

BUCKS COUNTY STORMWATER MANAGEMENT PLAN WATERSHED PLAN ADVISORY COMMITTEE (WPAC) WORKSHOP NO. 5

MAY 20, 2026

In cooperation with:



Presented By:



WELCOME FROM BUCKS COUNTY PLANNING COMMISSION

MICHAEL ROEDIG, EXECUTIVE DIRECTOR
MROEDIG@BUCKSCOUNTY.ORG



Bucks County

MATTHEW WALTERS, SENIOR PLANNER/PROJ MGR
DEANNA MILLER, PLANNER/ASSISTANT PROJ MGR
ANDREW HEIMARK, DIRECTOR OF GIS SERVICES

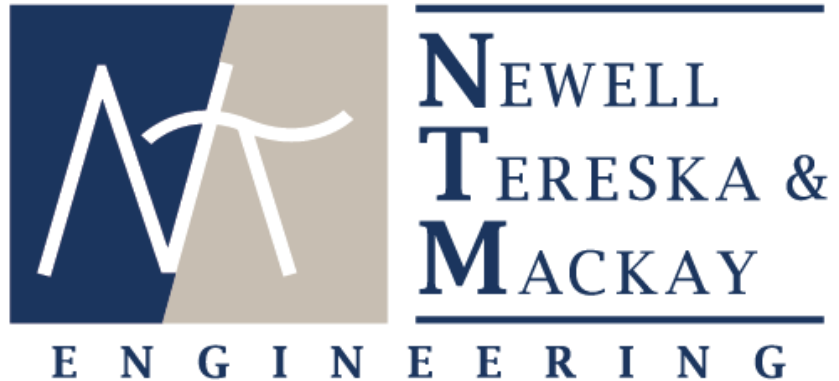


BCPC

Bucks County Planning Commission

THIS MEETING IS BEING RECORDED. RECORDING CAN BE FOUND AT:
[HTTPS://CONNECTS.BUCKSCOUNTY.GOV/ACT-167-STORMWATER-PLAN-UPDATE](https://connects.buckscounty.gov/act-167-stormwater-plan-update)

CONSULTING TEAM



SCOTT BROWN, MS, PE, D.WRE
PAUL DEBARRY, MS, PE, PH, GISP, D.WRE
BETHANY SHUMAKER, MS, PE, CSI
SETH DELLINGER, GIS SPECIALIST



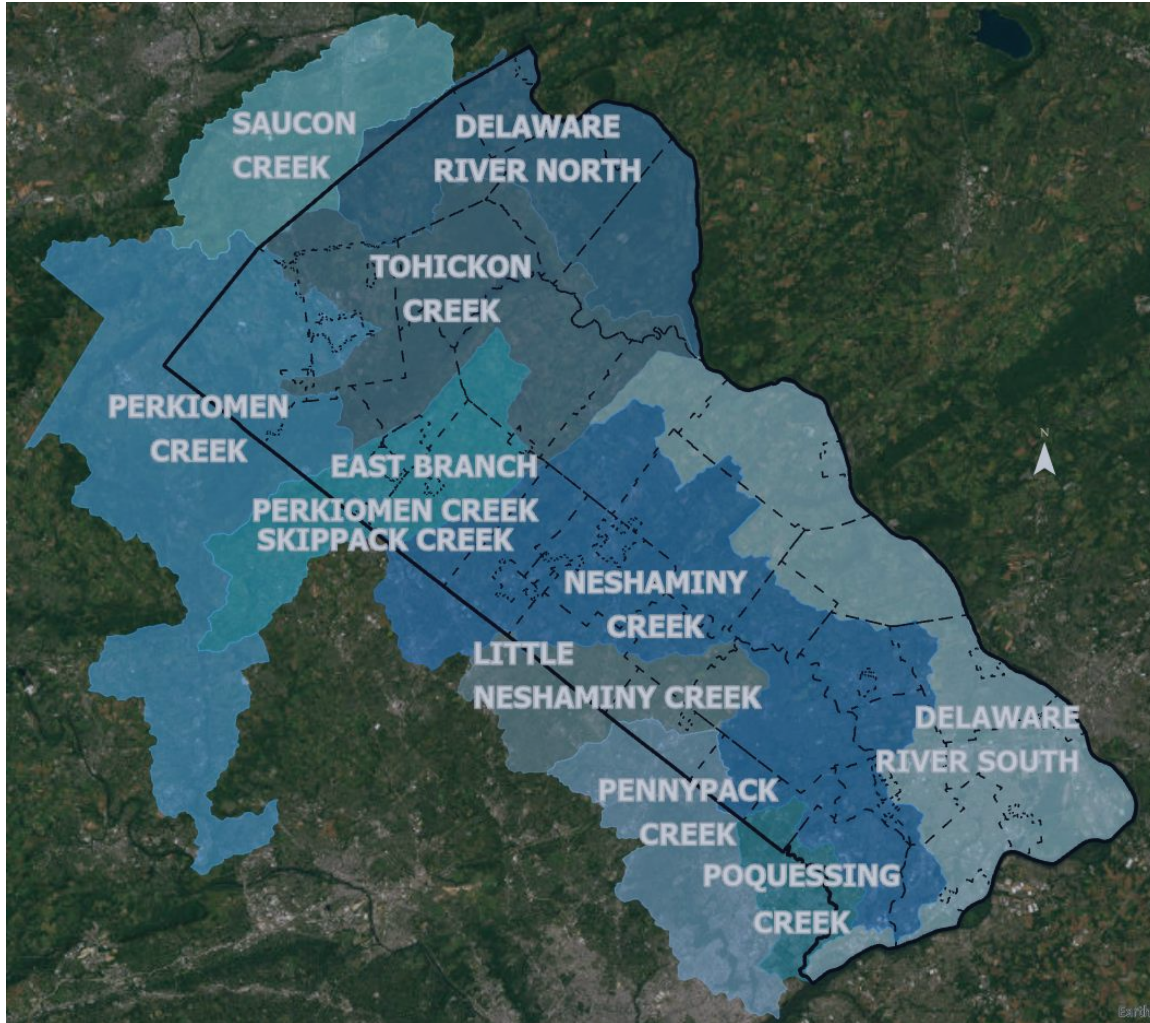
BETH UHLER
PENNSYLVANIA DIRECTOR



TYLER CHARLES, PE
SENIOR ASSOCIATE

AGENDA

- Welcome & Introductions
- Phase 2 Overview
- Problem Area Solutions
- Standards and Criteria
 - Stormwater Standards recap
 - Unami Creek Release Rates
- Model Ordinance Update
- Schedule/Timeline
- Reimbursement Information
- Open Discussion



PHASE 2 OVERVIEW

ACT 167 PHASE 2 OVERVIEW

Task 1. Data Collection, Review and Analysis

Task 2. Technical Analysis

Task 3. Model Ordinance Development

Task 4. Public/Municipal Participation

Task 5. Plan Preparation and Implementation

ACT 167 PHASE 2 OVERVIEW

Task 1. Data Collection, Review and Analysis

Task 2. Technical Analysis

- Standards Evaluation (Peak Runoff Rates, Streambank Stabilization, Groundwater Recharge/Volume Control, and Water Quality)
- Hydrologic modeling and desktop evaluations of problem areas
- Land Use Change Study
- Development of conceptual solutions for problem areas

ACT 167 PHASE 2 OVERVIEW

Task 1. Data Collection, Review and Analysis

Task 2. Technical Analysis

Task 3. Model Ordinance Development

- Consistent with
 - MS4 Model Ordinance
 - PCSM Manual Model Ordinance
 - PADEP Coordination

ACT 167 PHASE 2 OVERVIEW

Task 1. Data Collection, Review and Analysis

Task 2. Technical Analysis

Task 3. Model Ordinance Development

Task 4. Public/Municipal Participation

- WPAC Meetings
- Public Hearing
- Informational Workshop

ACT 167 PHASE 2 OVERVIEW

Task 1. Data Collection, Review and Analysis

Task 2. Technical Analysis

Task 3. Model Ordinance Development

Task 4. Public/Municipal Participation

Task 5. Plan Preparation and Implementation

- Final Plan
- Plan/Ordinance Adoption by Municipalities.

TASK 2. TECHNICAL ANALYSIS - PROBLEM AREA ANALYSIS SUMMARY

- Field Work Completed
- Problem Types:
 - Flooding (82%)
 - Accelerated Erosion (26%)
 - Sedimentation – 12%
 - Water Recharge – 2%
 - Water Quality - < 1%
- Detailed Priority Problem Area Analysis nearing completion
- Solution prioritization – last step

East Branch Perkiomen Creek		
Problem Area(s) - Map ID: 45		Comments
Municipality:	Hilltown Township	This problem area was reported by Tim Fulmer of Wynn Associates for Hilltown Township. The problem area is at the Steel crossing Tributary 01263.
Inspected By/Date:	BAS/BDH 06/03/2025	The problem is reported to accelerated erorison affect Steeplebush Drive.
Checked By/Date:	BAS 10/22/2025	
Type of Problem (highlighted):		
1	Flooding	
2	Deficient Bridge/Culvert	
3	Erosion	
4	Sedimentation	
5	Water/Groundwater Pollution	
6	Other	
		Descr
		Culvert was measured and been completed for this lo observed to the roadway
		Descr
		The presence of bare ear bank of the tributary, which may indicate erosive flows. Aerial imagery indicates significant upstream erosion of banks of Pleasant Spring Creek
		Descr
		
Solution		1) Stabilize Stream Bank
		2) Reduce Peak Flows
		3) Evaluate Culvert Sizing

TASK 2. TECHNICAL ANALYSIS - PROBLEM AREA ANALYSIS SUMMARY

■ Solution Prioritization

- Relative cost
- Level of Design/Permitting
- Ease of Construction
- Land Availability (Public vs. Private)
- Solution Lifespan
 - Action short term (channel or culvert cleaning)
 - Action may not have significant benefit (enlarging culvert may not produce significant reduction in flooding)

Solution	Ratings 0 (low desirability) to 3 (high desirability)						
	Land Type	Relative Cost	Level of Design/Prmit	Ease of Construction	Land Availability	Solution Lifespan	Rank (total)
Basin on municipal	Public	2	1	1	3	3	10
Basin on private property	Private	1	1	1	0	3	6
Improved conveyance - swales	Public	2	2	2	3	3	12
Improved conveyance - swales	Private	1	2	2	0	3	8
Improved Conveyance - Pipe	Public	1	3	1	3	3	11
Improved Conveyance - Pipe	Private	1	3	1	0	3	8
Improved Crossing Pipe	Public	2	1	1	3	3	10
Improved crossing Pipe	Private	1	1	1	0	3	6
Floodplain reconnection	Public	1	0	0	3	3	7
Floodplain reconnection	Private	0	0	0	0	3	3
Waterway Obstruction Removal Minor	Public	3	3	3	3	0	12
Waterway Obstruction Removal Minor	Private	2	3	3	2	0	10
Waterway Obstruction Removal Large	Public	3	3	3	3	0	12
Waterway Obstruction Removal Large	Private	2	3	3	2	0	10

TASK 2. TECHNICAL ANALYSIS - PROBLEM AREA ANALYSIS SUMMARY

- Problem Area Summary
 - Conceptual Solutions Map
 - Potential Solutions/Analysis
- Flooding Detail
 - Type of Flooding/# of Buildings Inundated
 - Floodplain Map (FEMA Zones)
- Problem Site Description
 - Type of Problem/Potential Solutions
 - Site Photographs/Descriptions

PROBLEM SITE DESCRIPTION			
PA #9B - HOUGHS CREEK - UNT TO HOUGHS CREEK			
Bucks County Act 167 Plan			
Problem Area(s) - Map ID:	Site 136	Municipality:	Upper Makefield Township
Inspected By/Date:	ADC 05/27/25	Checked By/Date:	TJC 03/06/26
Type of Problem (highlighted):		Comments	
1	Flooding	The residential properties located at 11 and 19 Aqueduct Rd have experienced significant flooding. In certain storm events, their driveway culverts have been overtopped which prevents them from being able to evacuate the area.	
2	Deficient Bridge/Culvert		
3	Erosion		
4	Sedimentation		
5	Water/Groundwater Pollution		
6	Other		
Solution(s)	Driveway culvert replacements at 11 and 19 Aqueduct Rd and floodplain restoration (BMP 3.4.3) / stormwater basin retrofits.		
		Description	
		Looking downstream towards the residential property of 11 Aqueduct Rd, which is located on the left bank of the unnamed tributary to Houghs Creek and just upstream from the confluence with another tributary. This property floods when stormwater backs up against the 9ft wide arch culvert that conveys flow under the driveway.	
		Description	
		Looking upstream towards the driveway of 19 Aqueduct Rd. An unnamed tributary of Houghs Creek flows through Washington Crossing Rd and the driveway culvert of 11 Aqueduct Rd before flowing through the driveway culvert at 19 Aqueduct Rd on the right side of the photo. Another unnamed tributary of Houghs Creek flows across Aqueduct Rd via the elliptical pipe on the left side of the photo. Increasing the hydraulic openings of the driveway in this area could help to reduce flooding and driveway overtopping at this junction.	

TASK 2. TECHNICAL ANALYSIS - PROBLEM AREA ANALYSIS SUMMARY

- Hydrology
 - USGS StreamStats
 - HydroCAD Calibrated to StreamStats
- Hydraulics
 - HY-8 Bridge/Culvert Analysis
 - HydroCAD Volume Storage Analysis
 - FlowMaster Channel Velocity Analysis
- Results
 - Problem Area Summary Sheet
 - Existing vs. Proposed (WSEL, Peak Discharge, Velocity)

StreamStats Report

Region ID: PA
Clicked Point (Latitude, Longitude): 40.27587, -74.89137
Time: 2026-02-10 09:00:27 -0500

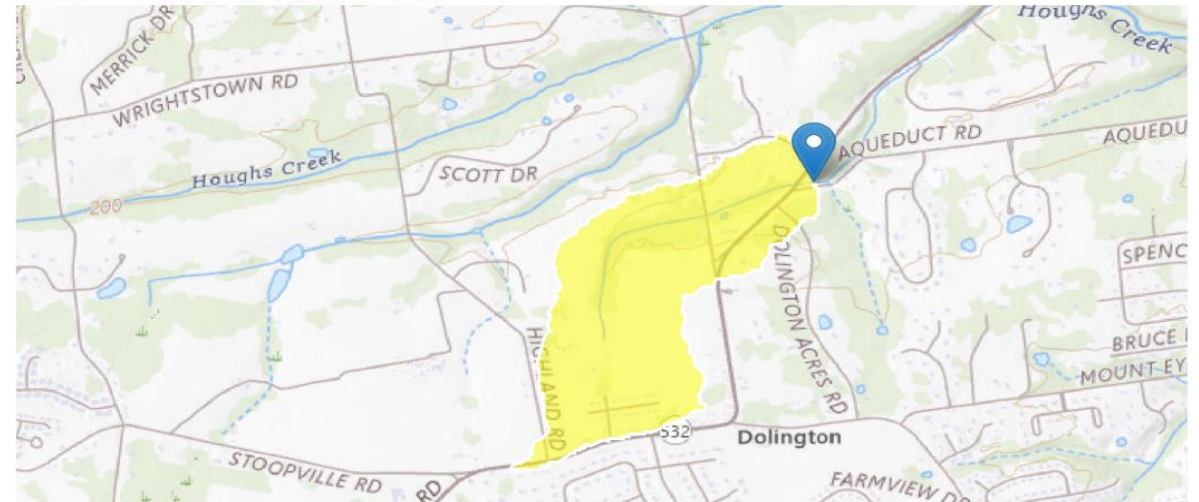
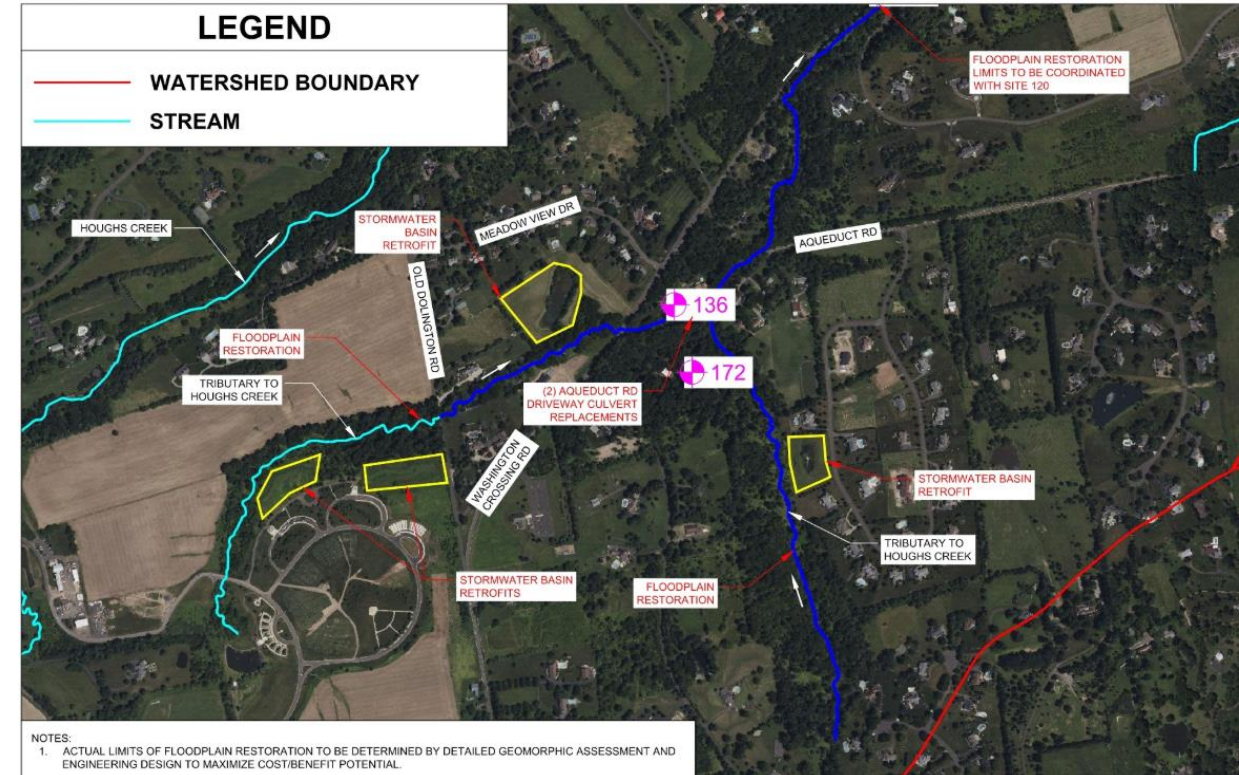


Table 1 - Summary of Culvert Flows at Crossing: Site 136 - Existing Aqueduct Rd Driveway Culverts

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
143.84	2 year	119.00	119.00	0.00	1
145.36	5 year	216.00	216.00	0.00	1
146.48	10 year	300.00	274.49	25.43	5
147.28	25 year	424.00	313.46	110.41	3
147.85	50 year	530.00	339.74	190.24	4
148.39	100 year	647.00	364.74	282.15	3
146.00	Overtopping	249.60	249.60	0.00	Overtopping

TASK 2. TECHNICAL ANALYSIS - PROBLEM AREA ANALYSIS SUMMARY

- Problem Area #9B (UNT to Houghs Creek)
 - Aqueduct Rd (Upper Makefield Township)
 - Site 136: Driveway overtopping and severe flooding of residential property
 - Site 172: Streambank erosion and sedimentation
- Potential Solutions
 - Site 136: Culvert Replacement, Floodplain Restoration and/or Stormwater Basin Retrofits
 - Site 172: Floodplain Restoration



TASK 2. TECHNICAL ANALYSIS - PROBLEM AREA ANALYSIS SUMMARY

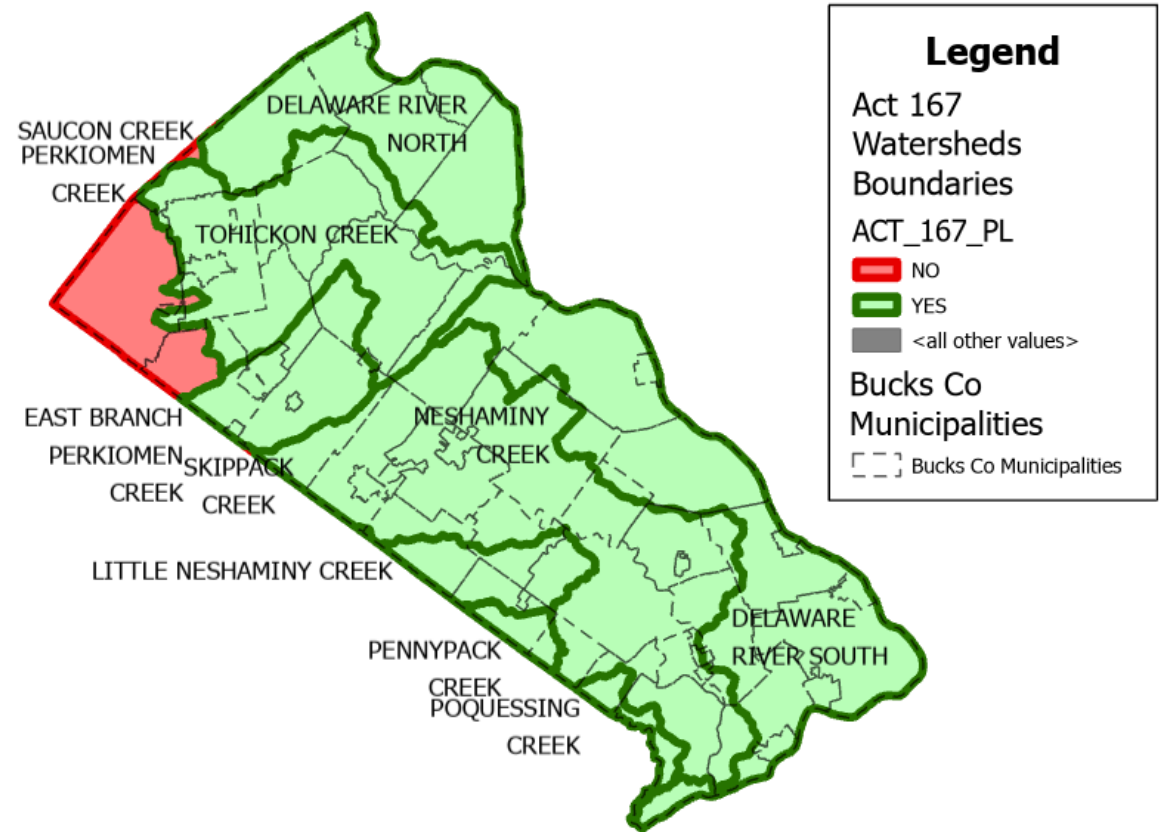
- Problem Area Analysis (Site 136)
 - Replace 9' x 4.5' Existing Arch Culvert with 20' x 4.5' Proposed Box Culvert
 - Proposed Structure Passes 50-yr storm (vs. 5-yr storm)
 - 100-yr storm with mitigated peak discharge
- Problem Area Analysis (Site 172)
 - Floodplain Restoration to Address Streambank Erosion/Sedimentation
 - Existing 100-yr Channel Velocity = 9.92 ft/s
 - Proposed 100-yr Velocity = 3.97 ft/s

Problem Area Analysis - Site 136 (11 & 19 Aqueduct Rd Driveway Culvert)			
Drainage Area	250 acres		
Solution Description	Replace existing 9ft x 4.7ft arch culvert with proposed 20ft x 4.5ft concrete box culvert. Provide 56 acre-ft of storage with floodplain restoration and/or regional stormwater facility upstream of the structure to mitigate peak flows.		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (ft)
2-Year	207.74	159.40	-48.34
10-Year	355.00	306.53	-48.47
25-Year	454.99	406.44	-48.55
50-Year	540.30	491.67	-48.63
100-Year	633.48	584.77	-48.71
Hydraulic analysis completed in HY-8 v. 7.70, storage and volume calculations completed in HydroCAD 10.20-6a, and input discharges obtained from StreamStats. The existing structure passes the 5-yr storm event and the proposed structure passes the 50-yr storm event. With mitigated peak discharges, the proposed 20ft x 4.5ft concrete box culvert passes the 100-yr storm event (assumes roadway overtopping elevation = 146.00).			

Problem Area Analysis - Site 172			
Drainage Area	218 acres		
Solution Description	Floodplain restoration		
Storm Frequency	Existing Channel Velocity (ft/s)	Proposed Channel Velocity (ft/s)	Difference (ft/s)
2-Year	5.59	2.05	-3.54
10-Year	7.72	2.95	-4.77
50-Year	9.32	3.68	-5.64
100-Year	9.92	3.97	-5.95
Hydraulic analysis completed in FlowMaster CONNECT Edition Update 3, input discharge obtained from StreamStats. Floodplain restoration provides a maximum velocity reduction of 5.95 ft/s during the 100-yr storm event.			

TASK 2. TECH ANALYSIS - STANDARDS & CRITERIA

- Peak Rates
 - Release rates where they exist
 - Adding Upper Perkiomen release rates
 - Other without release rates – Post to pre (100% release rate)
- Stream Bank Protection
 - 2-year post-development to 1-year pre-development
- Recharge/Volume Control (State Standard)
- Water Quality (State Standard)



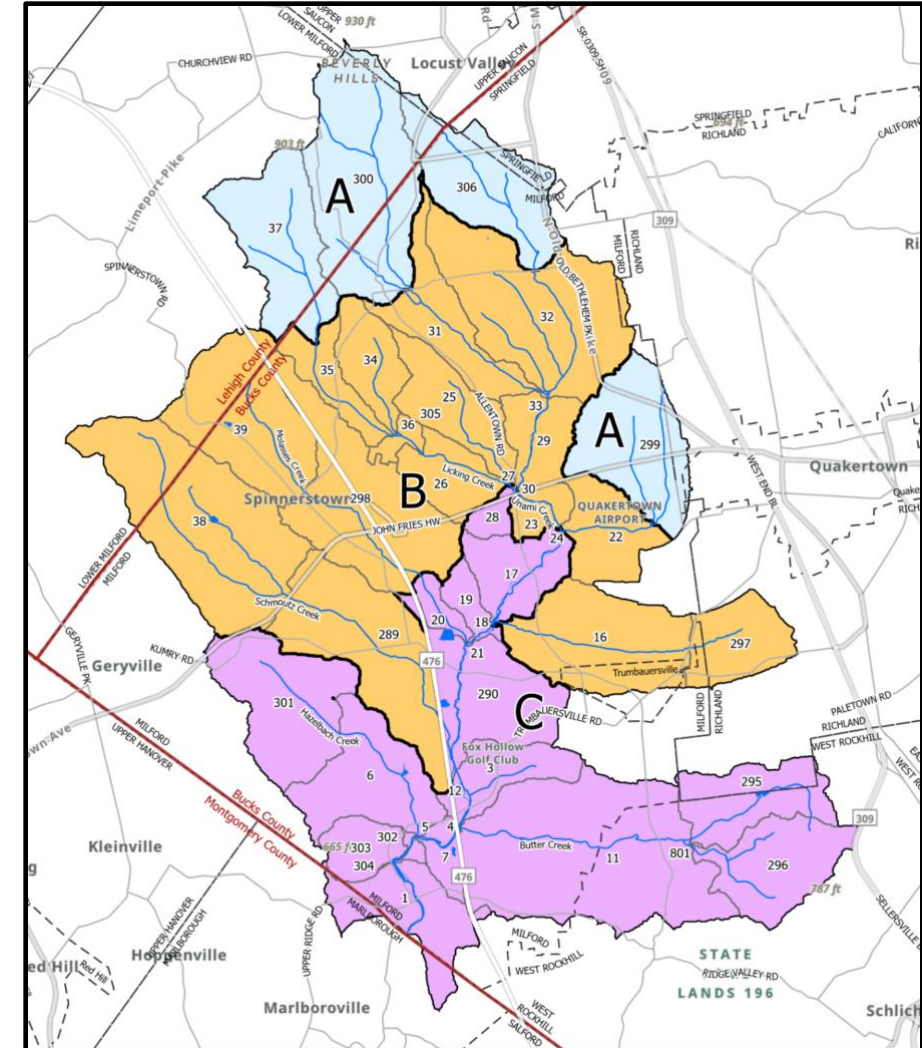
TASK 2. TECHNICAL ANALYSIS – UNAMI CREEK RELEASE RATES

Highlights:

- Calibrated Runoff Model
- Goal – Hold peak rates at or below existing peak rates at the Montgomery County Boundary
- District A – 100% release rate
- District B – 75% release rate
- District C – Conditional Direct Discharge

➔ Requires demonstration of stable conveyance.

Districts	Design Storm Proposed Conditions		Design Storm Existing Conditions
A	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	Reduce To	1-Year 5-Year 10-Year 25-Year 50-Year 100-Year
B	2-Year 5-Year 10-Year 25-Year 50-Year 100-Year	Reduce To	1-Year 2-Year 5-Year 10-Year 25-Year 50-Year
C	2-Year Conditional Direct Discharge	Reduce To	1-Year 5-Year 10-Year 25-Year 50-Year 100-Year

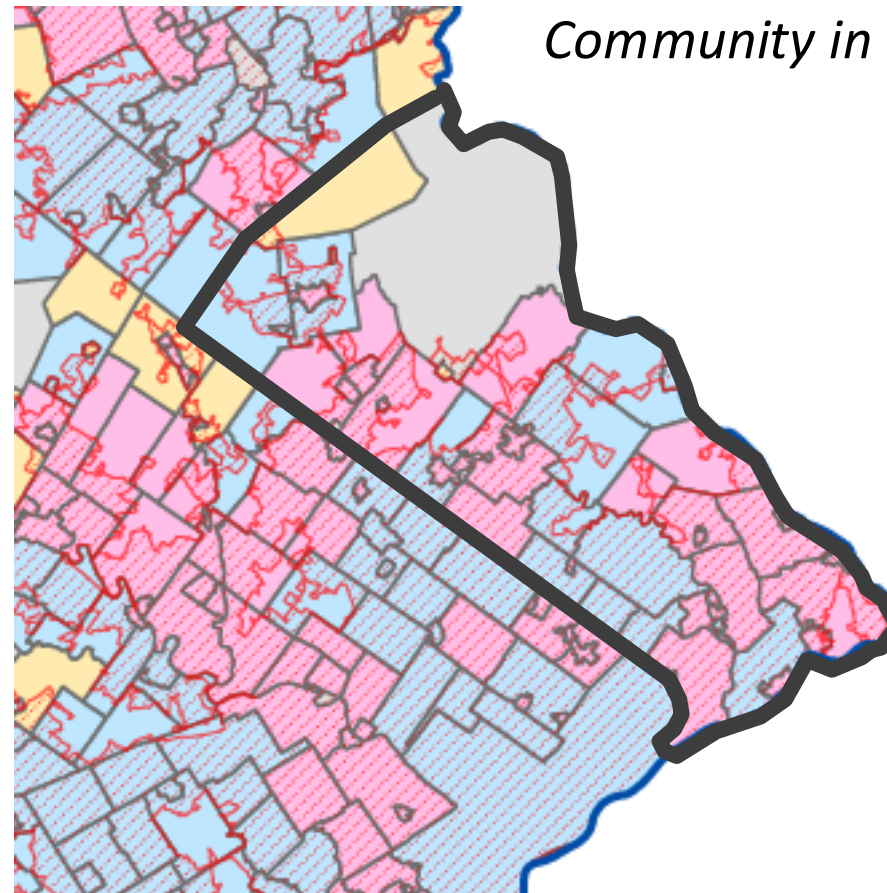


Upper Perkiomen – Unami Creek Release Rate Map

TASK 3. MODEL ORDINANCE

- First Countywide Model Stormwater Management (SWM) Ordinance
- Consistent with Draft PCSM Manual & Draft 2028 PA DEP Model SWM Ordinance
- Customize for Bucks County
 - Impervious Surface threshold minimum (5,000 sq ft or more restrictive)
 - Language to clarify interpretation of impervious surface definition

Current MS4 Regulated Community in Bucks County



Category	No. of Municipalities
Total	54
General Permits	19
Waivers (General)	2
Individual Permits	26
Waivers (Individuals)	1
Non-Municipal MS4s	1
Unregulated Municipalities	6

TASK 3. MODEL ORDINANCE

- PCSM Manual & 2028 PA DEP Model SWM Ordinance releases are impacting project schedule
- Municipalities will have **6 months** to adopt an ordinance consistent with the Countywide Model after the County adopts the Act 167 Plan
- Ordinance will allow for flexibility in restrictiveness – *do not just repeal and replace without detailed review*
- Municipal Ordinance Workshop TBD

3800-PM-BCW0100j 1/2025
Model Ordinance
 Pennsylvania
Department of
Environmental Protection

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
STORMWATER DISCHARGES FROM SMALL
MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s)
PENNSYLVANIA STORM WATER MANAGEMENT ACT (ACT 167)
2028 MODEL STORMWATER MANAGEMENT ORDINANCE**

The Pennsylvania Storm Water Management Act (Act 167) at 32 P.S. § 680.11 requires municipalities to “adopt or amend, and...implement such ordinances and regulations, including zoning, subdivision and development, building code, and erosion and sedimentation ordinances, as are necessary to regulate development within the municipality in a manner consistent with the applicable watershed stormwater plan and the provisions of this act.”

Federal regulations at 40 CFR § 122.34 require the use of ordinances by small municipal separate storm sewer systems (MS4s) to address 1) the prohibition of unauthorized non-stormwater discharges (MCM #3), 2) erosion and sediment controls for construction activities involving earth disturbances of one acre or more (or disturbances less than one acre if the construction activity is part of a larger common plan of development or sale that would disturb one acre or more) (MCM #4), and 3) post-construction stormwater management for new development and redevelopment projects (MCM #5).

The Pennsylvania Department of Environmental Protection (DEP) is directed under Act 167 to develop a model stormwater ordinance. DEP's intention in publishing the Model Stormwater Management Ordinance contained in this document is that its use will satisfy both Act 167 requirements and, for MS4s, regulatory requirements as implemented through NPDES permits. It is intended to contain the minimum standards and criteria for municipal stormwater ordinances. Municipalities should consider requirements unique to their municipality and specific county-wide or watershed-wide Act 167 Plans when developing or updating ordinances. The title of this document contains the year 2028 because it is expected that MS4s will update existing ordinances to be consistent with the model ordinance in this document by September 30, 2028.

A Word version of the 2028 Model Ordinance is available on DEP's website, www.dep.pa.gov/MS4, and may be used by municipalities to facilitate development of a new ordinance or modification to existing ordinances. Text highlighted in **gray** indicates where municipality-specific information should be entered. Text highlighted in **yellow** is optional content that municipalities can consider using where applicable.

It is recommended that the municipal solicitor review Article XI (Inspection, Enforcement and Penalties) and make any revisions necessary to ensure enforcement is pursued commensurate with applicable municipal laws and regulations. Appendix A to the Model Stormwater Management Ordinance is a recommended format for a landowner Operation and Maintenance Agreement.

SCHEDULE/TIMELINE

- Draft Plan (including Ordinance) - September 4, 2026
- WPAC #6 (Plan Overview) – September 9, 2026
- Draft Plan Comments Due - September 23, 2026
- Final Draft Plan to PADEP for review – October 16, 2026
- Final Plan / Start of Implementation Phase –
January/February 2027 (PADEP review dependent)



MUNICIPAL REIMBURSEMENT

- [Municipal Reimbursement Form and Application](#) (linked here)
- More information on eligibility for reimbursements is at [PA Clean Water Academy](#)
 - Use the Find Learning dropdown menu to select “Stormwater – Act 167.” Then click on the “Act 167 Plan Municipal Reimbursements” course

3800-FM-BCW0059 Rev. 1/2025
Instructions
Pennsylvania
Department of
Environmental Protection

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

INSTRUCTIONS FOR COMPLETING THE APPLICATION FOR MUNICIPAL REIMBURSEMENT UNDER THE PENNSYLVANIA STORM WATER MANAGEMENT ACT (1978 ACT 167)

General Instructions

Municipalities located in counties for which watershed stormwater management plans (“Act 167 Plans”) have been adopted by the county and approved by the Department shall be eligible for partial reimbursement of the allowable costs incurred during the adoption of stormwater ordinances and for the administration, implementation, and enforcement of the provisions of the county Act 167 Plan. Only municipalities that have enacted a stormwater ordinance consistent with a model ordinance contained in a current and approved 167 Plan are eligible for reimbursement. Municipalities updating ordinances independent of a county Act 167 Plan or Plan update are not eligible for reimbursement. Reimbursements shall be made from and to the extent of funds appropriated by the General Assembly for such purposes. When funding is available, municipalities may request reimbursement for 75% of the allowable costs up to a cap of \$9,999 per year.

The following instructions and explanatory notes are for use in completing the municipal reimbursement application.

- Costs for reviewing stormwater management components of land development plans.
- Costs for inspection and monitoring of the construction of Stormwater Management Facilities
- Costs for technical, legal, and clerical services necessary to enact ordinances, regulations, creation or purchase of administrative forms, maps, and other items required by the Act 167.
- Costs for technical and legal services necessary for required public hearings related to the adoption or implementation of the Act 167 Plan.
- Costs incurred for participation in a watershed plan advisory committee, including mileage expenses.

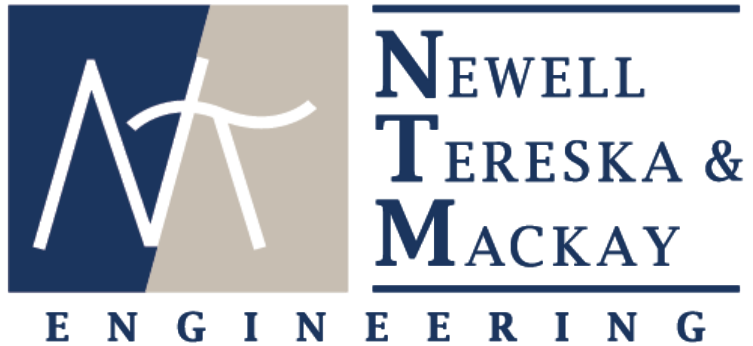
- Costs which are offset by permit review or stormwater fees imposed by the municipality.
- Costs for activities or expenses which are not solely required by Act 167 including BMP implementation required to comply with MS4 NPDES Permits.

... are allowable

...es relating to
cons...

...on or purchase
...e adoption or
...ses.

ment.
activities
activities other than purely stormwater management
by Act 167 including BMP implementation require
ents for allowable costs incurred must be include



THANK YOU!

Q&A

SCOTT BROWN, PE

SBROWN@NTMENG.COM

BETHANY SHUMAKER, PE

BSHUMAKER@NTMENG.COM

BETH UHLER

BEU@CWP.ORG

TYLER CHARLES

TCHARLES@JMT.COM