COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

SCM 3.3.1 SPREADSHEET
PROTECTED NATURAL STORMWATER FEATURES
INSTRUCTIONS

Draft, March 23, 2026

Introduction

The Department of Environmental Protection (DEP) has developed the SCM 3.3.1 Spreadsheet (Spreadsheet) to calculate volume and water quality management credits when Protected Natural Stormwater Features (PNSFs) are proposed as an SCM. The following describes PNSFs:

- They are non-structural stormwater control measures (SCMs);
- They are existing vegetated lands that are protected from disturbance;
- They receive stormwater runoff prior to and following earth disturbance;
- They may or may not be riparian buffers or riparian forest buffers;
- They may or may not be hydraulically connected to surface waters;
- They may be enhanced to maintain stability following construction; and
- They are not riparian forest buffers meeting the criteria at 25 Pa. Code § 102.14(b).

The SCM 3.3.1 Spreadsheet should also be used for non-forested riparian buffers of any width and for riparian forest buffers with an average width of less than 150 feet (but at least 50 feet).

The Spreadsheet was designed using the latest version of Microsoft Excel® and is in Excel macro workbook (XLSM) format.

Users should check DEP's website periodically for updates to the spreadsheet and instructions by visiting www.dep.pa.gov/constructionstormwater and selecting "E&S Resources". In general, DEP/CCD will accept older versions of the spreadsheet no more than 6 months following the revision date of the spreadsheet. DEP/CCD also reserves the right to request completion of the latest version of the spreadsheet for any project.

Questions on the use of the spreadsheet can be directed to the Bureau of Clean Water at **RA-EPCHAPTER102@pa.gov**.

General Information

It is important that the user follow these instructions carefully. Omission of data in any cell designed for data entry may result in the failure of important calculations.

If prompted by Excel after opening the spreadsheet, enable editing and macros. *Note that you may need to add additional Trusted Locations in the Trust Center Settings of Excel in order to run the macros*. These locations may include server drives and/or locations where you intend to save the file for use. The following steps may be taken:

1. Excel Options > Trust Center > Trust Center Settings > Trusted Locations
2. Check the box to "Allow Trusted Locations on my network"
3. Select "Add new location"
4. Browse to select the folder (or server) where the file will be saved, check the "Subfolders of this location are also trusted" box, and then OK.

The top of the worksheet contains a "Clear Form" button. The user may click on the "Clear Form" button at any time to delete **all** data from the current worksheet. All cells available for data entry or selection from a drop-down menu are highlighted. **The user may use the Tab, arrow, or Enter keys to move from cell to cell. Using the mouse to click from cell to cell may result in validation errors**.

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Care must be taken to enter the data in the correct order identified in these instructions to avoid potential errors with the calculations and logic. For example, skipping a cell may prevent a calculation or produce an error message. The spreadsheet is protected. Formulas are not visible but are explained in this document. Validation that exists in the spreadsheet is highlighted and explained in this document.

Completing the Spreadsheet

General Section

- **SCM ID** – Enter the SCM ID as is identified on plan drawings and PCSM Module 2. A legal instrument, easement or other recording will be needed to ensure long-term protection.

- **SCM Type** – Select the type of NPSF from the dropdown list. The NPSF must be identified on plan drawings and PCSM Module 2 and be located within the project site.

  o **Riparian Forest Buffer Not Meeting § 102.14(b)** – Select this option if there will be stormwater discharges to an existing riparian forest buffer (RFB) with an average width of at least 50 feet but less than 150 feet, within the project site. An RFB is a type of riparian buffer that consists of permanent vegetation that is predominantly native trees, shrubs and forbs along surface waters that is maintained in a natural state or sustainably managed to protect and enhance water quality, stabilize stream channels and banks, and separate land use activities from surface waters. A riparian buffer is an SCM that is an area of permanent vegetation along surface waters.

  o **Riparian Buffer (Non-Forested)** – Select this option if there will be stormwater discharges to an existing riparian buffer with an average width of at least 50 feet, within the project site.

  o **Other Forested Area** – Select this option if there will be stormwater discharges to an existing forested area that is not a riparian forest buffer and the forest has an average width of at least 50 feet, within the project site.

  o **Other Non-Forested Vegetated Area** – Select this option if there will be stormwater discharges to an existing non-forested vegetated area (e.g., meadow) with an average width of at least 50 feet, within the project site.

- **2-Year/24-Hour Precipitation Depth** – Enter the 90th upper confidence interval statistic for the 2-year/24-hour precipitation depth using NOAA Atlas 14, in inches.

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- **SCM Drainage Area** – Enter the proposed post-construction drainage area of the SCM, in acres.

- **Has the Protected Natural Stormwater Feature been investigated in the field?** DEP expects that each PNSF will be evaluated in the field by individual(s) who have experience with the management of stormwater by vegetated land features. If "Yes" is selected, go to the next question. If "No" is selected the following message will be displayed, "A field investigation for preferential flow paths and color photographs are required."

- **Are color photographs of the Protected Natural Stormwater Feature attached?** If "Yes" is selected, go to the next question. If "No" is selected the following message will be displayed, "Attach color photographs of the Protected Natural Stormwater Feature."

- **Do preferential flow paths through the SCM currently exist?** Preferential flow paths are pathways that will concentrate runoff through the PNSF, even if runoff enters as sheet flow. If "No" is selected, go to the next question. If "Yes" is selected, remedial action will be necessary. Select the proposed remedial action from the dropdown menu: "Eliminate preferential flow paths", "Stabilize preferential flow paths to prevent erosion up to the 10-yr/24-hr storm", or "Other". If "Other" is selected provide a description of the proposed remedial action. Remedial actions should be documented on plan drawings.

- **Will flow be concentrated upslope of the Protected Natural Stormwater Feature?** Select "Yes" if stormwater within the SCM drainage area will be collected by a conveyance system or otherwise captured by another SCM prior to the PNSF, otherwise select "No". If "Yes" is selected, select either "Level Spreader" or "Other" from the dropdown menu to indicate how flow will be distributed across the length of the PNSF SCM. If "Other" is selected, enter a description.

Post-Construction Land Cover Section

☑ **Post-Construction Land Cover**

Protected Natural Stormwater Feature Cover Type	Area (ac)	HSG	Runoff, 2-Yr/24-Hr (CF)

Impervious (Within PNSF Drainage Area) Cover Type	Area (ac)	HSG	Runoff, 2-Yr/24-Hr (CF)
		N/A	

- **Protected Natural Stormwater Feature Cover Type** – Select the predominant land cover of the PNSF, the Area of the PNSF within the project site in acres (including areas proposed for enhancement), and the predominant Hydrologic Soil Group (HSG) within the PNSF. A soils scientist or other professional with soils expertise should confirm the HSG; reliance on the NRCS web soil survey is not acceptable. Runoff for the 2-year/24-hour storm is automatically calculated.

- **Impervious (Within PNSF Drainage Area) Cover Type** – Select the type of impervious that best characterizes the impervious surface within the SCM Drainage Area and the impervious area within the PNSF Drainage Area of the project site. Runoff for the 2-year/24-hour storm is automatically calculated.

  For a Riparian Forest Buffer Not Meeting § 102.14(b) and Other Forested Area, the maximum area that can be entered is 50% of the PNSF Area entered above. For a Riparian Buffer (Non-Forested) and Other Non-Forested Vegetated Area, the maximum impervious area that can be entered is 25% of the PNSF Area entered above.

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For example, if there is a 1-acre meadow, the user is limited to 0.25 acre for impervious. If greater than 0.25 acre of impervious will exist in the PNSF Drainage Area, the runoff from impervious in excess of 0.25 acre should be directed to another SCM or off-site, as appropriate.

Design Standards Section

☑ **Design Standards**		
Parameter	**Standard**	**Design Value**
PNSF Length (ft)		
PNSF Contributing Drainage Area Length (ft)		
PNSF Inflow Length, Minimum (ft)		
PNSF Average Width, Minimum (ft)	50	
PNSF Area (ac)		
Average Slope within PNSF, Maximum (ft/ft)	15%	
Method used for long-term protection of PNSF	Select One	
Pretreatment:	Select One	

- **PNSF Length (ft)** – Enter the length, in feet, of the PNSF, within the project site.

- **PNSF Drainage Area Length (ft)** – Enter the maximum length of the PNSF Drainage Area, parallel to the PNSF, in feet, within the project site.

- **PNSF Inflow Length (ft)** – Enter the length that runoff from the PNSF Drainage Area is distributed over prior to entering the PNSF. The PNSF Inflow Length may not exceed the PNSF Length.

- **PNSF Average Width, Minimum (ft)** – Enter the average width of the PNSF based on field measurements or LIDAR. The standard is 50 feet and a value less than 50 feet cannot be entered. In addition, validation is enforced that the product of PNSF Inflow Length and PNSF Average Width must be within 10% of the PNSF Area.

- **PNSF Area (SF)** – PNSF Area is the area of the Protected Natural Stormwater Feature Cover Type entered in the Post-Construction Land Cover Section.

- **Average Slope within PNSF (ft/ft)** – The average slope may not exceed 15% in order to generate credit. A value greater than 15% cannot be entered. If the value exceeds 6%, velocity calculations will need to be provided to demonstrate non-erosive conditions (see below).

- **Peak runoff velocity @ 10-year/24-hour storm (fps)** – When the average slope exceeds 6%, the user must calculate and enter the runoff velocity at the 10-year/24-hour storm. The standard is 2 feet per second (fps). An allowance of 10% is provided. When the velocity is more than 110% of the standard, a deduction applies, as follows:

$$\text{Runoff Velocity} – (\text{Runoff Velocity Standard x 1.1}) / (\text{Runoff Velocity Standard x 1.1})$$

- **Method used for long-term protection of PNSF** – Select either "Deed Restriction", "Conservation Easement" or "Other" from the dropdown list. If "Other" is selected provide a description.

- **Pretreatment** – Select one of the following for pretreatment:

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- ○ **Meadow** – A meadow with a minimum width of 10 feet and a length equal to the PNSF Length may be provided. The average slope of the meadow may not exceed 5% (a value greater than 5% cannot be entered). If the width or length of the meadow is less than 90% of the standard, a deduction is calculated as described for PNSF Inflow Length above.

- ○ **Vegetated Filter Strip** – A filter strip with a minimum width of 20 feet and a length equal to the PNSF Length may be provided. In addition, at the end of the filter strip a retentive grading berm with a height of at least 0.5 foot (6 inches) must be provided (a value less than 0.5 foot cannot be entered). If the width or length of the filter strip is less than 90% of the standard, a deduction is calculated as described for PNSF Inflow Length above.

- ○ **Level Spreader** – A level spreader with a length equal to the PNSF Length may be provided. In addition, to ensure sheet flow to the PNSF, the flow depth over the level spreader may not exceed 0.1 foot at the 10-year/24-hour storm event. Attach calculations. If the length of the filter strip is less than 90% of the standard, a deduction is calculated as described for PNSF Inflow Length above. If the flow depth exceeds 110% of the standard, a deduction is calculated as described for peak runoff velocity, above.

- ○ **None** – This option is available if the Average Slope within PNSF is less than 5%.

Management Credit Section

- • **Does the PNSF Drainage Area contain residential land use?** Select "Yes" if residential land use is within the PNSF Drainage Area and answer the question below, otherwise select "No".

- • **Does the maximum impervious area allowed under local ordinances currently exist on the residential lot(s)?** If "No" is selected a deduction in credit of 10% is applied to account for future impervious. There is no deduction if "Yes" is selected.

- • **Volume Management Credit (CF)** – Volume management credit is calculated through a 4-step process:

  - ○ **Step 1, Volume** – Determine runoff volume for impervious within the PNSF Drainage Area, up to 50% of the PNSF Area for forests and up to 25% of the PNSF Area for meadows/non-forests.

    For example, if the PNSF is a 1-acre meadow, impervious is limited to 25% (0.25 acre), as shown below.

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Protected Natural Stormwater Feature Cover Type	Area (ac)	HSG	Runoff, 2-Yr/24-Hr (CF)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	1.00	B	994

Impervious (Within PNSF Drainage Area) Cover Type	Area (ac)	HSG	Runoff, 2-Yr/24-Hr (CF)
Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW)	0.25	N/A	2,512

NOTE – A higher credit is provided to forested land cover because research has shown that forests intercept a higher percentage of precipitation as compared with non-forest, vegetated land cover.

o **Step 2, Volume** – Determine runoff volume for the PNSF land cover using the impervious area. For example:

Protected Natural Stormwater Feature Cover Type	Area (ac)	HSG	Runoff, 2-Yr/24-Hr (CF)
Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay	0.25	B	249

o **Step 3, Volume** – The difference in runoff between the impervious and PNSF land covers is calculated:

$$2,512 \text{ CF} – 249 \text{ CF} = 2,263 \text{ CF}$$

o **Step 4, Volume** – Adjust the runoff volume by the following factors to determine the final volume management credit:

   o Deductions due to deviations from design standards, if any (volume from Step 3 x (1 – deductions));

   o A 10% factor of safety for future residential impervious, if applicable (volume from Step 3 x 0.9); and

   o An SCM width factor, which adds credit for PNSFs with widths greater than or equal to 100 feet, as follows:

      ▪ For average SCM widths of greater than or equal to 50 feet but less than 100 feet, a factor of 1.
      ▪ For average SCM widths of greater than or equal to 100 feet but less than 150 feet, a factor of 1.1.
      ▪ For average SCM widths of greater than or equal to 150 feet, a factor of 1.2

- **Water Quality Management (TSS, TP, and TN) Credits (lbs)** – A process similar to that of volume management is used to determine water quality management credit.

First, find the pollutant loads associated with the maximum impervious allowed within the PNSF Drainage Area. For the example above, the pollutant loads for 0.25 acre of Impervious Areas: Streets and Roads - Paved; Curbs and Storm Sewers (Excluding ROW) are shown below:

Event Mean Concentrations (EMCs)			Pollutant Loads*		
TSS	TP	TN	TSS	TP	TN
142	0.32	3.0	22.3	0.05	0.47

* Pollutant loads are calculated by the formula: Runoff Volume (2,512 CF) / 43,560 SF/acre x EMC x 2.72.

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Next, find the pollutant loads associated with the same area of PNSF land cover. For the example above, the pollutant loads for 0.25 acre of Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay are shown below:

Event Mean Concentrations (EMCs)			Pollutant Loads*		
TSS	TP	TN	TSS	TP	TN
48.8	0.22	2.3	0.76	0.003	0.012

Finally, find the difference between the impervious pollutant loads and PNSF pollutant loads, as shown below. These loads are adjusted based on the factors in Step 4, Volume, above, for final credits.

- ➢ TSS: 22.3 lbs – 0.76 lbs = 21.54 lbs
- ➢ TP: 0.05 lbs – 0.003 lbs = 0.047 lbs
- ➢ TN: 0.47 lbs – 0.012 lbs = 0.458 lbs

The user of the spreadsheet should enter their name and company after reading the certification statement.

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<u>**Revision History**</u>

Date	Version	Revision Reason
3/23/2026	1.0	Original Draft