

Sediment Traps



Sediment traps are used to collect sediment-laden runoff from disturbed areas on construction sites

Description

Sediment traps are small impoundments that allow sediment to settle out of construction runoff. They are usually installed in a drainageway or other point of discharge from a disturbed area. Temporary diversions can be used to direct runoff to the sediment trap (USEPA, 1993). Sediment traps detain sediments in stormwater runoff to protect receiving streams, lakes, drainage systems, and the surrounding area. The traps are formed by excavating an area or by placing an earthen embankment across a low area or drainage swale. An outlet or spillway is often constructed using large stones or aggregate to slow the release of runoff (USEPA, 1992).

Applicability

Sediment traps are commonly used at the outlets of stormwater diversion structures, channels, slope drains, construction site entrance wash racks, or any other runoff conveyance that discharges waters containing sediment and debris.

Siting and Design Considerations

Sediment traps can simplify stormwater management on a construction site by trapping small amounts of sediment at multiple spots (USEPA, 1992). Note the natural drainage patterns, and place the traps in areas with the highest erosion potential. Design alternative diversion pathways to accommodate potential overflows.

Design a sediment trap to maximize the surface area for infiltration and sediment settling. This increases the effectiveness of the trap and decreases the likelihood of backup during and after periods of high runoff intensity. Site conditions dictate specific design criteria, but the minimum storage capacity should be 1,800 ft³ per acre of total drainage area (Smolen et al., 1988). The volume of a natural sediment trap can be approximated using the following equation (Smolen et al., 1988):

$$\text{Volume (ft}^3\text{)} = 0.4 \times \text{surface area (ft}^2\text{)} \times \text{maximum pool depth (ft)}$$

In the siting and design phase, take care to situate sediment traps for easy access by maintenance crews. This allows for periodic inspection and maintenance. When excavating an area for a sediment trap, make sure the side slopes are no steeper than 2:1 and the embankment height no more than 5 feet from the original ground surface. Machine-compact all embankments to ensure stability. To reduce flow rate from the trap, line the outlet with well-graded stone.

The spillway weir for each temporary sediment trap should be at least 4 feet long for a 1-acre drainage area and increase by 2 feet for each additional drainage acre added, up to a maximum drainage area of 5 acres.

Limitations

Do not use sediment traps for drainage areas greater than 5 acres (USEPA, 1993). The effective life span of these structures is usually limited to 24 months (Smolen et al., 1988). Although sediment traps allow eroded soils to settle, their detention periods are too short for removing fine particles like silts and clays.

Maintenance Considerations

The primary maintenance consideration for temporary sediment traps is removing accumulated sediment. Do this periodically to ensure that the trap continues to operate effectively. Remove sediments when the basin reaches about 50 percent sediment capacity. Inspect the sediment trap after each rainfall event to ensure that the trap is draining properly. Also check the structure for damage from erosion. Check the depth of the spillway and maintain it at a minimum of 1.5 feet below the low point of the trap embankment.

Effectiveness

Sediment trapping efficiency is a function of surface area and peak inflow rate (Smolen et al., 1988). Traps that provide pools with large length-to-width ratios have a greater chance of success. Sediment traps have a useful life of about 18 to 24 months (USEPA, 1993), but their effectiveness depends on the amount and intensity of rainfall and erosion, and proper maintenance. USEPA (1993) estimates an average total suspended solids removal rate of 60 percent. An efficiency rate of 75 percent can be obtained for most Coastal Plain and Piedmont soils by using the following equation (Barfield and Clar, in Smolen et al., 1988):

$$\text{Surface area at design flow (acres)} = (0.01) \text{ peak inflow rate (cfs)}$$

Cost Considerations

The cost of installing temporary sediment traps ranges from \$0.20 to \$2.00 per cubic foot of storage (about \$1,100 per acre of drainage). The average cost is about \$0.60 per cubic foot of storage (USEPA, 1993).

References

Smolen, M.D., D.W. Miller, L.C. Wyatt, J. Lichthardt, and A.L. Lanier. 1988. *Erosion and Sediment Control Planning and Design Manual*. North Carolina Sedimentation Control Commission; North Carolina Department of Environment, Health, and Natural Resources; and Division of Land Resources, Land Quality Section, Raleigh, NC.

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