
2C-11 Inlet Sediment Forebays

A. Introduction

A sediment forebay is a settling basin or plunge pool constructed at the incoming discharge points of a stormwater BMP. The purpose of a sediment forebay is to allow sediment to settle from the incoming stormwater runoff before it is delivered to the balance of the BMP. A sediment forebay helps to isolate the sediment deposition in an accessible area, which facilitates BMP maintenance efforts. A sediment forebay is an essential component of most detention basins infiltration BMPs, including dry and dry ED detention basins, wet detention basins, constructed wetlands, and infiltration basins.

The sediment forebay is located at each inflow point in the stormwater BMP. Storm drain piping or other conveyances may be aligned to discharge into one forebay, or several, as appropriate for the particular site. Forebays are installed in a location which is accessible by maintenance equipment.

B. Water quality

A sediment forebay not only serves as a feature to reduce maintenance in the downstream stormwater BMP, it also enhances the pollutant removal capabilities of the BMP. The volume and depth of the forebay work in concert with the outlet protection at the inflow points to dissipate the energy of incoming stormwater flows. This allows heavier, coarse-grained sediments and particulate pollutants to settle out of the runoff. For the BMPs listed in this handbook, the target pollutant removal efficiencies have been established assuming sediment forebays are included in the design. Therefore, no additional pollutant removal efficiency is warranted for using a sediment forebay.

C. Channel erosion control and flood control

An online BMP designed for flood control and channel protection volume (CPv) is subject to the natural bed material (sediment) load, plus any bed load increases due to higher velocities in the upstream channels. This is especially true for regional facilities where the upstream channel is used to convey the increased developed condition flows. In such cases, the sediment forebay becomes an essential facility maintenance component, since it serves to simplify clean-out operations. A well-designed detention basin will function for 20 to 25 years before it needs dredging. This implies a gradual sediment accumulation process.

The sediment forebay, however, is designed to trap the sediments within a confined area. This causes a more rapid sediment accumulation. Studies indicate that for a typical mixed-use watershed, sediment removal from the forebay should occur every 3 to 5 years. Despite this frequency, removal of sediment from the forebay should be less costly over the same time period than a one-time cleaning of the entire basin. Removing sediment from the forebay is a much simpler operation than cleaning the entire stormwater basin or pond. The sediment is confined to strategic forebay locations with easy access. Furthermore, the more frequent and less expensive schedule can become a regular part of the operation and maintenance efforts of the owners.

D. Design criteria

The most attractive aspect of a sediment forebay is its isolation from the rest of the facility. To create this separation, an earthen berm, gabion, or concrete or riprap wall is constructed along the outlet side of the forebay. A designed overflow section is constructed on the top of the separation to allow flow to exit the forebay at non-erosive velocities (<5 fps) during the 2-year and 10-year frequency design storms. The overflow section is typically set at the permanent pool elevation or the extended-detention volume elevation. It may also be designed to serve as a spillover for the forebay if the forebay is set at a higher elevation than the second or remaining cell. The use of an aquatic bench with emergent vegetation around the perimeter will help with water quality as well as provide a safety feature for large forebays (used on large pond BMPs or retrofits).

1. **Volume.** The sediment forebay is sized for 0.25 inches of runoff per impervious acre of contributing drainage area, with an absolute minimum of 0.1 inches per impervious acre. The volume of the sediment forebay is considered part of the required volume of the detention basin permanent pool or extended detention volume. For dry facilities, the forebay does not represent available storage volume if it remains full of water. A dry forebay must be carefully designed to avoid the re-suspension of previously deposited sediments. The 0.1 to 0.25 impervious watershed inches guidance is for ideal performance. For smaller stormwater facilities, more appropriate sizing criteria of 10% of the total required pool or detention volume may be more practical. A typical sizing criteria is 10% of the WQv or water quality capture volume (WQCV). This volume should be 4 to 6 feet deep to adequately dissipate turbulent inflow without re-suspending previously deposited sediment (Center for Watershed Protection, 1995).
2. **Maintenance.** Direct access to the forebay is provided to simplify maintenance. Provision of a hardened access or staging pad adjacent to the forebay is also beneficial, as is a permanent easement for access. A hard-surfaced access helps protect the forebay and basin from excessive erosion resulting from operation of the heavy equipment used for maintenance. The pad area can be hardened by installing block pavers or similar material. A hardened bottom to the forebay will help avoid over-excavation during cleanout operations. A fixed, vertical, sediment depth marker is installed in each sediment forebay to measure the sediment deposition. The sediment depth marker assists with monitoring the accumulation and anticipating maintenance needs. Cleanout frequency will vary depending on the conditions of the upstream watershed and the given site.

In general, sediment should be removed from the forebay every 3 to 5 years, or when 6 to 12 inches have accumulated, whichever comes first. To clean the forebay, draining or pumping and a possible temporary partial drawdown of the pool area may be required. To reduce costs associated with hauling and disposing of dredged material, a designated spoil area should be approved and identified on the site during initial design and development of the project.

Several types of sediment forebays are shown in Figures 1 and 2. Several typical plan and profile schematics are illustrated in Figures 3 and 4.

Figure 1: Sediment forebay with earthen embankment and riprap



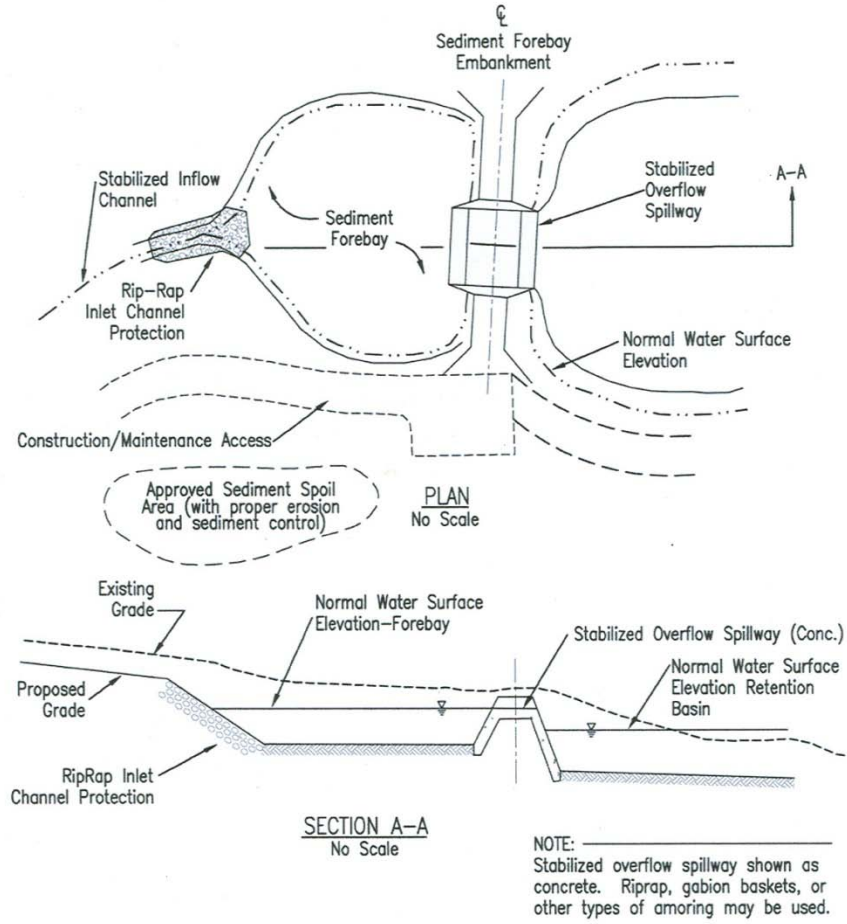
Source: Center for Watershed Protection

Figure 2: Sediment forebay constructed with submerged rip-rap weir



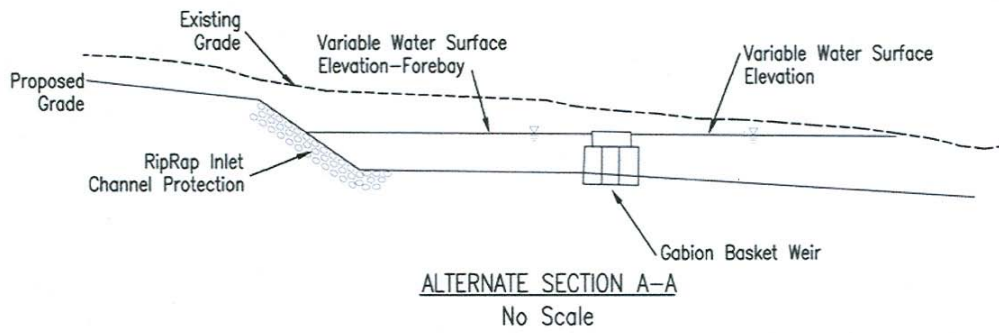
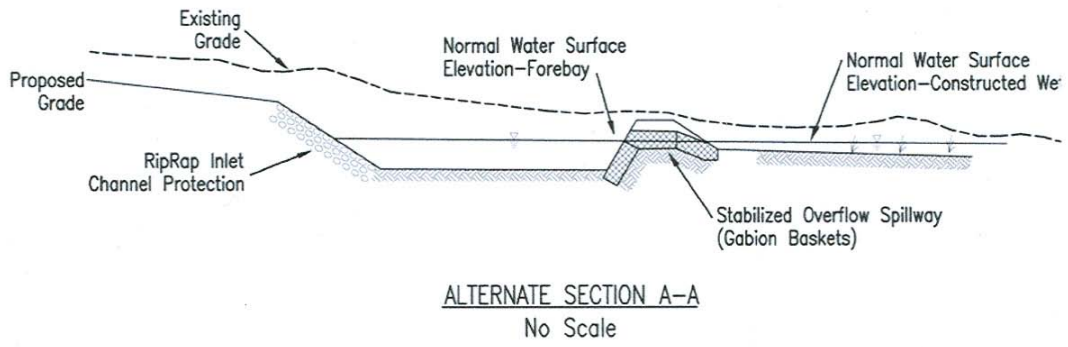
Source: Center for Watershed Protection

Figure 3: Typical sediment forebay plan and profile



Source: Center for Watershed Protection

Figure 4: Typical sediment forebay sections



Source: Center for Watershed Protection

