

### 3.1 INFILTRATION BASIN

<b>Type of BMP</b>	LID – Infiltration
<b>Priority Level</b>	Priority 1 – Full Retention
<b>Treatment Mechanisms</b>	Infiltration, Evapotranspiration (when vegetated), Evaporation, Sedimentation
<b>Infiltration Rate Range</b>	> 0.8 in/hr factored design infiltration rate
<b>Maximum Drainage Area</b>	50 acres

#### **Description**

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume,  $V_{BMP}$ . The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding  $V_{BMP}$  must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.



**Figure 1 – Infiltration Basin**

See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements.

#### **Siting Considerations**

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the Santa Margarita Region (SMR) Water Quality Management Plan (WQMP) for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin’s long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

## INFILTRATION BASIN BMP FACT SHEET

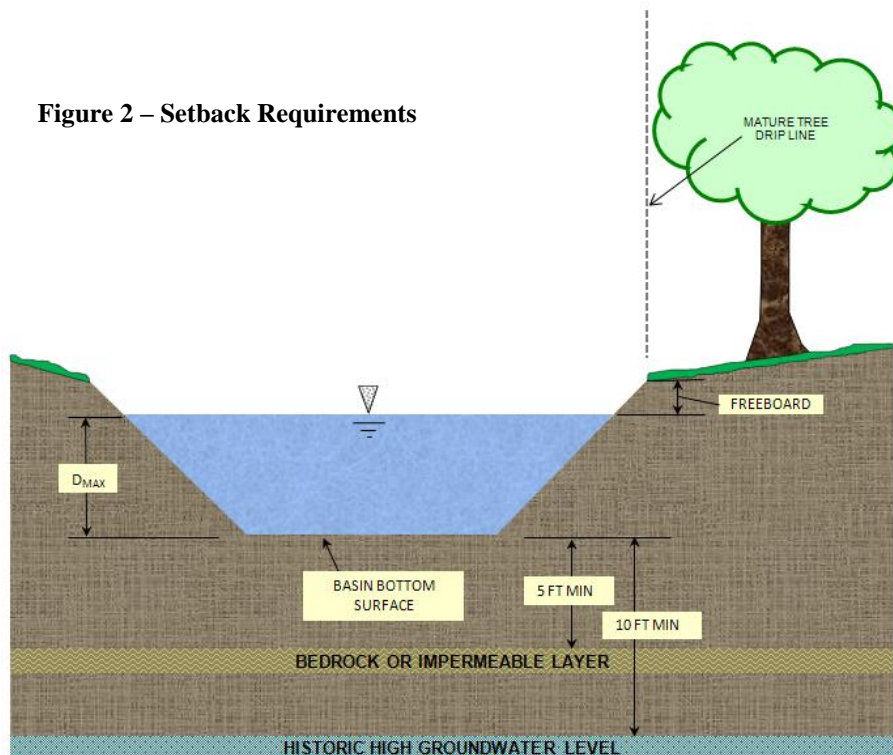
### Setbacks

Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).



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### Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5%  $V_{BMP}$  and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

### Overflow

Flows exceeding  $V_{BMP}$  must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for  $V_{BMP}$  and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

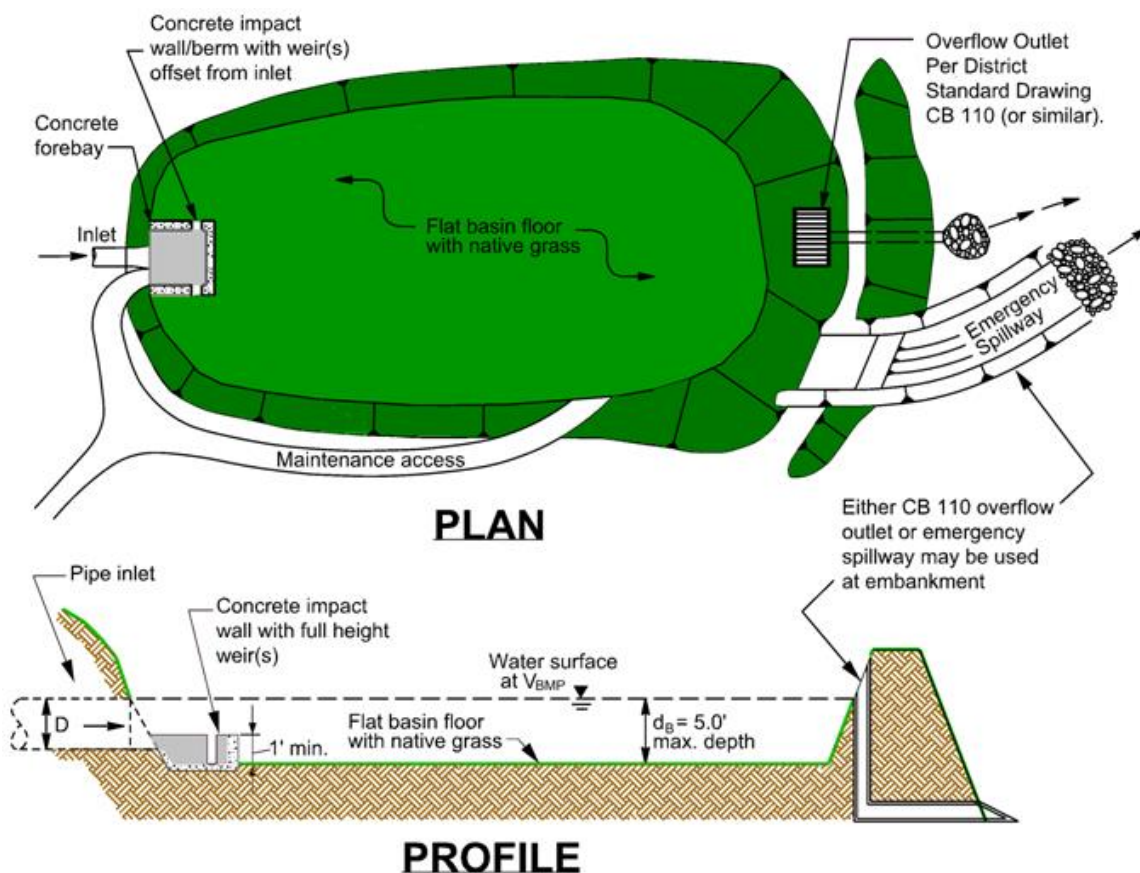


Figure 3 – Infiltration Basin

### Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses.

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Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District’s *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

### **Maintenance**

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District’s *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

**Table 1 - Inspection and Maintenance**

Schedule	Inspection and Maintenance Activity
<p><b>Ongoing</b> including just before annual storm seasons and following rainfall events.</p>	<ul style="list-style-type: none"> <li>• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don’t contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn’t be needed. If such projects are used,               <ul style="list-style-type: none"> <li>○ Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding.</li> <li>○ Fertilizers should not be applied within 15 days before, after, or during the rain season.</li> </ul> </li> <li>• Remove debris and litter from the entire basin to minimize clogging and improve aesthetics.</li> <li>• Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water.</li> <li>• Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed.</li> <li>• Revegetate side slopes where needed.</li> </ul>
<p><b>Annually.</b> If possible, schedule these inspections within 72 hours after a significant rainfall.</p>	<ul style="list-style-type: none"> <li>• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element.</li> <li>• Check for erosion, slumping and overgrowth. Repair as needed.</li> <li>• Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation.</li> <li>• Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis<sup>1</sup>.</li> <li>• No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed.</li> </ul>
<p><b>1. CA Stormwater BMP Handbook for New Development and Significant Redevelopment</b></p>	

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**Table 2 - Design and Sizing Criteria for Infiltration Basins**

Design Parameter	Infiltration Basin
Design Volume	$V_{BMP}$
Forebay Volume	0.5% $V_{BMP}$
Drawdown time (maximum)	72 hours
Maximum tributary area	50 acres <sup>2</sup>
Minimum infiltration rate	Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The SMR WQMP may include specific requirements for minimum tested infiltration rates.
Maximum Depth	5 feet
Spillway erosion control	Energy dissipators to reduce velocities <sup>1</sup>
Basin Slope	0%
Freeboard (minimum)	1 foot <sup>1</sup>
Historic High Groundwater Setback (max)	10 feet
Bedrock/impermeable layer setback (max)	5 feet
Tree setbacks	Mature tree drip line must not overhang the basin
Set back from wells, tanks or springs	100 feet
Set back from foundations	As recommended in Geotechnical Report
<ol style="list-style-type: none"> <li>1. Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures</li> <li>2. CA Stormwater BMP Handbook for New Development and Significant Redevelopment</li> </ol>	

*Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.*

### **INFILTRATION BASIN SIZING PROCEDURE**

1. Find the Design Volume,  $V_{BMP}$ .
  - a) Enter the Tributary Area,  $A_T$ .
  - b) Enter the Design Volume,  $V_{BMP}$ , determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
  - a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
  - b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
  - c) The spreadsheet will determine  $D_1$ , the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.
 
$$D_1 = [(t) \times (I)] / 12s$$

Where     $I$  = site infiltration rate (in/hr)  
            $s$  = safety factor  
            $t$  = drawdown time (maximum 72 hours)
  - d) Enter the depth of freeboard.

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- e) Enter the depth to the historic high groundwater level measured from the top of the basin.
- f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.
- g) The spreadsheet will determine  $D_2$ , the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.  
 $D_2 = \text{Depth to groundwater} - (10 + \text{freeboard}) \text{ (ft)}$ ;  
**or**  
 $D_2 = \text{Depth to impermeable layer} - (5 + \text{freeboard}) \text{ (ft)}$   
Whichever is least.
- h) The spreadsheet will determine the maximum allowable effective depth of basin,  $D_{MAX}$ , based on the smallest value between  $D_1$  and  $D_2$ .  $D_{MAX}$  is the maximum depth of water only and does not include freeboard.  $D_{MAX}$  shall not exceed 5 feet.

### 3. Basin Geometry

- a) Enter the basin side slopes,  $z$  (no steeper than 4:1).
- b) Enter the proposed basin depth,  $d_B$  excluding freeboard.
- c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where  $A_s$  = minimum area required (ft<sup>2</sup>)

$V_{BMP}$  = volume of the infiltration basin (ft<sup>3</sup>)

$d_B$  = proposed depth not to exceed maximum allowable depth,  $D_{MAX}$  (ft)

- d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

### 4. Forebay

A concrete forebay with a design volume of at least 0.5%  $V_{BMP}$  and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

- a) The spreadsheet will determine the minimum required forebay volume based on 0.5%  $V_{BMP}$ .
- b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).
- c) The spreadsheet will determine the minimum required forebay surface area.
- d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.