Calculation for Vegetated Swale Storage Capacity

Project Name: ____________________________
Date Submitted: ____________________________
Property Address: ____________________________
Development/Property Name: ____________________________
GMP Number: ____________________________
Design Firm: ____________________________
Design Engineer: ____________________________
Telephone: ____________________________
Email: ____________________________
KY PE No.: ____________________________

MSD Reviewer: ____________________________
WM No. ____________________________

Step A. Site Planning Recommendation
Define goals and primary function of Vegetated Swale based on the Vegetated Swale Step by Step Design Procedures beginning on page 18.5.16-6 as well as Table 18.5.16-A. Refer to these sections for design specifications as needed throughout the remainder of this calculation sheet.

Step B. Determine the Required Water Quality Volume Rain Event, RE_{WQV} in inches (Refer to Chapter 18.3, A minimum depth of 0.6 inches must be used):

Step C. Calculate the Required Water Quality Volume (WQV Required) of water to be removed by Vegetated Swale

1. A = Contributing drainage area to infiltration practice: _______ ft^2
2. RE_{WQV} = Required WQV Rain Event in inches: _______ inches
3. I = Impervious cover of the contribution drainage area in percent: _______ %
   a. R_v = 0.05 + 0.009 (I) = _______
4. WQV Required = (A/12)(RE_{WQV})(R_v) = _______ ft^3

Step D. Determine Width of Swale

1. Refer to table 18.5.16-A
2. C=Rational Runoff Coefficient
3. A=Drainage Area _______ acres
4. i=Rainfall Intensity _______ in/hour
5. Q=Peak flow rate at the WQV event=C*A*i _______ ft^3/s
6. n=Manning' roughness coefficient (Typical values range from 0.20 - 0.03)
7. D=flow depth (should be 4 inches or less) _______ ft
8. S=Slope _______ %
9. W=minimum bottom swale width=(n*Q)/(1.49*D^{5/3}*S^{1/2}) _______ ft^2

Step E. Determine Velocity of Swale

1. Q=Peak flow rate at the WQV event _______ ft^3/s
2. W=Design Width _______ ft
3. Side Slopes: H=Horizontal
   V=Vertical
4. D=flow depth _______ ft
5. A=Area=(W+2(H*D))*D _______ ft^2
6. V = velocity = Q/A _______ ft/s
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Step F. Determine Residence time of Swale
1. V=velocity ft/s
2. L=Length of swale ft
3. R=residence time=L/(60*V) minutes

Step G. Determine the Managed Water Quality Volume (MWQ_V)
1. Determine the GMP Management Capacity of the vegetated swale in percent (Refer to table 18.3-C for percent). Please attach model printouts or other documentation to verify retention times as required by Table 18.3-C.

2. MWQ_V = (1/100)(GMP Management Capacity in percent)(WQ_V Required) = ft^3
3. Is all of the WQ_V Required managed or treated (i.e. is MWQ_V greater than or equal to WQ_V Required)?
   If No, adjust WQ_V Provided parameters to allow for greater storage capacity and/or proceed to Step H.
   If Yes, proceed to step J.

Step H. Calculate the Required Remaining Water Quality Volume (RWQ_V)
1. Required RWQ_V = 2(WQ_V Required - MWQ_V) = ft^3

Step I. Select Alternate GMPs to Treat RWQ_V. Examples may include:
   Check all that apply. Include additional calculation sheets as necessary.
   □ Green Wet Basin
   □ Green Dry Basin
   □ Catch Basin Inserts
   □ Proprietary Water Quality Units
   □ Other: ______________________________

1. How much additional WQ_V is removed by the Alternate GMPs? ft^3
2. Does the Alternate GMP remove all the Required RWQV?
3. If Yes, proceed to step J.
   If No, alter existing GMPs or add new ones to provide adequate storage.

Step J. Complete O&M documentation.

Additional Calculations and Explanation (Required if design deviates from calculation sheet):
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________