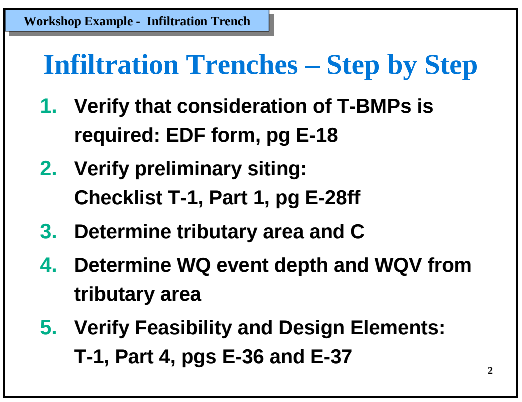
Slide 1: The Infiltration Trench is one of the newly approved Caltrans Treatment BMPs that can be employed on a project. Refer to the Workshop Handout for a description of the problem, and to find the equations that will be used.



Slide 2: There are several steps that the Project Engineer must do to determine that an Infiltration Trench can be used on the project, and to size it.

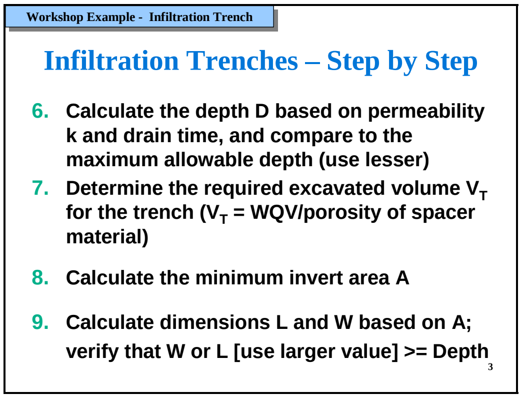
Step 1. Verify that consideration of Treatment BMPs is required for the project, using the Evaluation Documentation Form, PPDG page E-18

Step 2. Verify initial selection using PPDG Checklists T-1, Part 1 (pages E-28ff). Consideration of a Infiltration Devices (meaning both the Infiltration Basin and the Infiltration Trench) should be done as part of the “TDC process” (Targeted Design Constituent” process) discussed in Appendix E of the PPDG, and is always the 1st Treatment BMP to be considered using the TDC process.

Step 3. Determine the tributary area that would be treated by the Infiltration Trench; this should be known at the design (PS&E) stage of the project. It will be used in the calculation of the WQV that follows. For the PID and PA/ED phases, general siting criteria will be used for siting purposes, along with best estimate of the overall WQV if the drainage areas are not known. An area-weighted runoff coefficient C must usually be calculated, but recall that it is a goal that runoff only from impervious surfaces be treated. Once C is calculated, the volume of runoff is simply the Water Quality event depth (discussed below) x the runoff coefficient x the area (all consistent units).

Step 4. Determine the WQV event depth using the Basin Sizer program or as stipulated by the applicable RWQCB. Recall that the minimum WQV that is deemed economically feasible to treat according to the PPDG is 4,345 ft^3. In general, this should be from the impervious area, as that is the area needing treatment (e.g., other areas, such as grassy slopes, provide treatment whether designated as a Treatment BMP or as a Design Pollution Prevention BMP).

Step 5. Verify preliminary design selection using PPDG Checklists T-1, Part 4 (page E-36)



Slide 3: Step 6. Determine the maximum allowable depth. Recall that there are requirements for: minimum separation from seasonally high groundwater (3 m), maximum depth the trench (4 m), a depth related to the permeability and drain time, or any other depth requirement that may exist. The depth is the minimum calculated of these.

Step 7. Determine the required excavated volume in the trench. Recall that it must be able to hold both the runoff and the rock, with the water held in the voids between the rock.

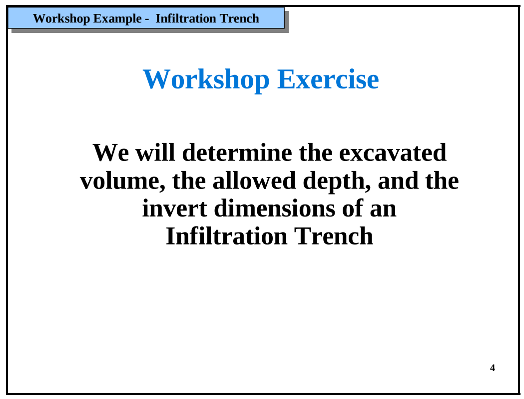
Step 8. Calculate the minimum invert area, using the Depth determined above.

Step 9. Calculate the dimensions L and W to meet the area determined, using site constraints. Note also that: the wider dimension at the surface must exceed the depth of the trench. Recall that an Infiltration Trench can be in any (plan view) shape but is usually rectangular.

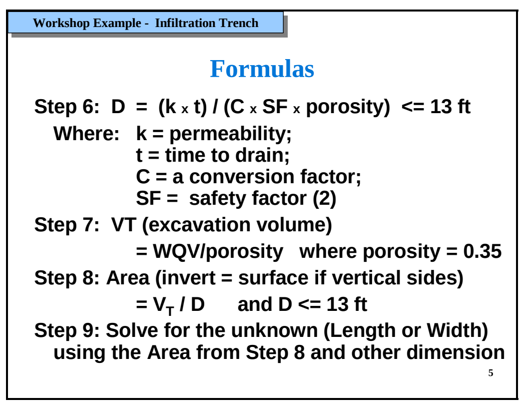
The design of an infiltration trench assumes all infiltration will occur through the trench bottom or invert, as will be shown on an upcoming slide.

Other design aspects: In order to avoid the classification of the Infiltration Trench as a regulated injection well, the infiltration trench should be designed as follows: a) The WQV should be directed to the infiltration trench by gravity flow in an open channel or as sheet flow; b) The captured volume should flow downward within the trench by the action of gravity, and without vertical piping for distribution to lower depths of the trench; c) the wider dimension at the surface must exceed the depth of the trench.

These are in the Preliminary Design Features of Appendix B of the PPDG, and must be checked; refer to PPDG Table B-2 for a complete list of criteria.



Slide 4: Today this workshop will calculate Steps 6 through 9 as these are the key calculations involved in sizing the Infiltration Trench.



Slide 5: See text on slide.

Workshop Example - Infiltration Trench

Step 6: Determine Maximum Depth

Depth = (k x t) / (C x SF x porosity) <= 13 ft

Let's use: k = 2.0 in/hr
t= 72 hr
porosity = 0.35

(2 in/hr x 72 hr) / (12 in/ft x 2 x 0.35) = 17.1 ft

Use 13 ft after verifying that ground water is no closer than 10 ft to the propose invert elevation of the Infiltration Trench

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Slide 6: See text on slide.

Workshop Example - Infiltration Trench

Step 7: Excavated Volume

V_T = WQV / porosity
where:
WQV = volume of runoff being directed to the Infiltration Trench
Porosity of the spacer rock (drain rock) = 0.35

Say WQV = 4,345 ft^3
Then VT = 4,345 ft^3 / 0.35 = 12,414 ft^3

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Slide 7: Recall that WQV = 123 m3 = 4,356 ft3

Workshop Example - Infiltration Trench

Step 8: Calculate Invert Area

Invert Area = V_T / Depth

= 12,414 ft^3 / 13 ft

= 955 ft^2

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Slide 8: See text on slide.

Workshop Example - Infiltration Trench

Step 9: Calculate Dimensions L or W

Invert Area = Surface Area = L x W
955 ft^2 = L x W
Assume: Length L = 2W
955 ft^2 / $2W^2$

then W = 21.85 ft and L = 43.70 ft

Check Injection Well criteria:
Larger Surface Dimension >= Depth
21.85 ft > 13 ft OK

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Slide 9: See text on slide.

Workshop Example for the Infiltration Trench Treatment BMP

Questions?

Caltrans

Slide 10: 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.