

How PSU Master Watershed Stewards Can Help Municipalities & EAC's Inventory, Assess & Fix Their Stormwater BMPs

(BMP literally means “best management practice”, but in stormwater context, means a discrete stormwater control or structure, like a detention basin)

Ross Snook, MWS Co-Lead

- BS Earth Science, PSU
- Master Watershed Steward – Montgomery County, PA
- Environmental Advisory Board (EAB) Chair, New Hanover Township
- Township Supervisor, New Hanover Township

Stormwater Best Management Practices (BMP) Inventory & Mapping - Pennsylvania -

This project was made possible by 2020 & 2021 PSU Science to Practice (S2P) Grants to:

1. Create first-ever comprehensive inventory, performance rating and online GIS map of stormwater BMP controls in Pennsylvania
2. Provide essential stormwater BMP education and tools for municipalities and other entities to enhance stormwater management, planning & study
3. Introduce an environmental review of development plan sets per Stormwater Ordinance & ERSAM Procedures (*Existing Resource and Site Analysis Map*)

We created an 8-step process to help municipalities better manage stormwater (SW) in PA

- 1 Prepare (educate and download standard “guiding” forms)
- 2 Start an inventory of SW BMP controls in your municipality
- 3 Locate and measure each SW BMP control
- 4 Inspect maintenance conditions of each SW BMP
- 5 Assess the performance of each SW BMP to manage stormwater
- 6 Fill out & submit your listing of all municipal SW BMPs to the PA map
- 7 Use your data to determine basin retrofits, fix maintenance issues...
- 8 Enhance Development Plan Set Reviews from an environmental POV

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Prepare for the stormwater management BMP inventory, assessment & mapping in your town

PennState Extension Search Master Watershed Steward Program...

CORONAVIRUS/COVID-19: UPDATE FOR EVENT ATTENDEES >

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Master Watershed Steward Program

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Volunteer Management System (VMS)

Montgomery County Master Watershed Steward Program

Montgomery County's Watershed Stewards are active throughout the county and invite you to learn with us in your watershed.

Montgomery County Master Watershed Stewards volunteer for numerous projects including bank pinning, grant writing, implementation of stormwater management programs, tree planting in riparian buffers and communities, building rain gardens, supporting municipal MS4 regulations, citizen scientists for our creeks, volunteering to support local environmental organizations and educating the public.



Montgomery County's next training program will be Spring 2022. A typical calendar for training runs March to June. [apply here.](#)

PA Stormwater BMP Inventory, Assessment, and Mapping Project

Master Watershed Stewards of Montgomery County were awarded a Penn State Extension Science to Practice Grant in October 2020. The purpose:

- Create first ever comprehensive inventory, functionality rating, and GIS map of stormwater BMP controls in Pennsylvania
- Provide essential stormwater BMP education and information to municipalities and other entities for planning and study

[Link to PA Stormwater Map](#)

Forms:

- [Stormwater BMP Field Inspection Form](#)
- [Municipal Stormwater BMP Listing Form](#)
- [Environmental Plan Review Guide](#)

Contact Us:

- Submit/Email forms: StormwaterMap@psu.edu
- Questions for the team or contact Ross Snook: wrs60@psu.edu

Education:

- [MWS Ross Snook introduces the mapping project and grant](#) (13 min.)
- [How EABs/EACs Can Help Municipalities Inventory & Assess Their Stormwater BMPs](#) with MWS Ross Snook (63 min.)
- [How to Use the Map & How to Begin Assessment](#) with Harry Crissy and MWS Jackie O'Neil (60 min.)
- [How EABs/EACs Can Help Municipalities Protect & Preserve Their Water Resources](#) MWS Ross Snook (41min.)
- [Inspection of MS4 Outfalls](#) Beth Uhler, Cedarville Engineering (50 min.)
- [STORMWATER, What it is and Why it Matters!](#) Krista Brown, Environmental Protection compliance Specialist PA DEP Southeast Regional Office (46 min.)
- [Coming Soon: Water Quality, Storm Water, Trees and Invasive Species: How are they connected?](#) MWS Geoffrey Selling (58 min.)
- [Introduction to Stormwater Management Plan Review in Pennsylvania](#) Eric Konzelmann, Montgomery County Conservation District (60 min.)

>Montco Penn Extension Stormwater BMP Education & Mapping

A. Become informed

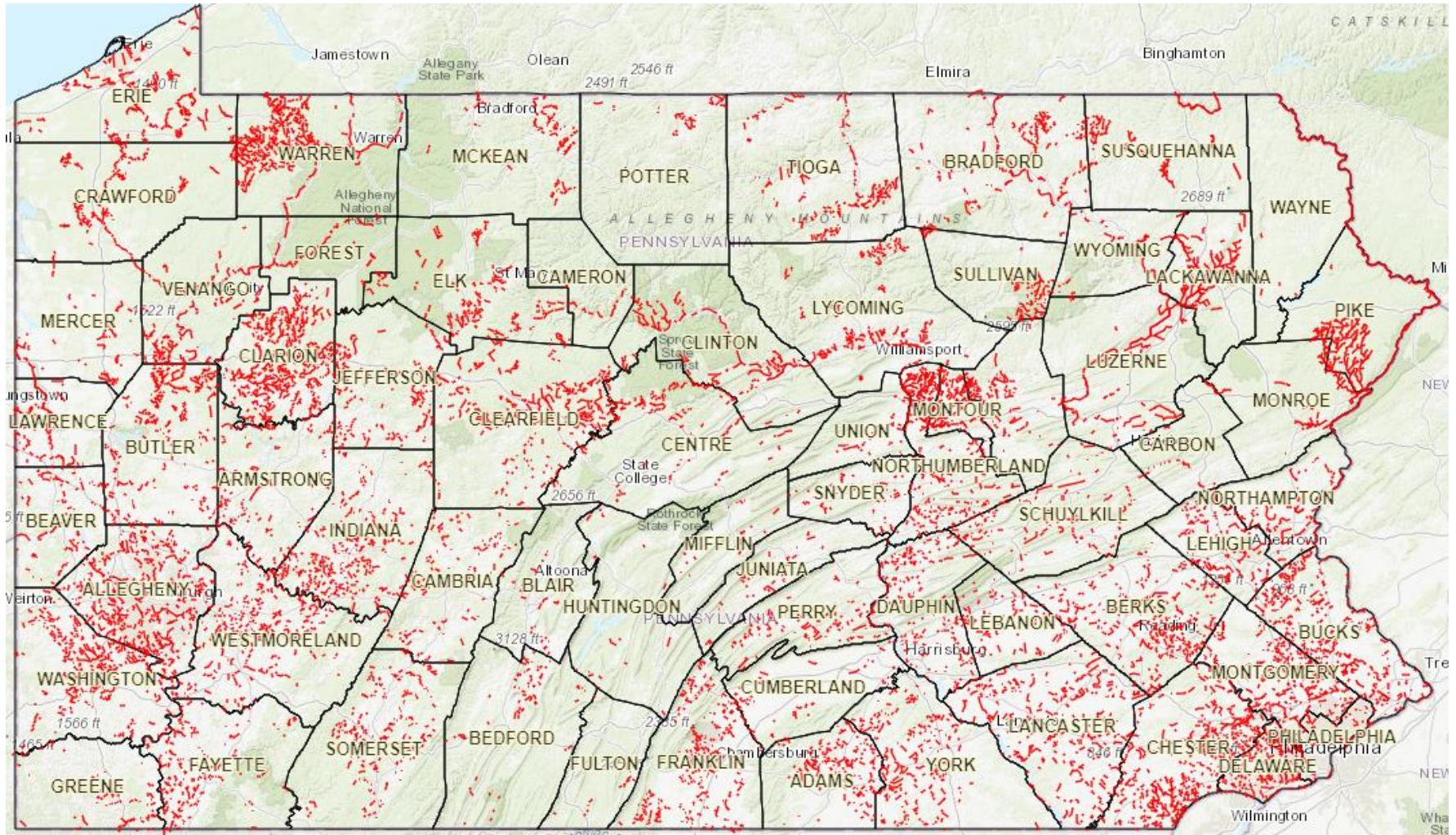
- Watch educational videos

B. Download standard guiding forms

- *Stormwater BMP Control Field inspection form*
- *Municipal Stormwater BMP inventory & assessment list*

Let's walk through some key educational points...

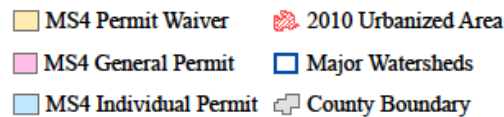
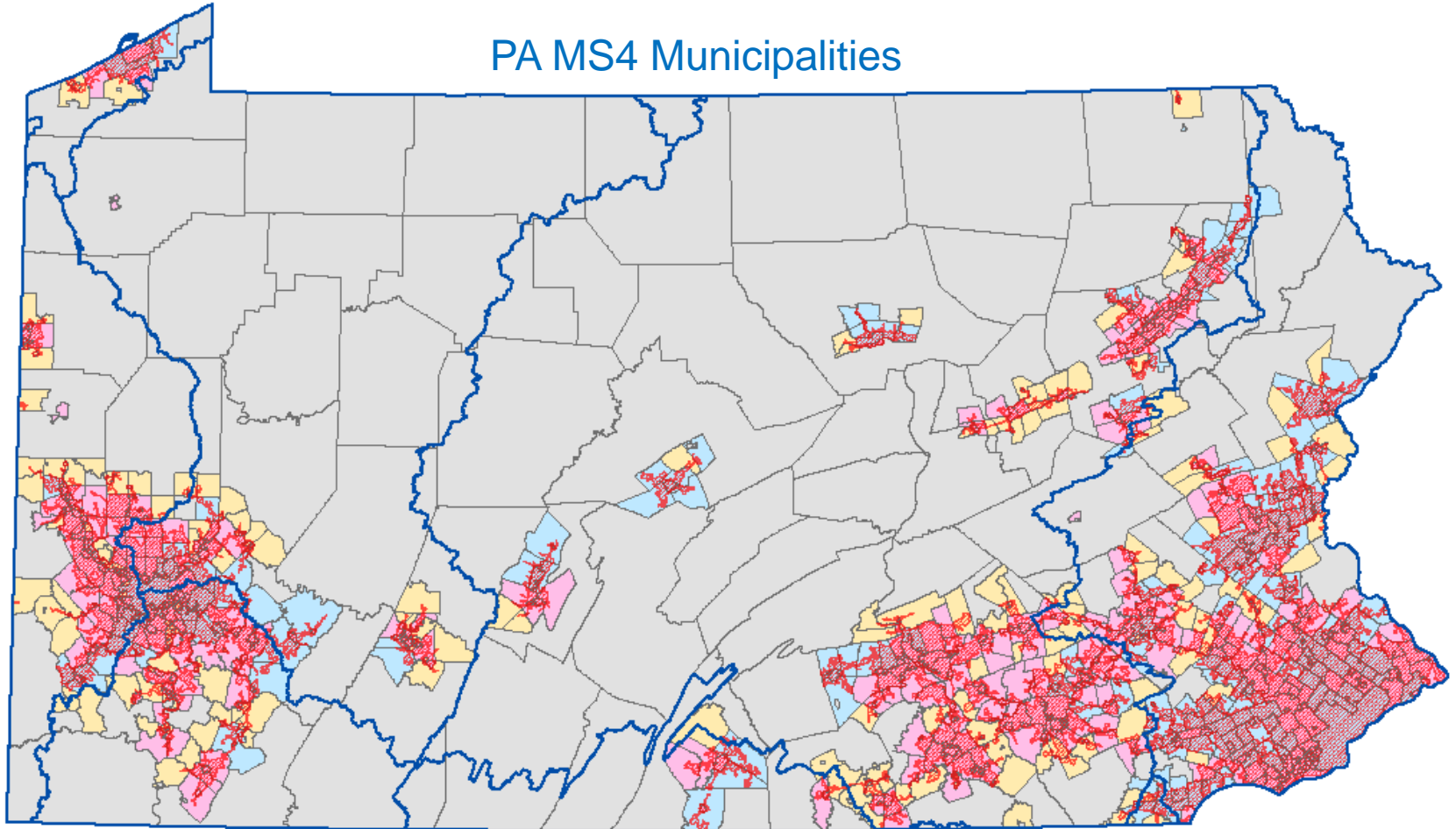
Most of PA's 83,000 stream miles are impaired by agriculture, mining, development, point source pollution, etc.



[Pennsylvania Stream Impairment \(arcgis.com\)](https://arcgis.com)

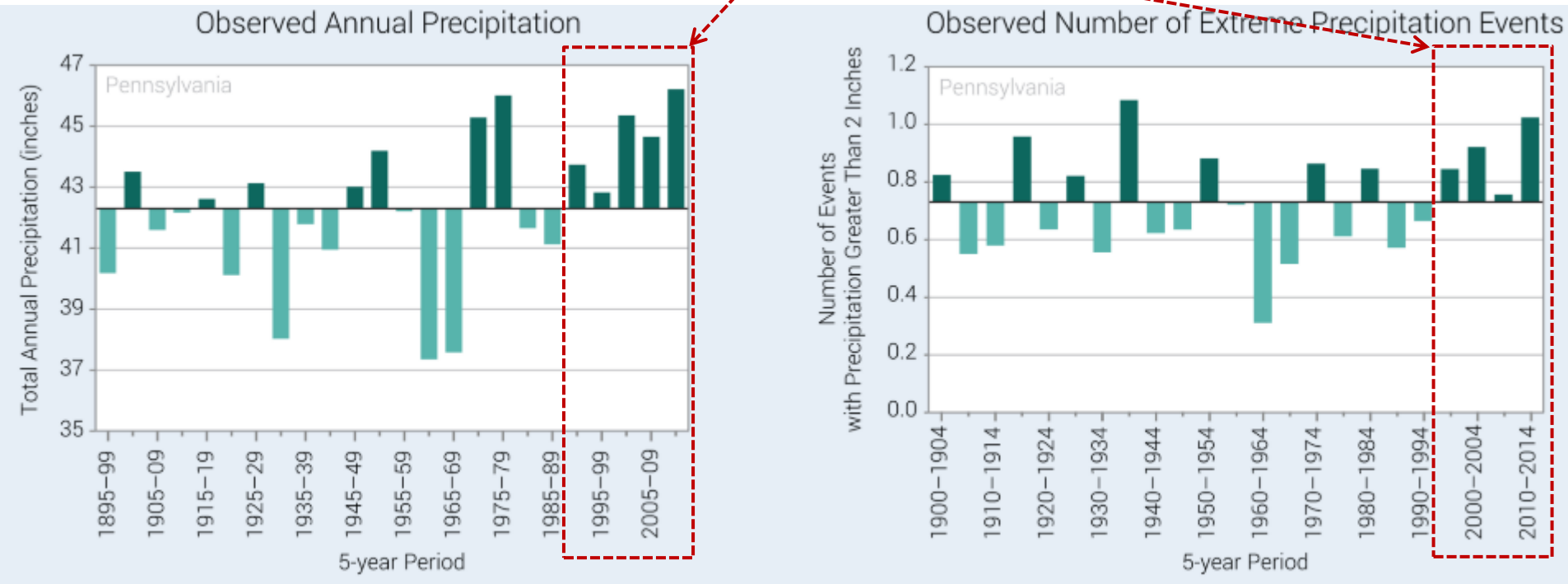
Only streams within PA MS4 municipalities are monitored by DEP, leaving most up to municipalities

PA MS4 Municipalities



Stormwater is any type of precipitation generated during a storm event—it continues to rise in PA

Significant increases, without downturns, since 1995



[>NCIS PA State Summary Precipitation](#)

Stormwater runoff greatly impacts our water as it erodes soil and carries pollutants to our streams



#1 PA water pollutant:
silt



Photos: Lower Frederick Township, Montgomery County, PA

How can we also handle increasing runoff from sump pump discharge?



Photos: New Hanover Township, Montgomery County, PA

1. Include sump pump discharge in stormwater calculations
2. Restrict building below the Seasonal High-Water Table (SHWT)

New developments are required to control same stormwater runoff as site did before development



Photo: New Hanover Township, Montgomery County, PA

How can this be accomplished?

Nature controls stormwater best!

For example, wetlands are key, like the kidneys of the water cycle



["Sodden"](#) by [Nicholas_T](#) [CC BY 2.0](#)



["Woodland"](#) by [WayShare](#) [CC BY-ND 2.0](#)

- The new PA Model Stormwater ordinance prioritizes natural SW BMPs
- Unfortunately, most existing SW BMPs in PA are man-made (“structural”)

Dry Detention Basins (primary BMP since 1970), mainly reduce runoff volume of 1 to 100yr storms

- Detains runoff*, to attenuate runoff peaks and slowly releases water through an outflow sized to drain over 1-3 days
- Has overflow to limit water level & reinforced spillway to direct excess
- Has screen mesh on outflows & overflows to filter debris from discharge



Photo: Lower Frederick Township, PA

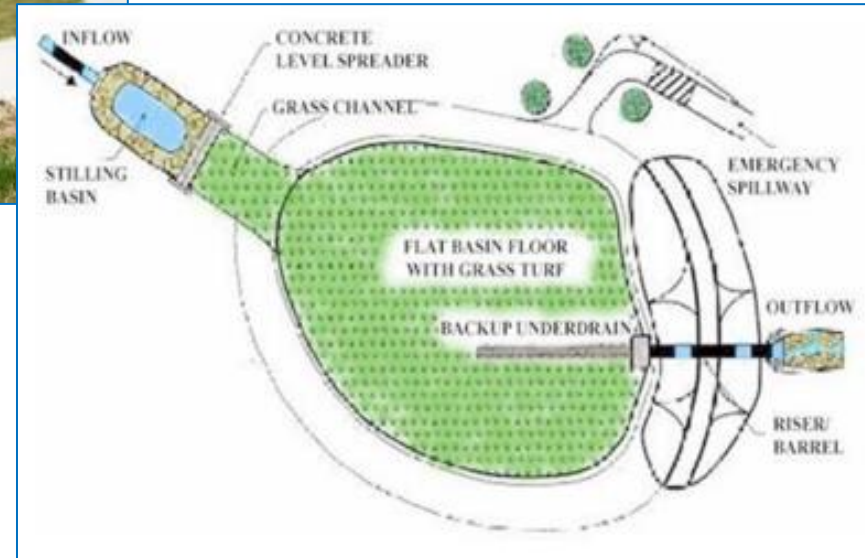
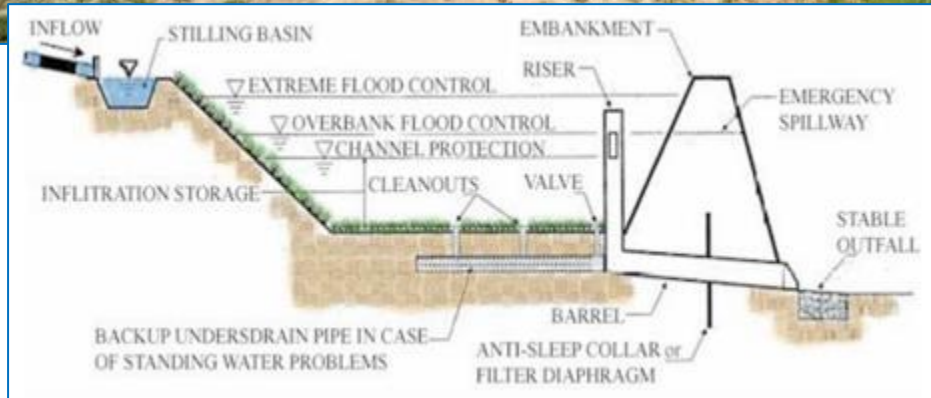


Photo: New Hanover Township, PA

Unfortunately, many orifices are too large for today's precipitation

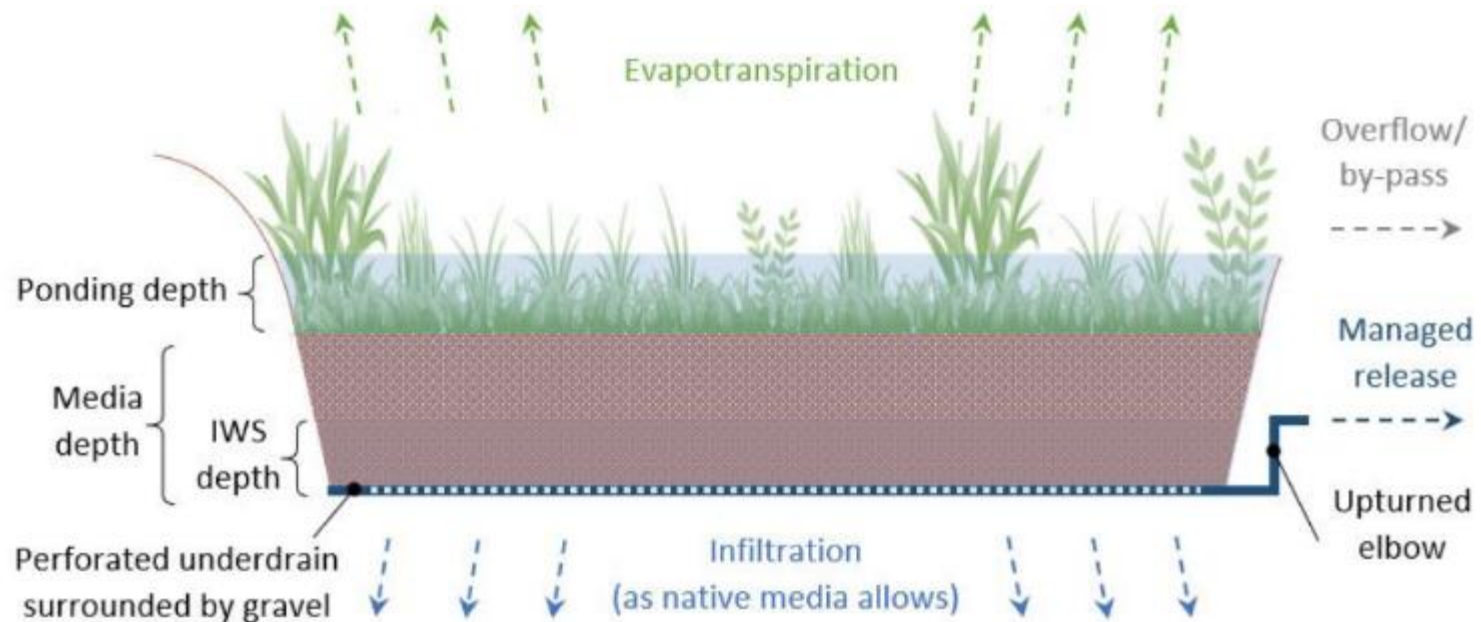
Retention/Infiltration Basins retain runoff then slowly infiltrate & evaporate it over 4 days

- Retains water after precipitation events—no outlet structure
- Shallow areas designed to temporarily hold & infiltrate 1.5” storm runoff
- An engineered overflow structure should be provided for larger storms
- Has a spillway (reinforced notch at top of berm) to direct excess
- Occasionally has stilling basin to reduce velocity and sediment



Managed Release Concept (MRC) Basins simulate infiltration

- Used where infiltration is unfeasible, so infiltration is simulated
- Runoff from 1.2" rainfall is impounded in vegetation, filtered, then slowly released to an underdrain, covered with amended soils
- Additional runoff is stored above, in a vegetated pond, where some is evaporated and some is slowly infiltrated
- Occasionally coupled with a detention basin for volume control



Wet Ponds retain water in a permanent pool with additional vegetated capacity above the pool

- Normally used in areas with naturally high groundwater table
- Almost always has a permanent pool with a forebay for water quality
- Most have an overflow structure to limit water levels in addition to a reinforced spillway to direct excess
- Sometimes includes aeration to limit algae growth & cool the water



Rain Gardens pool runoff, then slowly filter, infiltrate & evaporate it using native vegetation

- Normally used for smaller runoff volumes, like roof & sump pump runoff, but can be used effectively in series with other BMPs
- Excavated shallow surface depression filled with infiltrating planting soil
- Planted with deep-rooted native vegetation to capture & treat runoff
- Also provides wildlife & pollinator habitat and aesthetic value

RECHARGE GARDEN / BIORETENTION BED



Photo: Borough of Ambler Rain Garden

All SW BMPs, natural and constructed require ongoing maintenance to adequately perform!

1. The PA SW BMP Manual has guidelines for each type of BMP
2. Municipalities must ensure proper O & M language to properly maintain BMPs and have a procedure to enforce it



Photo: Lower Frederick Township, PA

2

Start an inventory of SW BMP controls collected from your municipal manager & engineer

- A. Ask your municipal manager or engineer for any lists they have used to track and inspect BMPs
- B. Get lists of BMPs maintained by your municipal maintenance department
- C. Use google satellite maps to scan for probable BMPs
- D. If you are a MS4 municipality, start with stormwater BMPs reported in your annual MS4 status report (PCSM BMP Inventory) to the DEP

3800-FM-BCW0491 9/2017
Annual MS4 Status Report

PCSM BMP INVENTORY								
<p>Table 1. To complete the information needed for MCM #5, BMP #3, list all <u>existing structural BMPs</u> that discharge stormwater to the permittee's MS4 that were installed to satisfy PCSM requirements for earth disturbance activities under Chapter 102, and provide the requested information (see instructions).</p>								
BMP No.	BMP Name	DA (ac)	Entity Responsible for O&M	Latitude	Longitude	Date Installed	O&M Requirements	NPDES Permit No.
1	Landmesser Bioretention Basin	11.0	John Landmesser	40°16'36"	75°28'59"	2004	Inspection and removal of sediment or debris	PAG2004603107
2	207 Meng Road Infiltration Bed	1.2	James and Lora Krier	40°15'37"	75°29'23"	2004	Inspections and removal of sediment	PAG2004604206
3	CB Fisher Rain Barrels and Rain Gardens	4.98	BC Fisher Contracting	40°16'58"	75°27'50"	2006	Inspections and removal of sediment or debris	PAG2004606044
	Bechtel Subdivision		Paul and Robin				Inspections and removal	

3

Locate and measure each SW BMP control using the *SW BMP Field Inspection Form*

Stormwater BMP Field Inspection Form - v20			
*Required for all BMPs			
**Required for only MS4 BMPs			
Field Name	GIS Abbv	Field Description	Enter Value
INVENTORY DATA:			
*State Abbreviation	State	Standard 2-letter State Abbreviation--only PA for now. Required.	
*County Name	County	Full county name. Required.	
*Municipality Full Name	MuniName	The full legal unique name of municipality. Required. Can find here: //dced.pa.gov/local-government/municipal-statistics/municipalities	
*Municipality BMP #	BMP#	Unique ID for the stormwater BMP within municipality. Typically, a number; can also be 999.99 or 99.A. Required.	
*In MS4 District?	MS4?	Select "Y" if BMP is in the municipality's MS4 district (municipal separate storm sewer system), if not, "N". (Engineers can provide.)	
**Property or Development Name	Property	Name of property or development used by municipality; can be property owner name or place, like a park. Note each property or development can have more than 1 BMP. Required for MS4 BMPs.	
*BMP Category	BMP Cat.	The major categories of structural BMPs, listed in chapter 6 of most recent PA DEP SW BMP manual and "Other". Required. DB = Detention Basin Unnaturalized DBN = Detention Basin Naturalized MRC = Managed Release Concept Basin RB = Retention/Infiltration Basin Unnaturalized RBN = Retention/Infiltration Basin Naturalized RG = Rain Garden Basin SS = Sub Surface WP=Wet Pond O=Other	
**BMP DEP Type	BMP Type	The type of structural BMP listed in chapter 6 of most recent PA DEP SW BMP manual plus older types and "Other" if not known.	
*BMP Latitude DD	Latitude	Latitude in absolute decimal degree format with 6 decimal places. Must be in text format preceded with + sign for all states in the US (except American Samoa). Required. Ex. = +040.283535. (Use Theodolite App or if needed, convert from degrees/minutes/seconds to decimal degrees using: https://www.fcc.gov/media/radio/dms-decimal)	
*BMP Longitude DD	Long.	Longitude in absolute decimal degree format with 6 decimal places. Must be in text format preceded with - sign in the US. Required. Ex. = -075.469362. (Use Theodolite App or if needed, convert from degrees/minutes/seconds to decimal degrees using: https://www.fcc.gov/media/radio/dms-decimal)	
LxW Inches		diameter or dimensions LxW in inches. Only provide for basin category MRC, RB, RBN, RG or wet pond.	

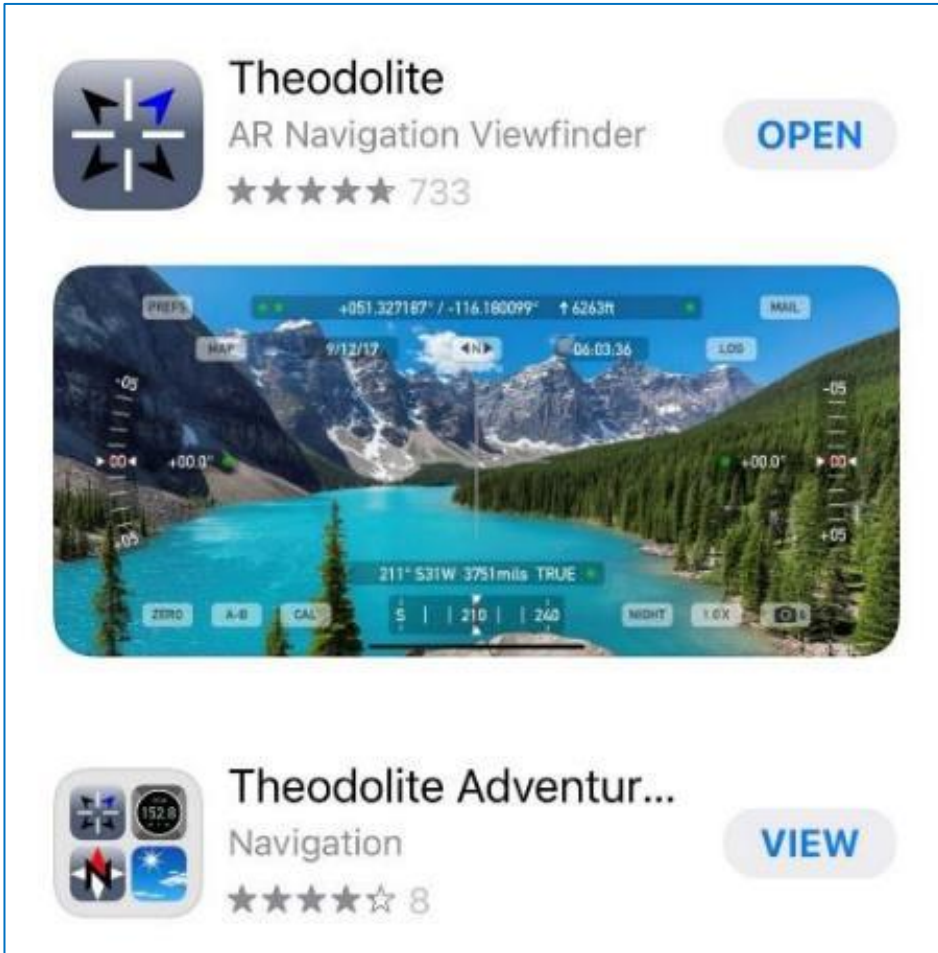
Why?

1. Ensure data is accurate and precise, for instance:
 - Discrete location
 - SW BMP category
 - SW BMP type

***Focus on these most impactful, volume-control basin BMP categories**

***Focus on core information for a basic inventory (page1)**

Use an App to find latitude & longitude, and to photograph key BMP features and conditions



-Take pictures in immediate location of basin, to ensure accurate latitude & longitude



Photo: Lower Frederick Township, Montgomery County, PA

4

Inspect conditions of each SW BMP to ensure it is properly maintained

1. Erosion
2. Stagnant water
3. Inadequate vegetation
4. Accumulated debris/sediment
5. Damaged pipes or structures
6. Missing/damaged grate on outlet or overflow
7. Spillway not reinforced
8. Clogged orifice or riser
9. Berm failure (collapse, slumped, washed out...)

***Inspect after every significant storm, minimally annually**

5

Assess the performance of each SW BMP to manage stormwater as needed

(For now, only inspect large basin type stormwater BMPs)

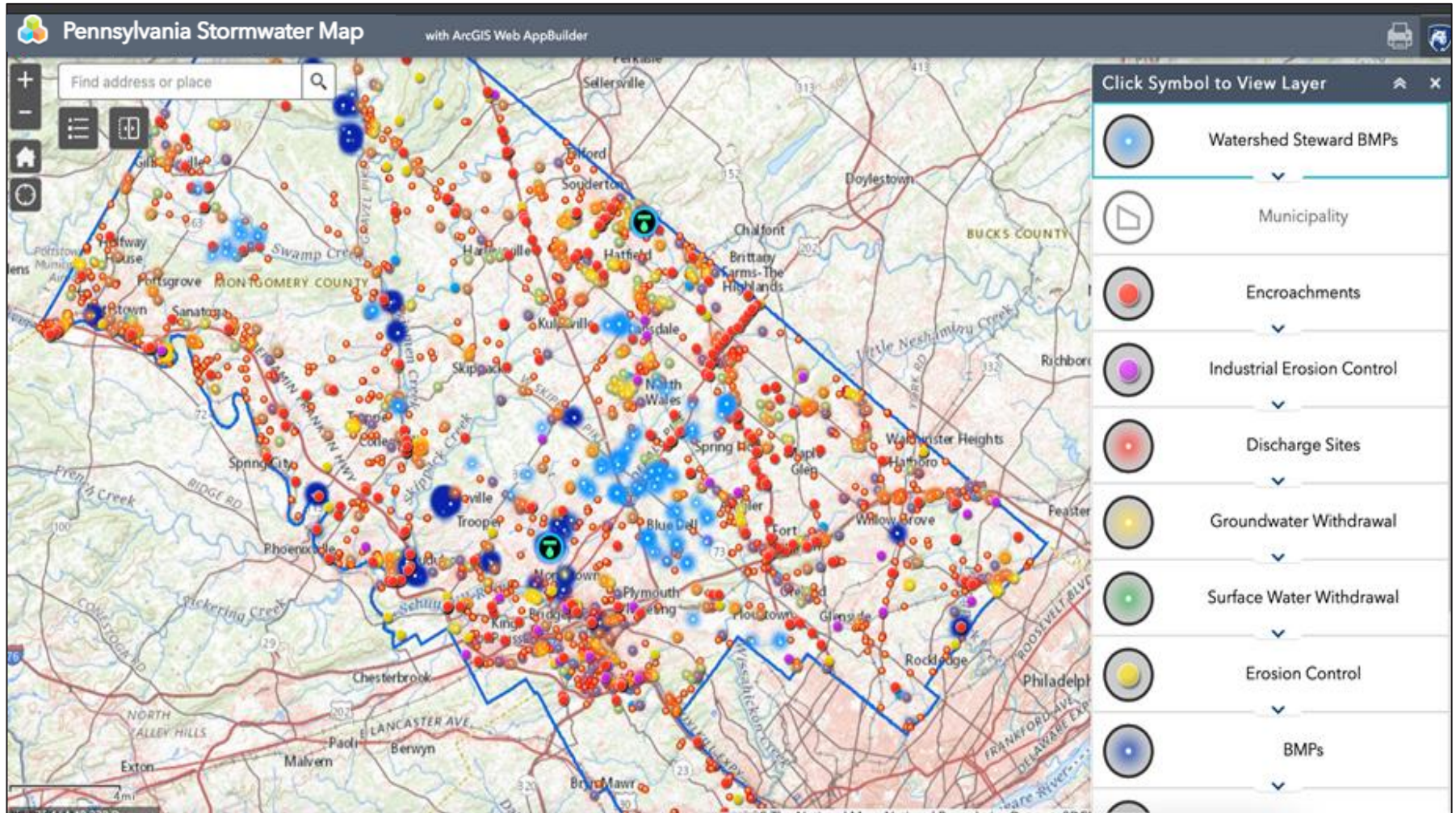
Determining SW BMP performance requires 3 inspections:

1. Prior to any rain in last 5 days
2. Day of significant rain >1.5” to ensure water did not drain too quickly
3. End of day 3 or 4 after significant rain to ensure basin drains as required

Select 1 appropriate rating:

- **Works Properly** (Empties in 1-4 days and does not overflow)
- **Doesn't Work Properly** (Empties too fast, too slow, or overflows)
- **Not Assessed Yet**

PSU GIS mapping team will load your info onto the PA Stormwater BMP Map Website: <http://bit.ly/PASStormWaterMap>



***Map is work in progress**

7a

Use your data to determine which basins are potential candidates for retrofits, for example:

Detention basins rated “**Doesn't Work Properly**” with bottom orifice diameter > 1” can be candidates for retrofitting

Municipal Stormwater BMP Control Inventory & Assessment Listing (2022 v21)						
* = Minimally Required for all BMPs						
**= Only Required for MS4 BMPs						
INVENTORY DATA:						
*State Abbr.	*County Name	*Municipality Name (Full, legal name)	*BMP #	*MS4 ? (y/n)	**Property or Development Name	*BMP Major Category: DB =Detention Basin DBN=Detention Basin Naturalized MRC=Managed Release Concept RB =Retention/Infiltration Basin RBN=Retention/Infiltration Basin Naturalized RG = Rain Garden SS = Sub Surface WP = Wet Pond O =Other
PA	Montgomery	New Hanover Township	1	y		DB
PA	Montgomery	New Hanover Township	2	y		DB
PA	Montgomery	New Hanover Township	3	y		DB
PA	Montgomery	New Hanover Township	4	y		WP
PA	Montgomery	New Hanover Township	5	y		DB
PA	Montgomery	New Hanover Township	6	y		DB
PA	Montgomery	New Hanover Township	7	y		DB
PA	Montgomery	New Hanover Township	8	y		DB
PA	Montgomery	New Hanover Township	9	y	Minister Creek Farms	DB
PA	Montgomery	New Hanover Township	10	y	Windlestrae	DB

Outlet Structure: Bottom Orifice Diameter or Dimensions (LxW) In.
6
2
3
4
10
3
1
1
4

Performance Rating Code: Works Properly (Empties in 3-4 days; doesn't overflow) Does Not Work Properly (Empties too fast, slow or overflows) Not Yet Assessed
Does Not Work Properly
Does Not Work Properly
Does Not Work Properly
Does Not Work Properly
Does Not Work Properly
Does Not Work Properly
Does Not Work Properly
Does Not Work Properly
Works Properly
Not Yet Assessed

Retrofitting a detention basin with a minimizing orifice plate is simple and very cost-effective



Metal plate minimizing orifice size costs < \$500

Local Guide to retrofitting basins:
[PEC_BasinRetrofitGuide.pdf \(pecpa.org\)](https://pecpa.org/PEC_BasinRetrofitGuide.pdf)

PWD Field Team; basin at Foxfield and Pennlyn in Lower Gwynedd

...Imagine if every Detention Basin in PA was appropriately retrofitted?
...Imagine if these minimizing plates were automated, base on precipitation?

7b

Use your data to ensure BMPs are properly maintained, such as these common issues:



Missing grate on orifice

Debris & sediment

Erosion in basin

Data: Lower Frederick Township, Montgomery County, PA

8

Enhance Your Development Plan Set Review process from an environmental perspective

(A systematic refinement of current ERSAM Procedures)

Environmental Resources



- Clean surface water
- Clean ground water
- Healthy soil
- Open space
- Noninvasive flora
- Noninvasive fauna...


Environmental Services



- Stormwater control
- Water purification
- Food production
- Pollination
- Climate control
- Wildlife habitat
- Recreation...

Download the *Environmental Plan Review Guide* to conduct your review of a plan here:

[>Penn Extension Stormwater Education & Resources](#)

Environmental Development Plan Review Guide (2021 v8) 

Plan Name: _____ Phase: _____ Plan Date: _____
 Developer : _____ Review Date: _____


What key impactful ENVIRONMENTAL CONDITIONS are on/adjacent to the site?

Topography (height, depth, relief)	
General Flow of Water Through Site	
Depth to Bedrock	
Depth to Seasonal High Water Table (SHWT)	
Soil Types	
Soil Classes (A, B, C, D)	
Known Toxic Conditions	
Known Invasive Flora	
Known Invasive Fauna	
Other	

List all INFILTRATION TESTS completed on the site, for each test location: (as in PA SW Manual Appendix C)

Infiltration Test ID	Infiltration Rate (inches/hr.)	Redox Features (inches)	Depth to SHWT* (inches)	Depth to Bedrock (inches)	Depth of Test (inches)	Final Elevation at test site	Diff B/T Pre & Planned Const. Test Elevation
Test 1							
Test 2							
Test 3							
Test 4							
Test 5							
Test 6							
Test 7							
Test 8							
Test 9							
Test 10							
Test 11							
Test 12							
Test 13							
Test 14							
Test 15							

*Indicated by areas of gleyed soil or redoximorphic features (Add additional tests on the back of this form)

v8) 

environmental considerations,

much of the key environmental

infiltration?

areas?

trees?

sonal High Water Table (SHWT)?

s?

al groundwater recharge?

d?

D (Low Impact Development) over

hydric soils, or seasonal high water

or large mowed areas?

mally found in plan set fine print)?

MP & recharge location?

If not, was the proper 24-hour

ter Manual Appendix C)

ement, SW BMPs, recharge areas?

n BMP at the same final planned

- e. Do all the planned infiltration type SW BMPs have an infiltration test that indicates an infiltration rate above the required .2 inches per hour?

-Let's review the form in detail...

A. Collect key impactful current environmental conditions of the planned development site

What key impactful *Environmental Conditions* are on/adjacent to the site?

Topography (height, depth, relief)	
General Flow of Water Through Site	
Depth to Bedrock	
Depth to Seasonal High Water Table (SHWT)	
Soil Types	
Soil Classes (A, B, C, D)	
Known Toxic Conditions	
Known Invasive Flora	
Known Invasive Fauna	
Other	

- The first 6 conditions are found throughout the plan set (examples to follow)
- Toxic conditions can be found in Phase 1 & II Environmental Site Assessments
- Invasive flora & fauna might be found in “existing conditions” of the site plan and by walking the site (with permission)

Soil attributes & limitations found in PCSWM plan (depth to bedrock & SHWT, hydric, infiltration...)

SOIL LIMITATIONS	SEASONAL HIGH WATER TABLE (FT)	DEPTH TO BEDROCK (IN)	HYDROLOGIC GROUP	HYDRIC SOILS	CUTBANKS CAVE	CORROSIVE TO CONCRETE/STEEL (C, S, OR C/S)	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/SEASONAL HIGH WATER TABLE	HYDRIC / HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK-SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
	SOIL TYPE																			
ABBOTTSTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES, (Abb)	0.5-1.5 1.2-2.5	48-60	D	NO	YES	C/S	NO	YES	NO	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES
BOWMANVILLE-KNAURS SILT LOAMS, (Bo)	0.0-1.5 6.0	85-99	C/D	NO	YES	C/S	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	YES
BRECKNOCK CHANNERY SILT LOAM, 15 TO 25 PERCENT SLOPES, (BsD)	-	41-60	B	NO	YES	C	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO	NO	NO	NO
CROTON SILT LOAM, OCCASIONALLY PONDED, 0 TO 3 PERCENT SLOPES, (CrA)	0.0-0.5 2.3-2.6	44-60	D	YES	YES	C/S	NO	YES	NO	YES	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES
LEHIGH SILT LOAM, 3 TO 8 PERCENT SLOPES, (LhB)	0.5-3.0 3.5-5.0	58-60	C/D	NO	YES	C/S	NO	NO	NO	YES	YES	NO	YES	YES	YES	YES	NO	NO	NO	YES
PENN-KLINESVILLE CHANNERY SILT LOAMS, 15 TO 25 PERCENT SLOPES, (PkD)	-	18-40	B	NO	YES	C	YES	NO	NO	NO	YES	YES	NO	YES	YES	YES	NO	NO	NO	NO
REAVILLE SILT LOAM, 0 TO 3 PERCENT SLOPES, (RhA)	0.5-3.0 6.0	32-40	D	NO	YES	C/S	YES	YES	NO	YES	YES	NO	YES	YES	YES	YES	NO	NO	NO	YES
REAVILLE SILT LOAM, 3 TO 8 PERCENT SLOPES, (RhB)	0.5-3.0 6.0	32-40	D	NO	YES	C/S	YES	YES	NO	YES	YES	NO	YES	YES	YES	YES	NO	NO	NO	YES
REAVILLE SILT LOAM, 8 TO 15 PERCENT SLOPES, (RhC)	0.5-3.0 6.0	32-40	D	NO	YES	C/S	YES	YES	NO	YES	YES	NO	YES	YES	YES	YES	NO	NO	NO	YES
URBAN LAND-NESHAMINY COMPLEX, 0 TO 8 PERCENT SLOPES, (UruB)	-	54-99	C	NO	NO	-	NO	NO	NO	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO

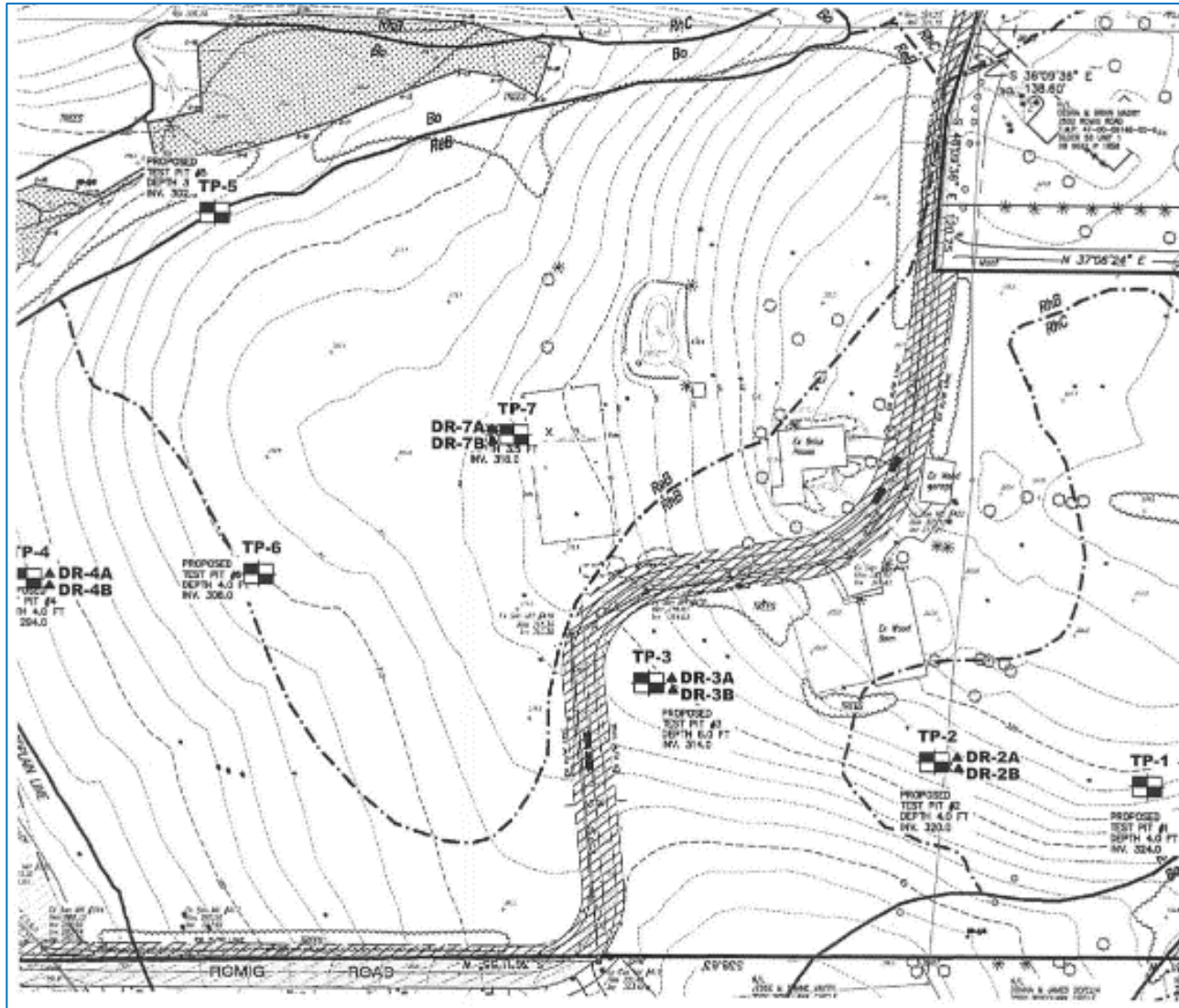
B. Collect all the key infiltration testing results to easily refer to when evaluating the plan design

Infiltration Test ID	Infiltration Rate (inches/hr)	Redox Features (inches)	Depth to SHWT* (inches)	Depth to Bedrock (inches)	Depth of Test (inches)	Final Elevation (at test site)	Diff B/T Pre & Planned Const. Test Elevation
Test 1							
Test 2							
Test 3							
Test 4							
Test 5							
Test 6							
Test 7							
Test 8							
Test 9							
Test 10							
Test 11							
Test 12							
Test 13							
Test 14							

-Let's see where to find the information...

Most infiltration info is on stormwater management plan (PCSWM)--if not, in soil engineer's report

- It's informative to overlay infiltration test map with soil map, BMPs & structures



Photos: Example Soil Engineer's Report From New Hanover Township, Montgomery County, PA

Most infiltration info is on stormwater management plan (PCSWM)--if not, in soil engineer's report

Pit No.	Pit Depth (in, BGS)	Observed Redox Features (in, BGS)	Depth to Rock (in, BGS)	Depth to Observed Water (in, BGS)	Infiltration Test Depth (in, BGS)	Average Infiltration Rate (in/hr.)
SW-1	72	14 to 72	72	NE	6	0.5
SW-2	41	8 to 41	41	NE	6	0.0
SW-3	48	9 to 48	48	NE	6	0.0
SW-4	40	9 to 40	40	40	6	1.25
SW-5	43	24 to 43	43	NE	6	2.875
SW-6	40	28 to 40	40	NE	6	11.5
SW-7	45	NE	45	NE	12	2.625
SW-8	48	NE	48	NE	12	3.625
SW-9	32	NE	32	NE	6	9.125
SW-10	30	NE	30	NE	6	0.125
SW-11	32	NE	32	NE	6	1.375
SW-12	30	NE	30	NE	6	2.125
SW-13	30	NE	30	NE	6	14.25
SW-14	30	NE	30	NE	6	15.75
SW-15	48	30 to 48	48	NE	6	2.875
SW-16	30	NE	30	NE	6	5.0
SW-17	62	11 to 62	62	NE	6	0.25
SW-18	32	9 to 32	32	NE	6	1.25
SW-19	24	12 to 24	24	NE	6	0.25
SW-20	38	23 to 38	38	NE	6	3.375
SW-21	40	9 to 40	40	NE	6	0.25
SW-22	55	9 to 55	55	NE	6	2.125
SW-23	36	8 to 36	36	NE	6	0.375
SW-24	38	12 to 38	38	NE	6	2.0
SW-25	44	7 to 44	44	NE	6	0.125
SW-26	36	10 to 36	NE	30	6	1.5

NE= not encountered

_Example Plan Set From Jackie O'Neil

C. Given environmental resources, impactful conditions & the development plan, ask:

1. Are the planned structures located to preserve/protect as much of the environmental resources and services as possible? For example:
 - A. Are zones of concentrated building in the areas of the worst infiltration?
 - B. Do planned structures avoid the best ground water recharge areas?
 - C. Do planned structures avoid heavily wooded areas and large trees?
 - D. Are planned below grade structures at least 2' above the SHWT?
 - E. Do planned structures avoid rich soils or highly absorbent soils?
 - F. Are riparian buffers well-protected in the plan?
 - G. Does the plan maximize natural stormwater BMPs groundwater recharge?
 - H. Are other sensitive environmental areas avoided or protected?

2. Does the plan mitigate key environmental risks? For example:

- A. Does the stormwater plan maximize green infrastructure/LID (Low Impact Development) over constructed stormwater BMPs?
 - If not, has it been appropriately justified?
- B. Are any SW Basins in limiting zones, such as bedrock, hydric soils, SHWT?
- C. Do landscaping plans call for non-natives, monocultures, large mowed areas?
- D. Does the plan test for & mitigate contaminants on/adjacent to site?
- E. Is any contaminated construction fill planned to be used (in plan fine print)?

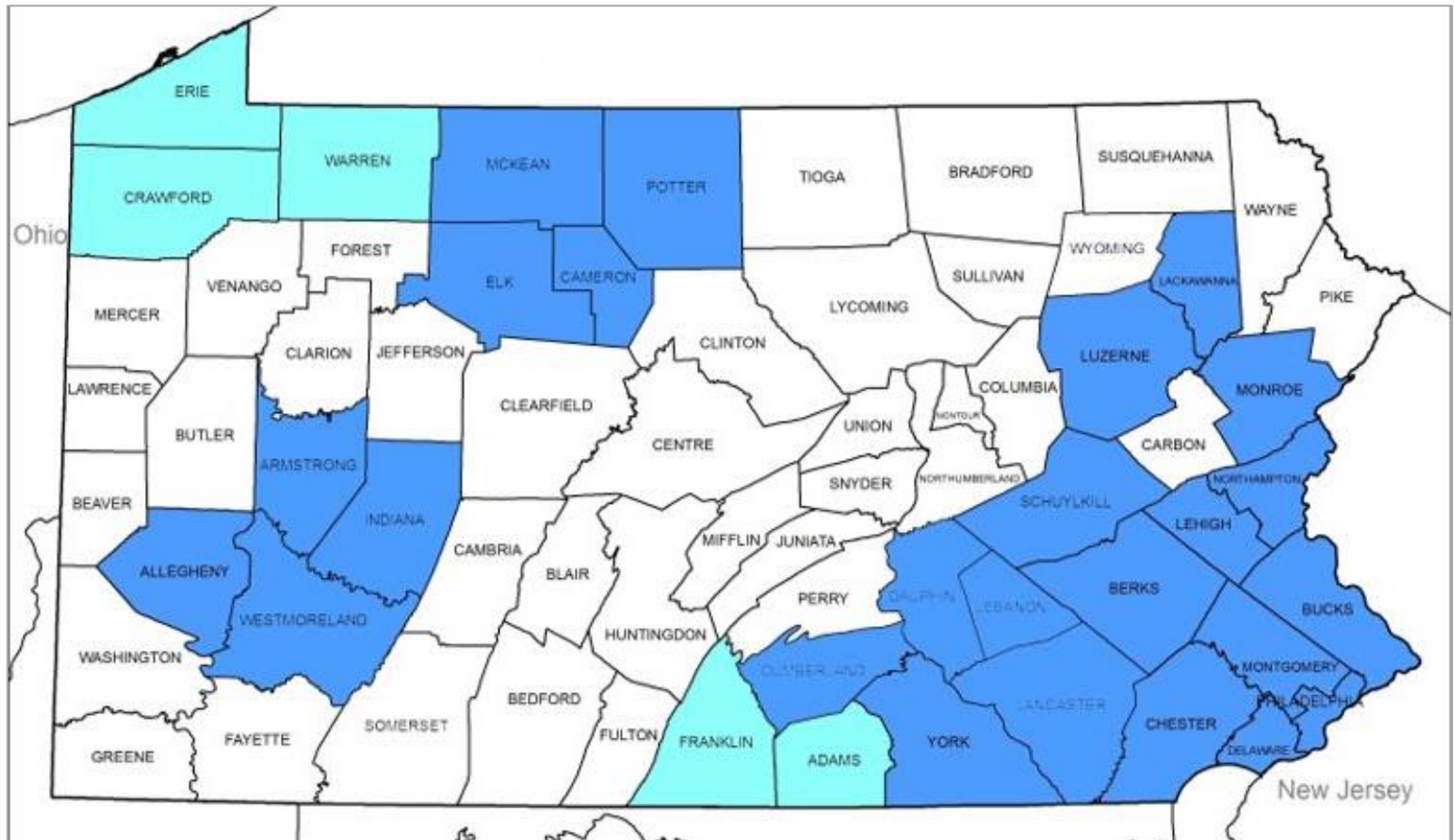
3. Has adequate infiltration testing been done?

- A. Was a test done at every planned building, SW BMP & recharge location?
- B. Was infiltration testing done between January-June?
 - If not, was the proper 24-hour pre-soak protocol observed?
(as specified in the PA DEP Stormwater Manual Appendix C)
- C. Were all test pits deep enough for planned uses, such as basements, SW BMPs, recharge areas?
- D. Is the surface elevation of test pits for all planned infiltration BMPs at the same final planned elevation?
- E. Do all the planned infiltration type stormwater BMPs have an infiltration test that indicates an infiltration rate above the required minimum .2" per hour?

Ensuring planned stormwater BMPs adequately manage stormwater will mitigate future problems and reduce increasing costs due to stormwater

In addition to education and online tools, you have one more resource to tap...

Almost 800 Master Watershed Stewards spread across 30 counties in PA



Have questions or want assistance getting started with your municipality's inventory?

William (Ross) Snook

WRS60@PSU.edu

