Maryland
Department of
the Environment

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TECHNICAL MEMORANDUM #12

TO: Applicants and Designers for State and Federal Projects

FROM: Plan Review Division - Sediment, Stormwater, and Dam Safety Program
Water and Science Administration

DATE: April 1, 2019

SUBJECT: **Clarification on Grass Swale Design for State and Federal Projects**

This technical memo reproduces the April 23, 2012 clarification issued by the Plan Review Division.

Grass swales are included in the 2000 Maryland Stormwater Manual to encourage the use of open section roadway. The grass swale should parallel the contributing roadway, and the runoff from the impervious surface must sheetflow into the swale. Being a linear application, the grass swale must be as long as the surface it treats.

In accordance with the design criteria in Section M-8 of Chapter 5 from the Manual, all swales shall meet the following criteria:

- Swales shall have a bottom width between two and eight feet.
- The channel slope shall be less than or equal to 4.0%.
- The maximum flow velocity for the ESD_v shall be less than or equal to 1.0 fps.
- Swales shall be designed to safely convey the 10-year, 24-hour storm at a non-erosive velocity with at least six inches of freeboard.
- The channel side slopes shall be 3:1 or flatter.
- A thick vegetative cover shall be provided for proper function.

In addition, the following criteria apply to grass swales:

- Grass swales shall only receive sheetflow. If concentrated flow from curb cuts or storm drains is delivered to a grass swale, the flow must spread to mimic sheetflow prior to entering the grass swale.
- Grass swales shall be as long as the treated surface.
- The surface area (A_f) of the swale bottom shall be at least 2% of the contributing drainage area. A thick vegetative cover shall be provided for proper function.
- The channel shall have a roughness coefficient (Manning's *n*) value of 0.15.
- The maximum flow depth for ESD_v treatment shall be 4 inches.
- A P_E value based on Equation 5.3 shall be applied to the contributing drainage area.

Repeated questions have arisen about how to calculate the ESD_v provided by a grass swale. Because there is no storage volume in the practice, the provided ESD_v should be calculated based on the achieved P_E using Equation 5.3.

$$P_E = 10\,in. \times \frac{A_f}{DA} \text{ (Equation 5.3) and } ESD_v = \frac{P_E \times R_v \times A}{12\ in/ft}$$

Note that Equations 5.1, 5.2, and 5.3 in Chapter 5 are regarded as planning tools to be used for site layout during concept design. These equations provide a two-dimensional approximation of the respective three-dimensional ESD practice. However, in the case of grass swales, the practice is two-dimensional and Equation 5.3 provides an accurate assessment of the P_E. Equation 5.3 is effectively requiring the surface area of the grass swale to be 10% of the drainage area when treating a P_E of 1.0 inch. To treat a target P_E of 2.6 inches, the surface area would have to be 26% of the drainage area.

If the P_E achieved by the grass swale is less than the target P_E, additional ESD practices (i.e. “treatment train”) will have to be provided.

Grass swales automatically meet recharge.