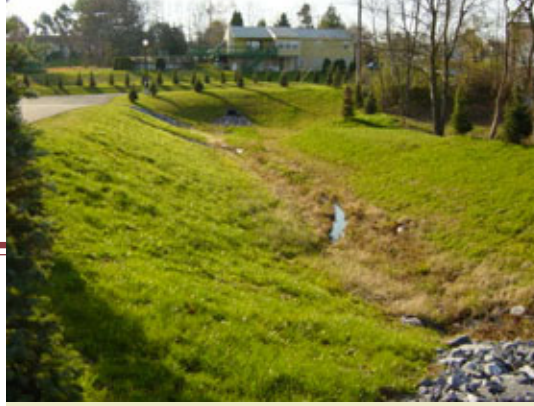
Best Management Practices Fact Sheet

Detention Ponds



PURPOSE: Detention ponds temporarily store stormwater runoff, thereby reducing the peak rate of runoff to a stream or storm sewer. They help to prevent localized flooding and, if designed to do so, provide some water quality benefits and reduce streambank erosion downstream.

During a storm, runoff drains from impervious surfaces directly to storm sewers or waterways. Large storm events contribute a significant volume of runoff moving at an increased rate, which raises the potential for erosion and flooding downstream. Detention ponds are basins that receive and hold runoff for release at a predetermined rate, thereby reducing the peak runoff delivered to storm sewers and streams. The ponds generally are earthen structures constructed either by impoundment of a natural depression or excavation of existing soil. Detention ponds are designed to release all captured runoff over time, and do not allow for permanent pooling of water. Captured runoff is released through multi-level outlet structures consisting of weirs, risers, orifices or pipes, which provide for increased discharge as water levels in the basin increase *(see reverse side)*.

Detention ponds are generally ineffective at removing pollutants in runoff because they do not provide adequate holding time for solids to settle before water is released into a stream or storm sewer system. However, extending the detention time of the basin and/or including a forebay to the basin in the design when space allows will enhance water quality and quantity benefits. Extended detention will require a larger basin. Forebays trap sediment to pretreat runoff prior to release to the main pond, and also provide additional temporary storage of runoff.

In areas where thermal impacts to receiving waters, such as trout streams, are a consideration, extended detention times should be shortened. Typical extended detention time is 24 hours but may be longer. Time should be reduced to 12 hours if thermal impacts are an issue.

Due to their ability to contain a substantial volume of runoff, detention ponds are suited for placement at all sites, including large sites. Detention basins are most frequently used at sites where other stormwater BMPs do not apply or are not effective.

General Design Considerations

- Suitable for capturing runoff from a drainage area of at least five acres
- Inflow and discharge hydrographs should be calculated for each selected design storm
- Location of basin should be down gradient of disturbed/developed areas on site
- Construction on or near steep slopes or modifying existing slope is not recommended
- Planting of native vegetation on floor of basin and embankments is recommended
- Floor of basin should be at least two feet above high water table
- Design for maximum water depth of 10 feet
- Design for length to width ratio of 2:1, minimum width of 10 feet; side slope ratio no greater than 3:1, maximum height of side embankments less than 15 feet
- Site placement should be at least 10 feet from property line and 50 feet from private well or septic system to address water quality concerns
- Forebay for should contain 10% to 15% of total pool volume
- Compaction of basin bottom should be avoided
- Outlet structures must be resistant to corrosion and clogging by debris, sediment and plant material

Benefits

- Reduces peak rate of runoff
- Alleviates flooding
- Cost effective
- Can be designed to address water quality
- Space surrounding pond can be landscaped to enhance aesthetics and provide habitat for wildlife

Additional Resources

PA Department of Environmental Protection
- www.dep.state.pa.us
- Pennsylvania Stormwater Best Management Practices Manual

US Environmental Protection Agency
www.epa.gov

Center for Watershed Protection
www.cwp.org

Stormwater Manager's Resource Center
wwww.stormwatercenter.net

Metropolitan Council of Minnesota Environmental Services - Urban Small Sites BMP Manual
www.metrocouncil.org and click on "Environmental Services" to find the link to the manual

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How a Riser Outflow Structure Works

A riser is an outflow structure used in conjunction with a detention basin for the purpose of maintaining a given amount of flow released from the detention basin to a stream or storm sewer system. Drainage holes placed along the height of the riser connect to a drain under the detention basin that has an outlet to a stream or storm drain. When the water level in the detention basin reaches the height of the entry holes of the riser, the water enters the holes and flows into the drainage pipe for release from the basin.

Crushed stone placed near the outlet point absorbs the energy of the water being released from the riser, which helps decrease runoff velocity and maintain an acceptable rate of runoff to the stream or storm sewer.

Detention Basin Side Profile

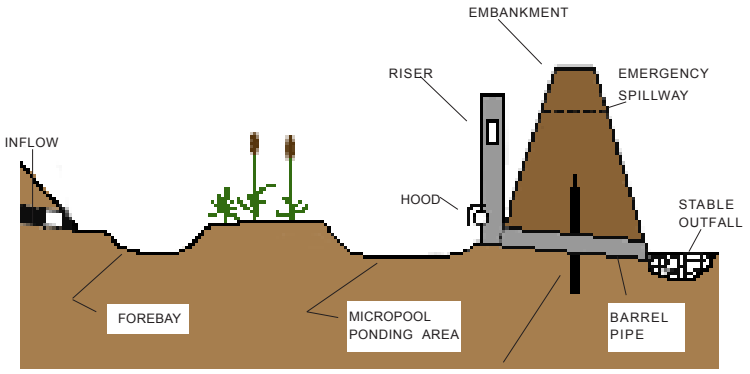
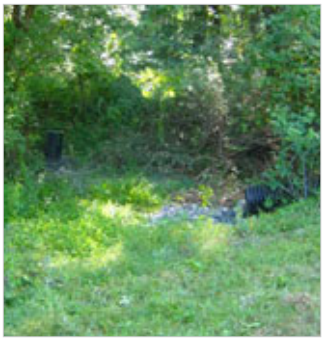


Diagram courtesy of Maryland BMP Manual



Basin at DCCD Tour Site #7

Detention Basins Featured in the BMP Tour

Two types of detention basins are featured in DCCD's stormwater BMP tour. Each is designed to illustrate how a detention basin can be incorporated with site features.

The first basin (#7 on the tour) uses a riser structure to aid with regulating the volume of runoff released from the site. The second basin (#10) takes advantage of the site's natural characteristics. Note that the contour of the land makes a natural depression suitable for detaining water. Surrounding existing vegetation will aid with absorption of water through plants' roots. A rock outfall has been added near the basin inlets to reduce the energy of runoff entering the basins.

Basin at DCCD Tour Site #10

Detention Basin Overhead Profile

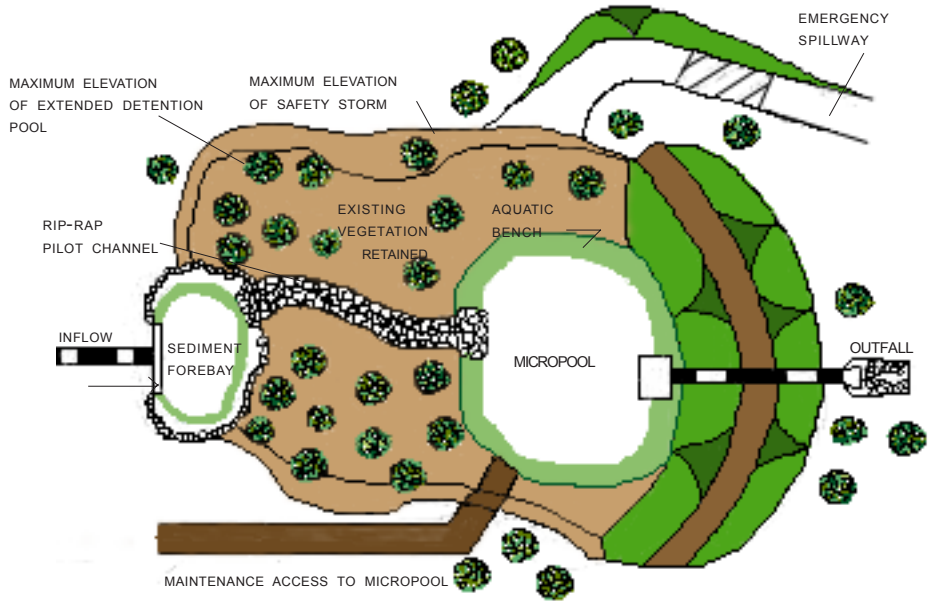


Diagram courtesy of Maryland BMP Manual

Detention vs. Retention

What's the Difference?

At times, the terms detention and retention seem to be used interchangeably - both are designed to capture and store runoff and they appear to be similar in design. However, they differ in purpose.

Retention is defined as "maintaining posession of; holding in a particular place"; detention refers to delaying an action. For stormwater objectives, this refers to the amount of time water is left to stand in the basin.

Detention ponds, whose primary function is to delay the release of runoff to streams, are designed for the eventual release of water. Retention basins are designed to allow sediment and pollutants to settle out of the water after it is captured through use of a permanent pool. Additional water received from a storm remains in the basin until it infiltrates into the ground or it reaches a depth that flos into a pipe or overflow structure. As it infiltrates, the water is filtered through the soil for removal of pollutants.