6.8 Extended Detention Basin

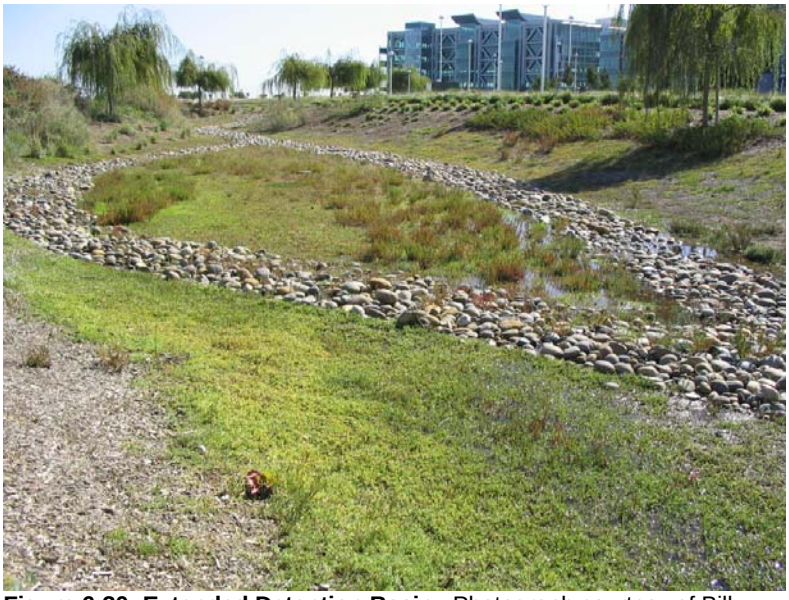

Figure 6-30: Extended Detention Basin. Photograph courtesy of Bill Southard (DES Architects and Engineers)

Best uses

- Detain low flows
- Can be expanded to detain peak flows
- Sedimentation of suspended solids
- Sites larger than 5 acres

Advantages

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

Limitations

- Storage area available
- Moderate pollutant removal

Extended detention ponds (a.k.a. dry ponds, dry extended detention basins, detention ponds, extended 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.

Design and Sizing Guidelines

- Extended detention basins shall be sized to capture the required water quality volume over a 48-hour period. At least 10 percent additional storage shall be provided to account for storage lost to deposited sediment.
- The outlet shall be sized with a drawdown time of 48 hours for the design water quality volume. The outlet shall have two orifices at the same elevation sized using the following equation:

$$a = (7x10^{-5}) * A * (H-Ho)^{.5} / CT$$

Where:

a = area of each orifice in square feet
A = surface area of extended detention basin at mid-treatment storage elevation (square feet)
H = elevation of basin when filled by water treatment volume (feet)
Ho = 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 shall 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 shall 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 shall protect the orifice openings from runoff on all exposed sides.
- Extended detention basin shall have no greater than 3:1 side slopes.
- The optimal basin depth is between 2 and 5 feet.
- If planting of the extended detention basin is not completed by October 1st, a 1-year biodegradable loose weave geofabric shall be installed on exposed side slopes to anchor soils. If vegetation is not established by October 15th, sod or an equivalent measure shall be placed where disturbed soils are present.
- Piping into the extended detention basin shall have erosion protection. The inlet pipe shall have at least 1 foot of clearance to the pond bottom. As a minimum, a forebay with a 6-inch thick layer of Caltrans Section 72, Class 2 rock slope protection shall be placed at and below the inlet to the extent necessary for erosion protection. For each outlet, documentation shall be provided regarding adequacy of outlet protection, and a larger stone size may be necessary depending on the slope and the diameter of the outfall.
- Extended detention basin shall empty within five days of the end of a 6-hour, 100-year storm event to avoid vector generation.
- Irrigation of the extended detention basin is recommended, depending on the requirements of the specified vegetation.
- A 12-foot wide maintenance ramp leading to the bottom of the basin and a 12-foot wide perimeter access road shall be provided. If not paved, the ramp shall have a maximum slope of 5 percent. If paved, the ramp may slope 12 percent.
- The extended detention basin shall have a length to width ratio of at least 1.5:1.
- If the groundwater level is within 10 feet of the ground surface, a liner shall be provided.
- A fixed vertical sediment depth marker shall be installed in the sedimentation forebay. The depth marker shall have a marking showing the depth where sediment removal is required. The marking shall be at a depth where the remaining storage equals the design water quality volume.
- The detention basin is a volume-based treatment measure and requires detention time to be effective. The basin shall not empty more than 50% of its treatment volume in less than 24 hours to ensure treatment of runoff.
- A Maintenance Agreement shall be provided as required by the municipality. The Maintenance Agreement shall state the parties' responsibility for maintenance and upkeep and allow access by mosquito abatement personnel.

MAINTENANCE

The maintenance plan shall include the following provisions:

- Vegetation shall be harvested annually during the summer.
- The structural integrity of the outlet and berms shall be inspected semiannually.
- Accumulated trash and debris shall be removed from the extended detention basin at the middle and end of the wet season. (January and April).
- Remove sediment from the forebay when the sediment level reaches the level shown on the fixed vertical sediment marker.

- Pesticides and fertilizers shall not be used in the extended detention basin.

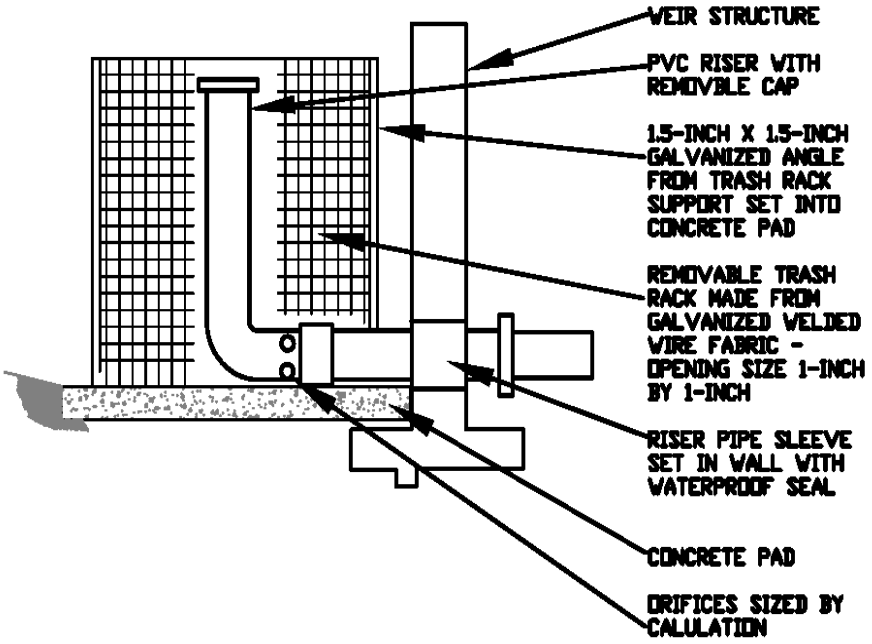

Figure 6-31. Side View of Riser

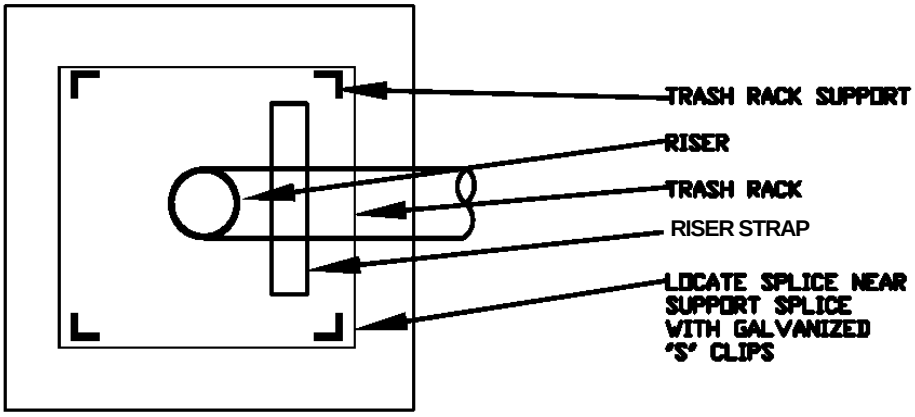

Figure 6-32. Top View of Riser (Square Design)

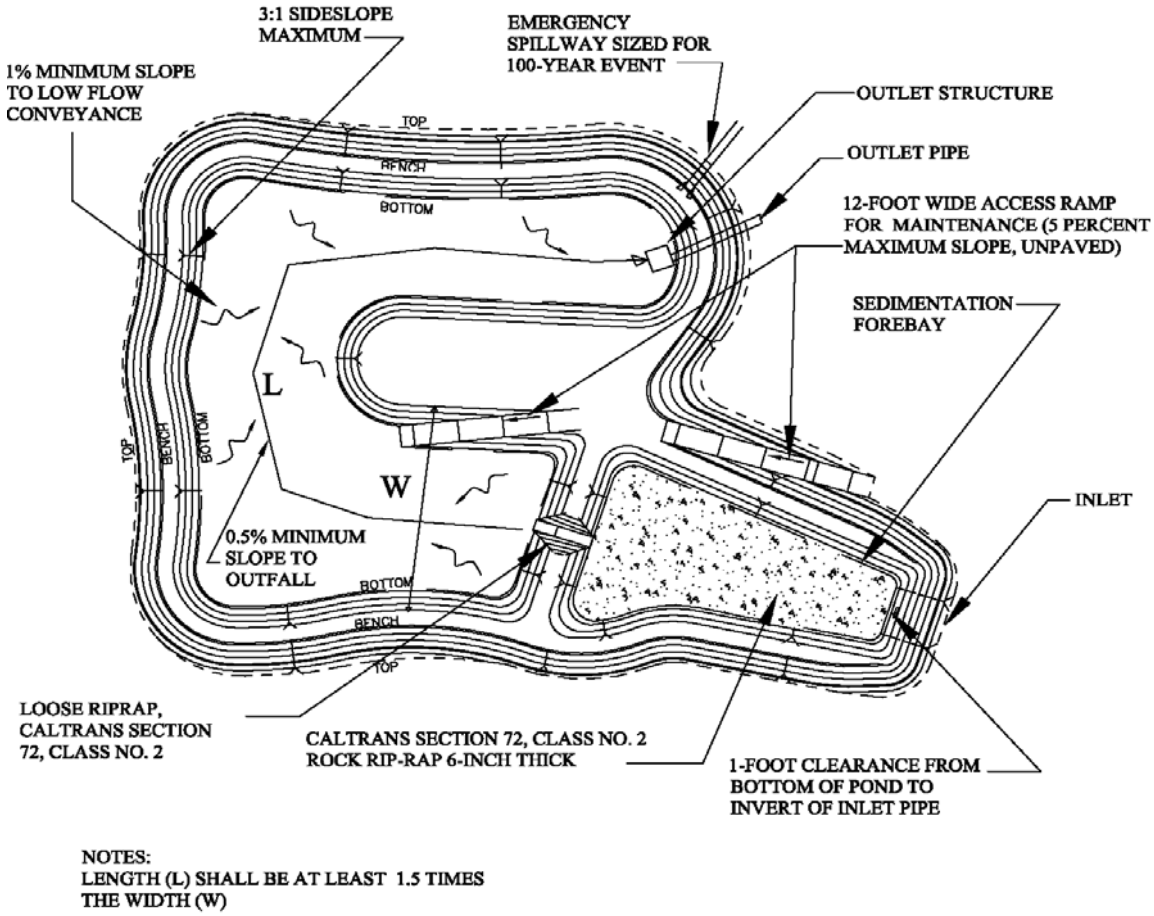

Figure 6-33. Plan View, Typical Extended Detention Basin