SOIL CONSERVATION SERVICE
CONNECTICUT - RHODE ISLAND

SEDIMENT BASIN

Definition

A basin constructed to collect and store debris or sediment.

Scope

This standard applies to the installation of all basins where the primary purpose is to trap and store waterborne sediment and debris.

Purpose

To preserve the capacity of reservoirs, ditches, canals, diversions, storm sewers, waterways and streams; to prevent undesirable deposition on bottom-lands and developed areas; to trap sediment originating from critically eroding areas and construction sites; and to reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel and stone.

Conditions Where Practice Applies

Sediment basins created by construction of dams or barriers are referred to as "Embankment Sediment Basins" and those constructed by excavation as "Excavated Sediment Basins." Basins resulting from both excavation and embankment construction are classified as "Embankment Sediment Basins" where the depth of water impounded against the embankment at emergency spillway elevation is three feet or more.

The standard applies where physical conditions, land ownership or construction operations preclude the treatment of the sediment source by the installation of erosion control measures to keep soil and other material in place, or where a sediment basin offers the most practical solution to the problem.

The standard covers the installation of sediment basins on sites where:

I. Failure of the sediment basin should not, within reasonable expectations, result in loss of life.

II. Failure of the sediment basin would not result in damage to homes, commercial or industrial buildings, main highways, or railroads; or interrupt the use or service of public utilities.

III. The drainage area is 100 acres or less.

IV. The effective height of the dam is 15 feet or less. The effective height of the dam is defined as the difference in elevation in feet between the emergency spillway crest and the lowest point in the cross section taken along the centerline of the dam. If there is no emergency spillway, the top of the dam becomes the upper limit.

Sediment basins that do not meet the above conditions shall be designed to meet the criteria in "Earth Dams and Reservoirs, Technical Release No. 60" (TR-60).

Planning Considerations

I. Drainage Area

The basin shall be designed to provide both detention time for runoff plus the sediment accumulation from the basin's total drainage area.

II. Location

The basin should be located as much as possible:

A. To intercept only runoff from disturbed areas.

B. To minimize disturbance from its own construction.

C. To obtain maximum storage benefit from the terrain.

D. For ease of cleanout of the trapped sediment.

E. To minimize interference with other construction activities and construction of utilities.

III. Permits

A. In Connecticut a local or state Inland Wetlands Permit will be required if a sediment basin is proposed in a wetland area. A State Water Diversion Permit from the Department of Environmental Protection Water Resources Unit will be required for sediment basins with drainage areas greater than 100 acres. The State Department of Environmental Protection regulates all dam construction within the State. Contact DEP Water Resources Unit early in the planning process to determine the need for a dam construction permit.

B. In Rhode Island an Applicability Determination will be required if a sediment basin is Proposed in a wetland area. The Department of Environmental Management (DEM), Land Resources Division may require a formal permit to alter, based on the Applicability Determination. Any dam with an effective height greater than 3 feet will require a permit from DEM regardless of its location.

Design Criteria

I. Sediment Basin Volume

The volume in the sediment basin below the crest elevation of the emergency spillway shall be at least that required for sediment storage plus that required for detention time.

II. Sediment Storage Volume

The sediment storage volume of a sediment basin shall equal the volume of sediment expected to be trapped at the site during the planned useful life of the sediment basin. Where it is determined that periodic removal of sediment is practical, the sediment storage volume may be proportionately reduced. Planned periodic removal of sediment shall not be more frequent than once a year.

Trap efficiency is the amount expressed as a percent of the total sediment delivered to the basin that will remain in the reservoir. It is a function of detention storage time, character of the sediment, nature and character of inflow, and other factors.

For the purpose of determining the sediment storage volume use 75 percent trap efficiency for a normally dry sediment basin and 80 percent trap efficiency for a normally wet sediment basin. USDA, SCS, Technical Release No. 12, Sediment Storage Requirements for Reservoirs, may be used to provide a more refined estimate of the actual trap efficiency of the sediment basin.

Provide sediment volume based on one of the following methods:

A. $V = (DA)\cdot(A)\cdot(DR)\cdot(TE)\cdot(1/Y)\cdot(2{,}000\ \text{lbs./tons})\cdot(1/43560\ \text{sq. ft./ac.})$

- V = the volume of sediment trapped in Ac. ft./yr.
- DA = the total drainage area in acres
- A = the average annual erosion in tons per acre per year using the values below for the listed land use.
- DR = the delivery ratio determined from Figure 1, pg 16.
- TE = the trap efficiency as given above.
- Y = the estimated sediment density in the sediment basin in lbs/cu. ft. (From Table 1)
- Y^s = the submerged density in a wet sediment pool.
- Y^a = the aerated density in a normally dry sediment pool.

Land Use	Average Annual Erosion
Wooded area	0.2 ton/ac/yr
Developed urban areas, grassed areas, pastures, hay fields, abandoned fields with good cover	1.0 ton/ac/yr
Clean tilled cropland (corn, vegetables, etc.)	10 ton/ac/yr
Construction area	50 ton/ac/yr

TABLE 1

ESTIMATED SEDIMENT DENSITY

SOIL TEXTURE	Y^s Submerged (lbs/cu. ft.)	Y^a Aerated (lbs/cu. ft.)
Clay	40-60	60-80
Silt	55-75	75-85
Clay-silt mixtures (equal parts)	40-65	65-85
Sand-silt mixtures (equal parts)	75-95	95-100
Clay-silt-sand mixtures (equal parts)	50-80	80-100
Sand	85-100	85-100
Gravel	85-125	85-125
Poorly sorted sand and gravel	95-130	95-130

B. Use the same procedure as above except determine A (average annual erosion) using the Universal Soil Loss Equation, with on-site conditions.

III. Detention Storage Volume

Detention time is defined as the volume weighted average time that a slug of flow will be detained in a reservoir, for dry basins this can be taken as the time difference between the center of mass of the inflow and outflow hydrographs.

The sediment basin shall provide, in addition to sediment storage volume, adequate detention storage volume to provide minimum 10 hour detention time for a 10 year frequency, 24 hour duration, Type III distribution storm. The E.F.M. and the approximate flood routing methods in TR-55 or the Engineering Field Manual will provide acceptable estimates of the minimum required detention storage volume and the maximum allowable principal spillway discharge.

IV. Principal Spillway

The maximum discharge will be determined by the detention storage volume.

The minimum pipe size shall be 8 inches for corrugated pipe and 6 inches for smooth pipe.

The principal spillway crest elevation shall be set at or below the detention storage volume elevation.

V. Shape and Depth

The length, width, and depth of the basin are measured at the emergency spillway crest elevation. The basin configuration shall be such that the effective flow length is equal to at least two times the effective flow width. The average depth shall be at least 4 feet.

The minimum width shall be: $W = 10\sqrt{Q_5}$

Where: W = the width in feet
Q_5 = peak discharge from a 5-year frequency storm in cfs.

This basin shape may be attained by selecting the basin site, by excavating the basin to the required shape or by the installation of one or more baffles.

When downstream damage may be severe, the minimum width should be:

$$W = 10\sqrt{Q_{25}}$$

Where: W = the width in feet
Q_{25} = peak discharge from a 25-year frequency storm in cfs.

VI. Emergency Spillway

Emergency spillways are provided to convey large floods safely past the sediment basin.

An emergency spillway must be provided for each sediment basin, unless the principal spillway is large enough to pass the routed emergency spillway design storm and the trash that comes to it without overtopping the dam. A closed conduit principal spillway having a conduit with a cross-sectional area of 3 square feet or more, an inlet which will not clog, and an elbow designed to facilitate the passage of trash is the minimum size and design that may be utilized without an emergency spillway.

A. Excavated Sediment Basins

Excavated sediment basins may utilize the natural ground or the fill for the emergency spillway if the downstream slope is 5 to 1 or flatter and has existing vegetation or is immediately protected by sodding, rock riprap, asphalt lining, concrete lining, or other equally effective protection. The spillway shall meet the capacity requirement for embankment sediment basins.

B. Embankment Sediment Basins

Embankment sediment basins shall meet the following requirements:

1. Capacity

The minimum capacity of the emergency spillway shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in Table 2 less any reduction creditable to conduit discharge and detention storage.

If routed, the flood routing shall be done using the approximate methods in TR-55 or Engineering Field Manual, or other generally accepted methods of emergency spillway flood routing. When discharge of the principal spillway is considered in calculating outflow through the emergency spillway, the crest elevation of the inlet shall be such that full flow will be generated in the conduit before there is discharge through the emergency spillway.

TABLE 2

DRAINAGE AREA (acres)	FREQUENCY (years)	MINIMUM DURATION (hours)
less than 50	25	24
50-100	100	24

2. Velocity

Emergency spillways are to provide for passage of the design flow at a safe velocity to a point downstream where the dam will not be endangered.

The maximum permissible velocity in the exit channel shall be 4 feet per second for vegetated channels in soils with a plasticity index of 10 or less and 6 feet per second for vegetated channels in soils with a plasticity index greater than 10. For exit channels with erosion protection other than vegetation, the velocities shall be in the safe range for the type of protection used.

3. Cross Sections

Emergency spillways shall be trapezoidal and will be located in undisturbed earth. The side slopes shall be 2:1 or flatter. The bottom width shall be 10 feet or wider. The embankment requirements determine elevation differences between crest of the emergency spillway and settled top of dam.

4. Component Parts

Emergency spillways are open channels and consist of an inlet channel, control section and an exit channel. The emergency spillway should be as long as possible to provide protection from breaching.

(a) Inlet Channel

The inlet channel shall be level and straight for at least 20 feet upstream of the control section. Upstream of the level area it may be graded back towards the basin to provide drainage. The alignment of the inlet channel may be curved upstream of the straight portion.

(b) Exit Channel

The grade of the exit channel of a constructed spillway shall fall within the range established by discharge requirements and permissible velocities. The exit channel shall carry the design flow downstream to a point where the flow will not discharge on the toe of the dam. The design flow should be contained in the exit channel without the use of dikes. If a dike is necessary, it shall have 2:1 or flatter side slopes, 8 foot top width (minimum) and be high enough to contain the design flow plus 1 foot of freeboard.

VII. Structural Spillways Other Than Pipe

Structural spillways other than pipe will have structural designs based on sound engineering data with acceptable soil and hydrostatic loading as determined on an individual site basis.

When used as a principal spillway they shall meet the flow requirements for principal spillway and shall not be damaged by the emergency spillway design storm. When used as an emergency spillway they shall pass the storm runoff from the appropriate storm in Table 2.

VIII. Foundation Cutoff for Embankment Sediment Basin

A foundation cutoff constructed with relatively impermeable materials shall be provided for all embankments. The minimum depth of the cutoff shall be 2 feet. The cutoff trench, as a minimum, shall extend up both abutments to the emergency spillway crest elevation. The width shall be wide enough to permit operation of compaction equipment (4 feet Min.). The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for the embankment. The trench shall be kept free from standing water during the backfilling operations.

IX. Seepage Control

Seepage control is to be included if seepage may create swamping downstream; if needed to insure a stable embankment; or if special problems require drainage for a stable dam. Seepage control may be accomplished by foundation, abutment or embankment drains, reservoir blanketing or a combination of these and other measures.

X. Foundation

The area on which an embankment is to be placed shall consist of material that has sufficient bearing strength to support the embankment without excessive consolidation.

XI. Earth Embankment

A. Top Width

The minimum top width of the embankment shall be 8 feet.

B. Side Slopes

The combined upstream and downstream side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical (5:1) with neither slope steeper than 2:1. Slopes must be designed to be stable in all cases.

C. Freeboard

The minimum elevation of the top of the settled embankment shall be 1.0 foot above the water surface in the reservoir with the emergency spillway flowing at design depth.

D. Allowance for Settlement

The design height of the embankment shall be increased by the amount needed to insure that, after all settlement has taken place, the height of the dam will equal or exceed the design height. This increase shall not be less than 10 percent when compaction is by hauling equipment or 5 percent if compactors are used, except where detailed soil testing and laboratory analysis shows that a lesser amount is adequate.

E. Compaction

The compaction requirements shall be specified.

XII. Embankments of Other Than Earth Fill

Sediment basins with effective heights of 5 feet or less may use materials other than earth for the embankment. These embankments shall be structurally sound and have hydraulic character that will safely handle the principal and emergency spillway design storms.

INSTALLATION REQUIREMENTS

I. Principal Spillway

A. Pipe Conduits

Sediment basins shall have pipe conduits with required appurtenances except where a structural spillway is used. The material and installation for pipe conduits for excavated sediment basins, shall meet the local town requirements for culverts or storm sewers. Pipe conduits for embankment sediment basins shall meet the following requirements:

B. Pipe Materials

The pipe shall be capable of withstanding external loading without yielding, buckling, or cracking. The following pipe materials are acceptable:

1. Corrugated Steel Pipe

Pipe gage is not to be less than that indicated in Table 3. The maximum principal spillway barrel size shall be 48 inches. The pipe shall be helical fabrication. Connections between pipe joints must be watertight. Flanges with gaskets or caulking may be used. Rod and lug coupling bands with gaskets or caulking may be used.

2. Corrugated Aluminum Pipe

Pipe gage is not to be less than that in Table 3. The maximum principal spillway barrel size shall be 36 inches. The pipe shall be helical fabrication. The pH of the embankment and water shall be between 4 and 9. Inlets and coupling bands must be made of aluminum.

Fittings for aluminum pipe of metals other than aluminum or aluminized steel must be separated from the aluminum pipe at all points by at least two layers of plastic tape having a total thickness of at least 24 mils, or by other permanent insulating material that effectively prevents galvanic corrosion. Bolts used to join aluminum and steel must be galvanized, plastic coated, or otherwise protected to prevent galvanic corrosion.

Connections between pipe joints must be watertight. Flanges with gaskets or caulking may be used. Rod and lug coupling bands with gaskets or caulking may be used. Slip seam coupling bands with gaskets or caulking may be used.

3. Plastic Pipe

The pipe is to be PVC meeting the requirements of Table 4. Connections between pipe joints and antiseep collar connections to the pipe must be watertight. Pipe joints must be solvent welded, O-ring, or threaded. All fittings and couplings shall meet or exceed the same strength requirements as that of the pipe and be made of material that is recommended for use with the pipe. Connections of plastic pipe to less flexible pipe or structures must be designed to avoid stress concentrations that could rupture the plastic. The maximum principal spillway barrel size shall be 12 inches unless approval is obtained from the State Conservation Engineer. The State Conservation Engineer may approve up to 24 inches with proper design and installation.

4. Smooth Steel

The minimum wall thickness shall be 3/16 inch. Used pipe shall be in good condition and not have deep rust pits. The maximum principal spillway barrel shall be 48 inches. Pipe joints shall be threaded or welded by a competent welder.

5. Concrete, With O-Ring Gaskets

The pipe shall be laid in concrete bedding. Connections between pipe points and antiseep collar connections to pipe must be watertight and remain watertight after movement caused by foundation and embankment consolidation.

TABLE 3

Corrugated Steel Pipe

							Riser Only		
Pipe Diameter	8-21	24	30	36	42	48	54	60	66
Minimum Gage	16	16	14	14	12	10	10	10	10

Corrugated Aluminum Pipe

					Riser Only		
Pipe Diameter	8 to 21	24	30	36	42	48	54
Gage (inches)	16(.06)	14(.06)	14(.075)	14(.075)	12(.105)	10(.135)	10.(.135)

TABLE 4

PVC* PIPE

NOMINAL PIPE SIZE (Inches)	STRENGTH	MAXIMUM DEPTH OF FILL OVER PIPE (Feet)
6, 8, 10, 12	Sched. 40	10
	Sched. 80	15
	SDR 26	10

* Polyvinyl chloride pipe, PVC 1120 or PVC 1220, conforming to ASTM D 1785 or ASTM D 2241

C. Inlets for Pipe Conduits

The inlet shall be structurally sound and made from materials compatible with pipe. The inlet shall be designed to prevent floatation. The inlets shall be designed to function satisfactorily for the full range of flow and hydraulic head anticipated. The inlet materials shall be subject to the same limitations and requirements as pipe conduits.

1. Watertight Riser

Risers, where used, shall be completely watertight except for the inlet at the top.

2. Dewatering the Sediment Basin

If it is necessary to dewater the sediment basin, see Section X for Design Criteria. Sediment basins with a permanent pool of water are less of a safety hazard than basins with wet, soft sediment exposed.

D. Pipe Drop Inlet

Pipe drop inlets where designed for pressure flow shall meet the following conditions:

1. The weir length shall be adequate to prime the pipe below the emergency spillway elevation.

2. For pipe on less than critical slope, the height of the drop inlet shall be at least 2 times the conduit diameter.

3. For pipe on a critical slope or steeper, the height of the drop inlet shall be at least 5 times the conduit diameter.

E. Antivortex Devices

Sediment basins with the principal spillway designed for pressure flow are to have effective antivortex devices.

F. Trash and Safety Guards

An appropriate guard shall be installed at the inlet. The guard shall be a type that will not plug with leaves, grass or other debris. The guard shall prevent clogging of the pipe by trash and reduce the safety hazard to people.

G. Outlets for Pipe Conduits

The outlets shall be structurally sound and made from materials compatible with the pipe. The outlets shall be designed to function satisfactorily for the full range of flow and hydraulic head anticipated. Protection against scour at the discharge end of the spillway shall be provided. Measures may include an impact basin, riprap, excavated plunge pool or use of other generally accepted methods for outlet protection.

H. Antiseep Collars

Antiseep collars are not required for excavated sediment basins. Pipe conduits for embankment sediment basins shall be provided with antiseep collars.

The following criteria are to be used to determine the size and number of antiseep collars.

V = projection of the antiseep collar in feet

L = length in feet of the conduit within the zone of saturation, measured from the downstream side of the riser to the toe drain or point where phreatic line intercepts the conduit, whichever is shorter.

n = number of antiseep collars

The ratio of the length of the line of seepage (1 + 2 n V) to L is to be not less than 1.15. Antiseep collars should be equally spaced along that part of the barrel within the saturated zone at distances of not more than 25 feet.

The antiseep collars and their connections to the pipe shall be watertight. The collar material shall be compatible with pipe materials.

VII. Vegetation

The dam, emergency spillway, spoil and borrow areas, and other disturbed areas above normal water level shall be stabilized in accordance with the Technical Guide Standards.

IX. Disposal

The sediment basin plans shall indicate the method(s) of disposing of the sediment removed from the basin. The sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the basin or in or adjacent to a stream or floodplain.

The plans shall also show the method of removal of the sediment basin after the drainage area is stabilized, and shall include the stabilizing of the sediment basin site. Water lying over the trapped sediment shall be removed from the basin by pumping, cutting the top of the riser or other appropriate method prior to removing or breaching the embankment. Sediment shall not be allowed to flush into the stream or drainageway.

X. Dewatering

Dewatering is not recommended since sediment basins with a permanent pool of water are less of a safety hazard than basins with wet, soft sediment exposed. However, if it is necessary to dewater the sediment basin Figure 2 provides a method.

A. For Permanent Installations (See Figure 2)

1. Use s = 15 feet to 25 feet depending on relative permeability of the subsoil. Spacing of tile = 2S.

2. Use filter around tile except use topsoil for the top 3 to 6 inches instead of bringing filter all the way to the surface.

3. As tile is installed deeper, spacing must be decreased to provide the same drainage, however, spacing should not be less than 30 feet (S=15').

B. For Temporary Installations (See Figure 2)

1. Any method on Figure 2 may be used.

2. Same recommendations as in A(1), (3) above apply.

XI. Safety and Maintenance

Sediment basins attract children and can be dangerous. Local ordinances and regulations regarding health and safety must be adhered to.

The plans shall indicate who is responsible for operation and maintenance during the life of the sediment basin.

The level of sediment at which cleanout is required shall be marked on some fixed point. Some methods to accomplish this are:

A. Set stake in sediment storage area with painted mark showing cleanout elevation.

B. When using a riser type outlet, a paint mark on the pipe showing cleanout elevation.

Figure 1 - Sediment Delivery Ratio Vs. Drainage Area

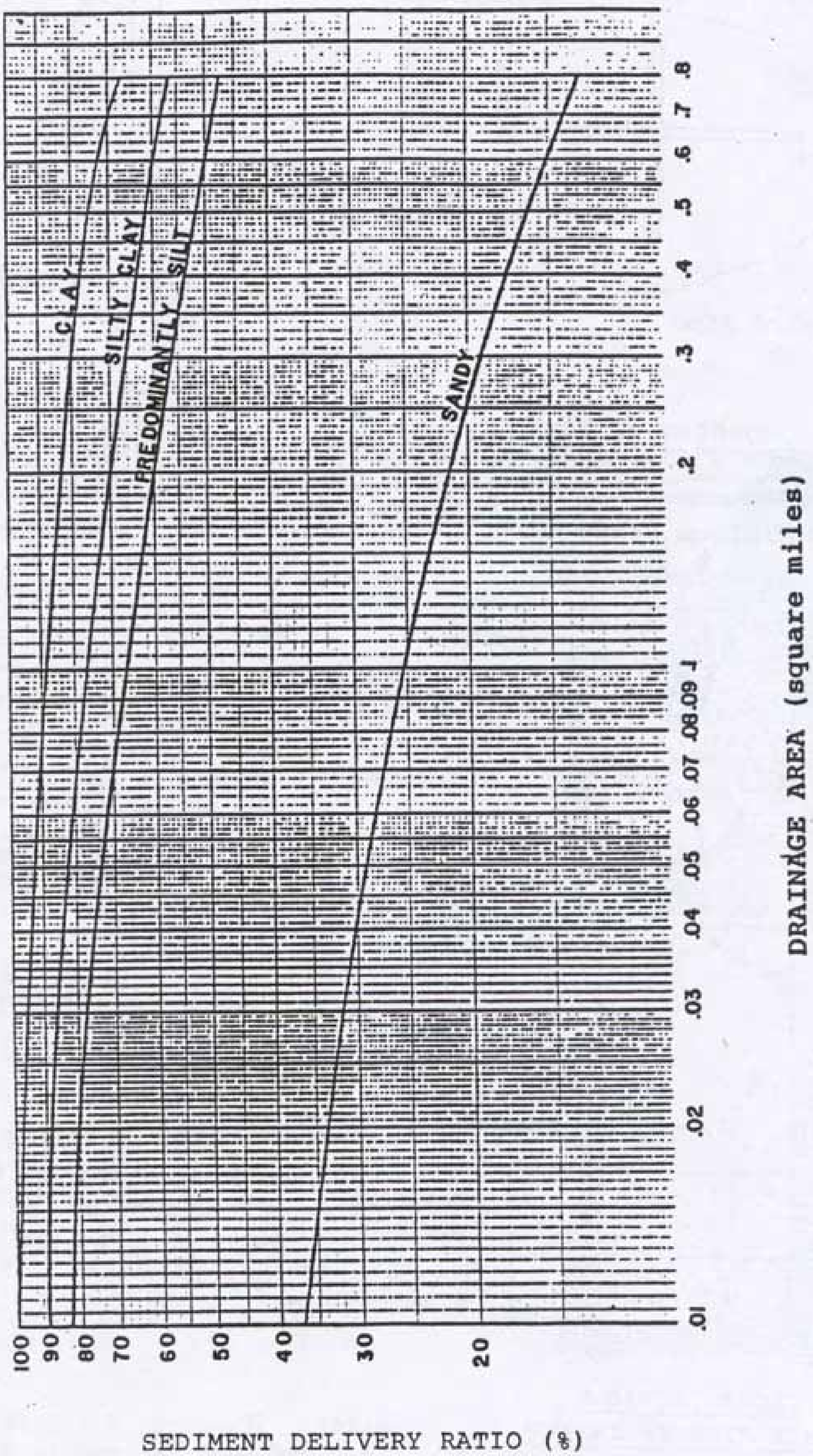
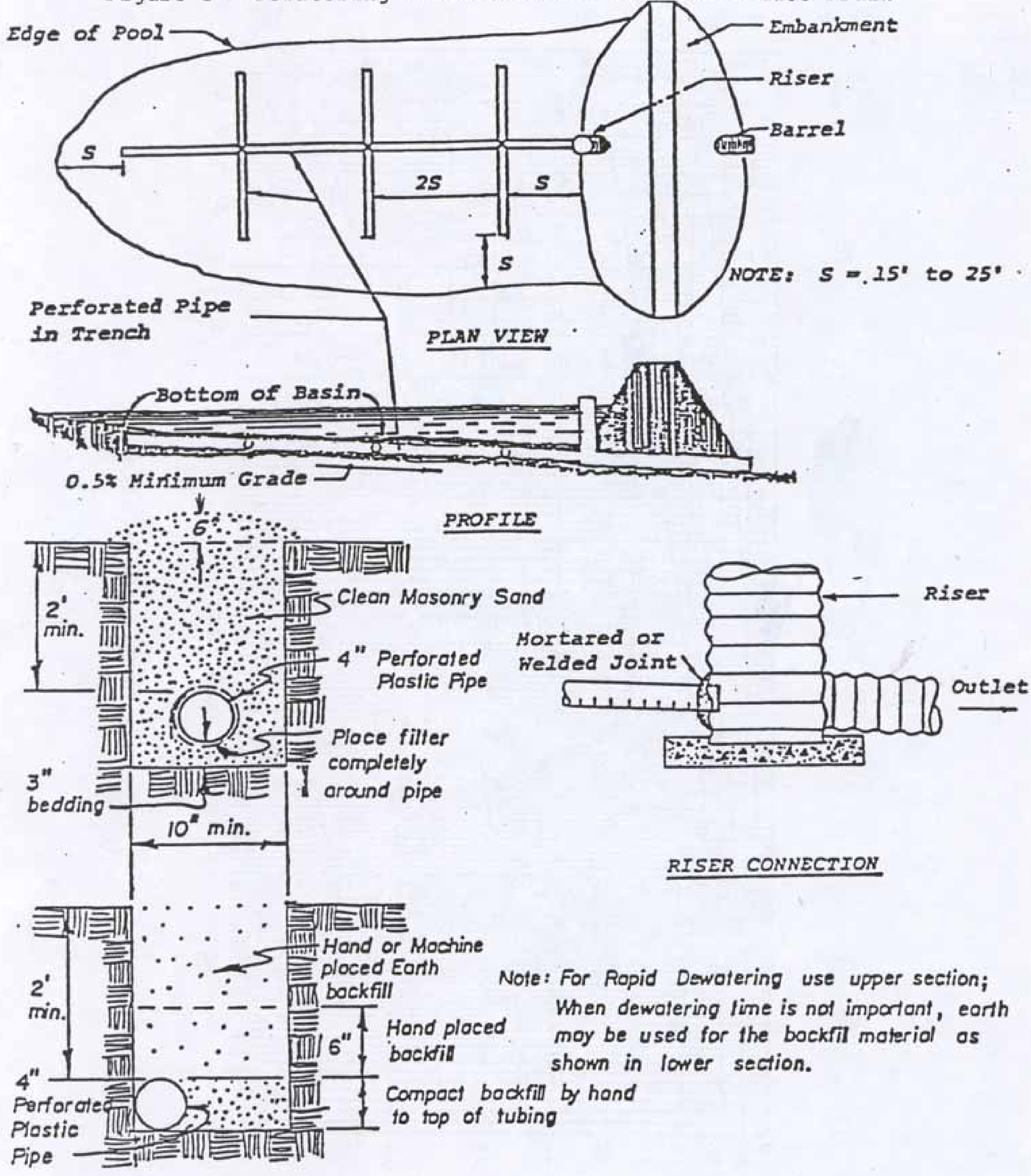


Figure 2 - Dewatering Sediment Basin with Subsurface Drain



CROSS SECTIONS
DRAIN PIPE IN TRENCH

Source: Standards for Soil Erosion and Sediment Control in New Jersey. New Jersey State Soil Conservation Committee.

DESIGN EXAMPLE NO. 1

Determining Volume in a Sediment Basin to Meet Sediment Storage Volume and Detention Storage Volume Requirements (Hartford County)

Twenty acres drains into a planned sediment basin. Failure of the sediment basin at the planned site will not result in loss of life or damage to buildings, roads, railroads or utilities. Ten acres are to be cleared and developed into houses. Ten acres are in woods and will not be disturbed during the life of the sediment basin. It is estimated it will take 12 months to developed the site. The sediment basin will be installed as the first item of construction and removed as the last item of construction. The owner estimates that the ten acres to be developed will be bare for 12 months. The soils are Agawam fine sandy loam on a flat slope. The sediment pool will be norally wet. The 10 year, 24 hour rainfall is 4.7 inches.

Determine sediment storage volume using the following method:

Determine, DA - Drainage Areas and A - Average Annual Erosion

Woods
(DA)·(A) = 10 ac x 0.2 tons/ac/yr = 2 tons/yr
Construction Area
(DA)·(A) = 10 Ac x 50 tons = 500 tons/yr
(DA)·(A) = 502 tons for the 1st year.

Determine DR - delivery ratio

20/640 = 0.031 sq mi from Figure 1 for a sandy soil, DR = 31.5%

Determine Y - density of the wet sediment. From Table 1 the density of submerged sand is 85-100 lbs/cu. ft., Use Y_s = 90 lbs/cu. f

Determine TE trap efficiency. The TE is 75% from the sediment storage volume section pag. 350-3 of the Sediment Basin standard.

Determine V - minimum volume for sediment storage for the planned life of the structure.

V = (DA)·(A)·(DR)·(TE)·(1/Y)·(2,000 lbs/ton)·(1/43,560 sq. ft./ac.)

V = (502)·(0.315)·(0.75)·(1/90)·(2,000)·(1/43,560)

V = 0.061 Ac. ft. for sediment storage.

Determine detention storage volume.

From Chapter 2, EFM with RCN = 62 for the Agawam soil which is Hydrologic Soil Group B and flat slopes.

Q_{10}yr. = 13 cfs

V_r = 1.26 inches

Therefore:

Qi = 13 cfs $\quad V_r = 1.26$

$$\frac{Qi}{DA} = \frac{13}{20} = 0.65$$

From Exhibit 11-10, sheet 1 of 2, EFM.

$$\frac{Qo}{Qi} = 0.13 \qquad Qi = 13 \text{ cfs} \qquad \therefore Qo = (0.13)(13) = 1.7 \text{ cfs}$$

Qo = 1.7 cfs = maximum allowable principal spillway discharge.

$$\text{Release rate} = \frac{1.7 \text{ cfs}}{20 \text{ Ac}} = 0.085 \text{ cfs/Ac.}$$

Vr = 1.26 inches

From the figures in the Exhibit 11-9, EFM for single stage structures with release rates less than 0.6 cfs/Ac, the minimum storage requires, Vs, is 0.55 inches.

$$Vs = 0.55 \text{ inches} = \frac{(0.55 \text{ inc.})\ (20 \text{ Ac.})}{(12 \text{ in./Ft.})} = .92 \text{ Ac. ft.}$$

Vs = 0.92 Ac. ft. for detention storage volume.

The minimum volume required below the crest of the emergency spillway is 0.061 Ac. ft. plus 0.92 Ac. ft. or 0.98 Ac. ft.

DESIGN EXAMPLE NO. 2

Same as Design Example No. 1 except the soil is Hollis fine sandy loam on a steep slope.

Determine sediment storage volume using method given in Example No. 1.

(DA) (A) same as in Design Example No. 1
(DA) (A) = 502 tons for the 1st year

Determine, DR - delivery ratio.

The Hollis soil is a fine sandy loam. Using the Soil Survey Report, this soil would be approximately 60 percent sand and 40 percent silt. Using Figure 1 with 0.031 sq. mi. drainage area and a value between the sandy and silty curves, the delivery ratio is 50 percent.

Determine, Y^S - density of wet sediment. Y^S = 80 lbs/cu. ft., using Figure 1 with sand-silt mixture.

The trap efficiency is the same as Design Example No. 1 and is 75 percent.

Determine minimum volume for sediment storage for the planned life structure.

V = (DA)·(A)·(DR)·(TE)·(1/Y)·(2,000 lbs./ton)·(1/43,560 sq. ft./Ac.)

V = (502)·(0.50)·(0.75)·(1/80)·(2,000)·(1/43,560)

V = 0.10 Ac. ft. for sediment storage

Determine detention storage volume.

From Chapter 9 with RCN=75 for Hollis soil which is Hydrologic Soil Group C and steep slopes.

Q_{10}yr. = 56 cfs

V_r = 2.20 inches

Therefore:

Qi = 56 cfs　　　　Vr = 2.20 inches

$\frac{Qi}{DA} = \frac{56}{20} = 2.80$

From Exhibit 11-10, Sheet 1 of 2, EFM

$\frac{Qo}{QI} =$ 0.054 and Qo = (0.054)·(56) = 3.0 cfs

Qo = 3.0 cfs = maximum allowable principal spillway discharge release rate = $\frac{3.0 \text{ cfs}}{20 \text{ Ac}}$ = 0.15 cfs/Ac

Vr = 2.20 inches

From the figures in the Exhibit 11-9, EFM for single stage structures with release rates less than 0.6 cfs/Ac, the minimum storage required, Vs, is 1.18 inches.

Vs = 1.18 inches = $\frac{(1.18 \text{ in.})\ (20 \text{ Ac.})}{(12 \text{ in./ft.})}$ = 1.97 Ac. ft.

Vs = 2.07 Ac. ft. for detention storage volume

The minimum volume required below the crest of the emergency spillay is 0.10 Ac. ft. for sediment storage volume plus 1.97 Ac. ft. for detention storage volume or 2.07 Ac. ft.

Conclusion From Design Examples

To have a reasonable size sediment basin that is effective, two components are critical. the total drainage area must be small. the volume of runoff must be low. To accomplish this requires good vegetative cover and soils with high water infiltration rates.

Planning considerations for water quantity and quality

Quantity

1. Effects on the water budget, expecially volumes and rates of runoff, infiltration, evaporation, deep percolation, and ground water recharge.

2. Effects on downstream flows and aquifers that would affect other water uses and users.

3. Effects on volume of discharge flow on the environmental, social, and economic conditions.

4. Effects on the water table downstream and the results of changes of vegetative growth.

Quality

1. Effects on erosion, movement of sediment, pathogens, and soluble and sediment-attached substances.

2. Effects on the visual quality of onsite and downstream water resources.

3. Effects of construction and early establishment of protective vegetation on the surface and ground water.

4. Effects on wetlands and water-related wildlife habitats.