Calculation for Tree Box 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 Tree Boxes based on the Tree Box Step by Step Design Procedures beginning on page 18.5.13-5 as well as Table 18.5.13-A. Refer to these sections 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):

_____ inches

Step C. Calculate the Required Water Quality Volume (WQ_V Required) of water to be removed by Tree Boxes

1. A = Contributing drainage area to tree boxes: _____ ft^2
2. RE_{WQV} = Required WQ_V 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. WQ_V Required $= (A/12)(RE_{WQV})(R_V) =$ _____ ft^3

Step D. Determine minimum surface area of Tree Box

1. Refer to table 18.5.13-A
2. WQ_V=required water quality volume: _____ ft^3
3. h=average height of water above the treebox bed during WQ_V rain event _____ ft
4. d=depth of tree box _____ ft
5. P=porosity of the soil mix in the tree box (% void): 40 %
6. A=Surface area of the ponding area of the tree box$=(WQ_V)/[(d)(P)+h]$ _____ ft^2

Step E. Calculate the Provided Water Quality Volume (WQ_V Provided), or storage capacity of Tree Boxes

1. A = Area of tree box: _____ ft^2
2. φ = porosity of media (% void): 40 %
3. M = depth of media _____ ft
4. P = ponding depth of water _____ ft
5. WQ_V Provided $= (A)[\varphi(M) + P]$ _____ ft^3

Step F. Compare the minimum calculated surface area of the tree boxes to the input area of tree boxes

Calculation for Tree Box Storage Capacity

    1. Is the area in step E.1 greater than the minimum surface area calculated in step D.6?

    _____

Step G. Determine the Managed Water Quality Volume (MWQ$_V$)

    1. Determine the GMP Management Capacity of the tree box 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$_V$ Provided) =

    _____ 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):
_____
_____
_____
_____