**NATURAL RESOURCES CONSERVATION SERVICE**
**PACIFIC ISLANDS AREA**

## CONSERVATION PRACTICE STANDARD

# WATER AND SEDIMENT CONTROL BASIN

**(No.)**

**CODE 638**

### DEFINITION

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

### PURPOSE

This practice may be applied as part of a resource management system for one or more of the following purposes:

- To reduce watercourse and gully erosion
- To trap sediment
- To reduce and manage onsite and downstream runoff

### 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 damages land and works of improvements.
5. Adequate outlets can be provided.

Do not use this standard in place of terraces. Where the ridge and/or channel extends beyond the detention basin or level embankment, use Conservation Practice Standard (600), Terrace or (362) Diversion as appropriate.

### CRITERIA

**General Criteria Applicable to All Purposes**

Install Water and Sediment Control Basins *(WASCOB)* as part of a conservation system that adequately addresses resource concerns both above and below the basin. 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 safety and 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 conservation practice, Terrace (412)). 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 must consider embankment slope lengths, top width, and outlet location.*

**Location.** Locate Water and Sediment Control Basins to control erosion in drainage ways. Basins may be installed singly or in series as part of system. Adjust the location to fit the topography, maximize storage and accommodate farm equipment and farming operations.

**Earth embankment.** Minimum top widths are given in Table 1. Construct embankments at least *10%* greater than design height to allow for settlement. Measured from natural ground at

the centerline of the embankment, the maximum settled height of the embankment must be 15 feet or less.

Table 1. Minimum Top Width of Embankments

| Fill Height (feet) | Top Width (feet) |
|---|---|
| 0 – 5 | 3 |
| 5 - 10 | 6 |
| 10 –15 | 8 |

Design embankment slopes no steeper than 2 horizontal to 1 vertical. The sum of the horizontal components of the upstream and downstream slopes of the embankment must be 5 or greater. Design all slopes to be farmed no steeper than those on which farm equipment can be operated safely.

*See **Figure 1**, for a typical Water and Sediment Control Basin (WASCOB) cross section.*

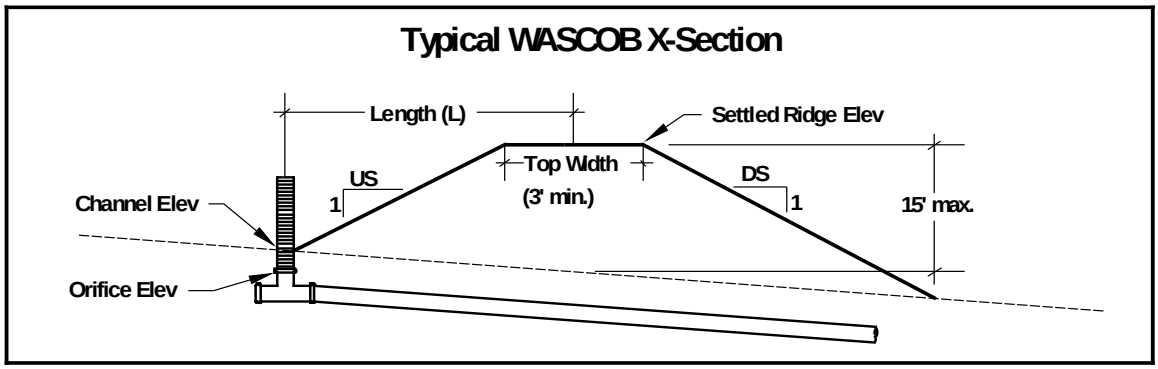


Figure 1. Typical Water and Sediment Control Basin cross section.

**Foundation cutoff and seepage control.** Portions of basin ridges designed to impound more than a 3-foot depth of water must include foundation cutoff and if conditions warrant, seepage control. Refer to Conservation Practice Standard (378), Pond for criteria for foundation cutoff and seepage control.

**Capacity.** As a minimum, design Water and Sediment Control Basins with sufficient capacity to control the runoff from a 10-year frequency, 24-hour duration storm using a combination of flood storage and discharge through the outlet. Where basins are used for flood control or to protect other works of improvement, if warranted, use larger design storms appropriate to the risk.

In addition to the above storage, Water and Sediment Control Basins must have the capacity to store at least the anticipated 10-year sediment accumulation, or periodic sediment removal is required in the Operation and Maintenance Plan to maintain the required capacity.

*Basin ends must be closed to an elevation that will contain design capacity. If the storage versus discharge curves in the Pacific Islands Area Supplement to the National Engineering Handbook Part 650, Engineering Field Handbook Chapter 8, show an auxiliary spillway is needed, a minimum 1 foot of freeboard above the flow depth in the auxiliary spillway must be added to the design height to provide for an auxiliary spillway around one or both ends of the basin.*

**Outlets.** A Water and Sediment Control Basin must have an adequate outlet. The outlet must convey runoff water to a point where it will not cause damage. Outlets can be underground outlets, pipe drop structures, soil infiltration, stabilized channels or a combination of outlet types.

If the basin is cropped, design the outlet so that the flow release time does not exceed the inundation tolerance of the planned crops. If sediment retention is a primary design goal, adjust the release rate according to sediment particle size so that sediment is retained in the basin. Refer to Conservation Practice Standard (620), Underground Outlet for design criteria for underground outlets.

Outlets can include auxiliary spillways above the primary storage to handle large storm flows. If an auxiliary spillway is used, add freeboard to the design height of the embankment to provide for the safe operation of the spillway. The freeboard shall be at least 0.5 ft. above the design flow depth through the auxiliary spillway. Auxiliary spillways must not contribute runoff to lower Water and Sediment Control Basins *(or ponds)* unless they are designed to handle the runoff. Refer to Conservation Practice Standard (378), Pond for criteria to design auxiliary spillways.

*For basins with underground outlets, the minimum storage volume and discharge may be obtained from curves shown in the Hawaii Supplement to the NEH, Part 650, EFH, Chapter 8. The maximum discharge capacity used to compute storage requirement shall be 1.00 cubic foot per second per acre.*

*Water and sediment control basins using vertical drains or soil infiltration as outlets shall have the capacity to store 80 percent of the runoff from a 10-year, 24-hour storm. This storage capacity may be reduced if the discharge capacity of the vertical drains can be documented.*

*Soil infiltration may be used if it will permit draining the design storm from the basin in a period such that growing crops will not be significantly damaged by standing water. Soil infiltration outlets should be limited to soils in hydrologic soil group A. Hydrologic soil groups can be found in the NEH, Part 650, EFH, Chapter 2.*

**Topsoil.** Where necessary to restore or maintain productivity, spread topsoil over areas disturbed by construction. Topsoil can be salvaged and stockpiled from the site of the Water and Sediment Control Basin prior to construction.

**Vegetation.** After construction of the Water and Sediment Control Basin, revegetate disturbed areas that will not be cropped as soon as possible. In non-cropland settings other erosion protection such as gravel or organic mulches can also be used.

*In fields with multiple-year crops, such as pineapple, sugarcane, and orchards that provide canopy cover, and where it may not be practical to establish grass on the steep slopes of basin ridges, non-vegetative means, such as organic mulches or gravel, may be used.*

Refer to Conservation Practice Standard (342), Critical Area Planting *table of the Pacific Islands Vegetative Guide* for criteria on *species* selection, *site* preparation, fertilizing and *planting methods*.

## CONSIDERATIONS

Water and Sediment Control Basins can be spaced at intervals down a slope, similar to terraces, in order to control erosion. Refer to Conservation Practice Standard (600), Terraces for methods to determine spacing. Additional conservation measures may be needed in the water course between basins to prevent erosion.

When choosing the location of a Water and Sediment Control Basin be sure to consider the extent of ponding that will occur from the basin. If the basin will cause water to pond near or across property lines both land owners should agree in writing on the elevation and expected duration of ponding.

The soil survey can be a valuable resource when planning and designing water and sediment control basins. The soil survey can identify potential problems such as the presence of limiting layers to plant growth in the soil profile. Field investigations can then identify problem areas to avoid such as shallow bedrock or dense, acid or saline layers that will adversely affect plant growth if construction brings them into the root zone.

Sediment retention within the basin can be enhanced by using flow deflectors, inlet and outlet selection, and by increasing the length to width ratio of the basin.

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.

Underground outlets from Water and Sediment Control Basins can provide a direct conduit to receiving waters for contaminated runoff from crop land. To reduce the impact of this runoff, Water and Sediment Control Basins should be

installed as part of a conservation system that includes such practices as grassed waterways, contouring, a conservation cropping system, conservation tillage, nutrient and pest management, crop residue management and filter areas to reduce or mitigate contaminated runoff. *More specifically, various conservation practices can reduce erosion and runoff while improving soil function, permeability, and structure. As appropriate, these conservation practices: Conservation Cover (327), Conservation Crop Rotation (328), Cover Crop (340), Forage and Biomass Planting (512), Nutrient Management (590); Residue and Tillage Management, No Till / Strip Till / Direct Seed (329); Row Arrangement (557), and Vegetative Barrier (601) should be discussed in detail with the land user.*

Seasonal water sources can be very important for migratory waterfowl and other wildlife. Partially blocking the outlet of a basin during non-cropping times of the year will allow water to pond in the basin to provide water for wildlife. Refer to Conservation Practice Standard (646) Shallow Water Development and Management for information on managing seasonal water sources for wildlife.

The construction of a Water and Sediment Control Basin can disturb large areas and potentially affect cultural resources. Be sure to follow state cultural resource protection policies before construction begins.

The construction of Water and Sediment Control Basins can introduce steep and potentially dangerous slopes into crop fields. When designing Water and Sediment Control Basins that will be farmed, choose flat slopes that will be safe for operating farm equipment. Where steep slopes are unavoidable, make sure that the farmer is aware of the location of the basin and the potential danger.

**PLANS AND SPECIFICATIONS**

Prepare plans and specifications for Water and Sediment Control Basins that describe the requirements for applying the practice according to this standard. As a minimum the plans and specifications shall include:

1. *Location map showing each Water and Sediment Control Basin in a field.*
2. A plan view of the layout of the Water and Sediment Control Basin system.
3. Typical profile(s) and cross sections of the basin(s), *including the embankment(s) and auxiliary spillway(s), showing storage depths for water and sediment accumulation.*
4. Details of the outlet system.
5. For underground outlets, details of the inlet and profile(s) of the underground outlet.
6. *Vegetative requirements specifying species, planting method, and nutrient requirements,* if needed.
7. Construction specifications that describe in writing site specific installation requirements of the Water and Sediment Control Basin system.

**OPERATION AND MAINTENANCE**

Prepare *the Pacific Islands Area* Operation and Maintenance Plan for the operator. The minimum requirements to be addressed in the operation and maintenance plan are:

1. Periodic inspections, especially immediately following significant runoff events.
2. Prompt repair or replacement of damaged components.
3. Maintenance of basin ridge height and outlet elevations.
4. Removal of sediment that has accumulated in the basin to maintain capacity and grade.
5. Regular cleaning of inlets for underground outlets. Repair or replacement of inlets damaged by farm equipment. Removal of sediment around inlets to ensure that the inlet remains the lowest spot in the basin.
6. Where vegetation is specified, regular mowing and control of trees and brush. Vegetative disturbance should be scheduled to avoid the peak nesting season.
7. Notification of hazards about steep slopes on the basin.

**REFERENCES**

USDA, NRCS. National Engineering Handbook, Part 650 Engineering Field Handbook, Chapters 6, 8, 14.