

# Erosion Potential Analysis (EPA)

Westmoreland Conservation District  
Engineers Workshop  
March 19-20, 2026

(Formerly called, Off-Site Discharge Analysis)

# Erosion Potential Analysis

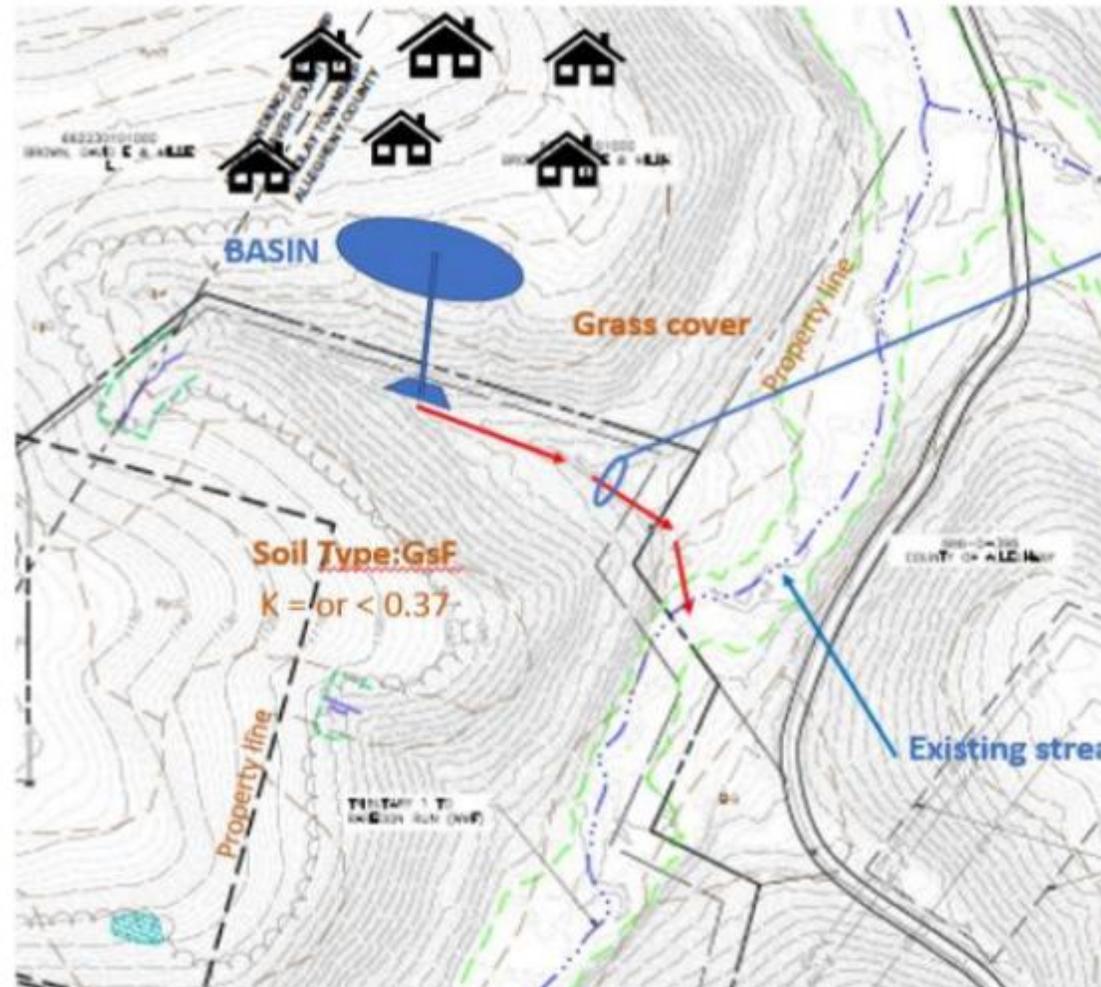
- To protect flow paths of water leaving a permitted site
- To prevent erosion
- Applies to concentrated outflows from E&S BMP's and PCSM SCMs.



# Erosion Potential Analysis

- Used to be called “off-site discharge analysis”
- Applies to discharges of stormwater whether or not they are on your site
- Applies to water flow paths until a *surface water* is reached

Figure 1: Example Illustration and Photograph of



# Surface Waters

- Perennial and Intermittent
- Streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps, and estuaries



# Surface Waters ?

- Perennial and Intermittent
- Streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps, and estuaries



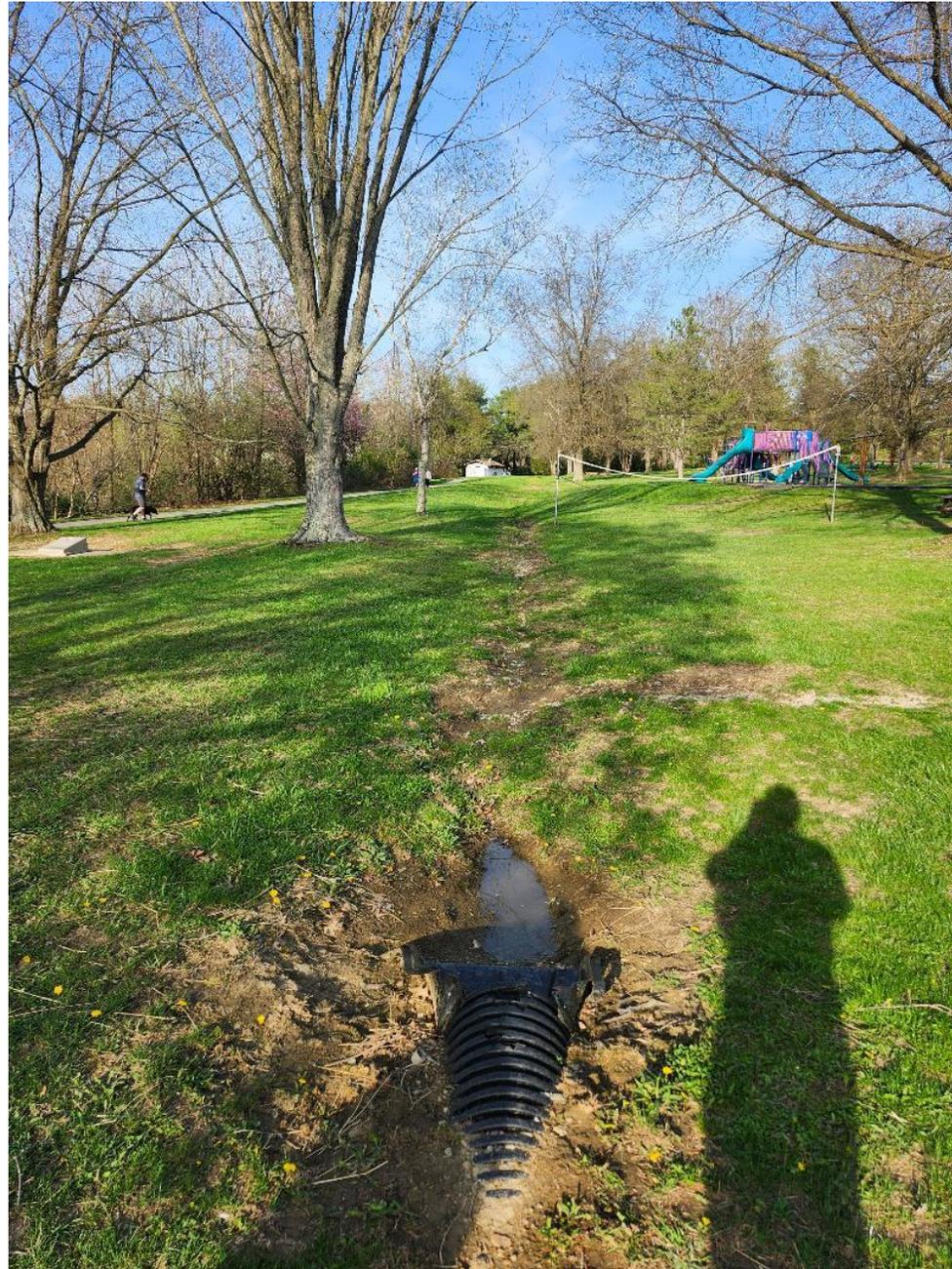
This is not a  
surface water



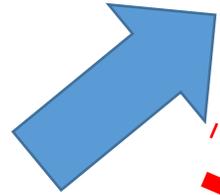
This is not a surface water



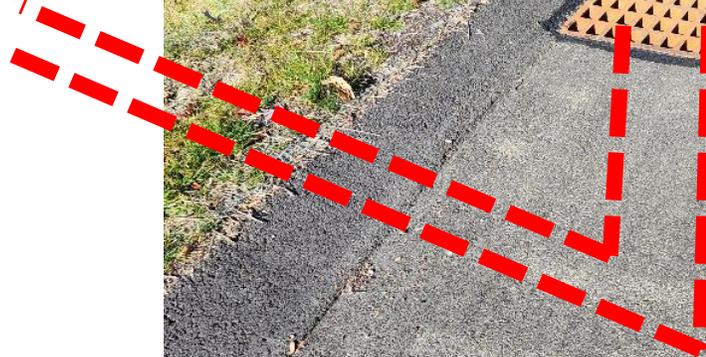
This is not a  
surface water



May have to show  
where this goes to.



Does the storm sewer  
outlet directly to a  
Surface Water?

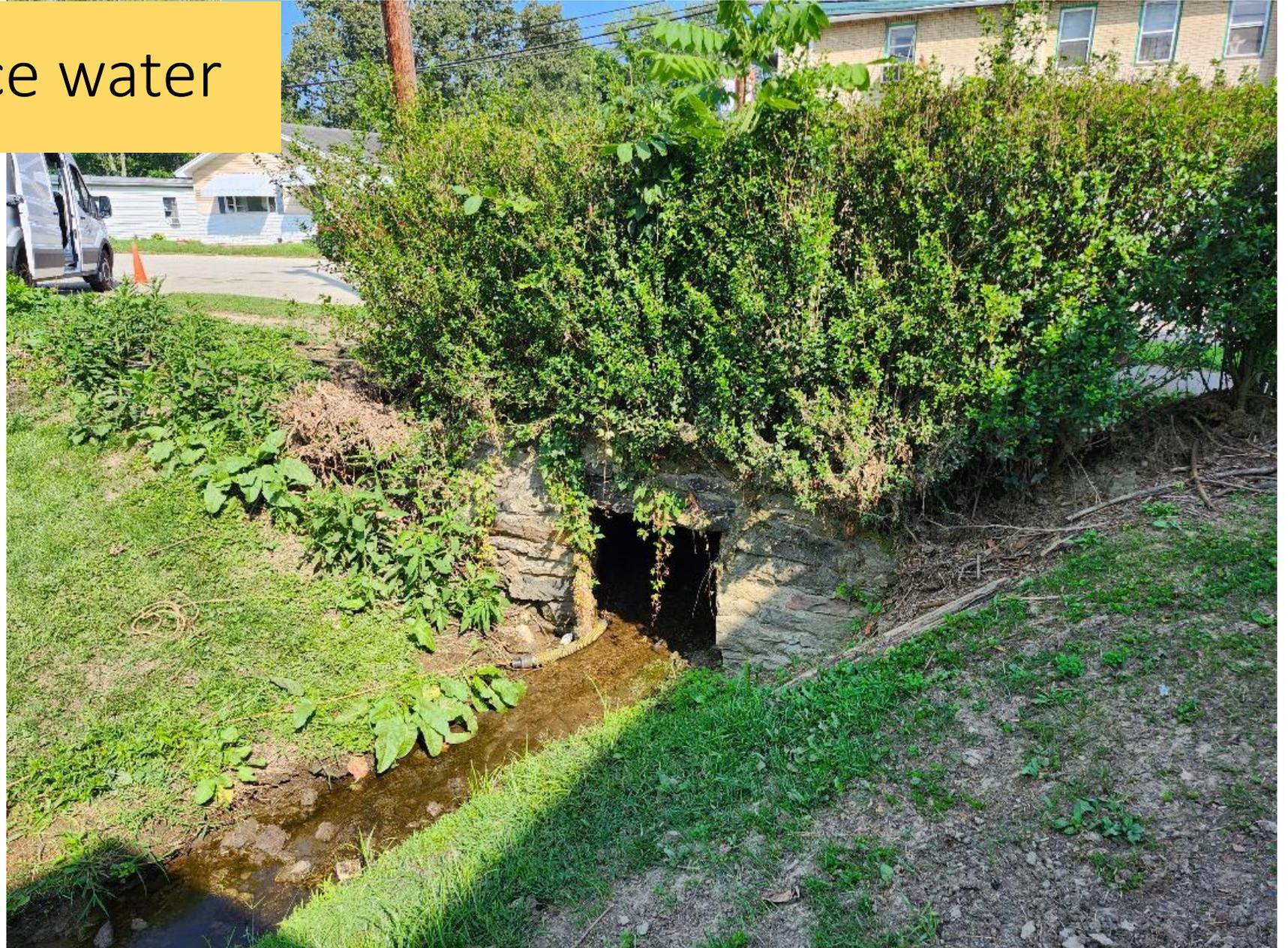


# Following a storm sewer to its outlet



Figure 6A from PA DEP's EPA FAQ document

This is a surface water



# You don't need an E. P. A. when...

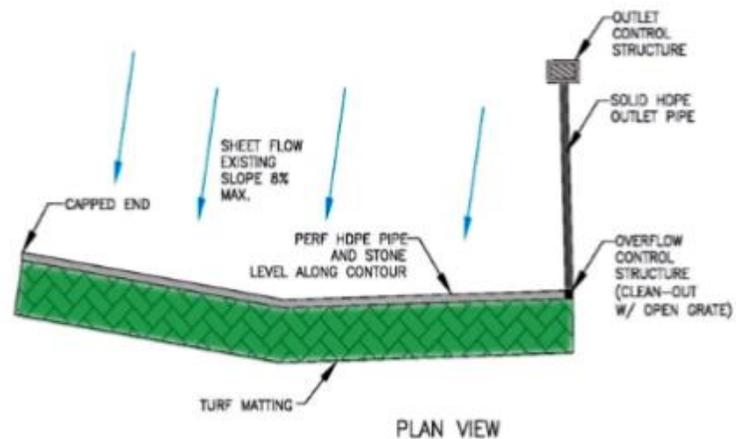
- You are designing and constructing a new channel (or improving an existing channel) to carry the outflow safely to a surface water



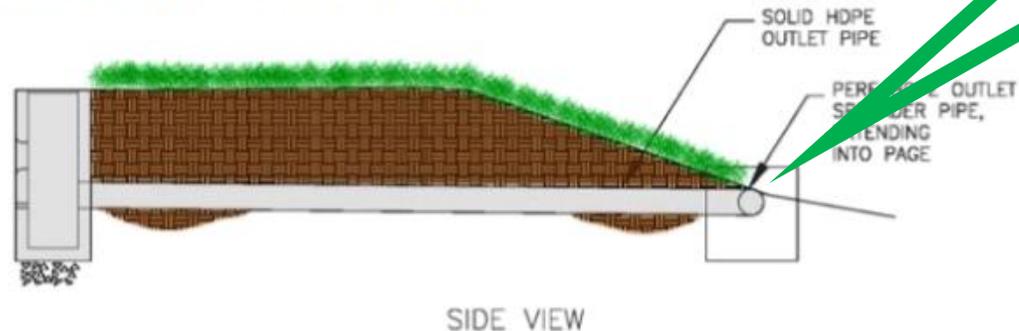
You don't need an E. P. A. when...

You discharge to a properly designed and constructed level spreader\*

## BMP 6.8.1: Level Spreader



Level Spreaders are measures that reduce the erosive energy of concentrated flows by distributing runoff as sheet flow to stabilized vegetative surfaces. Level Spreaders, of which there are many types, may also promote infiltration and improved water quality.



Depth of flow < 0.1 foot

\* See PA's 2006 SWM Manual and PA's 2012 E&S Manual for details

## Some Level Spreader design points

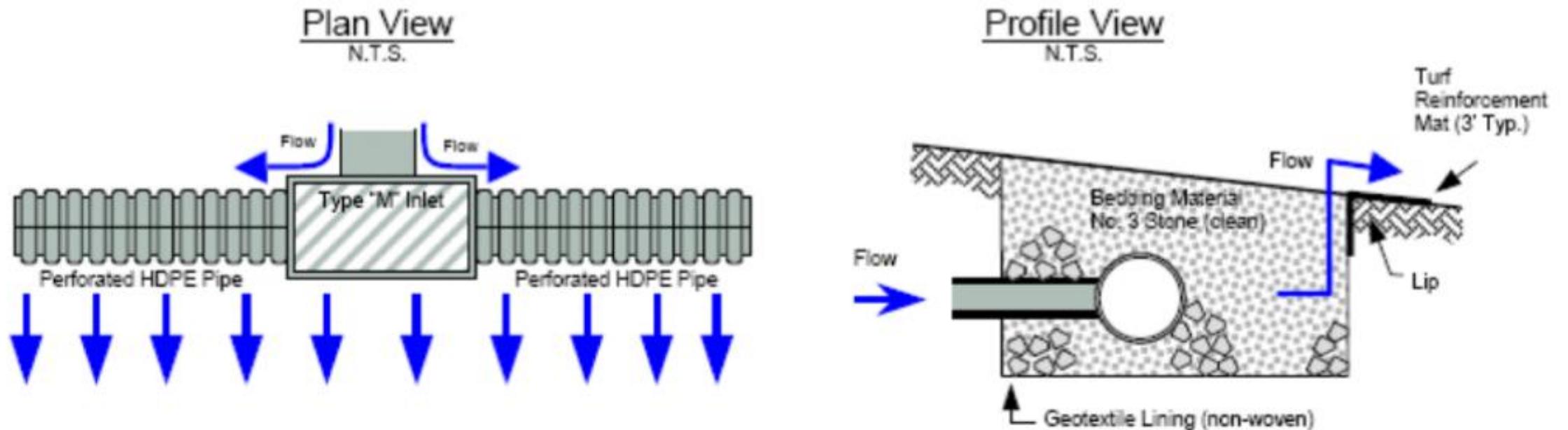
- Level Spreaders are not a substitute for a detention pond or an infiltration SCM.
- Try to limit the drainage area of a Level Spreader to < 5 acres.
- Level Spreaders should discharge to a well established grass area. If discharging to woods, limit the flow.
- Coordinate with the site contractor to prevent disturbance below the Level Spreader
- Make sure the flow doesn't re-concentrate downstream of the LS

See PA DEP's 2012 Erosion and Sediment Control Manual, Appendix G, by Domenic Rocco PE for design help

# A frequently used Level Spreader design

- Use a Type M inlet or other inlet at the junction between the pipe feeding the LS and the perforated pipes.
- Surround the perforated pipe with No. 3 stone.
- Use a TRM immediately downstream of the LS.

**Figure G.5. Typical Orientation of Level Spreader with Subsurface Discharge**

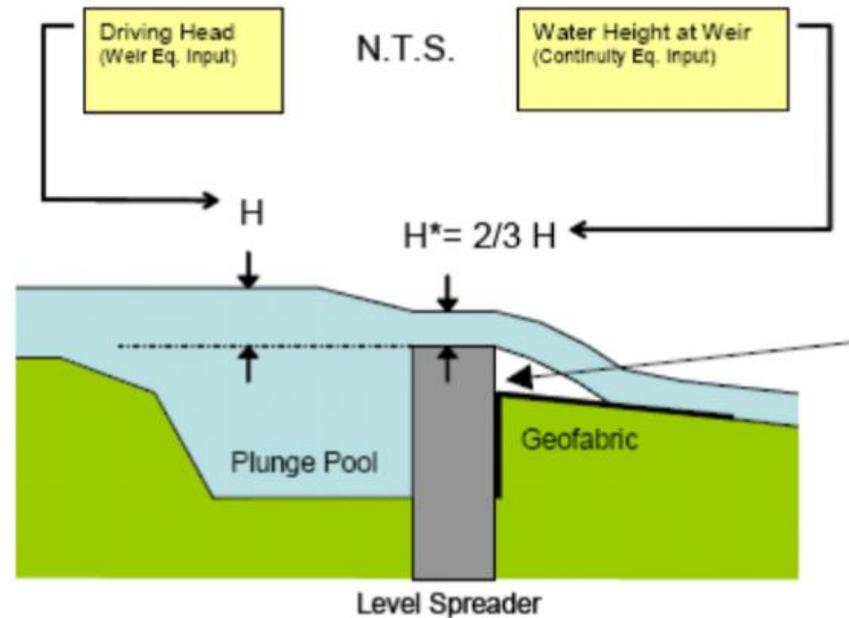


Notice that if you are discharging into woods, you will need a longer level spreader in order to reduce the flow velocity.

Table G.2. Maximum Velocities of Flow Across Level Spreader

Down Slope Ground Cover	Velocity at Level Spreader V (fps)	Driving Head H (feet)	"Equivalent" Water Height over Level Spreader, $H^*=2/3H$
Grass/Thicket	1.33	0.09	0.058
Gravel	1.50	0.11	0.074
Mulch (Trees, Shrubs)	0.67	0.02	0.015

Figure G.8. Weir Equation Inputs



Source: *Designing Level Spreaders to Treat Stormwater Runoff*

# You may not need an Erosion Potential Analysis when...

- You aren't changing the flow path characteristics, AND
- You aren't increasing the 10 year 24 hour storm Q

Peak Q 10

Cover condition

Slope

Geometry

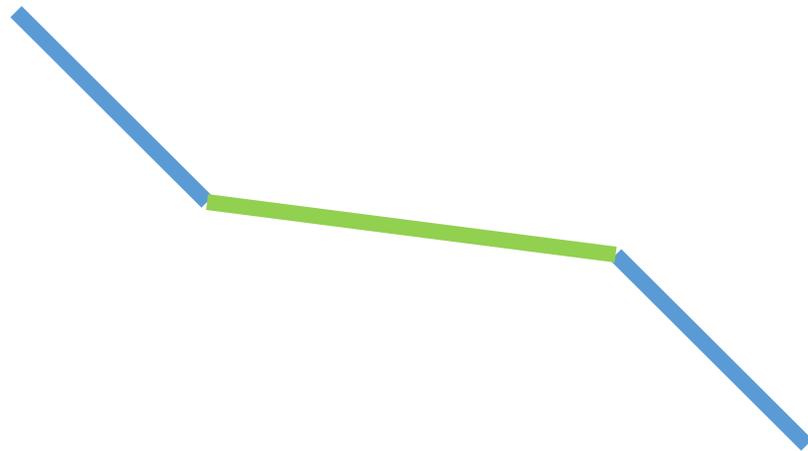
Location

Outfall

Provide information demonstrating each of these factors

## E. P. A. calculations

- Based on the 10-year/24 hour storm
- Show stability (and capacity) for your flow path
- Velocity calculations sufficient if slope is  $< 10\%$
- Shear stress calculations needed if slope is  $> 10\%$



Analyze  
each  
segment  
separately

## Calculating *Shear Stress* for a flow path

- PA DEP's 2012 E&S Manual, Chapter 6
- Tables give accepted values for shear stress and velocity
- Determine the type of soil you are in—is it highly erodible?

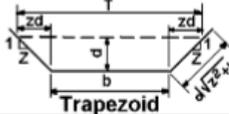
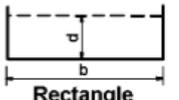
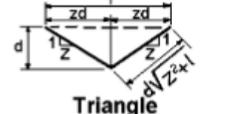
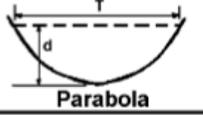
$$\tau_d = 62.4 d \times s.$$

Where:  $d$  = Anticipated flow depth (ft)  
 $s$  = Channel Bed Slope (ft/ft)

# Calculating *Velocity* for a flow path

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

**TABLE 6.1**  
**Geometric Elements of Channel Sections**

Section	Area $a$	Wetted Perimeter $P$	Hydraulic Radius $r$	Top Width $T$
 Trapezoid	$bd + zd^2$	$b + 2d\sqrt{z^2 + 1}$	$\frac{bd + zd^2}{b + 2d\sqrt{z^2 + 1}}$	$b + 2zd$
 Rectangle	$bd$	$b + 2d$	$\frac{bd}{b + 2d}$	$b$
 Triangle	$zd^2$	$2d\sqrt{z^2 + 1}$	$\frac{zd}{2\sqrt{z^2 + 1}}$	$2zd$
 Parabola	$\frac{2}{3}dT$	$T + \frac{8d^2}{3T}$ <sup>1</sup>	$\frac{2dT^2}{3T^2 + 8d^2}$ <sup>1</sup>	$\frac{3a}{2d}$
 Circle < 1/2 full <sup>2</sup>	$\frac{D^2}{8} \left( \frac{\pi\theta}{180} - \sin\theta \right)$	$\frac{\pi D \theta}{360}$	$\frac{45D}{\pi\theta} \left( \frac{\pi\theta}{180} - \sin\theta \right)$	$\frac{D \sin \frac{\theta}{2}}{2}$ or $2\sqrt{d(D-d)}$
 Circle > 1/2 full <sup>3</sup>	$\frac{D^2}{8} \left( 2\pi - \frac{\pi\theta}{180} + \sin\theta \right)$	$\frac{\pi D (360 - \theta)}{360}$	$\frac{45D}{\pi(360 - \theta)} \left( 2\pi - \frac{\pi\theta}{180} + \sin\theta \right)$	$\frac{D \sin \frac{\theta}{2}}{2}$ or $2\sqrt{d(D-d)}$
<sup>1</sup> Satisfactory approximation for the interval $0 < d/T \leq 0.25$ When $d/T > 0.25$ , use $p = 1/2\sqrt{16d^2 + T^2} + \frac{T^2}{8d} \sin^{-1} \frac{4d}{T}$ <sup>2</sup> $\theta = 4 \sin^{-1} \sqrt{d/D}$ <sup>3</sup> $\theta = 4 \cos^{-1} \sqrt{d/D}$ } Insert $\theta$ in degrees in above equations				

National Engineering Handbook, Section 5, ES-33

Be very careful not to cause damage to farmland



You may need to provide an upgrade for an existing outlet with an erosion problem.



# Important DEP Resources for Erosion Potential Analysis:

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF CLEAN WATER  
**EROSION POTENTIAL ANALYSIS  
FOR CHAPTER 102 PERMITS  
INSTRUCTIONS**

## General

An Erosion Potential (EP) Analysis is a technical evaluation of the stability of a flow path from a surface water or storm sewer that directly discharges to a surface water. An EP Analysis is part of Chapter 102 permit applications and Notices of Intent (NOIs) to evaluate the potential for erosion and sedimentation during and after construction when concentrated flows, such as outflows from erosion and sedimentation management practices (BMPs) or post-construction stormwater management practices (SCMs), will be directed to areas on-site and/or off-site that are not surface water bodies. Ephemeral streams, channels, open areas such as fields) or storm sewers that are tributaries to surface waters should be identified on E&S Plans and/or PCSM Plans at the outflow of the BMP or SCM. An EP Analysis has been performed. **Note that the stormwater analysis required by 25 Pa. Code § 102.11(a) or may not be necessary at DPs.**

Except as otherwise required by the Department of Environmental Protection (DEP) District (CCD), an EP Analysis is generally unnecessary when:

- A new channel will be designed and constructed to convey runoff in accordance with the DEP District Pollution Control Program Manual (363-2134-008; E&S Manual). If segments of the channel are not improved, the segments of the flow path that will not be improved will need an EP Analysis.
- A level spreader is proposed in which calculations are provided to demonstrate that the sheet flow conditions immediately below the level spreader. The designer must document the calculations.



**pennsylvania**  
DEPARTMENT OF ENVIRONMENTAL  
PROTECTION  
Bureau of Clean Water

## Chapter 102 Erosion Potential Analysis Frequently Asked Questions (FAQ) Revised, May 19, 2025 Version 1.3

### Background

Any person conducting or proposing to conduct an earth disturbance activity must design, implement and maintain erosion and sediment control (E&S) best management practices (BMPs) to minimize the potential for accelerated erosion and sedimentation during construction (see 25 Pa. Code § 102.11(a)). After earth disturbance is complete, the site must be permanently stabilized and protected from accelerated erosion and sedimentation (see 25 Pa. Code § 102.22(a)). When stormwater runoff concentrates and forms channelized flow, the runoff can cause accelerated erosion unless the channel or other conveyance is adequately stabilized. Channelized or concentrated flow frequently occurs below the outlets or overflows of BMPs and post-construction stormwater management (PCSM) stormwater control measures (SCMs) and the use of outlet protection is expected to minimize accelerated erosion.

# E. P. A. form to fill out—one for each Discharge Point that meets criteria

3800-FM-BCW0271h Rev. 10/2024  
Erosion Potential Analysis  
 Pennsylvania  
Department of  
Environmental Protection

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF CLEAN WATER

## EROSION POTENTIAL ANALYSIS FOR CHAPTER 102 PERMITS

**DISCHARGE POINT (DP) ID:** \_\_\_\_\_  **DURING**  **FOLLOWING CONSTRUCTION**

Applicant Name:

Project Site Name:

### CONVEYANCE INFORMATION

***Type of Conveyance:***

- Existing channel/swale or other flow path that will be partially improved
- Existing channel/swale or other flow path that will not be improved

Distance to Property Boundary: \_\_\_\_\_ ft

Distance to Surface Water or Storm Sewer: \_\_\_\_\_ ft

### FLOW PATH INFORMATION

The entire flow path is shown on:  E&S  PCSM  Plan Drawings

Plan Drawing No(s): \_\_\_\_\_

Description of land cover of flow path: \_\_\_\_\_

- Photographs of the flow path are attached.

# E. P. A. form to fill out

**Critical Section Data:**

Peak discharge rate at 10-year/24-hour storm (*attach calculations or model output*): \_\_\_\_\_ cfs

Slope: \_\_\_\_\_ %    Soil type(s): \_\_\_\_\_    Soil Erodibility (k) factor: \_\_\_\_\_

Maximum Allowable Velocity: \_\_\_\_\_ fps    Source: \_\_\_\_\_

Maximum Allowable Shear: \_\_\_\_\_ psf    Source: \_\_\_\_\_

Calculated Maximum Velocity: \_\_\_\_\_ fps    (*Attach calculations or model output*)

Calculated Maximum Shear: \_\_\_\_\_ psf    (*Attach calculations or model output*)

Source of topographic data for flow path: \_\_\_\_\_

The flow path will be improved as described below.

**Affected Landowners:**

Stormwater discharges will not flow off-site.

Landowner Name	Address	Phone No.	Email

Landowner consent has been or will be obtained for stormwater discharges.

\_\_\_\_\_  
Name of Individual Completing Form

\_\_\_\_\_  
Date

# Erosion Potential Analysis...

Is your friend



Questions: Contact Westmoreland Conservation District

[www.westmorelandconservation.org](http://www.westmorelandconservation.org)