

APPENDIX D

SEDIMENT FOREBAY

VERSION 1.0
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SECTION D-1: DESCRIPTION OF PRACTICE

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.

SECTION D-2: PERFORMANCE CRITERIA

Not applicable.

SECTION D-3: PRACTICE APPLICATIONS AND FEASIBILITY

A sediment forebay is an essential component of most impoundment and infiltration BMPs including retention, detention, extended-detention, constructed wetlands, and infiltration basins.

A sediment forebay should be 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 should be installed in a location which is accessible by maintenance equipment.

Water Quality

A sediment forebay not only serves as a maintenance feature in a 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 the heavier, coarse-grained sediments and particulate pollutants to settle out of the runoff. **Note that 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.

Channel Erosion Control and Flood Control

An “on line” BMP designed for flood control and channel erosion control 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.

Studies indicate that a well-designed retention basin will function for 20 to 25 years before it needs dredging. This implies a gradual sediment accumulation process. A concern regarding stormwater basins is that the landowners will probably change at least once during that 20 to 25-year period. The new owners may not be aware of the maintenance requirements and, may therefore, neglect to maintain the facility. Sediment will then continue to accumulate and will eventually fill the BMP pool volume.

A 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 should be removed from the forebay every three-to-five 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. This is due in part to the fact that removing sediment from the forebay is a much simpler operation than that of an entire stormwater basin or pond. The sediment is confined to strategic forebay locations with easy access. Furthermore, the more frequent and less expensive schedule will likely become a regular part of the operation and maintenance efforts of the owners.

SECTION D-4: ENVIRONMENTAL AND COMMUNITY CONSIDERATIONS

Not applicable. (?)

SECTION D-5: DESIGN APPLICATIONS AND VARIATIONS

Not applicable.

SECTION D-6: SIZING AND TESTING GUIDELINES

The sediment forebay should be sized to hold 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 not in addition to the required volume of the retention basin permanent pool, but rather as part of the required pool 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 resuspension of previously deposited sediments. The 0.1 to 0.25 impervious watershed inches is guidance for ideal performance. For smaller stormwater facilities, a more appropriate sizing criterion of 10% of the total required pool or detention volume may be more practical. This volume should be 4 to 6 feet deep to adequately dissipate turbulent inflow without resuspending previously deposited sediment (Center for Watershed Protection, 1995).

[NOTE: Apart from this sizing criteria, there are no other specific dimensions listed anywhere in this specification. Is this sufficient for design?]

SECTION D-7: 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, or a gabion, concrete, or riprap wall can be constructed along the outlet side of the forebay. A designed overflow section should be constructed on the top of the separation to allow flow to exit the forebay at non-erosive velocities during the 2-year and 10-year frequency design storms. The overflow section may be 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 lake BMPs or retrofits).

Maintenance

Direct access to the forebay should be provided to simplify maintenance. Provision of a hardened access or staging pad adjacent to the forebay is also beneficial. Such an area helps protect the forebay and basin from excessive erosion resulting from operation of the heavy equipment used for maintenance. Installing block pavers or similar material can harden the pad area. Also, a hardened bottom to the forebay will help avoid over excavation during clean out operations.

In addition, a fixed, vertical, sediment depth marker should be installed in each sediment forebay to measure the sediment deposition. The sediment depth marker will allow the owner to monitor the accumulation and anticipate maintenance needs. Clean out frequency will vary depending on the conditions of the upstream watershed and the given site.

SECTION D-8: REGIONAL AND CLIMATE DESIGN VARIATIONS

Not applicable. (?)

SECTION D-9: TYPICAL GRAPHICAL DETAILS

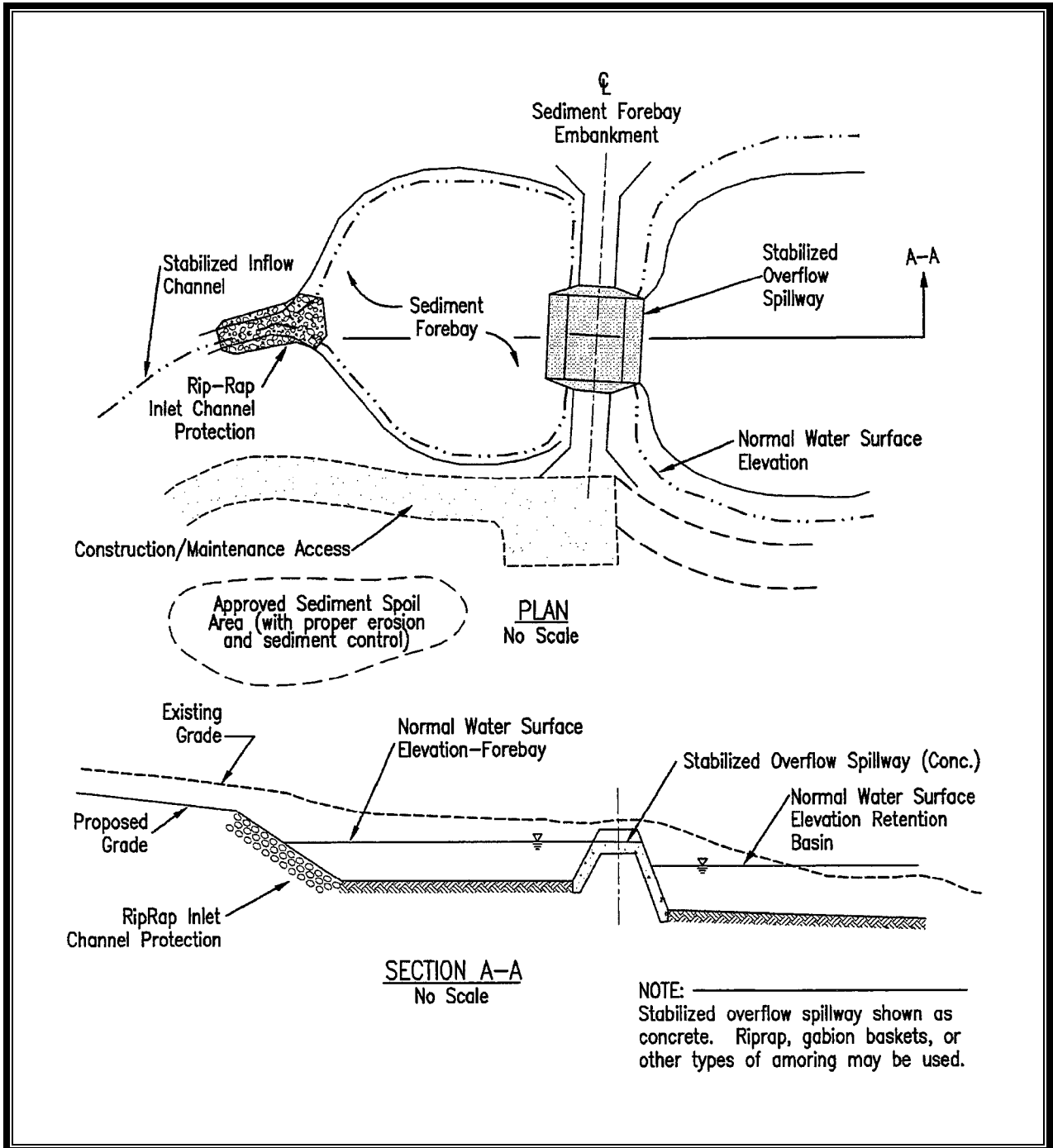


Figure D-1. Typical Sediment Forebay Plan and Section

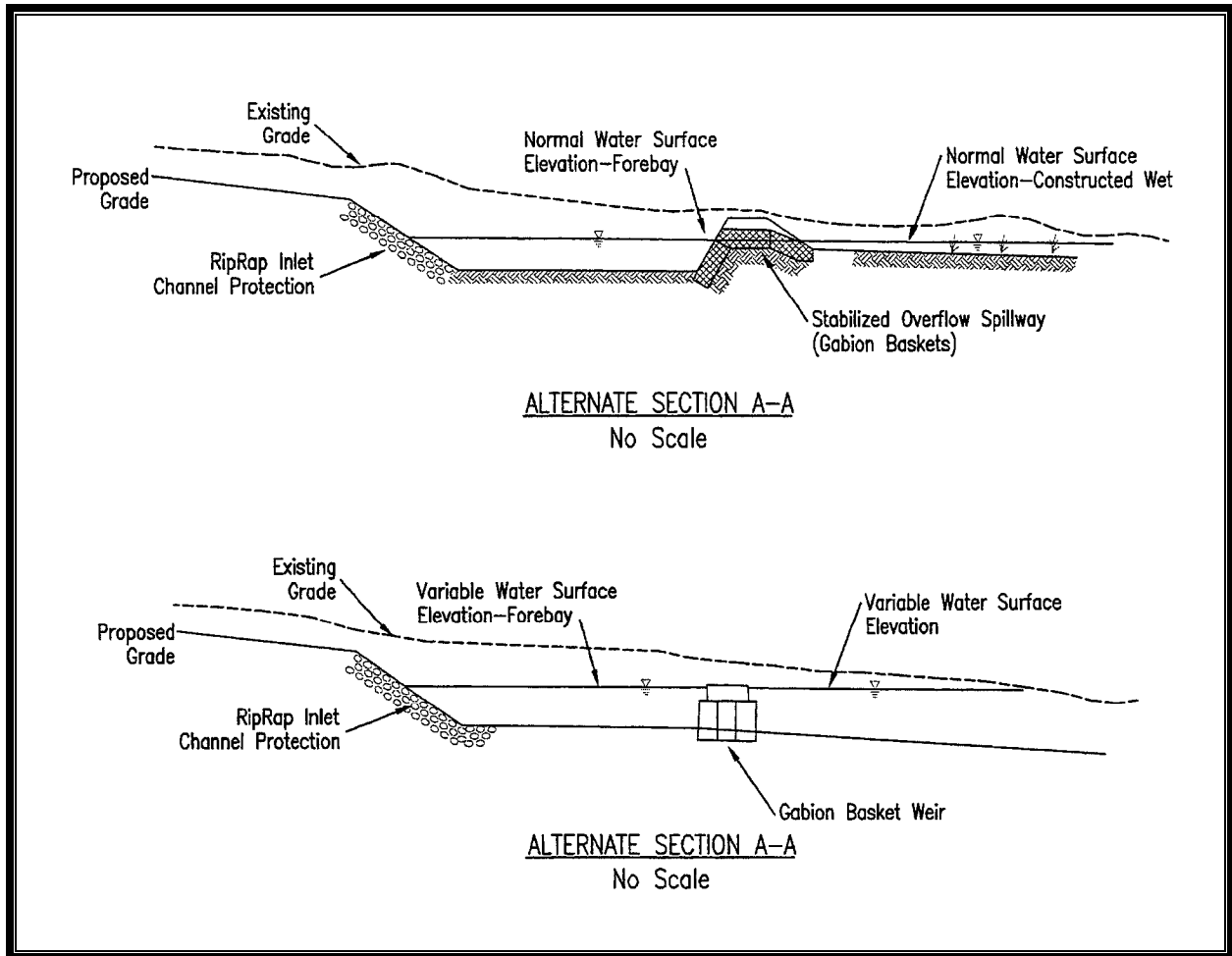


Figure D-2. Typical Sediment Forebay Sections



Figure D-3. Sediment Forebay Constructed with a Submerged Rip-Rap Weir

SECTION D-10: MATERIAL SPECIFICATIONS

Not applicable. (?)

SECTION D-11: CONSTRUCTION SEQUENCE AND INSPECTION

Not applicable. (?)

SECTION D-12: OPERATION AND MAINTENANCE

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. Refer to the *Virginia Erosion and Sediment Control Handbook* (1992) for proper dewatering methods.

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.

SECTION D-13: REFERENCES

Not applicable. (?)