROJECTS

- Efficiency of Cost for Load Reduction
- Access and Feasibility (Public or Private Property)

NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
- **Access and Feasibility (Public or Private Property)**

	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M

NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
- **Access and Feasibility (Public or Private Property)**

	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M
2. Stream Restoration – 3 projects	45%	$1.6 M
TOTAL	73%	$2.34M

NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
- **Access and Feasibility (Public or Private Property)**

	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M
2. Stream Restoration – 3 projects	45%	$1.6 M
3. West Wayne Wooded Wetland	7.5%	$0.71M
TOTAL	80.5%	$3.05M

NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
- **Access and Feasibility (Public or Private Property)**

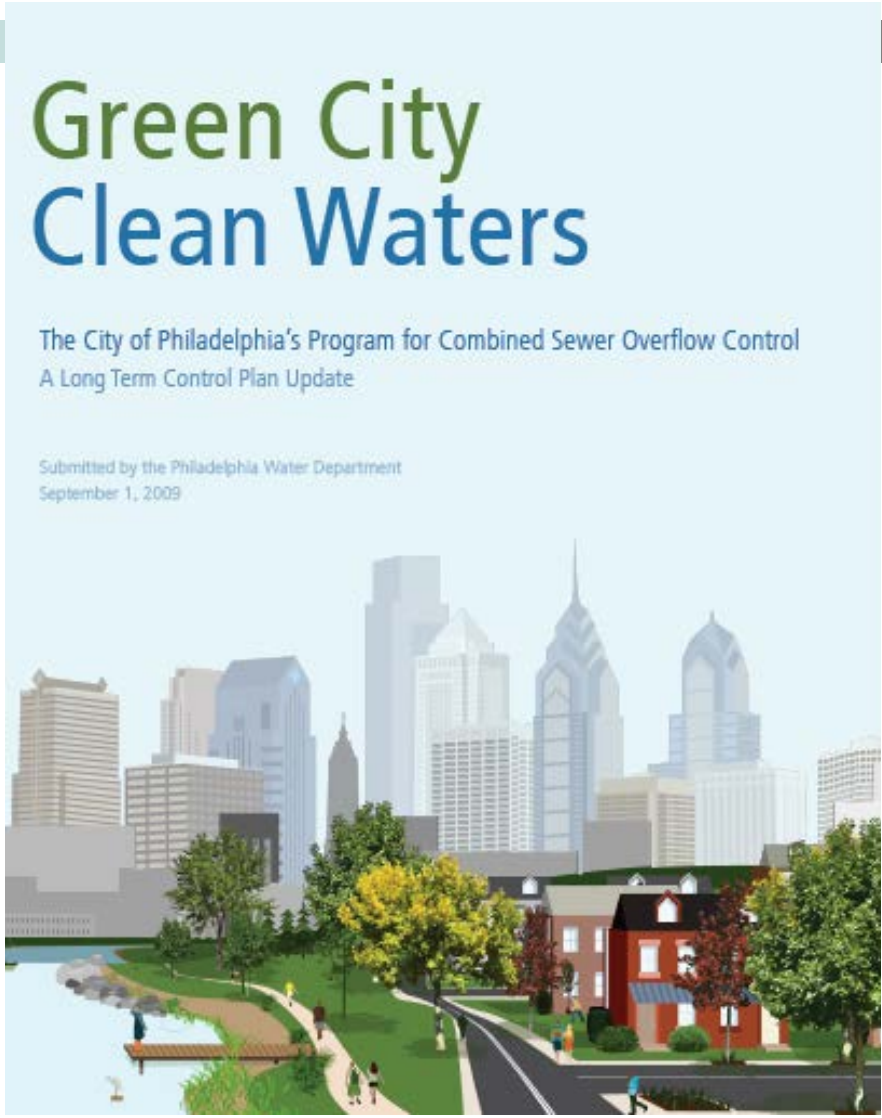
	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M
2. Stream Restoration – 3 projects	45%	$1.6 M
3. West Wayne Wooded Wetland	7.5%	$0.71M
4. Villanova improvements	6.1%	$ 0
TOTAL	86.6%	$3.05M

STORMWATER ORDINANCE

All New and Redevelopment

- All projects manage volume 1.5”
- Does not matter if site was impervious – no grandfathering
- Improving water quality through redevelopment

IMPROVE WATER QUALITY AS PART OF REDEVELOPMENT



NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
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	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M
2. Stream Restoration – 3 projects	45%	$1.6 M
3. West Wayne Wooded Wetland	7.5%	$0.71M
4. Villanova improvements	6.1%	$ 0
5. Bioretention – Radwyn Apartments	1%	$1.2M
TOTAL	**87.7%**	**$4.25M**

NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
- **Access and Feasibility (Public or Private Property)**

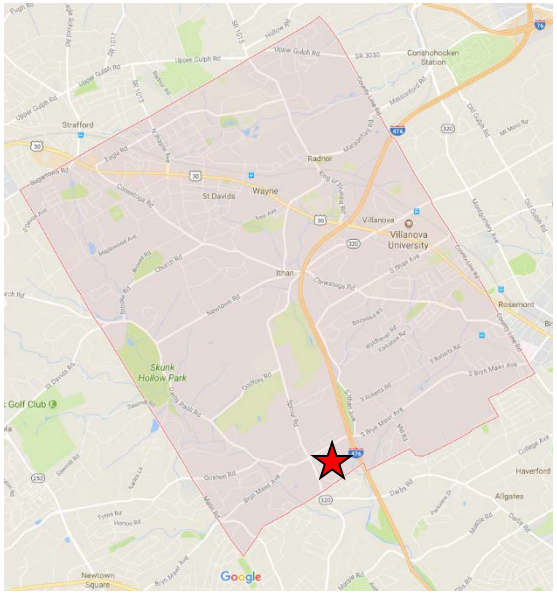
	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M
2. Stream Restoration – 3 projects	45%	$1.6 M
3. West Wayne Wooded Wetland	7.5%	$0.71M
4. Villanova improvements	6.1%	$ 0
5. Bioretention – Radwyn Apartments	1%	$1.2M
6. Retrofit Lincoln Financial	12%	$3.1M
TOTAL	**99.6%**	**$7.35M**

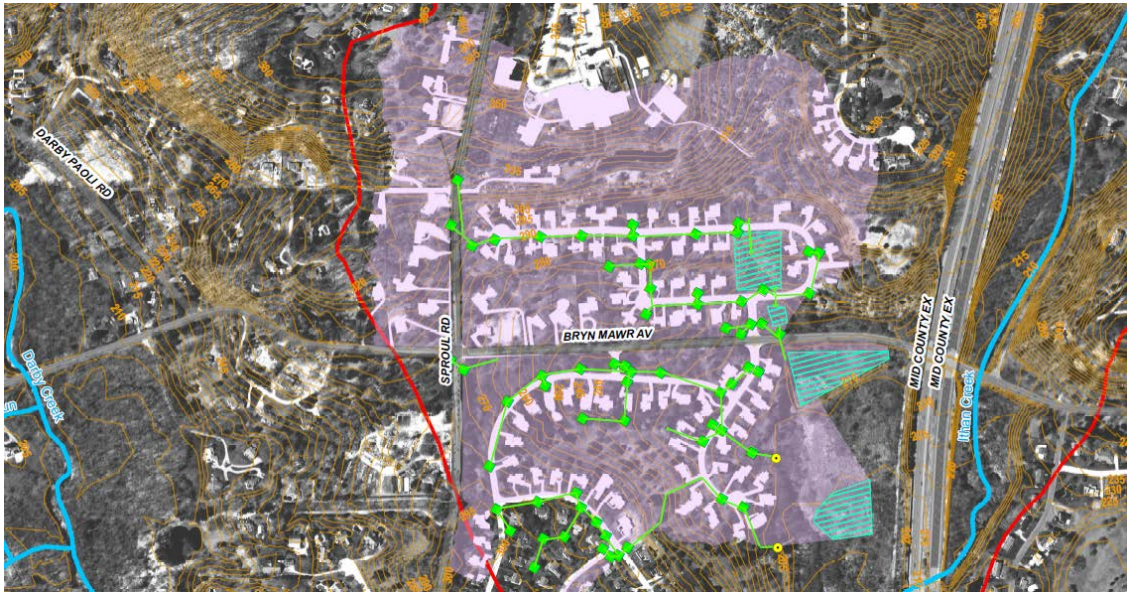
BASIN RETROFITS – 10 PROJECTS

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Cornerstone and Hills of Bryn Mawr Basin Retrofit	Cornerstone Dr.	Basin Retrofit	108.39	18	36,212





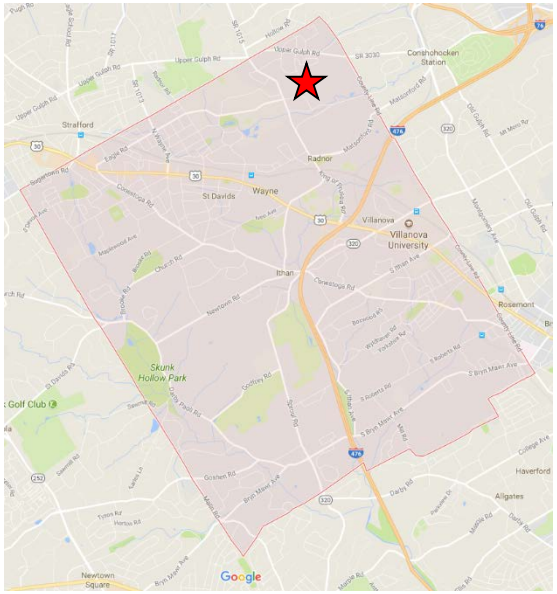
Retrofitting Suburban Basins: Hold 1”

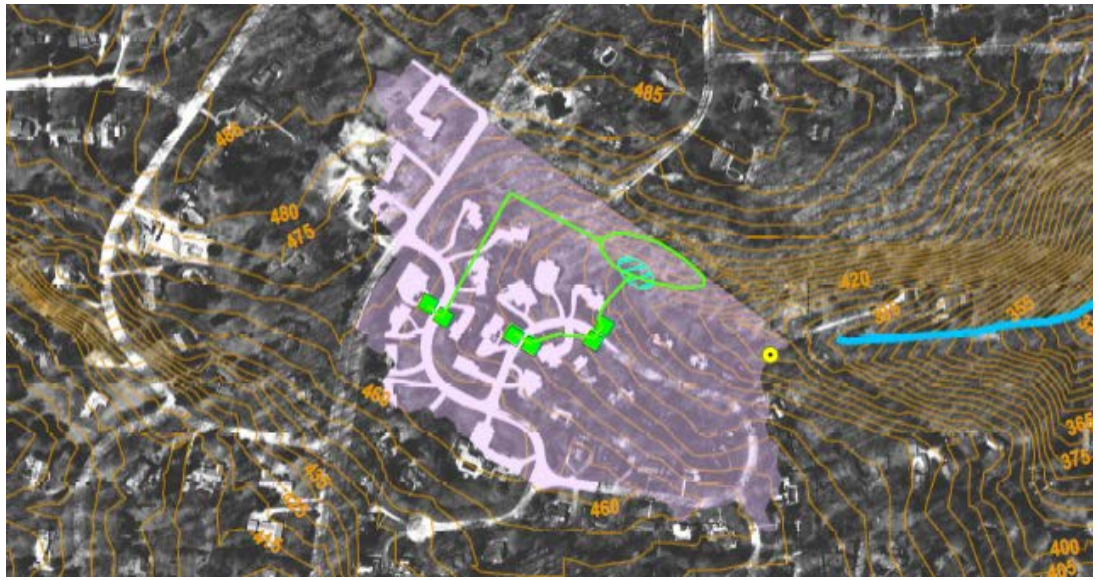
Retrofitting Suburban Basins: Hold 1”

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Woods Lane Subdivision Basin 1 Retrofit	Woods Ln.	Basin Retrofit	12.99	27	5,390

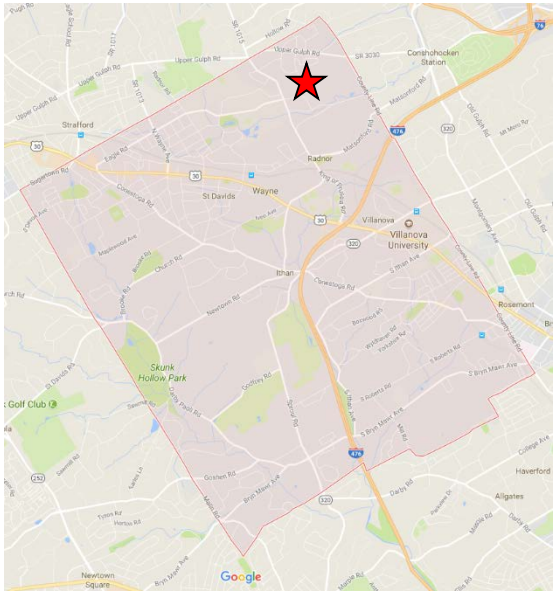


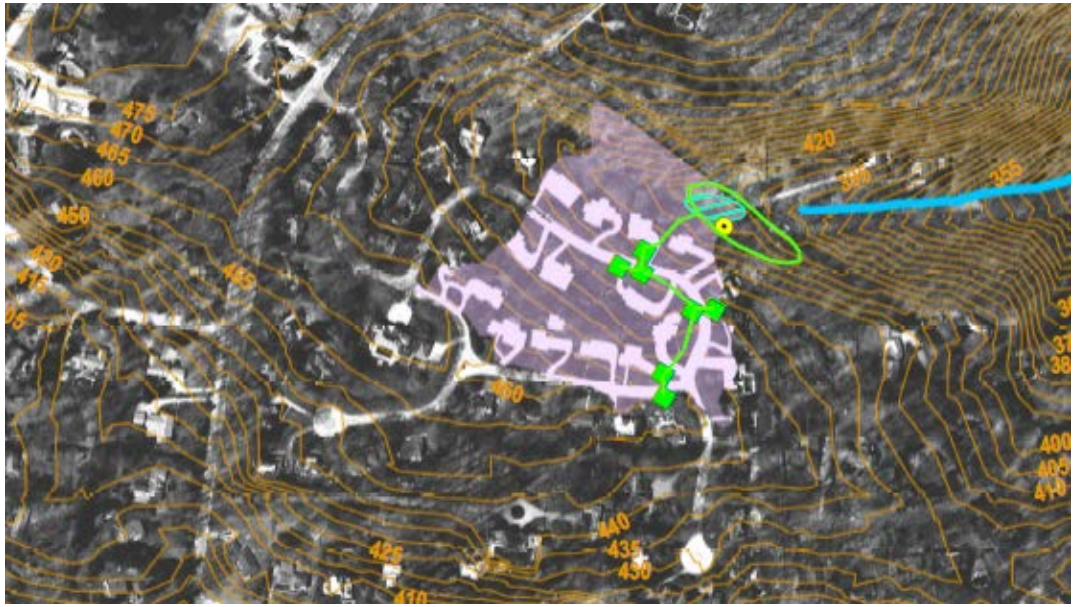


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Woods Lane Subdivision Basin 2 Retrofit	Woods Ln.	Basin Retrofit	8.09	28	3,444

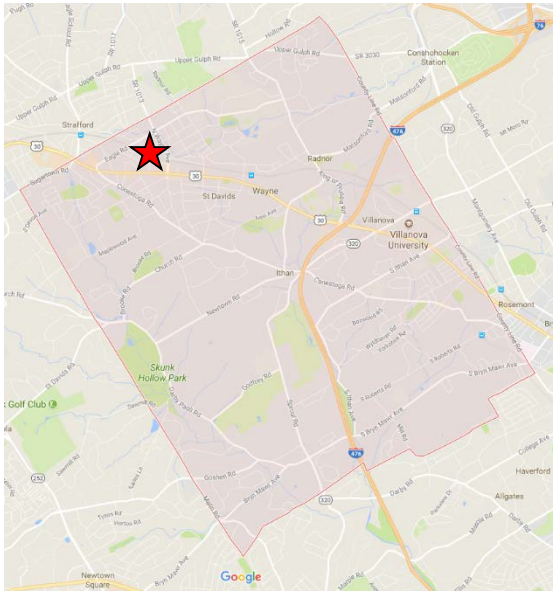


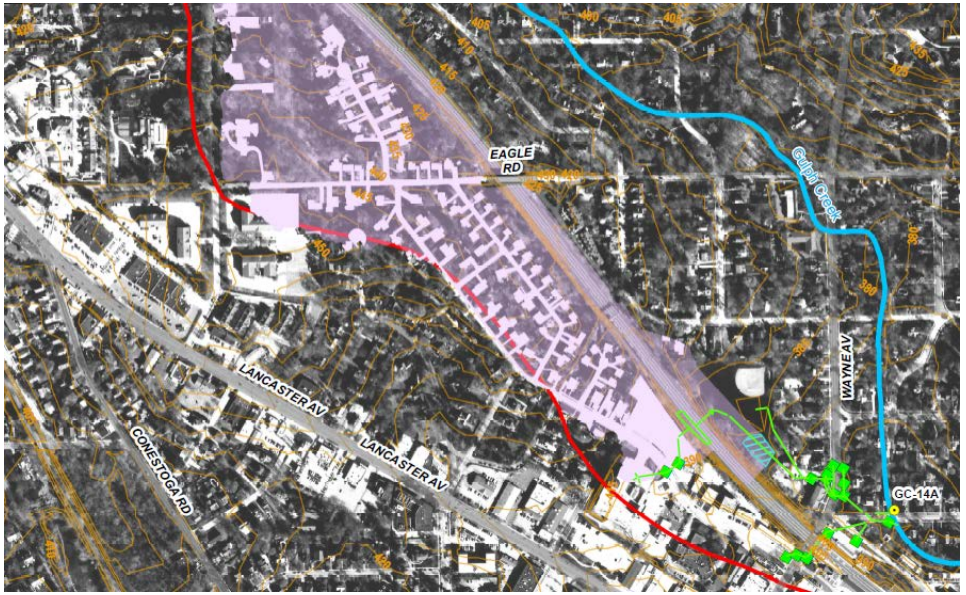


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
North Wayne Field Basin Retrofit	North Wayne Ave.	Basin Retrofit	43.44	25	17,258

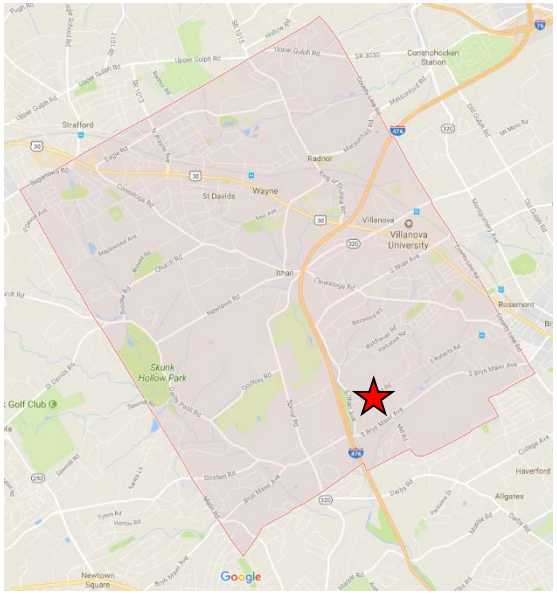




POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

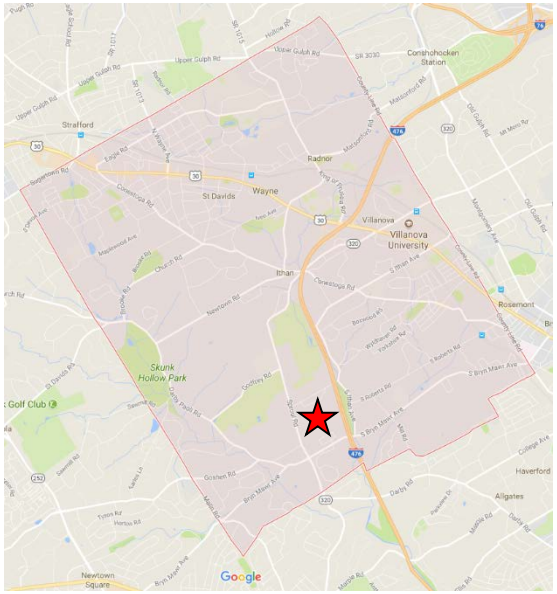
BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Portledge Subdivision Basin Retrofit	Portledge Dr.	Basin Retrofit	5.52	26	2,223

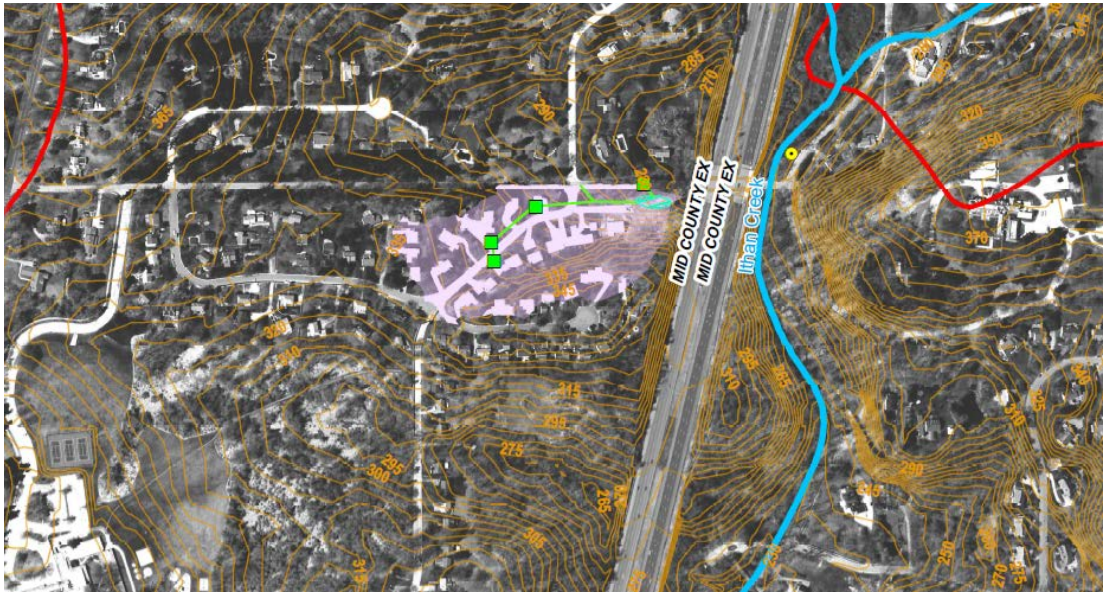


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Haymarket Subdivision Basin Retrofit	Haymarket Ln.	Basin Retrofit	8.15	30	3,603

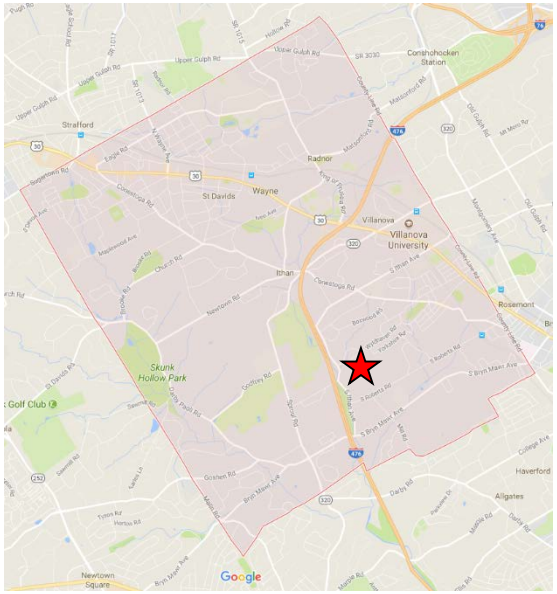


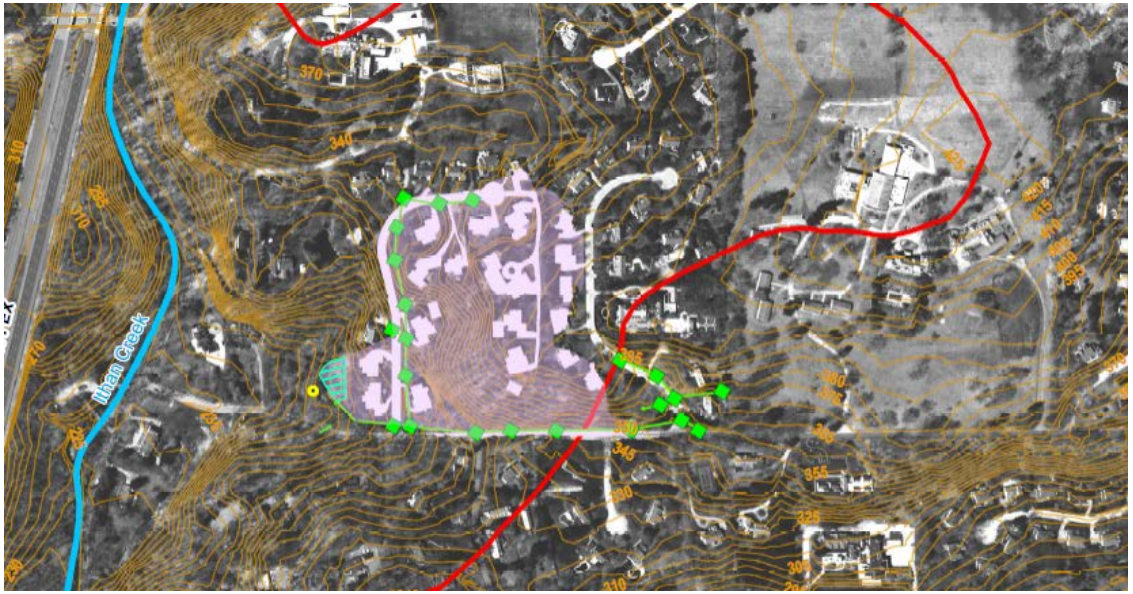


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Haviland Subdivision Basin Retrofit	Haviland Dr.	Basin Retrofit	15.08	27	6,263

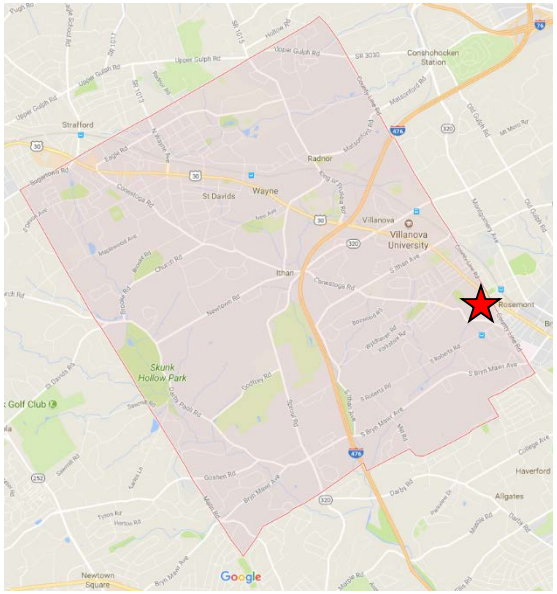


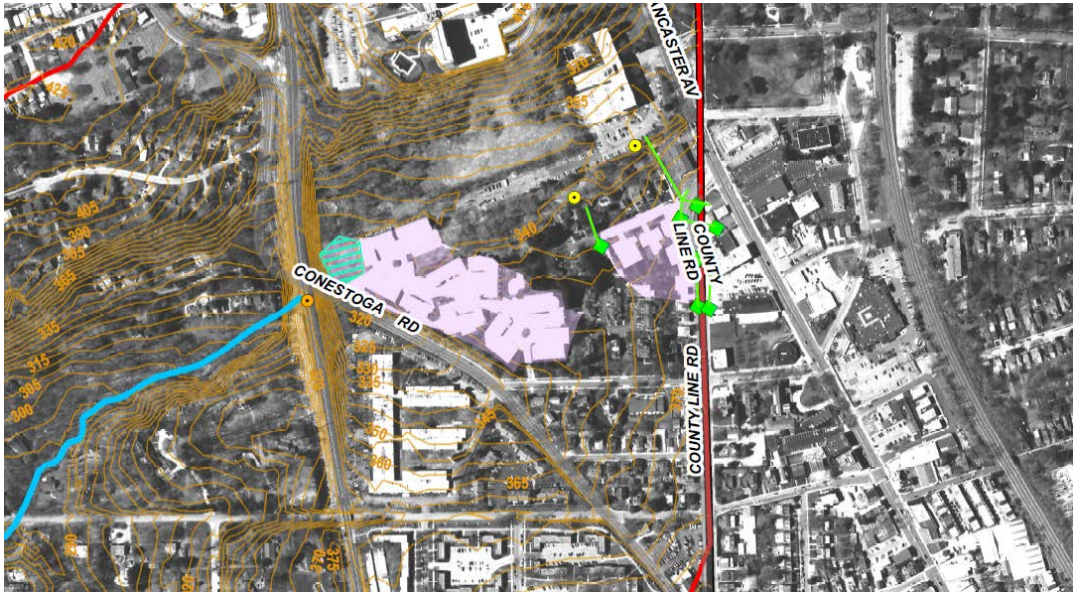


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Montrose Condominiums Basin Retrofit	Montrose Ave.	Basin Retrofit	7.95	64	6,092

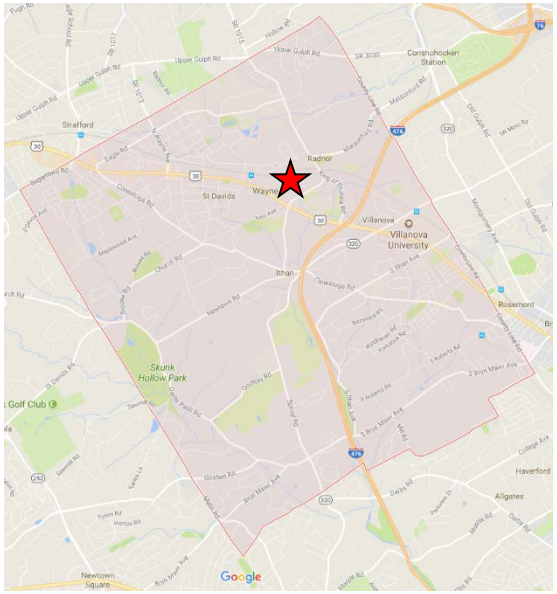


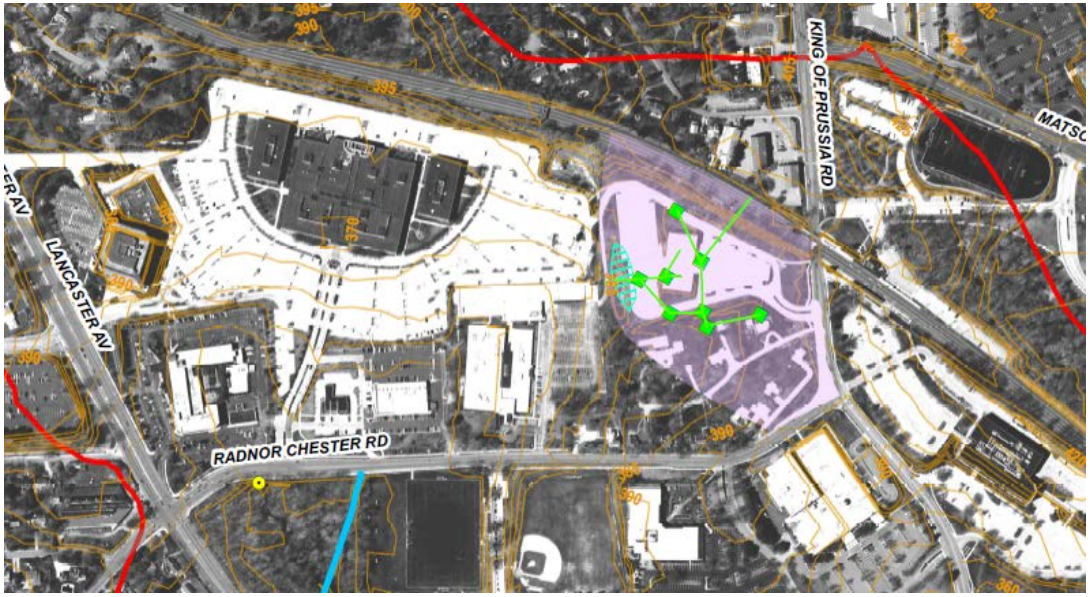


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
KTM&C, LLP Basin Retrofit	King of Prussia Rd.	Basin Retrofit	12.90	37	6,633

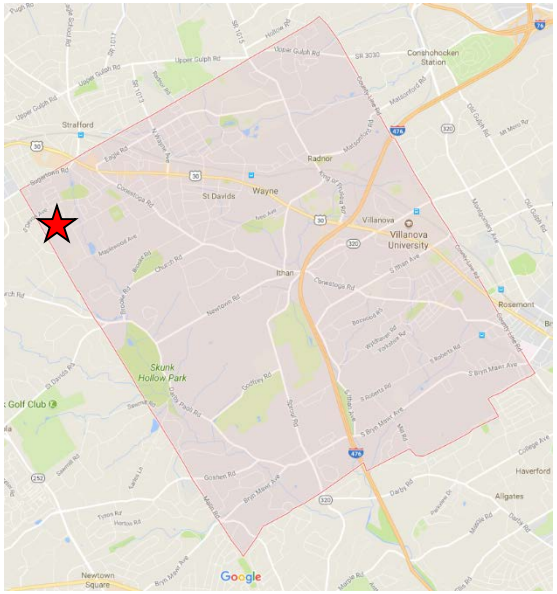




POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Devon Square Subdivision Basin Retrofit	Eaton Dr.	Basin Retrofit	19.22	36	9,650

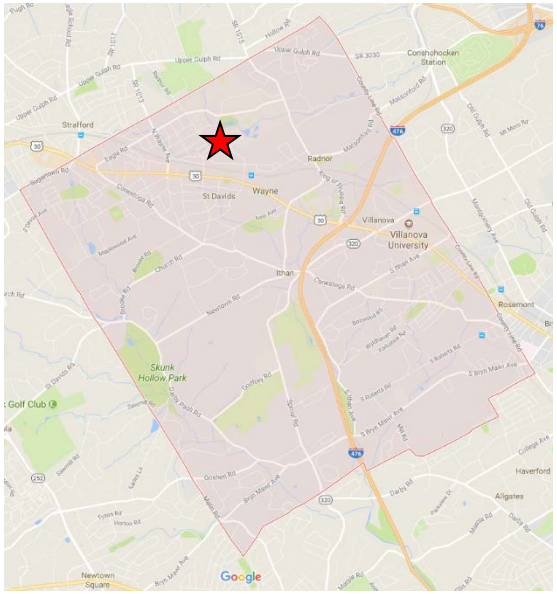


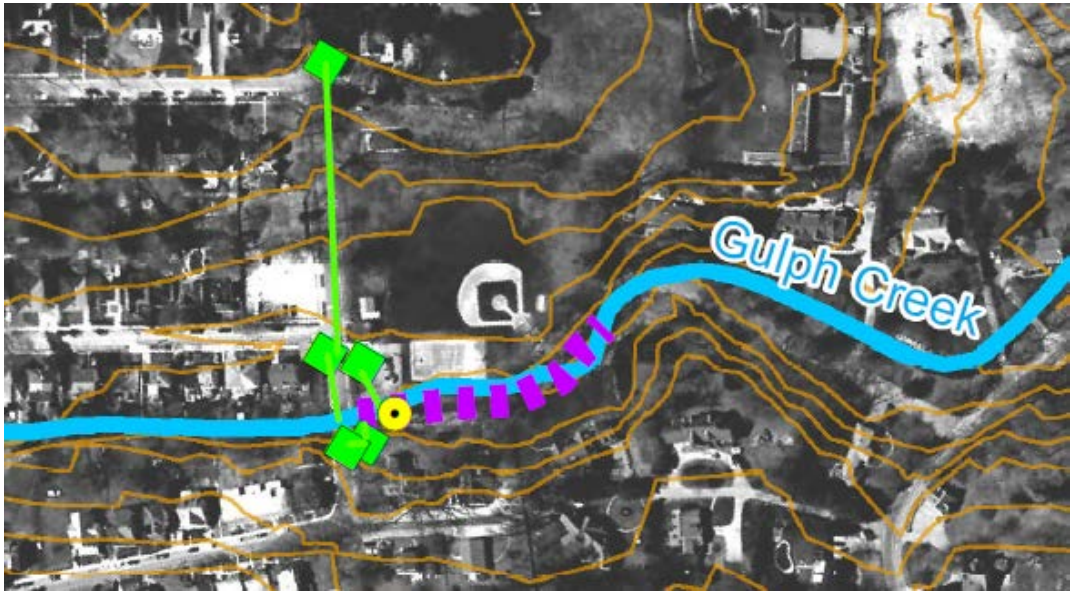
STREAM RESTORATION– 3 PROJECTS

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Cowan Park Stream Restoration	Radnor Street Rd.	Stream Restoration	NA – 374 ft	NA	16,785





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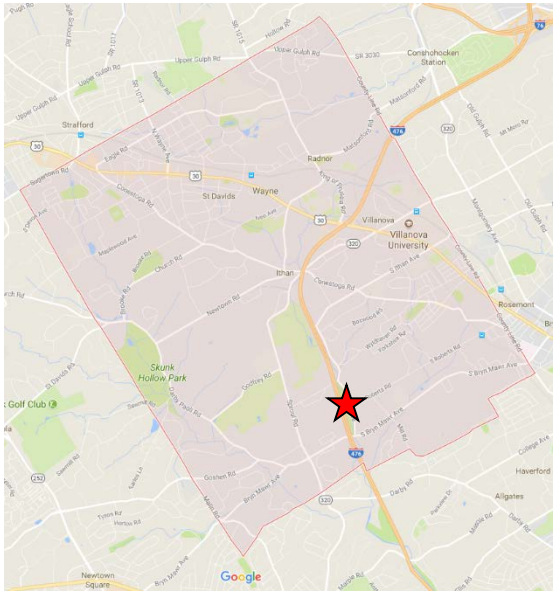
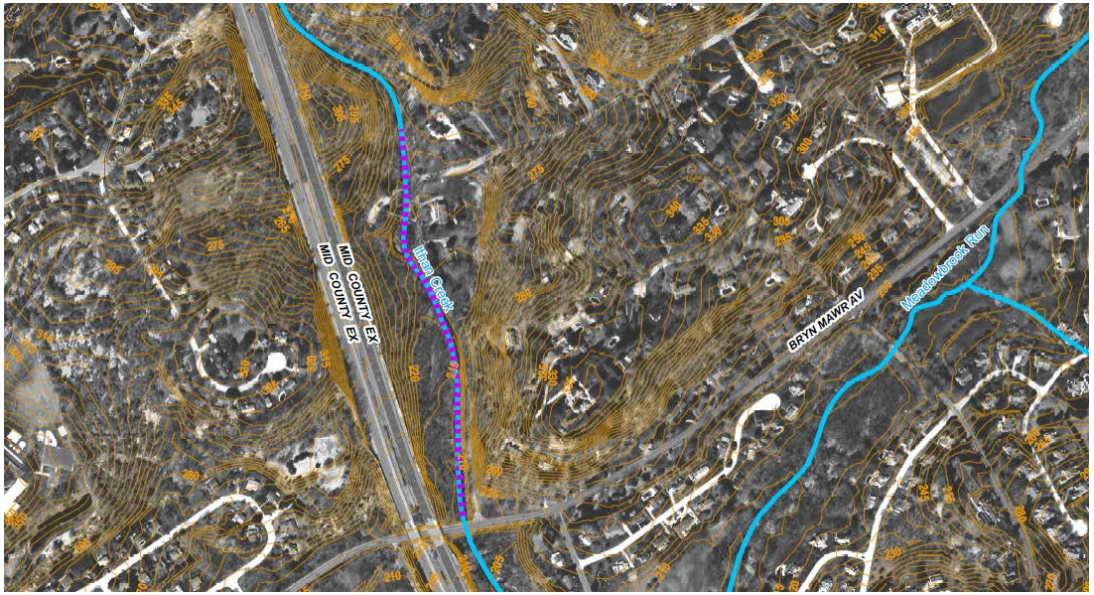
Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Ithan Valley Park Stream Restoration	S. Ithan Ave.	Stream Restoration	NA – 2000 ft	NA	89,760

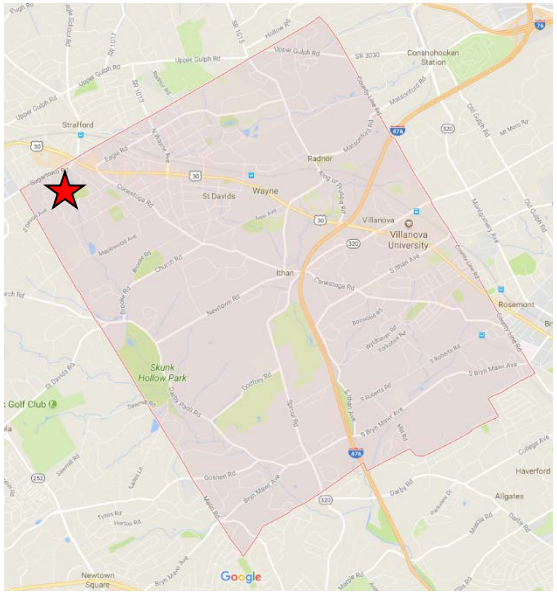




POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Warren Filipone Memorial Park Stream Restoration	S. Devon Ave.	Stream Restoration	NA – 704 ft	NA	31,596

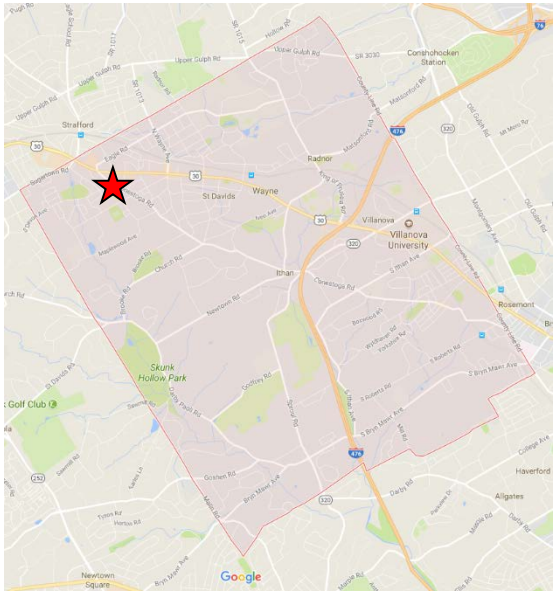


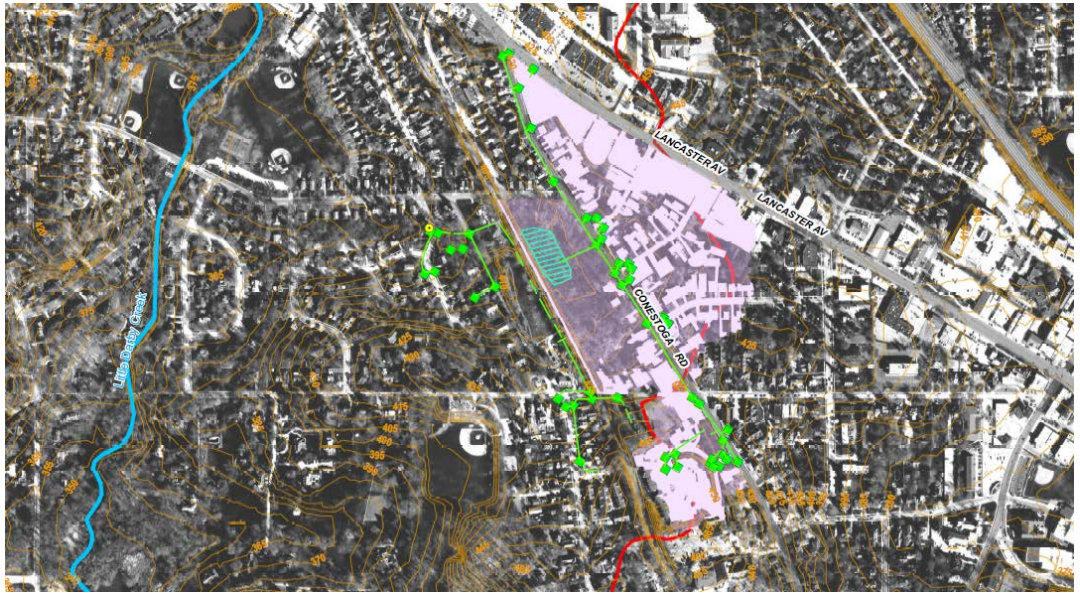
WOODED WETLAND– 1 PROJECT

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
West Wayne Preserve Wetland	Conestoga Rd.	Wetland	37.70	48	23,135



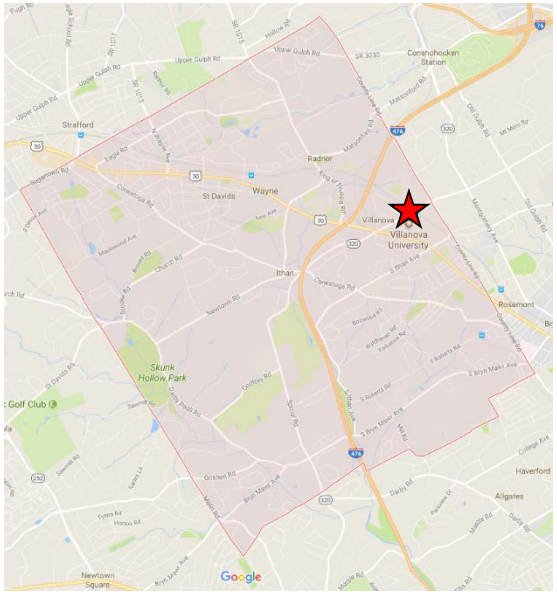


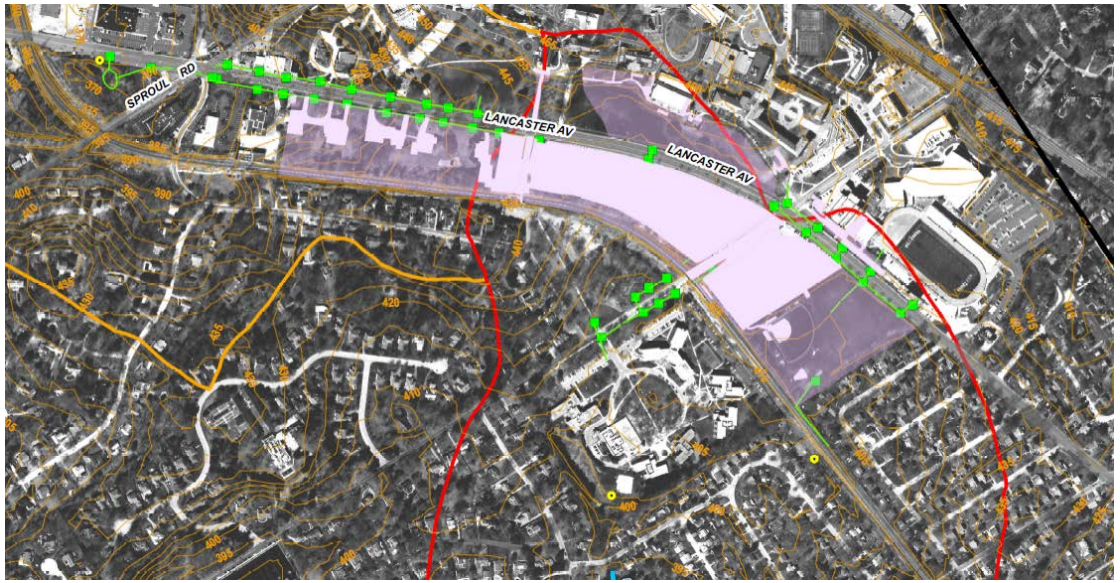
VILLANOVA

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Villanova Campus Improvements	Lancaster Ave.	Infiltration	20.78	69	18,763



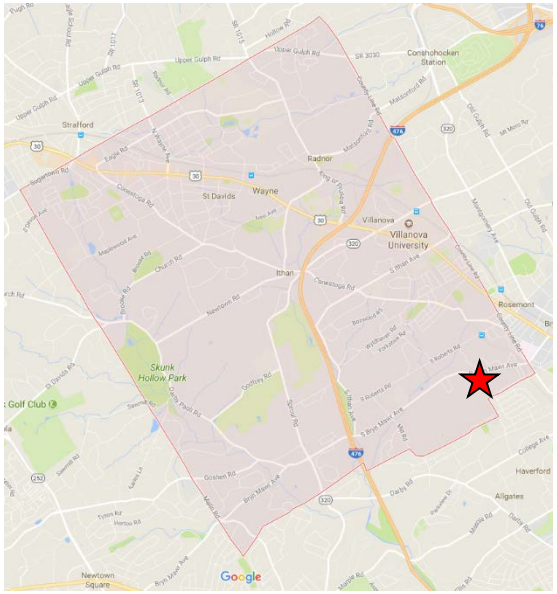


BIORETENTION –RADWYN APARTMENTS

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Cobbs Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Radwyn Apartments Raingarden / Bioretention	275 S. Bryn Mawr Ave.	Raingarden/ Bioretention	9.09	56	8,948

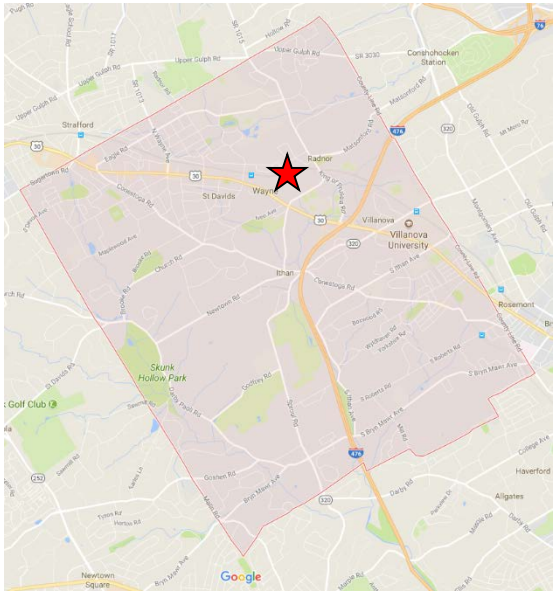


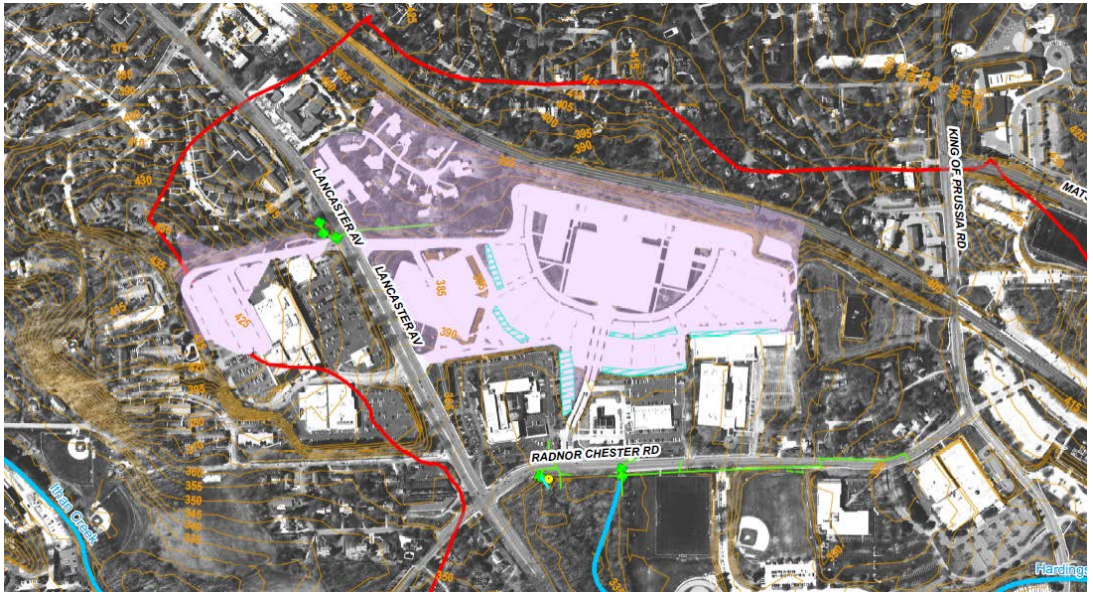
POROUS PAVEMENT AND INFILTRATION

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Lincoln Financial Porous Parking Retrofit	Radnor Chester Rd.	Porous Paving / Infiltration	49.91	61	33,549





NEXT STEPS: SELECT PROJECTS

- **Efficiency of Cost**
- **Access and Feasibility (Public or Private Property)**

	Load Reduction	Cost
1. Retrofit 10 Existing Detention Basins	28%	$0.74M
2. Stream Restoration – 3 projects	45%	$1.6 M
3. West Wayne Wooded Wetland	7.5%	$0.71M
4. Villanova improvements	6.1%	$ 0
5. Bioretention – Radwyn Apartments	1%	$1.2M
6. Retrofit Lincoln Financial	12%	$3.1M
TOTAL	**99.6%**	**$7.35M**

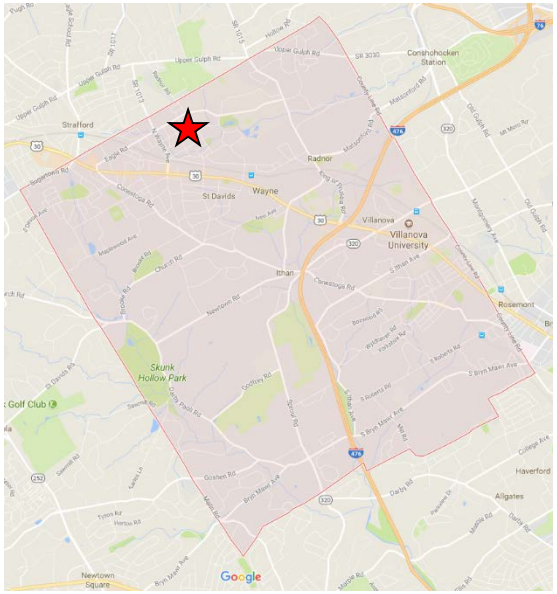
SEQUENCE OF EVENTS AND NEXT STEPS

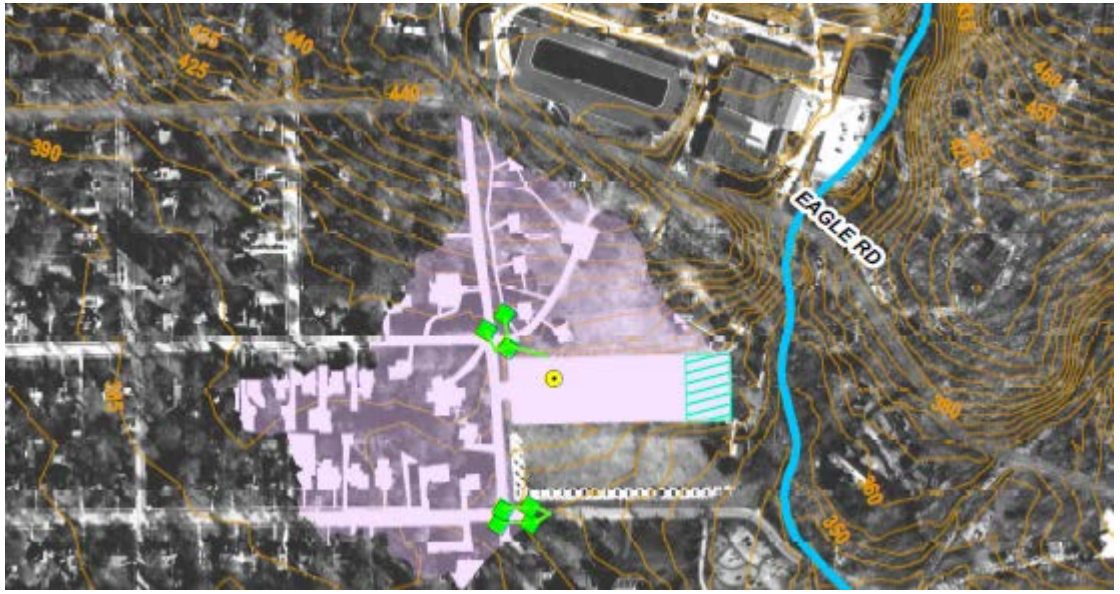
- ✓ Complete DRAFT PRP – Released August 2, 2017
- ❑ Public Comment – 30 days
  - Develop Cost Estimates, Schedule, and Priorities
- ❑ September 16, 2017 – Submit PRP and Notice of Intent (NOI or permit application) to PaDEP
- ❑ Begin Project Implementation
- ❑ Ordinance Work
- ❑ Six MCMs – Outfall Sampling, Training
- ❑ Revise and Update PRP by September 2018

POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Eastern University West Campus Lot Raingarden	Radnor Rd.	Raingarden/ Bioretention	17.27	40	13,125

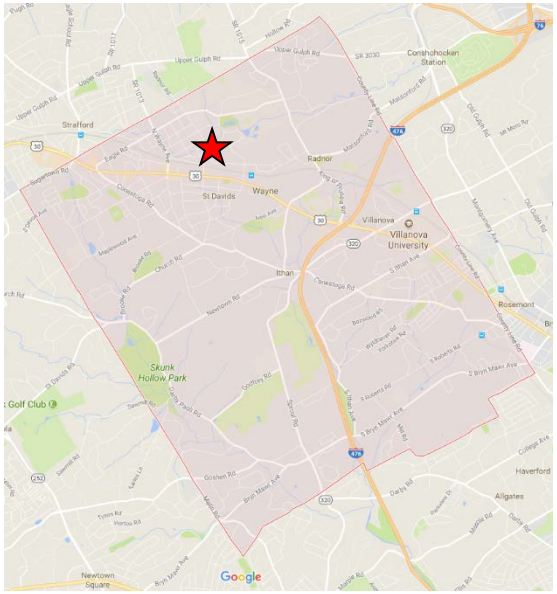




POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

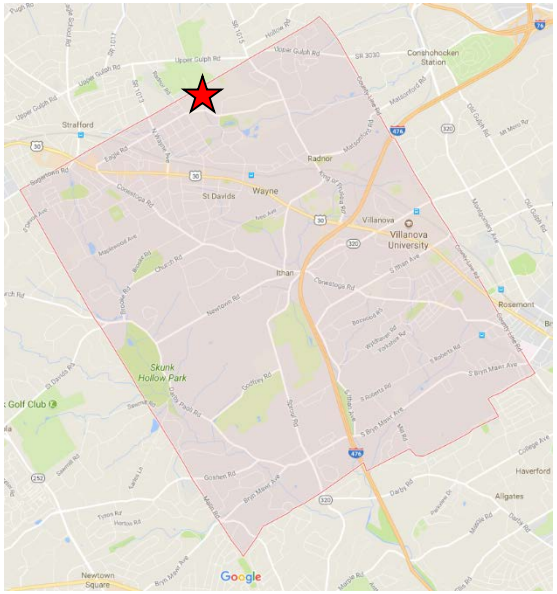
BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Township Parking	259 Willow Ave.	Porous paving / Infiltration	4.83	33	3,223

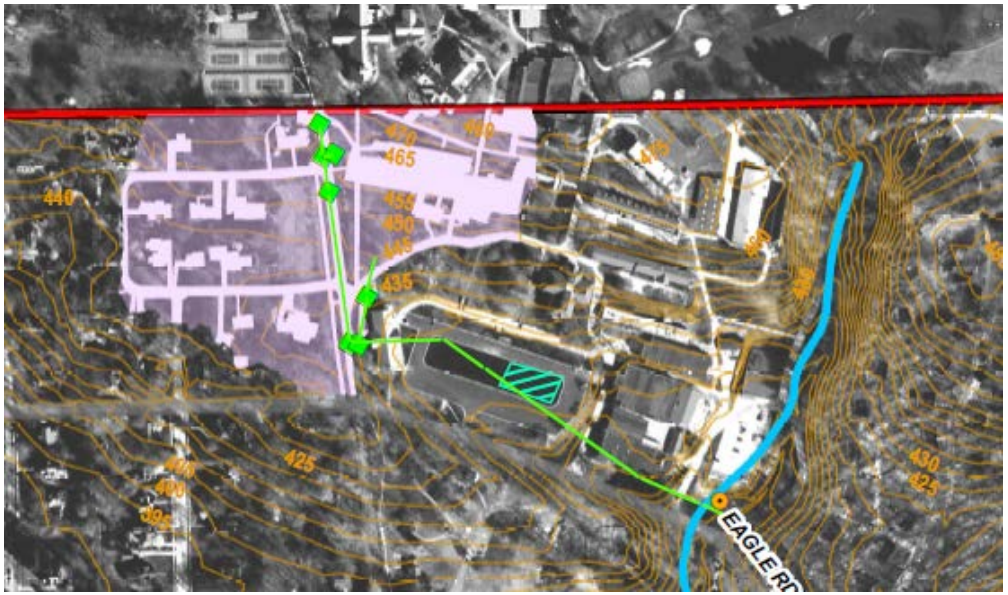


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Plymouth Creek – Schuylkill River

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Valley Forge Military Academy	Eagle Rd.	Porous Paving / Infiltration	13.39	35	9,338

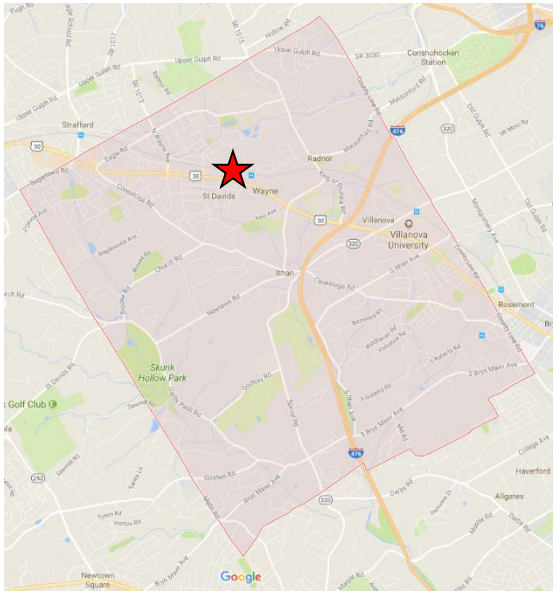


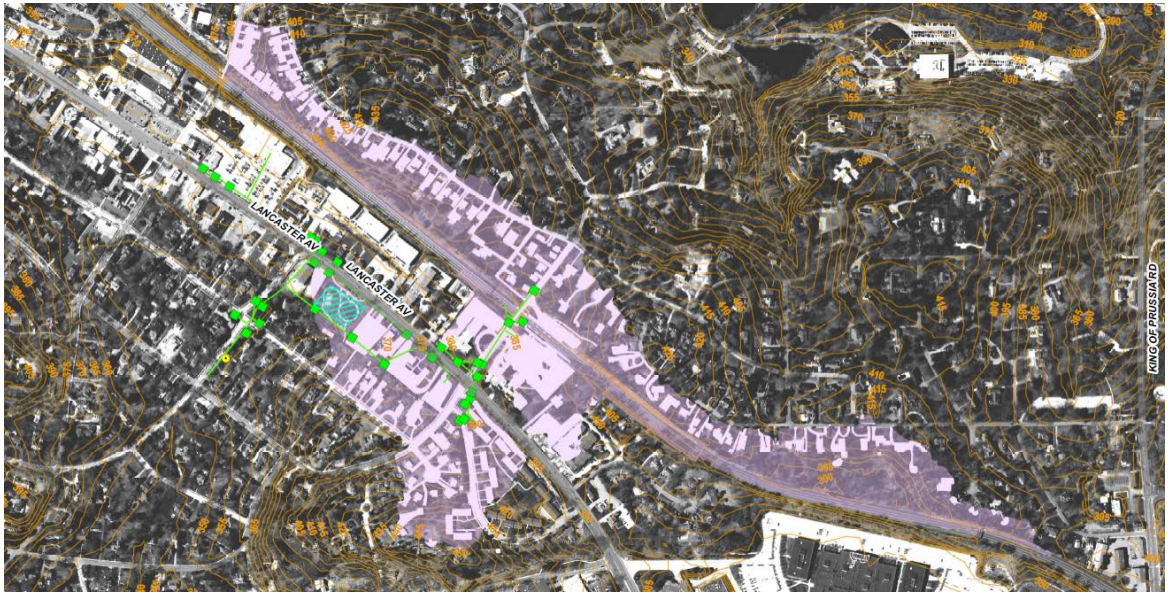


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Veterans Memorial Park Subsurface Infiltration	406 E. Lancaster Ave.	Subsurface Storage Module	70.35	35	31,561

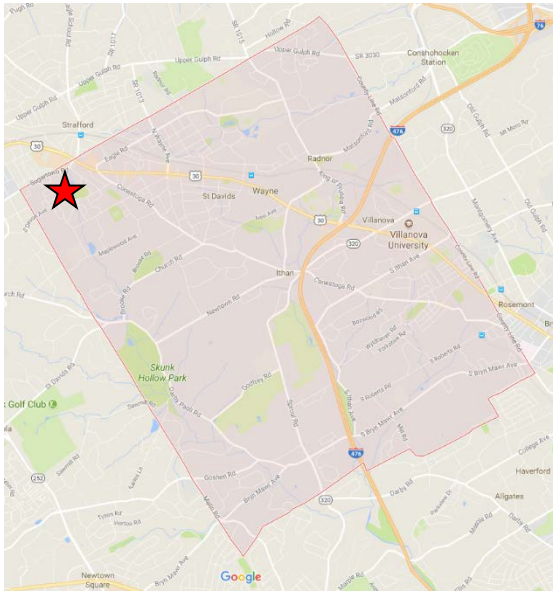


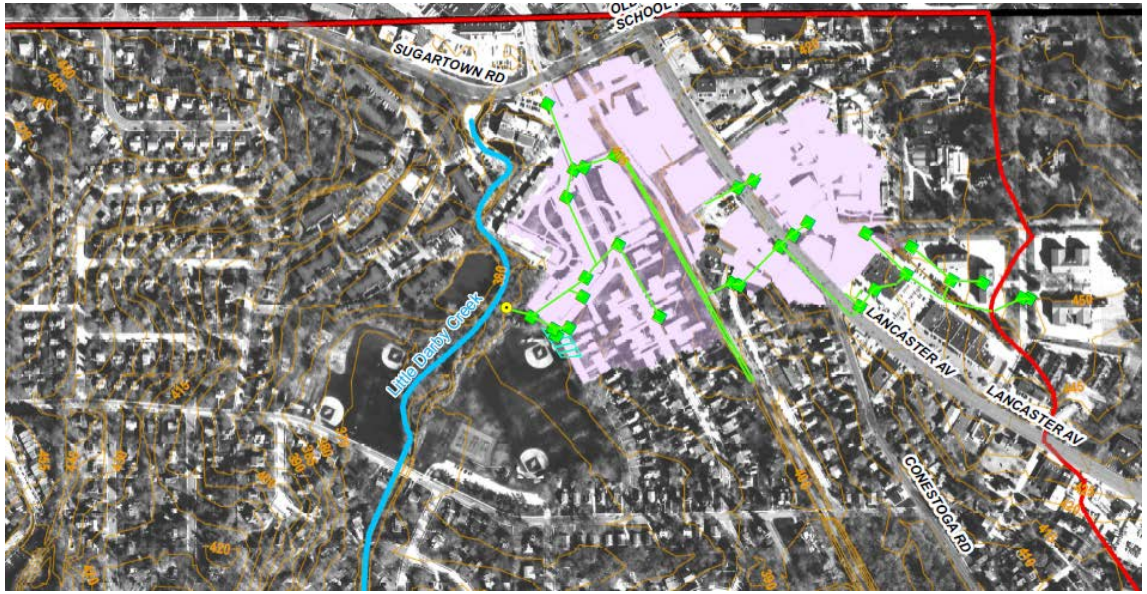


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Warren Filipone Memorial Park Subsurface Infiltration	S. Devon Ave.	Subsurface Storage Module	25.44	70	20,381

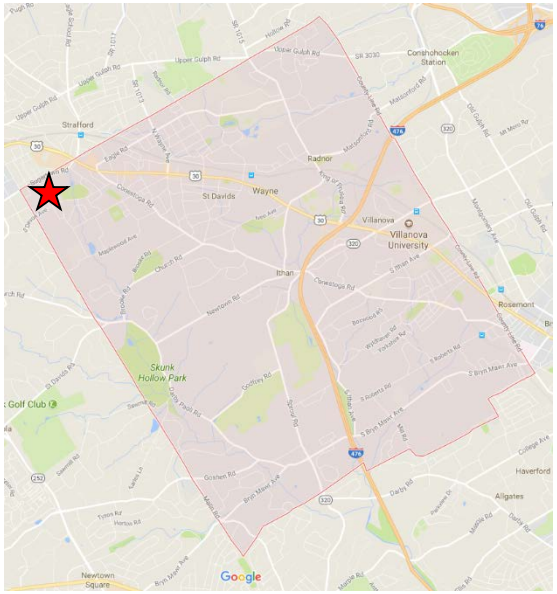


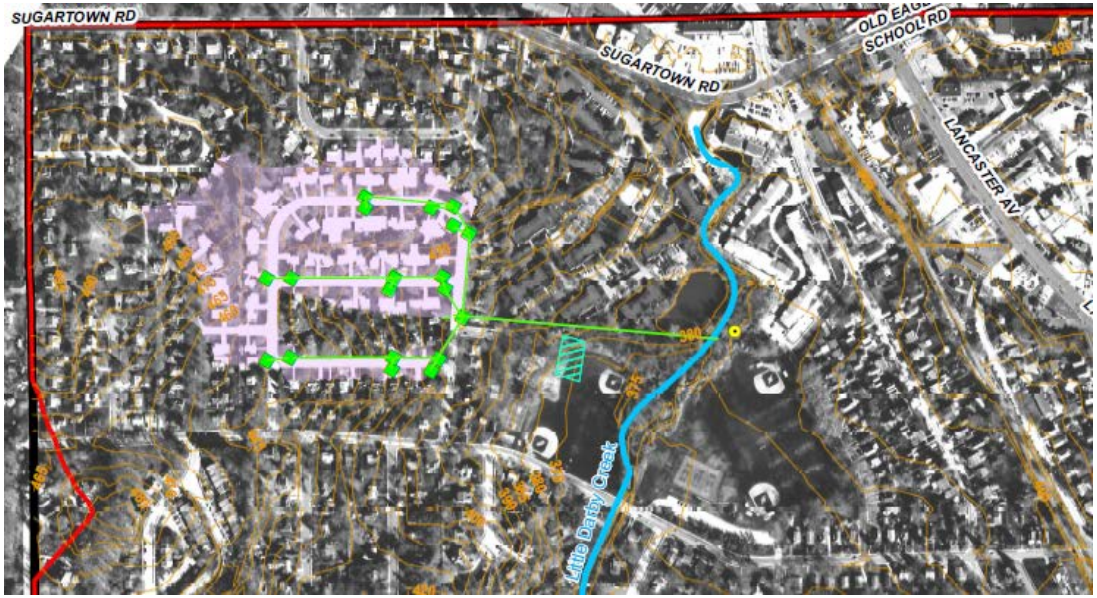


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Bo Connor Park Subsurface Infiltration	S. Devon Ave.	Subsurface Storage Module	15.74	39	7,685

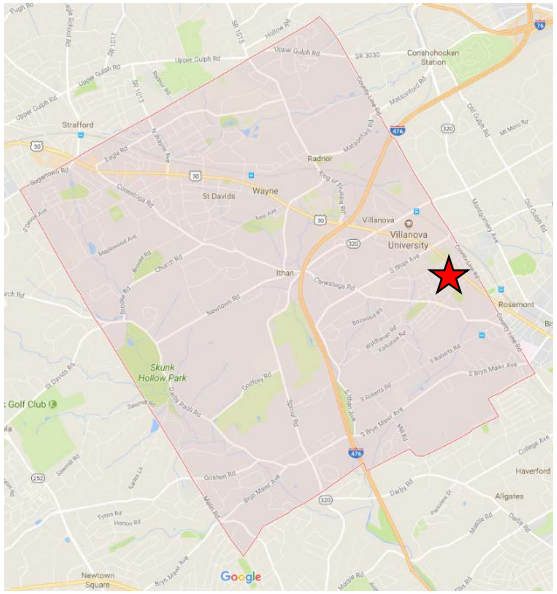


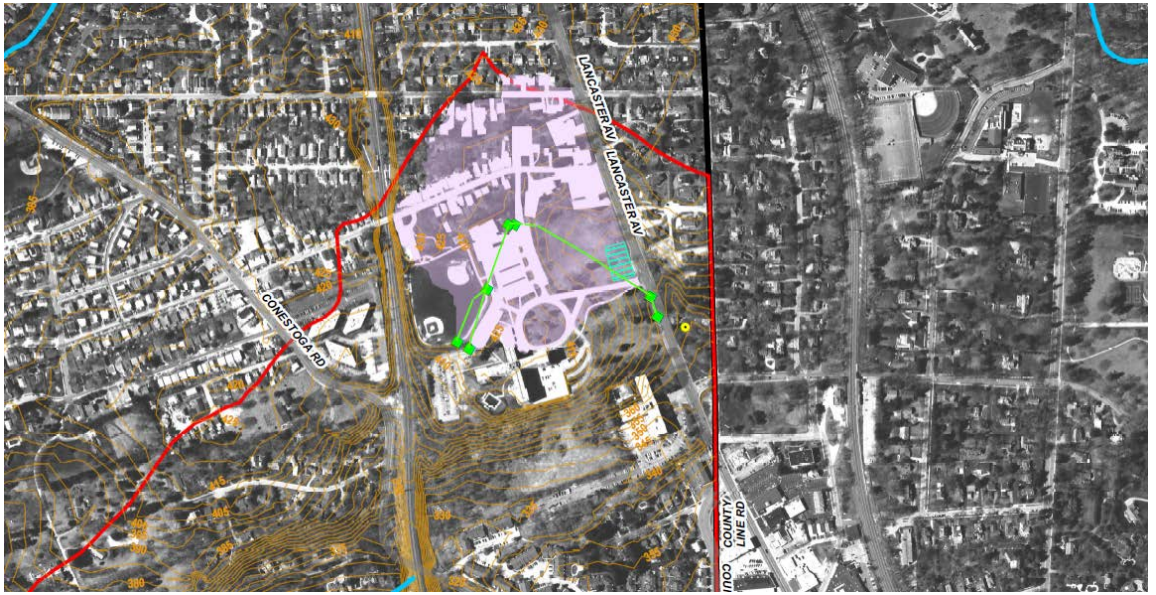


POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Radnor House Bioretention	E. Lancaster Ave.	Bioretention	23.97	38	17,732

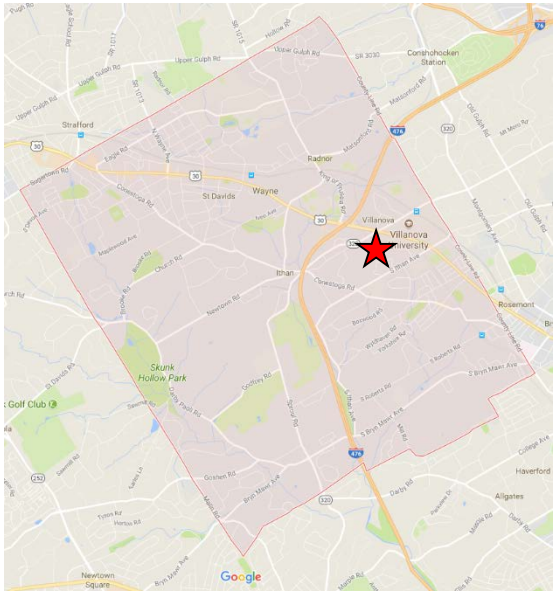




POLLUTANT REDUCTION PLAN DRAFT

Proposed BMP: Darby Creek

BMP Name	Location	BMP Type	Drainage Area (ac)	Percent Impervious (%)	TSS Reduction (lbs/yr)
Trianon Subdivision Basin Retrofit	Trianon Lane	Basin Retrofit	22.87	32	10,500



POLLUTANT REDUCTION PLAN DRAFT

Summary of Results

HUC 12	Waterway	Total Load (lbs/yr)	Existing BMP (lbs/yr)	Required Reduction (lbs/yr)	BMP Load Reduction (lbs/yr)	Reduction %	HUC 12 Reduction %
Cobbs Creek (HUC: 020402020504)	Cobbs Creek	26,591	0	2659.1	8,948	34	34
Plymouth Creek – Schuylkill River (HUC: 020402031007)	Gulph Creek	475,860	147	47571.3	68,563	14	12
	Mill Creek	95,439	0	9543.9	0	0	
Darby Creek (HUC: 020402020505)	Saw Mill Run	9,614	0	961.4	0	0	14
	Browns Run	119,971	0	11997.1	0	0	
	Abrahams Run	23,305	0	2330.5	0	0	
	Miles Run	30,126	326	2980	0	0	
	Glennbrook	29,533	0	2953.3	0	0	
	Kirks Run	144,532	7,576	13695.6	10,500	7	
	Meadowbrook Run	198,593	11,525	18706.8	23,824	12	
	Little Darby Creek	328,356	4,464	32389.2	92,447	28	
	Van Lear's Run	31,704	0	3170.4	0	0	
	Darby Creek	134,760	0	13476	0	0	
	Valley Run	214,796	0	21479.6	0	0	
	Ithan Creek	890,912	20,617	87029.5	188,385	21	
	Hardings Run	251,917	0	25191.7	40,182	16	
	Foxes Run	53,300	0	5330	0	0	
	Camp Run	10,665	0	1066.5	0	0	
	Finn Run	37,423	0	3742.3	0	0	
	Doom Run	1,590	0	159	0	0	
	Wigwam Run	7,948	0	794.8	0	0	
Total		3,116,935	44,655	307,280	432,849	14	

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