Calculation for Tree Box Storage Capacity

**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, \( R_{WQV} \) 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 (\( WQ_V \) Required) of water to be removed by Tree Boxes**
1. \( A \) = Contributing drainage area to tree boxes: 
2. \( R_{WQV} \) = Required WQV Rain Event in inches:
3. \( I \) = Impervious cover of the contribution drainage area in percent:
   a. \( R_V = 0.05 + 0.009 \times (I) = \)
4. \( WQ_V \) Required = \( \frac{A}{12} \times (R_{WQV}) \times (R_V) = \)

**Step D. Determine minimum surface area of Tree Box**
1. Refer to table 18.5.13-A
2. \( WQ_V \) = required water quality volume:
3. \( h \) = average height of water above the treebox bed during \( WQ_V \) rain event
4. \( d \) = depth of tree box
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 = \( \frac{(WQ_V)}{[(d)(P)+h]} \)

**Step E. Calculate the Provided Water Quality Volume (\( WQ_V \) Provided), or storage capacity of Tree Boxes**
1. \( A \) = Area of tree box:
2. \( \varphi \) = porosity of media (% void):
   40 %
3. \( M \) = depth of media
4. \( P \) = ponding depth of water
5. \( WQ_V \) Provided = \( (A)[\varphi(M) + P] \)

**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. \[ MWQ_V = \frac{1}{100} \times \text{(GMP Management Capacity in percent)} \times WQ_V \text{ Provided} = \]

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. \[ \text{Required RWQ_V} = 2 \times (WQ_V \text{ Required} - MWQ_V) = \]

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?

2. Does the Alternate GMP remove all the Required RWQ_V?

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):

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