



United States Department of Agriculture

Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
SEDIMENT BASIN

Code 350

(No.)

DEFINITION

A basin constructed with an engineered outlet, formed by an embankment or excavation or a combination of the two.

PURPOSE

To capture and detain sediment laden runoff, or other debris for a sufficient length of time to allow it to settle out in the basin.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to urban land, construction sites, agricultural land, and other disturbed lands:

- Where physical conditions or land ownership preclude treatment of a sediment source by the installation of erosion-control measures.
- Where a sediment basin offers the most practical solution.
- Where the Hazard Class of the dam is Low according to section 520.21(E) of the NRCS National Engineering Manual.
- Where failure of the basin will not result in loss of life, damage to homes, commercial or industrial buildings, main highways or railroads; or in the use of public utilities.
- Where the product of the storage times the effective height of the dam is less than 3,000. Storage is the volume, in acre-feet, in the reservoir below the elevation of the crest of the auxiliary spillway.
- Where the effective height of the dam is 35 feet or less. The effective height of the dam is the difference in elevation, in feet, between the auxiliary spillway crest and the lowest point in the cross section taken along the centerline of the dam.

CRITERIA

Sediment basin design and construction must comply with all applicable federal, state and local laws and regulations.

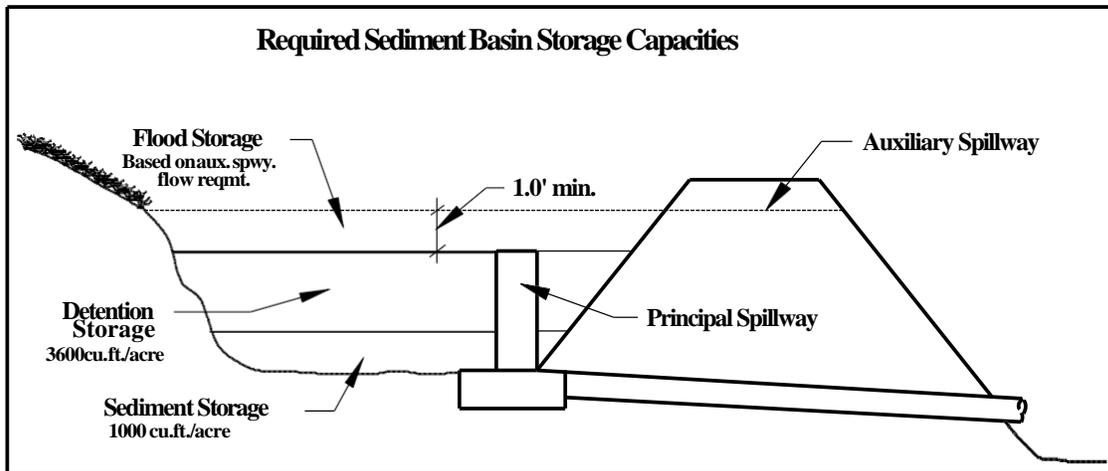
Location. Sediment basins are the last line of defense for capturing sediment when erosion has already occurred. When possible construct basins prior to soil disturbance in the watershed. Choose the location of the sediment basin so that it intercepts as much of the runoff as possible from the disturbed area of the watershed. Choose a location that minimizes the number of entry points for runoff into the basin and interference with construction or farming activities. Do not locate sediment basins in perennial streams.

<p>Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the Field Office Technical Guide.</p>

NRCS, NY
May 2017

Basin Capacity. The sediment basin must have sediment storage capacity, detention storage and temporary flood storage capacities. For maximum sediment retention, design the basin so that the detention storage remains full of water between storm events. However, if site conditions, safety concerns, or local laws preclude a permanent pool of water, design all or a portion of the detention and sediment storages to be dewatered between storm events.

Design the sediment storage for a minimum of 1000 ft³/acre of disturbed area. The sediment storage volume is calculated from the bottom of the basin. Design the detention storage for a minimum of 3600 ft³/acre of drainage area. The detention volume is calculated from the top of the sediment storage to the crest of the principal spillway.



Flood storage is based on the required design storm for the auxiliary spillways. Flood storage is calculated between the crest of the principal spillway and the crest of the auxiliary spillway. A minimum of 1 foot in elevation is required between the principal and auxiliary spillways.

Principal and Auxiliary Spillway Design. Design the principal spillway to carry long-duration, continuous, or frequent flows without discharge through the auxiliary spillway. The diameter of the principal spillway pipe must be 6 inches or greater.

The principal spillway can be designed to remove only water from the temporary flood storage or it can be designed to dewater all or part of the detention storage. Design the principal spillway to drawdown the temporary flood storage within 24 hours. Drawdown times for the detention storage can be longer to improve sediment trapping.

Design the auxiliary spillway to pass large storms without damage to the basin. Refer to NRCS Conservation Practice Standard 378, Ponds for the required design storm and design criteria for the auxiliary spillways.

The outlet of the principal spillway must be stable for anticipated design flow conditions.

Basin Shape. Design basins with a length to width ratio of 2 to 1 or greater. If needed, use baffles to divert the flow in the basin to lengthen the flow path of incoming water to achieve the required length-to-width ratio.

Embankment and Side Slopes. If the sediment basin includes an embankment, it must be constructed of well compacted soil with stable side slopes. Refer to NRCS Conservation Practice Standard 378, Pond for design requirements for the embankment.

Above the permanent water line, the side slopes of the pool area must be 3 horizontal to 1 vertical or flatter. Side slopes below the permanent water line can be as steep as 2 horizontal to 1 vertical.

Safety. Design measures necessary to prevent serious injury or loss of life in accordance with requirements of NRCS NEM, Part 503, Safety.

Sediment basins are often installed in developing areas and can be an attractive nuisance and safety hazard to the public. Design with the safety of the public in mind. Where appropriate, include safety features such as fencing to limit access to the basin, signs to warn of danger and a safety ledge at the permanent pool elevation, constructed 6 feet wide with a slope not steeper than 4 horizontal to 1 vertical.

Vegetation. Establish vegetation on the embankment and side slopes of the basin and pool area immediately after construction. Refer to NRCS Conservation Practice Standard 342, Critical Area Planting for criteria for the establishment of vegetation. If construction takes place during a time period that is not conducive to establishing vegetation, protect the embankment by mulching or other methods. Refer to NRCS Conservation Practice Standard 484, Mulching for mulching criteria.

Erosion and Sediment Control. An erosion and sediment control plan shall be developed for all disturbed areas. For disturbed areas greater than one acre, the erosion and sediment control plan shall meet the planning, installation, and maintenance requirements of the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges. All erosion and sediment structures and measures shall be installed prior to earth disturbing activities unless otherwise directed in the construction drawings. The 2016 New York State Standards and Specifications for Erosion and Sediment Control provides good information for selecting and implementing these practices.

CULTURAL RESOURCES

Evaluate the existence of cultural resources in the project area and any project impacts on such resources. Provide conservation and stabilization of archaeological, historic, structural, and traditional cultural properties when appropriate.

CONSIDERATIONS

A large sediment basin may have an effect on the peak discharge rate from a watershed. Planners should consider this and take steps to mitigate any potential negative effects this may have on riparian habitat downstream from the structure.

In many cases the use of a sediment basin alone may not provide sufficient protection for offsite sedimentation problems. To work most effectively, the sediment basin should be the last practice in a series of erosion control and sediment capturing practices installed in the disturbed area. Temporary erosion and sediment control measures such as planning considerations, diversions, sediment traps, silt fence, straw bales and storm drain inlet protection barriers can be effectively used to aid in managing erosion and sedimentation. The 2016 New York State Standards and Specifications for Erosion and Sediment Control provides good information for the utilization of these and other practices. This incremental approach will reduce the load on the basin and improve effectiveness of the overall effort to prevent offsite sedimentation problems.

The efficiency of sediment removal in a basin is affected by the detention time of runoff, the type of dewatering device, the presence of a permanent pool in the basin, a decrease in turbulence in the basin and soil particle size. The uses of the following techniques are particularly effective if there is a need to remove clay and other fine grained particles.

- Detention time can be increased by increasing the storage volume in the basin. Increased storage along with a properly designed dewatering device can significantly improve the efficiency of sediment capture.
- Dewatering should be done in a manner which removes the cleaner water above the sediment storage, without removing the sediment laden water found deeper in the basin. One dewatering device that has been very successful is a skimming device that floats on the surface of the water and rises and falls with the water level in the basin. Use of this type of dewatering device should improve the quality of the water leaving the basin. Details for this type of dewatering device can be found in

the North Carolina Erosion and Sediment Control Planning and Design Manual.

- Maintaining a permanent pool also improves sediment trapping by reducing the re-suspension of sediment in the basin. This can be accomplished by only dewatering the temporary flood storage or only a portion of the detention storage. Removal of sediment from the basin before it reaches the sediment storage elevation will maintain the pool volume and improve trapping efficiency.
- Turbulence in the basin can be reduced by constructing porous baffles that extend across the entire basin. The baffles slow down flows and force water to spread across the entire width of the basin. A thorough discussion and design criteria for porous baffles can be found in the North Carolina Erosion and Sediment Control Planning and Design Manual.
- For very fine grained sediments, flocculants can be added to the runoff before it enters the basin. One commonly used flocculent is anionic polyacrylamide (PAM). Do not use cationic polyacrylamide because it can be toxic to aquatic life.

Since the sediment basin must be designed to handle all of the contributing drainage, whether it is from disturbed areas or not, diverting runoff from undisturbed areas away from the basin will improve the function of the basin. The design storm for diversion measures should be equal to the design storm for the auxiliary spillway of the basin.

The use of forebays that are separate from the main basin, and easily accessible for cleanout will reduce turbulence and will allow larger particles to settle out of the runoff before it enters the main basin.

Because the sediment storage capacity of a basin is finite, choose a location that will allow access for sediment removal when the storage capacity is full.

Visual aesthetics may be a concern, especially in urban or suburban areas. To address these concerns, design the basin to blend with the surrounding topography, or use plantings to screen the view from surrounding homes or buildings.

In some situations, after they have served the sediment capture function, sediment basins may remain in place to function as stormwater detention or wildlife ponds. This will require appropriate planning during the design phase to ensure that the basin can function for a different use. In addition, significant modifications to outlet structures may need to be made as well as removal of accumulated sediment to convert it to a new use.

If the basin will be used by wildlife, the use of native species is recommended to provide food and habitat diversity. Also, consider wildlife use of the basin when scheduling maintenance activities that may disrupt wildlife life cycles or negatively impact pollinators.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for sediment basins that describe the requirements for applying the practice according to this standard. Include as a minimum, the following in the plans and specifications:

1. A plan view of the layout of the sediment basin.
2. Typical profiles and cross sections of the basin.
3. Details of the outlet system.
4. Requirements for vegetative establishment and/or mulching as needed. Seeding requirements if needed.
5. Written construction specifications that describe specific installation requirements of the sediment basin and its components, including safety features where applicable.

Prepare an operation and maintenance plan for the operator. The minimum requirements to be addressed in the operation and maintenance plan are:

1. Periodic inspections and maintenance of the embankment, principal and auxiliary spillways and dewatering device especially following significant runoff events.
2. Prompt repair or replacement of damaged components.
3. Prompt removal of sediment when it reaches pre-determined storage elevations.
4. Periodic mowing of vegetation to control of trees, brush and invasive species.
5. Periodic inspection of safety components and immediate repair if necessary.
6. Maintenance of vegetative protection and immediate seeding of bare areas as needed.

REFERENCES

American Society for Testing and Materials. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), ASTM D2487. West Conshohocken, PA

California Stormwater Quality Association. 2003. California Stormwater BMP Handbook, Construction. Menlo Park, CA

Center for Watershed Protection. 2000. Improving the Trapping Efficiency of Sediment Basins, Article 58, The Practice of Watershed Protection: Techniques for Protecting and Restoring Urban Watersheds. Ellicott City, MD

Department of Conservation and Recreation, Commonwealth of Virginia. 1992. Virginia Erosion and Sediment Control Handbook, 3rd Edition, Richmond, VA

Jarrett, A. R. August 1998. Controlling the Dewatering of Sedimentation Basins, Agricultural and Biological Engineering, Pennsylvania State University, University Park, PA

New York State Standards and Specifications for Erosion and Sediment Control. 2016. New York State Department of Environmental Conservation, Albany, NY

North Carolina Erosion and Sediment Control Planning and Design Manual. 2013~~06~~. North Carolina Department of Environmental and Natural Resources, Division of Land Resources, Raleigh, NC

Tennessee Erosion and Sediment Control Handbook. 2002. Tennessee Department of Environment and Conservation. Nashville, TN

USDA Natural Resources Conservation Service. Engineering Technical Releases, TR-210-60, Earth Dams and Reservoirs. Washington, DC

USDA Natural Resources Conservation Service. 1983. National Engineering Handbook, Section 3 – Sedimentation. Washington, DC

USDA Natural Resources Conservation Service. National Engineering Handbook, Part 628, Dams. Washington, DC

USDA Natural Resources Conservation Service. National Engineering Handbook, Part 633, Soil Engineering. Washington, DC.

USDA Natural Resources Conservation Service. National Engineering Handbook, Part 636, Structural Engineering. Washington, DC

USDA NRCS. NEH, Part 650, National Engineering Handbook, Washington, DC

USDA Natural Resources Conservation Service. National Engineering Manual. Washington, DC

USDA Natural Resources Conservation Service & Illinois Environmental Protection Agency. 2002. Illinois Urban Manual. Champaign, IL