

## 6.5 Extended Detention Basin

### Overview

#### Description

Extended detention ponds (a.k.a. dry ponds, dry extended detention basins, detention ponds) are basins whose outlets have been designed to detain the stormwater runoff from a water quality design storm for some minimum time (e.g., 48 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a permanent pool. They can also be used to provide flood control by including additional flood detention storage above the treatment storage area.



*Figure 6-30: Extended Detention Basin. (Courtesy of DES Architects and Engineers)*

**As of December 1, 2011**, projects can no longer meet stormwater treatment requirements with stand-alone extended detention basins that are designed to treat stormwater through the settling of pollutants and gradual release of detained stormwater through an orifice. However, this type of extended detention basin could be used as part of a treatment train, in which the basin stores a large volume of water, which is gradually released to a bioretention area that meets the new MRP requirements for biotreatment soil media and surface loading area. Detention basins can also be used for hydromodification management.

#### Best uses

- Detain low flows
- Can be expanded to detain peak flows
- Sedimentation of suspended solids
- Pre-treatment

#### Advantages

- Easy to operate
- Inexpensive to construct
- Treatment of particulates
- Low maintenance

#### Limitations

- Storage area available
- Moderate pollutant removal
- Not considered LID treatment

## Siting

Remember that stormwater control measures should be located in areas that can be accessible at any given time for the purpose of operation and maintenance and inspections.

*Table 6-7: Recommended locations for extended detention basins areas*

Recommended Locations	Extended Detention Basin
Parking Lot	
Roof	
Driveway	
Podium-level	
Close to building	
Away from Buildings	●
Underground	

## Design and Sizing Guidelines

### Treatment Dimensions and Sizing

- Extended detention basins should be sized to capture the required water quality volume and store and release it over a 48-hour period. At least 10 percent additional storage should be provided to account for storage lost to deposited sediment.
- Extended detention basins should have no greater than 3:1 side slope.
- The optimal basin depth is between 2 and 5 feet.
- A safety bench should be added to the perimeter of the basin wall for maintenance when basin is full.
- Extended detention basin should empty within five days to avoid vector generation.
- A 12-foot wide maintenance ramp leading to the bottom of the basin and a 12-foot wide perimeter access road should be provided. If not paved, the ramp should have a maximum slope of 5 percent. If paved, the ramp may slope 12 percent.
- The extended detention basin should have a length to width ratio of at least 1.5:1.
- A fixed vertical sediment depth marker should be installed in the sedimentation forebay. The depth marker should have a marking showing the depth where sediment removal is required. The marking should be at a depth where the remaining storage equals the design water quality volume.
- Extended detention basins are not designed to infiltrate the entire volume of water captured, but they may infiltrate some water if conditions allow.
- For sizing information relative to hydromodification management, refer to Chapter 7.

### Inlets to Treatment Measure

- The inlet pipe should have at least 1 foot of clearance to the basin bottom.
- Piping into the extended detention basin should have erosion protection. As a minimum, a forebay with a 6-inch thick layer of Caltrans Section 72, Class 2 rock slope protection should be placed at and below the inlet to the extent necessary for erosion protection.
- Check with municipality regarding trash screen requirements. Trash screen installation may be required upstream of the pipe conveying water into the pond, in order to capture litter and trash in a central location where it can be kept out of the pond until it is removed.

## Outlets and Orifices

- The outlet should be sized with a drawdown time of 48 hours for the design water quality volume. The outlet should have two orifices at the same elevation sized using the following equation:

$$a = (7 \times 10^{-5}) * A * (H - H_o)^5 / CT$$

Where:

a = area of each orifice in square feet

A = surface area of basin at mid-treatment storage elevation (square feet)

H = elevation of basin when filled by water treatment volume (feet)

H<sub>o</sub> = final elevation of basin when empty (bottom of lowest orifice) (feet)

C = orifice coefficient (0.6 typical for drilled orifice)

T = drawdown time of full basin (hours)

(Caltrans Method, Appendix B, Stormwater Quality Handbook, September 2002)

- The orifices should each be a minimum diameter of 1 inch. Extended detention basins are not practical for small drainage areas because the minimum orifice diameter cannot be met.
- Each orifice should be protected from clogging using a screen with a minimum surface area of 50 times the surface area of the openings to a height of at least 6 times the diameter. The screen should protect the orifice openings from runoff on all exposed sides.
- For each outlet, documentation should be provided regarding adequacy of outlet protection. A larger stone size may be necessary depending on the slope and the diameter of the outfall.

## Vegetation

- Plant species should be adapted to periods of inundation. See planting guidance in Appendix A.
- Use integrated pest management (IPM) principles in the landscape design to help avoid or minimize any use of synthetic pesticides and quick-release fertilizer. Check with the local jurisdiction for any local policies regarding the use of pesticides and fertilizers.
- Irrigation should be provided as needed to maintain plant life.
- If vegetation is not established by October 1st, sod should be placed over loose soils. Above the area of inundation, a 1-year biodegradable loose weave geofabric may be used in place of sod.

## Groundwater Separation Considerations

- Consideration of groundwater level:
  - If there is less than a 5-foot separation between the bottom of the facility and the seasonal high groundwater level, or infiltration is not allowed due to other site constraints, an impermeable liner should be placed at the bottom of the facility.
  - If there is at least a 5-foot separation between the bottom of the facility and the seasonal high groundwater level, and geotechnical conditions allow infiltration, the facility may be unlined.

### *Construction and Maintenance Plans*

#### Construction Considerations

- The GI Design Guide does not cover extended detention basins. However, some construction guidelines developed for other infiltration measures might apply to detention basins.
- ***For general construction guidelines, see Chapter 4 the GI Design Guide.*** Specifically, see Sections 4.3 through 4.9 of the GI Design Guide for construction strategies for dealing with slopes, overflows, poor soils, utilities, runoff capture, etc.

#### Remember

#### Maintenance Considerations for All Treatment Measures

- See Chapter 8 for specific maintenance guidance. Specifically, see Section 8.3.5 for maintenance concerns specific to detention basins.
- A Maintenance Agreement should be provided and should state the parties' responsibility for maintenance and upkeep.
- Prepare a maintenance plan and submit with Maintenance Agreement. Maintenance plan templates are in Appendix G.

Typical Design Details

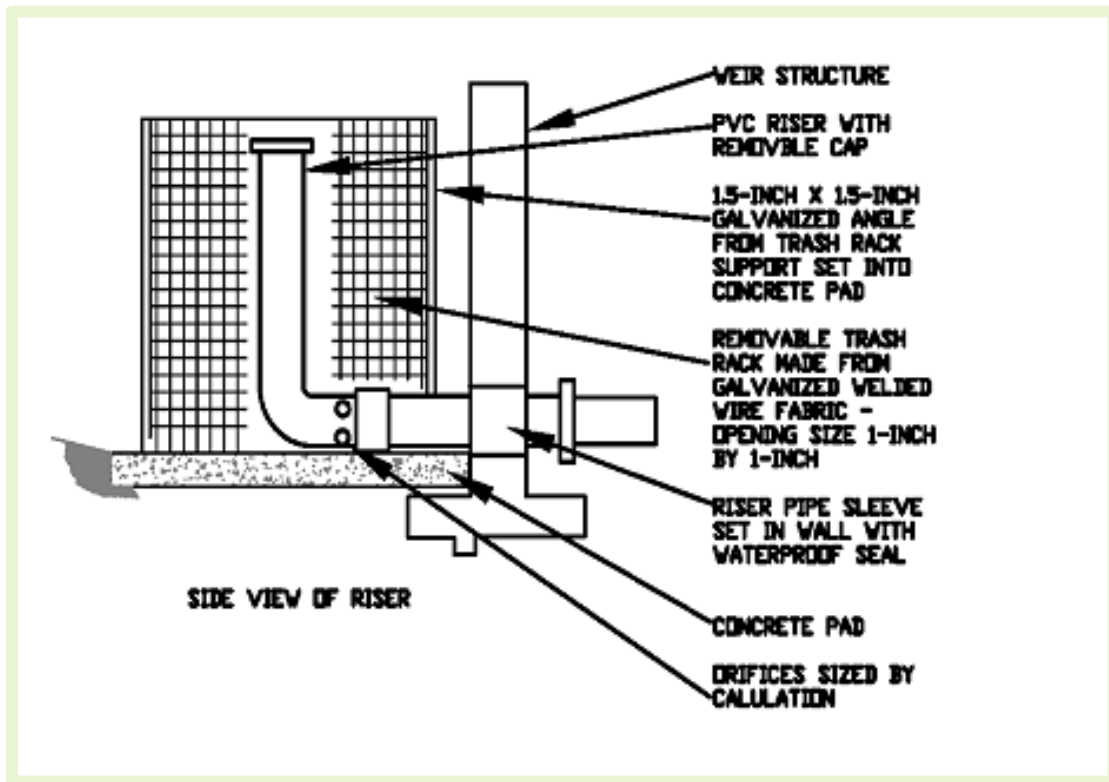


Figure 6-31. Side View of Riser

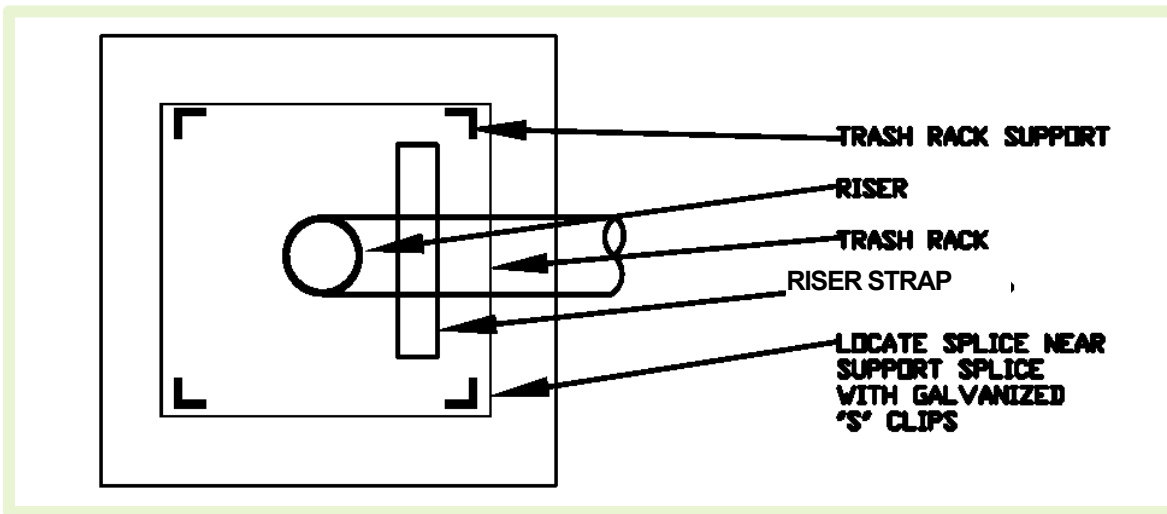


Figure 6-32. Top View of Riser (Square Design)

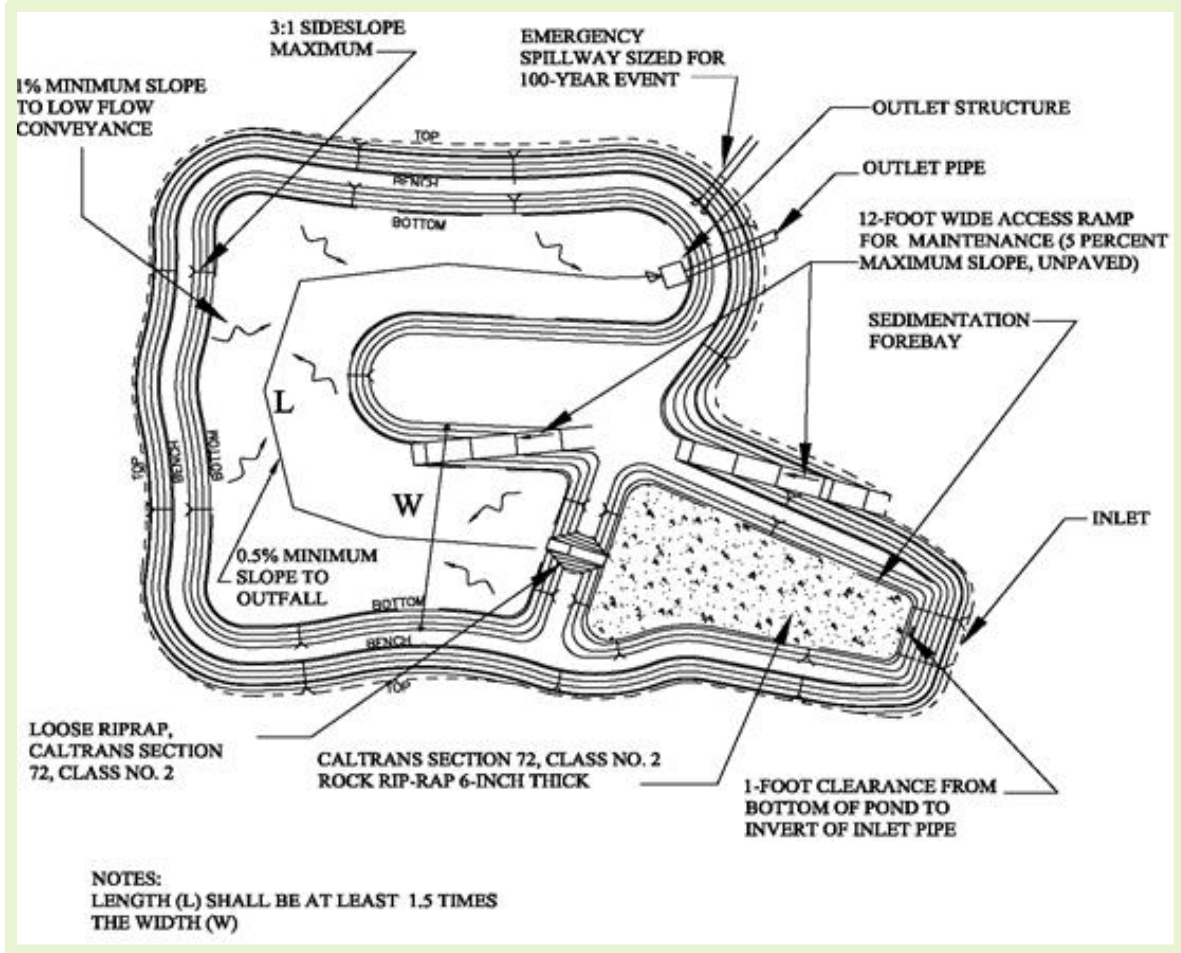


Figure 6-33. Plan View, Typical Extended Detention Basin