Temporary Sediment Basin Standard

This standard is intended to guide designers on the purpose, design, selection, installation, and maintenance of a sediment basin when used as a temporary sediment control practice to detain sediment from stormwater runoff prior to discharge from a construction site.

Keywords: sediment basin, sediment control, stormwater management

1 DEFINITION

1.1 A temporary sediment-control practice consisting of an inflow structure, settling pond, dewatering system, and auxiliary spillway.

2 PURPOSE

2.1 To detain sediment entrained in stormwater runoff by providing storage to promote gravitational sedimentation thereby reducing offsite sediment discharge.

3 DESIGN

Sediment basin performance is dependent on size, geometry, velocity dissipation, detention time, and dewatering mechanisms. Adequate volume and residence time is necessary to promote gravitational settling. Figure 1 provides a diagram with key design elements. Figure 2 illustrates a sediment basin cross-section with key storage features and outlets.

3.1 Placement

3.1.1 Sediment basins should be placed upstream of site discharge points to maximize the detention of sediment-laden stormwater prior to off-site discharge.

3.1.2 Sediment basin volume and depth must comply with local, state, and federal requirements.

3.1.3 Sediment basins should be located to allow the maximum amount of construction runoff to enter the inflow structure.

3.1.4 Sediment basins should have an access point for maintenance activities (i.e., sediment removal) throughout the duration of the project.

3.1.5 Erosion controls and velocity dissipation devices should be implemented upstream and downstream to prevent erosion of the inflow structure and the auxiliary spillway.

3.1.6 Sediment basins may be placed within an existing or proposed stormwater pond, or similar impoundment area, as long as they are configured with features outlined in this standard. Existing outlet control devices may need to be modified to allow for proper function as a sediment basin.

3.2 Inflow Structure

3.2.1 Flow must be directed into a sediment basin through a dedicated conveyance channel or pipe.

3.2.2 An inflow channel or pipe shall be sized to safely convey the peak flow rate of the 10-yr, 24-hr storm.

3.2.3 The discharge end of the inflow channel or pipe into the basin shall be stabilized to prevent erosion.

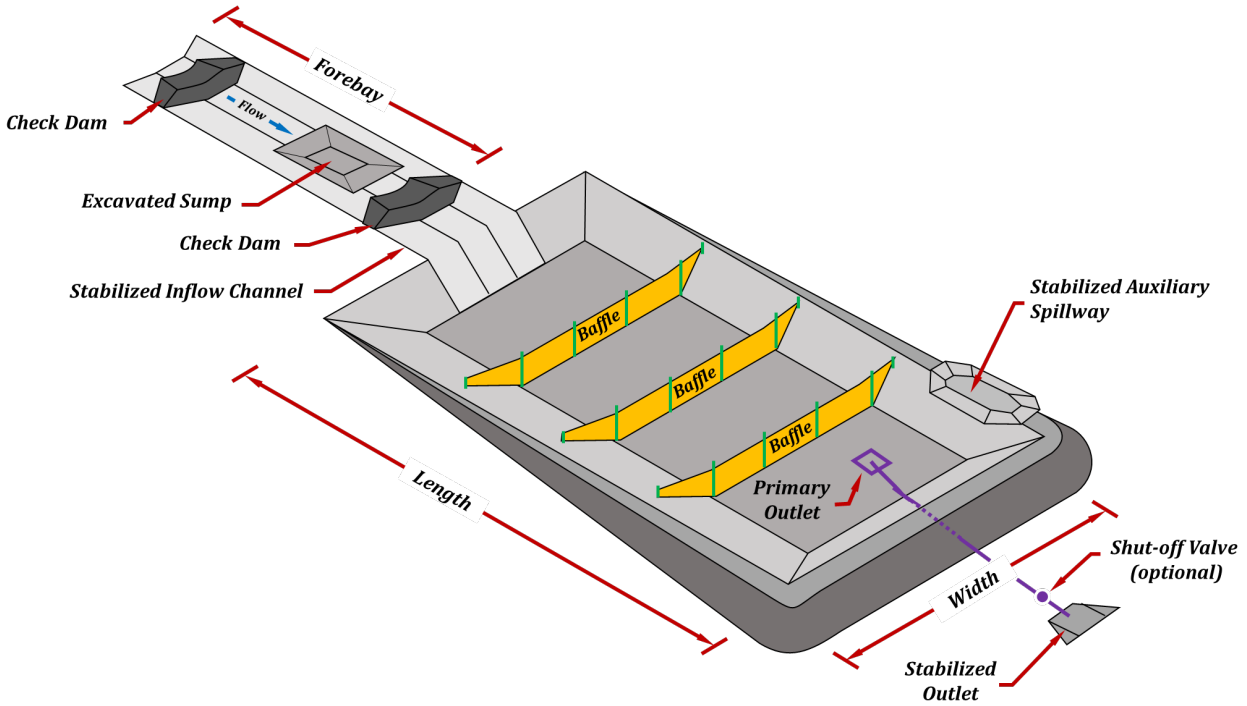

Figure 1. Typical sediment basin diagram with key elements.

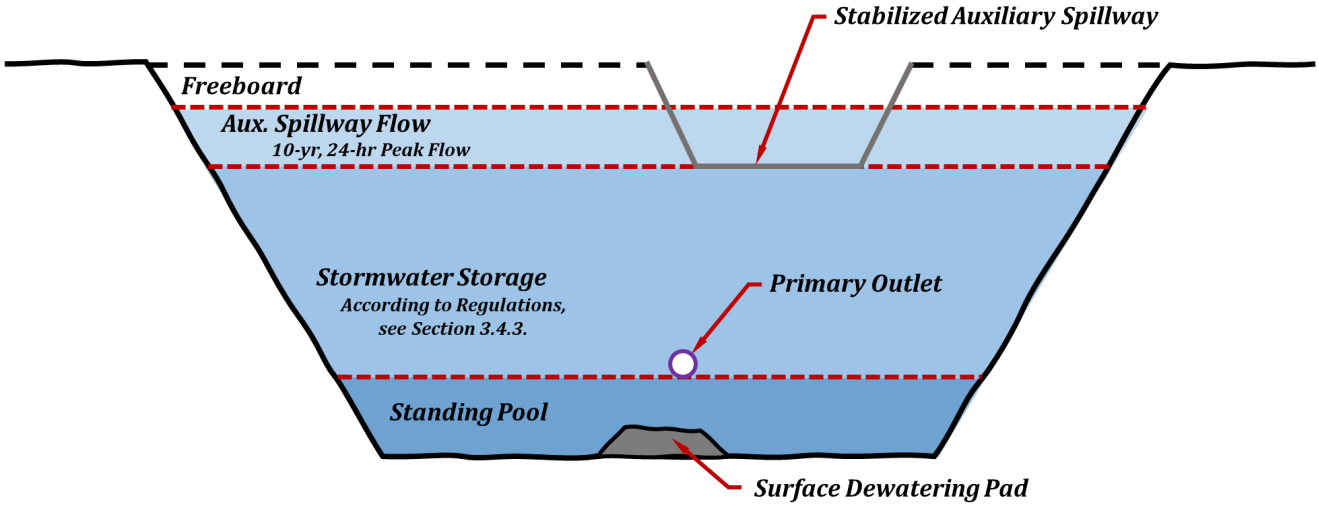

Figure 2. Sediment basin cross section.

3.3 Forebay

3.3.1 A forebay should be designed to adequately reduce velocity and promote gravitational settling of the heaviest particles. A forebay may be constructed in the first bay of the basin, or upstream in a stabilized inflow channel.

3.3.2 Where sediment loads are excessive, a forebay consisting of a lined, excavated sump and check dam should be constructed upstream of a stabilized inflow channel or inflow pipe to capture rapidly settable solids. A forebay can also be incorporated within the first bay of the basin using riprap as a velocity dissipater in lieu of the first coir baffle.

3.4 Capacity and Geometry

3.4.1 A sediment basin consists of a standing pool, stormwater storage, auxiliary spillway stage, and freeboard.

3.4.2 The standing pool is a permanent pool located below the primary outlet. The primary outlet shall be installed at a minimum of 0.3 m (1 ft) measured from bottom of basin.

3.4.3 Stormwater storage is the temporary detention volume that is discharged through the primary outlet. It is recommended that stormwater storage be designed to detain the selected design storm for the drainage area.

3.4.4 Selection of the design storm should be based on site-specific characteristics including: project location, duration of disturbance, and acceptable levels of risk to downstream receiving waters. Lacking site-specific guidance, a 2-yr, 24-hr design storm event is recommended. Alternatively, designers may provide 250 m^3 of storage per ha (3,600 ft^3/ac) drained. Design volume should adhere to local, state, and federal guidelines.

3.4.5 Avoid side slopes steeper than 2H:1V. Provide for sufficient top width, and stable back slopes for geotechnical stability. Refer to NRCS CPS Pond or design requirements.

3.4.6 Total basin depth generally should not exceed 1.5 m (5 ft), including up to the auxiliary spillway flow depth.

3.4.7 Freeboard is the vertical distance between the designed spillway flow elevation and the top of embankment.

3.4.8 Sediment basin surface area should be maximized to improve sediment trapping efficiency.

3.4.9 To maximize trapping efficiency, where topography allows, the surface area should be sized to a minimum 1,066 m^2 per m^3/s (325 ft^2 per ft^3/s) of the 10-yr, 24-hr peak flow.

3.4.10 To optimize settling, basins should have a long and narrow design with a minimum length to width ratio of 2:1 and should not exceed 6:1.

3.5 Velocity Dissipation

3.5.1 Riprap or alternative velocity reduction strategies shall be used at the transition between the stabilized inflow channel or pipe and the sediment basin.

3.5.2 Velocity dissipaters, such as porous flow baffles, shall be installed across the basin to maximize effective width, prevent turbulent flow, and minimize short-circuiting.

3.5.3 At a minimum, three rows of baffles shall be installed to separate the sediment basin into approximately four equal- volume sections or bays.

3.5.4 Baffles shall be installed in series perpendicular to flow direction.

3.5.5 A double layer of 700-900 g/m^2 (20.6-26.5 oz/yd^2) coconut coir with apparent opening size of 40% is the recommended baffle material.

3.5.6 Baffles shall be secured to the basin floor using sod staples or equivalent alternative.

3.5.7 Baffles shall be secured with ample support by incorporating a wire fence to prevent sagging. Posts such as studded t-posts of a minimum density of 1.98 kg/m (1.33 lb/ft), or equivalent, spaced at 3.0 m (10 ft) on-center are recommended.

3.5.8 The first baffle, or equivalent energy dissipater (i.e. riprap), must be designed to withstand high flow velocity, consider a post spacing of 1.2 m (4 ft) on-center.

3.5.9 Baffles shall extend and be secured to basin side walls to prevent short circuiting. The height of the baffles should be at the level of the auxiliary spillway flow.

3.6 Dewatering

3.6.1 The basin must include a surface dewatering mechanism that withdraws from the top of the water column, such as a floating surface skimmer.

3.6.2 The dewatering device shall be located in the basin at the furthest point from the inflow structure along the flow path.

3.6.3 The dewatering device size shall be selected to achieve the desired dewatering time for the stormwater storage volume of the basin. It is recommended to dewater within a period of 2 to 5 days.

3.6.4 Dewatering time should be calculated for site specific soils considering basin depth and settling velocity.

3.6.5 The dewatering pipe should pass through the dam with at least one anti-seep collar at the center of the dam, projecting a minimum of 0.5 m (1.5 ft) in all directions from the pipe.

3.6.6 Discharge from the dewatering device shall be extended to a receiving waterway, stabilized offsite area, or directed through a dissipation device (e.g. rock check dam).

3.6.7 A shut-off valve can be used downstream of the primary outlet to allow for extended detention of storage volume. During dry periods, extending the basin's detention time will allow for increased settling, infiltration, and evaporation. The shut-off valve should be left in the open position in advance of large precipitation events.

3.6.8 The discharge point shall be stabilized to prevent erosion from occurring.

3.7 Auxiliary Spillway

3.7.1 A stabilized auxiliary spillway shall be located on native soil (not earth fill) whenever possible.

3.7.2 The crest elevation of the auxiliary spillway should be at the top elevation of the stormwater storage volume.

3.7.3 A minimum freeboard depth of 0.3 m (1 ft) shall be provided above the spillway flow depth.

3.7.4 The spillway shall be required to safely pass the10-yr, 24-hr peak flow rate.

3.7.5 The spillway shall be lined to prevent erosion.

3.8 Erosion Control

As soon as the basin is constructed, stabilize all bare, earthen areas with either vegetation or other measures to prevent erosion. Refer to state and local erosion and sediment control handbook for seeding recommendations.

3.9 Safety

3.9.1 Install a fence to encompass the basin as required and mark with warning signs if trespassing is likely.

3.9.2 Follow all federal, state, and local safety requirements for impoundments.

3.10 Flocculants

3.10.1 Flocculants may be applied upstream of the sediment basin to enhance gravitational settling and reduce turbidity. Dosage shall be according to the manufacturer's recommendations and comply with state regulations for use of flocculants.

4 INSPECTION AND MAINTENANCE

4.1 Sediment basins should be inspected regularly and after significant runoff events to ensure adequate storage capacity.

4.2 Sediment should be removed once it occupies 1/3 to 1/2 the stormwater storage volume.

4.3 Sediment should be removed from the excavated sump when accumulation reaches 1/3 to 1/2 of the volume to avoid resuspension of captured material. Geotextile liners should be replaced if damaged during maintenance or operation.

4.4 If installed, ensure that the shut-off valve is functional and is in the desired operating position.

4.5 All dredged sediment shall be disposed of properly.

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