6.60 TEMPORARY SEDIMENT TRAP

Definition

A temporary basin formed by an embankment or excavation to collect sediment from construction runoff.

Purpose

To impound sediment-laden construction runoff and allow for sediment to settle out of suspension "trapping" it on site.

Conditions Where Practice Applies

Specific criteria for installation of a temporary sediment trap are as follows:

- At the outlets of diversions, channels, slope drains, or other runoff conveyances that have potential to discharge sediment-laden water.
- Below areas that are draining less than 1 acre.
- Where access can be maintained for sediment removal and proper disposal.
- In the approach to a stormwater inlet located below a disturbed area as part of an inlet protection system.
- Structure life is limited to active phases of grading.

A temporary sediment trap should not be located in an intermittent or perennial stream.

Planning Considerations

Select locations for sediment traps during site evaluation. Note natural drainage divides and select trap sites so that runoff from potential sediment-producing areas can easily be diverted into the traps. Ensure the drainage areas for each trap are less than 1 acre. Install temporary sediment traps before land disturbance takes place within the drainage area. Temporary perimeter erosion control measures may be necessary to contain the construction area for the Temporary Sediment Trap until it is completed and properly stabilized. Make traps readily accessible for periodic sediment removal and other necessary maintenance. Plan locations for sediment disposal from cleanout or maintenance as part of trap site selection. Clearly designate all disposal areas on the plans.

DRAFT

In preparing plans for sediment traps, it is important to consider provisions to protect the embankment from failure from storm runoff that exceeds the design capacity. Locate bypass outlets so that flow will not damage the embankment. Direct emergency bypasses to undisturbed natural, stable areas. If a bypass is not possible and failure would have severe consequences, consider alternative locations.

Sediment trapping is achieved primarily by settling within a pool formed by an embankment. The sediment pool may also be formed by excavation, or by a combination of excavation and embankment. Sediment-trapping efficiency is a function of surface area and inflow rate (Practice 6.61, *Sediment Basin*). Therefore, maximize the surface area in the design. Because porous baffles improve flow distribution across the trap, high length to width ratios are not necessary to reduce short-circuiting and to optimize efficiency.

Because well planned sediment traps are key measures to preventing off-site sedimentation, they should be installed in the first stages of project development.

Design Criteria

Summary:	Temporary Sediment Trap
Primary Spillway:	Stone Spillway
Maximum Drainage Area:	Less than 1 acre
Minimum Volume:	3600 cubic feet per acre of disturbed area
Minimum Surface Area:	435 square feet per cfs of Q_{10} peak inflow
Minimum L/W Ratio:	2:1
Minimum Depth:	3.5 feet, 1.5 feet excavated below grade
Maximum Height:	Weir elevation 3.5 feet above grade
Dewatering Mechanism:	Stone Spillway
Minimum Dewatering Time:	N/A
Baffles Required:	3 for traps greater than 20 ft in length 2 for traps less than 20 ft in length

Storage capacity—Provide a minimum volume of 3,600 ft^3/acre of disturbed area draining into the basin. Required storage volume may also be determined by modeling the soil loss with the Revised Universal Soil Loss Equation or other acceptable methods. Measure volume to the crest elevation of the stone spillway outlet.

Trap cleanout—Remove sediment from the trap and restore the capacity to original trap dimensions when sediment has accumulated to one-half the design depth.

Trap efficiency—The following design elements must be provided for adequate trapping efficiency:

DRAFT

- Provide a surface area of 0.01 acres (435 square feet) per cfs based on the 10-year storm;
- Convey runoff into the trap through stable diversions or temporary slope drains;
- Locate sediment inflow to the trap away from the embankment to prevent short circuits from inlets to the outlet;
- Provide porous baffles (Practice 6.65, Porous Baffles);
- Excavate 1.5 feet of the depth of the trap below grade and provide minimum storage depth of 2 feet above grade.

Embankment—Embankments for temporary sediment traps should not exceed 5 feet in height. Measure from the center line of the original ground surface to the top of the embankment. Keep the crest of the spillway outlet a minimum of 1.5 feet below the settled top of the embankment. Freeboard may be added to the embankment height to allow flow through a designated bypass location. Construct embankments with a minimum top width of 5 feet and side slopes of 2:1 or flatter. Machine compact embankments.

Excavation—Where sediment pools are formed or enlarged by excavation, keep side slopes at 2:1 or flatter for safety.

Inlet section—Construct the sediment trap inlet using an impermeable RECP, riprap underlain with geotextile, or other measures to prevent erosion of the trap inlet and embankments while directing water into the upper end of the pool area.

Outlet section—Construct the sediment trap outlet using a stone section of the embankment located at the low point in the trap. The stone section serves two purposes: (1) the top section serves as a non-erosive spillway outlet for excessive flows; and (2) the bottom section provides a means of dewatering the trap between runoff events.

Stone size—Construct the outlet using well-graded stones with a d_{50} size of 9 inches (NCDOT Class B erosion control stone is recommended) and a maximum stone size of 14 inches. The entire upstream face of the rock structure should be covered with stone meeting a d_{50} size of ½ - ¾ inches (NCDOT #57 or #5 classification is recommended), also called sediment control stone, being 1-foot thick to reduce the drainage rate.

Side slopes—Keep the side slopes of the spillway section at 2:1 or flatter. To protect the embankment, keep the sides of the spillway at least 21 inches thick.

Depth—The trap should be excavated 1.5 feet below grade.

DRAFT

Stone spillway height—The sediment storage depth should be a minimum of 2 feet and a maximum of 3.5 feet above grade.

Protection from piping—Place geotextile on the foundation below the riprap to prevent piping or excavate a keyway trench across the riprap foundation and up the sides to the height of the dam.

Weir length and depth—Keep the spillway weir at least 4 feet long and sized to pass the peak discharge of the 10-year storm (Figure 6.60a). A maximum flow depth of six inches, a minimum freeboard of 1 foot, and maximum side slopes of 2:1 are recommended. Weir length may be selected from Table 6.60a shown for most site locations in North Carolina.

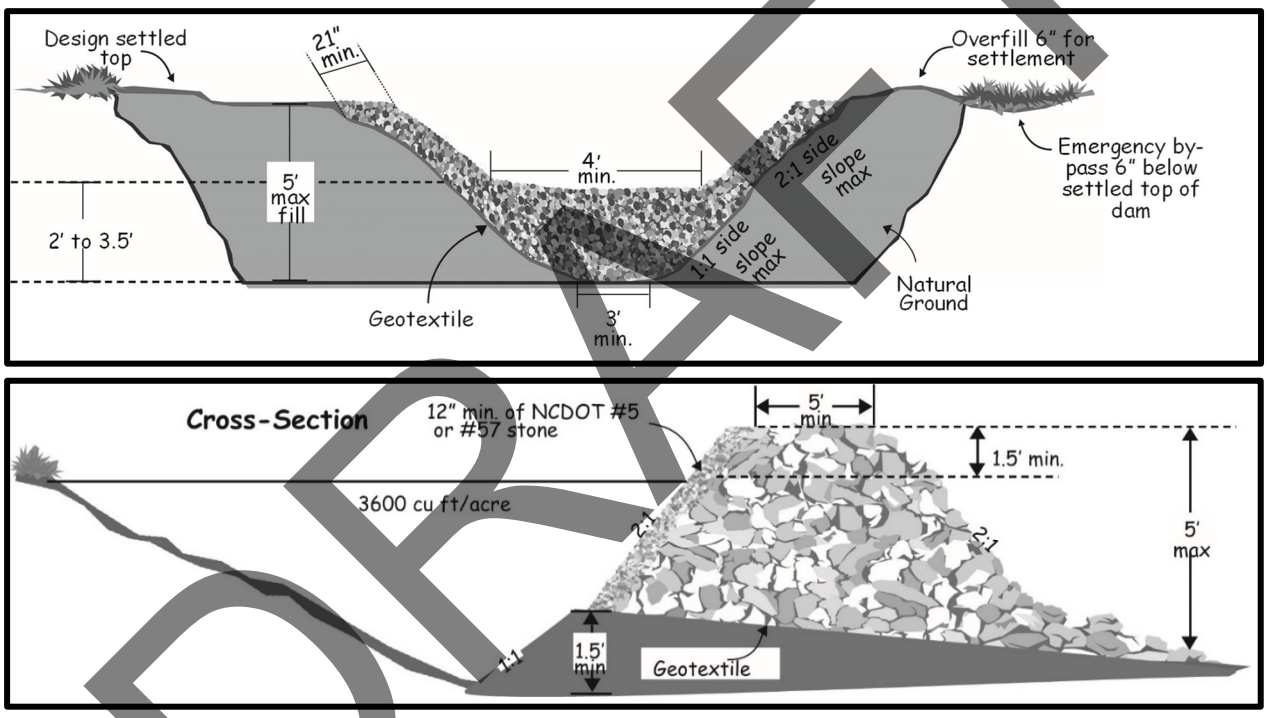


Figure 6.60a *Plan view and cross-section view of a temporary sediment trap.*

Drainage Area (Acres)	Weir Length[1] (ft)
1	4.0
2	6.0
3	8.0
4	10.0
5	12.0

[1]Dimensions shown are minimum

Table 6.60a *Design of Spillways*

DRAFT



Figure 6.60b *Temporary Sediment Trap collects runoff to allow sediment to settle.*

Construction Specifications

1. Clear, grub, and strip the area under the embankment of all vegetation and root mat. Remove all surface soil containing high amounts of organic matter, and stockpile or dispose of it properly. Haul all objectionable material to the designated disposal area.
2. Ensure that fill material for the embankment is free of roots, woody vegetation, organic matter, and other objectionable material. Place the fill in lifts not to exceed 9 inches, and machine compact it. Over fill the embankment 6 inches to allow for settlement. When using tracked equipment to construct embankments, the direction of the cleating or tracking should be perpendicular to the slope.
3. Prior to constructing the Trap, install and maintain appropriate silt fence or similar perimeter containment until Trap is properly constructed and surrounding area stabilized. Upon stabilization, the perimeter silt fence can be removed as needed. Construct the outlet section of the Trap in the embankment. Protect the connection between the riprap and the soil from piping by using geotextile with a keyway cutoff trench between the riprap structure and soil.
    - Place the geotextile between the riprap and the soil. Extend the geotextile across the spillway foundation and sides to the top of the dam; or
    - Excavate a keyway trench along the center line of the spillway foundation extending up the sides to the height of the dam. The trench should be at least 2 feet deep and 2 feet wide with 1:1 side slopes.
4. Clear the trap area below the elevation of the crest of the spillway to facilitate sediment cleanout.

DRAFT

5. All cut and fill slopes should be 2:1 or flatter.
6. Ensure that the stone (drainage) section of the embankment has a minimum bottom width of 3 feet and maximum side slopes of 1:1 that extend to the bottom of the spillway section.
7. Construct the minimum finished stone spillway bottom width, as shown on the plans, with 2:1 side slopes extending to the top of the over filled embankment. Keep the thickness of the sides of the spillway outlet structure at a minimum of 21 inches. The weir must be level and constructed to grade to assure design capacity.
8. Material used in the stone section should be a well-graded mixture of structural stone with a d_{50} size of 9 inches (NCDOT Class B erosion control stone is recommended) and a maximum stone size of 14 inches. The smaller stone to be placed on the upgradient side of structural stone should be a minimum of 12 inches in thickness.
9. Discharge construction runoff water into the trap in a manner to prevent erosion through the use of temporary slope drains or other stable conveyance. Ensure this runoff enters the upper end of the pool area of trap to improve efficiency (References: *Runoff Control Measures and Outlet Protection*).
10. Ensure that the stone spillway outlet section extends downgradient past the toe of the embankment until stable conditions have been achieved through establishment of permanent vegetation, the use of geotextile, or similar and that outlet velocity of trap discharge is non-erosive. Keep the edges of the stone outlet section flush with the surrounding ground and shape the center to confine the outflow stream (References: *Outlet Protection*).
11. Direct emergency bypass to natural, stable areas. Locate bypass outlets so that flow will not damage the embankment. Stabilize the embankment using proper seeding practices that include perennial seed species and a rolled erosion control product on all disturbed areas above the sediment pool and downgradient from the trap immediately after construction (References: Surface Stabilization).
12. Show the distance from the top of the spillway to the sediment cleanout level (1/2 the design depth) on the plans and mark it in the field.
13. Install porous baffles as specified in Practice 6.65, *Porous Baffles.*

Maintenance

Inspect temporary sediment traps at least weekly and after each significant (1 inch or greater) rainfall event and perform any necessary repairs immediately. Remove collected sediment from Trap and restore to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed

DRAFT

in the designated disposal area and replace any sediment control stone removed from outlet as part of that maintenance.

Check the structure for damage from erosion or piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet below the low point of the embankment. Immediately fill any settlement of the embankment to slightly above design grade. Any stone displaced from the spillway must be replaced immediately. After all upgradient sediment-producing areas have been permanently stabilized, the trap can be removed, and the immediate area permanently stabilized through grading and blending the area with the adjoining contours. Do not breach the embankment of the trap to release any remaining impounded water. Any remaining impounded runoff should be pumped to another Trap/Basin or silt bag to allow for proper grading and permanent stabilization of the area.

References

Outlet Protection

6.41, Outlet Stabilization Structure

Runoff Control Measures

6.20, Temporary Diversions
6.21, Permanent Diversions
6.22, Diversion Dike (Perimeter Protection)
6.23, Right-of-way Diversion (Water Bars)

Surface Stabilization

6.10, Temporary Seeding
6.11, Permanent Seeding
6.15, Riprap

Sediment Traps and Barriers

6.61, Sediment Basins
6.64, Skimmer Basins
6.65, Porous Baffles

North Carolina Department of Transportation

Standard Specifications for Roads and Structures

DRAFT