# NATURAL RESOURCES CONSERVATION SERVICE

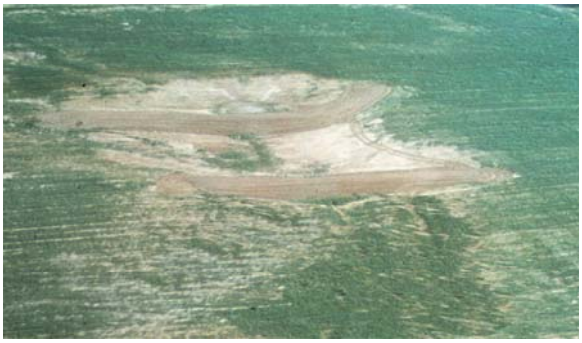
# CONSERVATION PRACTICE STANDARD

# WATER AND SEDIMENT CONTROL BASIN

**(No.)**

**Code 638**

This Standard is currently under revision and will be available by December 2006. For additional information, contact Robert Anderson, State Conservation Engineer, at Robert.anderson@tn.usda.gov.



## DEFINITION

An earth embankment or combination ridge and channel generally constructed across the slope and minor watercourses to form a sediment trap and water detention basin.

## PURPOSES

This practice may be applied as part of a resource management system to:

- Improve farmability of sloping land.
- Reduce watercourse and gully erosion.
- Trap sediment.
- Reduce and manage on-site and downstream runoff.
- Improve downstream water quality.

## CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sites where:

1. The topography is generally irregular.
2. Watercourse or gully erosion is a problem.
3. Sheet and rill erosion is controlled by other conservation practices.
4. Runoff and sediment damage land and improvements.
5. Soil and site conditions are suitable.
6. Adequate outlets can be provided.

Water and sediment control basins shall not be used in place of terraces. Where a ridge and/or channel extends beyond the detention basin or level embankment, NRCS Tennessee conservation practice standards for Terrace (Code 600) or Diversion (Code 362) must be applied as appropriate.

## CRITERIA

### General Criteria Applicable to All Purposes

The resource management system must

reduce soil loss in the interval above and below the basin to prevent excessive maintenance and operation problems.

Where land ownership or physical conditions preclude treatment of the upper portion of a slope, a water and sediment control basin may be used to separate this area from and permit treatment of the lower slope.

**Laws and Regulations**

This practice must conform to all federal, state, and local laws and regulations. Laws and regulations of particular concern include those involving water rights, dam construction, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Spacing. Water and sediment control basins must generally be spaced at terrace intervals (see NRCS Tennessee conservation practice standard for Terrace, Code 600). Adjust spacing or include other measures needed to prevent erosion in the watercourse between basins.

The system of basins and row arrangements must be parallel and spaced to accommodate farm machinery where needed to fit row crop spacing.

Spacing design must consider embankment slope lengths, top width, and outlet location.

The drainage of each basin shall be limited so duration of flooding, infiltration, or seepage does not damage crops or create other problems. Drainage areas of basins located in field interiors should be limited to ten (10) acres. For basins located adjacent to fences, roads, and/or property lines, drainage areas shall not exceed 20 acres.

**Embankment Cross-section**

The sum of the upstream and downstream slopes must be five horizontal to one vertical (5:1) or flatter with a maximum of two horizontal to one vertical (2:1) in either slope. Slopes may be vegetated or flattened to permit cropping. Farmable slopes shall not be steeper than four horizontal to one vertical (4:1).

Excavated areas shall not impound water after the drain down of the runoff accumulation following a storm event.

Site conditions shall determine the source area for borrow materials. Embankments shall be formed of material excavated from the tops of adjacent abutments and/or nearby ridges. Excavation of embankment material from the storage basins shall not be allowed when the existing ground slope within the basin exceeds 3 percent. Finished excavated slopes in storage basin areas should not exceed 5 percent.

The maximum settled height must be 15 feet or less measured from natural ground at centerline of the embankment. Constructed embankment height must be at least 5 percent greater than design height to allow for settlement. Additional design settlement may need to be added based on type of construction methods used to construct the embankment.

**Embankment Top Width**.

Minimum effective top widths are given in Table 1.

**Table 1 – Minimum Top Width of Embankments**

| Fill Height (Feet) | Effective Top Width (Feet) |
|---|---|

| | |
|---|---|
| 0-5 | 3 |
| 5-10 | 6 |
| 10-15 | 8 |

**Foundation Cutoff and Seepage Control**

Portions of basin ridges designed to impound more than a depth of 3 feet of water must include foundation cutoff and seepage control as required by NRCS Tennessee conservation practice standard Pond (Code 378).

**Capacity**

Basins must have capacity to prevent overtopping by runoff from a 10-year frequency, 24-hour duration storm. Larger design storms may be used where needed for flood control or other purposes.

In addition to the above storage, basins must have capacity to store at least the anticipated ten-year sediment accumulations, or periodic sediment removal must be provided to maintain the required capacity. Sediment storage equal to projected amount stored between cleanouts must be provided in addition to design storm.

Basins shall have the basin ends closed to an elevation that will contain design capacity. A minimum of 0.5 foot of freeboard shall be added to design height to provide for auxiliary spillways around one or both ends of the basin where located in a field planned for conventional till. Auxiliary spillways must not contribute runoff to a lower basin (or pond) except where the lower basin (or pond) is designed to control the flow. Freeboard shall not be required when basins are constructed in fields planned for no-till or permanent vegetation.

**Outlets**

Water and sediment control basins must have spillways, underground outlets, or soil infiltration outlets that conform to NRCS Tennessee conservation practice standards for Pond (Code 378), Grassed Waterway (Code 412), Diversion (Code 362), or Underground Outlet (Code 620), as appropriate.

Where water and sediment control basin underground outlets release stored water at the downstream toe of the basin and the area down below the basin is cropped, the following release rates will apply:

| Maximum Exit Slope (%) | Release Rate (cfs) |
|---|---|
| 1 to 3 | 1.5 |
| 3 to 5 | 0.5 |
| Greater than 5 | Underground Outlet or Grassed Waterway |

Removal rates shall be a minimum of 48 hours of vegetated systems and 24 hours for cropped systems. Higher release rates may be necessary for some crops depending on the soil characteristics and water tolerance of crops to be grown.

The outlet end of the pipe shall be protected from farm equipment by installing a post or other suitable device, and an animal guard shall be installed on the outlet.

**Vegetation**

Disturbed areas that are not cropped must be established to appropriate vegetation or otherwise protected from erosion using organic or gravel mulch or other measures.

Selection of vegetation species must consider environmental quantity and quality, endangered species needs, and wildlife food and habitat needs. Seedbed preparation, fertilizing, seeding, and mulching must be in

accordance with NRCS Tennessee conservation practice standards for Critical Area Planting (Code 342) and Mulching (Code 484).

## CONSIDERATIONS

Water and sediment control basins should be part of a resource management plan including such practices as terraces, grassed waterways, contouring, a conservation cropping system, conservation tillage, and crop residue management.

Where possible, the basin should be configured to enhance sediment deposition. This can be accomplished by using flow deflectors, inlet and outlet selection, and by adjusting the length to width ratio.

The topsoil from all borrow areas and under the footprint of the dam should be stockpiled and spread back over the excavated areas and over the dam.

The riser should be attached to a pressure treated support post. If livestock are present or damage to the riser from debris is expected, two pressure-treated support posts should be installed around the riser.

For cropped fields, embankment orientation and crop row direction should be approximately perpendicular to the land slope to support contour farming. The design should support farmability by limiting short point rows or sharp curves. Field boundaries and row lengths should also be considered in planning basin location and row direction.

Effects on streams and wetlands must be considered. Mitigation may be required where water is diverted or degraded for downstream uses.

A wet area must be acceptable in the storage basin. Efforts to reduce its size should be addressed. Drainage strategies such as shaping and grading and/or providing soil infiltration outlets can be used.

Where possible, the design should enhance habitat for native and endangered species. Effects on downstream water quality and temperature may be critical for some species.

This practice may adversely affect cultural resources. Planning, installation, and maintenance must comply with General Manual 420, Part 401.

Operation safety of vehicle and farming equipment should be considered when selecting cut and fill slopes, especially where cropping or haying is planned.

## PLANS AND SPECIFICATIONS

Plans and specifications for installing sediment and water control basins must conform to requirements of this standard and describe requirements for applying the practice and achieving its intended purpose.

## OPERATION AND MAINTENANCE

A site-specific operation and maintenance (O&M) plan must be prepared for and reviewed with the landowner or operator. The O&M plan shall contain guidance to maintain the embankment, design capacity, vegetative cover, and outlet.

All plans shall include a provision that after each large storm, basins must be inspected and needed maintenance performed. When sediment storage is full, accumulated sediment must be removed or the basin must be redesigned and modified to restore capacity.

Where designs include underground outlets, O&M plans should include checking for clogging and/or pipe damage.

**REFERENCES**

NRCS GM 420, Part 401

NRCS Tennessee Conservation Practice Standards:

Critical Area Planting, Code 342
Diversion, Code 362
Grassed Waterway, Code 412
Mulching, Code 484
Pond, Code 378
Terrace, Code 600
Underground Outlet, Code 620