

Treatment BMP Training – “Workshop Example for Infiltration Basins”
PowerPoint Presentation
Caltrans Headquarters Office of Storm Water Management



Slide 1: This is the example problem for this Workshop for the Infiltration Basin. We will be using pages 4 and 5 of the Workshop Handout, and the example problem statement is on page 5.

Infiltration Basins – Workshop Example

Workshop Exercise

1. Determine Area of Infiltration Basin invert
 $A = [(C)(SF)(WQV)]/[(k)(t)]$ Eqn. 2, PPDG B-18
 where:
 A = est.invert area, m² (or ft²)
 C = conversion factor
 (100 for cm/m, 12 for inches/ft)
 SF = safety factor of 2.0
 WQV = 123 m³ (4,344 ft³)
 k = infiltration rate = 2.5 cm/hr (1.0 in/hr)
 t = drawdown time, 40 hours

2

Slide 2: This formula is on page 4 of the Workshop Handout, and the example problem statement is on page 5.

Infiltration Basins – Workshop Example

Workshop Exercise

1. Determine Area of Infiltration Basin invert
 $A = [(C)(SF)(WQV)]/[(k)(t)]$ Eqn. 2, PPDG B-18
 $A = 100 \times 2 \times 123 \div (2.5 \times 40) = ? \text{ m}^2$ metric
 $A = 12 \times 2 \times 123 \div (1.0 \times 40) = ? \text{ ft}^2$ US

3

Slide 3: The problem statement givens have been inserted into the formula for invert area of the Infiltration Basin.

Infiltration Basins – Workshop Example

Workshop Exercise

1. Determine Invert of Infiltration Basin
 $A = [(C)(SF)(WQV)]/[(k)(t)]$ Eqn. 2, PPDG B-18
 $A = 100 \times 2 \times 123 \div (2.5 \times 40) = 246 \text{ m}^2$ metric
 $A = 12 \times 2 \times 123 \div (1.0 \times 40) = 2,615 \text{ ft}^2$ US

4

Slide 4: We would have to use the trapezoid formula to calculate the depth (and later we would need to include freeboard). But the key concept here is: infiltration is only assumed to occur through the invert, and we ignore any contributions through the side slopes.

Infiltration Basins – Workshop Example

Workshop Exercise

2. Design Overflow Spillway as a Broad Crested Weir from the Basin
 $Q = (C_{BCW}) \times L \times (H^{1.5})$ rearranging terms:
 $L = (Q)/[(C_{BCW}) \times (H^{1.5})]$ if solving for L or
 $H = [(Q)/(C_{BCW}) \times (L)]^{2/3}$ if solving for H
 Q = Design Storm
 C = Weir coefficient (See handout)
 L = Length of weir (perpendicular to flow)
 Note: Minimum 'L' is 1.0 m (3.28 ft)

5

Slide 5: We will use this formula, with these terms as givens. Note that there are two unknowns at this time: H and CBCW m, but these vary with each other. We will assume a CBCW at this time, and cycle through the formula iteratively if the assumed value and the value obtained from the table using the H calculated are too far apart.

Note that at this time the Workshop Handout has the broad-crested-weir coefficients only in metric, but note that there is a conversion factor for these

Treatment BMP Training – “Workshop Example for Infiltration Basins”
PowerPoint Presentation
Caltrans Headquarters Office of Storm Water Management

coefficients of 1.81 x the CBCW metric units.

Infiltration Basins – Workshop Example

Workshop Exercise

2. Design Overflow Spillway as a Broad Crested Weir from the Basin

$Q = (C_{BCW}) \times L \times (H^{1.5})$
For today: take $C_{BCW} = 1.55$, $L = 1.0$ m, and
 $Q = 0.26$ m³/sec

For today: take $C_{BCW} = 1.55 \times 1.81$,
 $L = 3.28$ ft, and $Q = 9.18$ ft³/sec

6

Slide 6: The CBCW must be assumed and we will check if after we complete this calculations; if the CBCW is too far the value that was assumed we will cycle through the interactive procedure again. Note that the factor 1.81 is used to convert the metric CBCW coefficient into US Customary units.

Infiltration Basins – Workshop Example

Workshop Exercise

2. Design Overflow Spillway as a Broad Crested Weir from the Basin

$Q = (C_{BCW}) \times L \times (H^{1.5})$
For today: take $C_{BCW} = 1.55$, $L = 1.0$, and
 $Q = 0.26$ m³/sec

Then, re-arranging terms,
 $H = [Q / C_{BCW} \times L]^{2/3}$ and solving
 $= [0.26 \text{ m}^3/\text{sec} / (1.55 \times 1.0 \text{ m})]^{2/3} = 0.304$ ft
 $= [9.18 \text{ cfs} / (1.55 \times 1.81 \times 3.28)]^{2/3} = 1.0$ ft ,

Slide 7: Solving for H. After solving for H, we must verify from the table that the assumed value for broad-crested weir coefficient CBCW was close enough. Note shown on a slide, but from the table the CBCW for the height calculated would be 1.56, which is sufficiently accurate.

**Workshop Example
for the
Infiltration Basin
Treatment BMP**

Questions?



Slide 8: We have now finished the ‘civil’ design of the basin. We have not designed the conveyance systems leading to the basin, the vegetation in the basin, the maintenance road around the basin, among key items. You will need to work with other functional units in some cases, including Geotechnical Services, but you have completed the main treatment aspects. Check also with the NPDES unit to determine if standard detail sheets are available for this Treatment BMP.