NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

RUNOFF MANAGEMENT SYSTEM
(No. and Acre)
CODE 570

DEFINITION

A system of conservation practice(s) for managing the quantity and quality of stormwater runoff from urban and rural watersheds for both existing and altered land use conditions.

PURPOSE

This practice applies to managing stormwater runoff to achieve one or more of the following:

- Minimize flooding impacts
- Reduce erosion and sedimentation
- Maintain or improve surface and ground water quantity and quality

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where there is a need to manage stormwater runoff that could cause undesirable downstream flooding and/or degradation of surface or ground water quality if left untreated. Runoff can originate from urban or rural watersheds for both existing and altered conditions.

This standard does not apply to agricultural practices. For agricultural practices, refer to the applicable practice standards found in the Field Office Technical Guide (FOTG).

CRITERIA

General Criteria for all purposes

A runoff management system must be compatible and consistent with the floodplain management and stormwater management programs of the local jurisdiction, and consistent with the Massachusetts (MA-DEP) Stormwater Management Standards (see Attachment #1 to this practice standard).

The following items shall be addressed when planning and designing all components of runoff management systems:

- Water quantity calculations (TR-55, TR-20) for existing and alternative conditions (volume of runoff, duration of flow, and peak discharge rates).
- Selection and analysis of appropriate stormwater management best management practices (BMPs).
- Water quality of the stormwater discharge.
- Evaluation of an adequate non-erosive outlet along with an analysis of the stability of the downstream channel.
- Selection and analysis of infiltration BMPs to minimize the reduction of annual recharge to ground water due to increases in impervious areas.

  The volume of stormwater to be recharged shall be computed using pre-development soil conditions, post development impervious areas in the watershed and the recharge volumes in the following table.

Hydrologic Soil Group Pre-Development Soils	Volume of Recharge
A	0.40 inches runoff x imp. area*
B	0.25 inches runoff x imp. area
C	0.10 inches runoff x imp. area
D	Waived

* impervious area

- Analysis of adequate erosion and sediment control measures during the construction phase.

- Development of an operation and maintenance (O&M) plan. Refer to the Operation and Maintenance section of this standard.
- Selection of pretreatment systems to remove a minimum of 80% of the Total Suspended Solids (TSS) or to the maximum extent practicable.
- The diameter of inlet and outlet pipes of practice components shall be designed to adequately carry the calculated peak rate of discharge from the contributing watershed (i.e. the pipe connection between a pre-treatment device and a treatment BMP). The minimum diameter pipe shall be six (6) inches.
- Selection of landscape architectural practices that will ensure that all measures are visually compatible with the surrounding landscape.
- Analysis of selected BMPs to assure that appropriate safety features and devices are installed to protect humans and animals from injury or drowning. Temporary fencing can be used until plantings are established. Protective measures such as guardrails, gratings, fences, and signage shall be used on spillways and impoundments as needed.
- Selection of appropriate grasses to protect exposed surfaces and other disturbed areas from eroding. Other protective measures, such as mulches, can also be used. Seedbed preparation, fertilizing, seeding, and mulching shall comply with the Critical Area Planting (342) Standard.
- Selection of reasonable measures to help prevent vandalism and damage to installed components. (e.g., locks, grouting of rock riprap).

Design Storms

Systems That Minimize Flooding Impacts

The peak discharges from the 2-year, 10-year, and 100-year frequency, 24-hour duration, type III distribution storms shall be analyzed. The source of the rainfall-frequency data shall be the National Weather Service (formerly US Weather Bureau) Technical Paper 40 (TP-40), unless specific local and state criteria require the use of other rainfall-frequency data for analyses.

No increase in the peak discharge shall be allowed for the 2-year and 10-year frequency, 24-hour storms. The 100-year, 24-hour duration storm shall be evaluated to ensure there is no increase in flooding impacts offsite. Local and state criteria may require that additional storm frequencies and/or durations be analyzed.

Systems That Reduce Erosion and Sedimentation

The peak discharge and runoff volume from the 2-year and 10-year, 24-hour duration, type III distribution storms shall be used for design.

Systems That Maintain or Improve Water Quality

The minimum volume of stormwater to be treated shall be as follows:

- For discharges to critical areas, the minimum treatment volume shall be 1.0 inch depth of runoff times the contributing impervious drainage area. Critical areas, as defined by MA-DEP, are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries, recharge areas for public water supply, or other areas specified by the MA-DEP.
- For all other discharges, the minimum volume shall be 0.5 inch times the impervious area.

When the volume of stormwater exceeds the design capacity of the system, its components shall be designed to bypass excess runoff by incorporating adequate overflow measures.

The design of all conservation practices with water quality elements will be compared to the current version of the Massachusetts Stormwater Policy (see Attachment #1 to this standard) and any existing local requirements for proper compliance.

Practices and Components

Conservation practices for runoff management systems include but are not limited to dams, excavated ponds, infiltration practices, stormwater wetlands, stormwater treatment devices, and underground storage. Each component shall be designed according to the applicable practice standards and sound engineering principles to ensure that the system achieves its intended purposes. Design criteria for individual practices and components shall be based on the following:

Dams. Dams shall meet the requirements specified in the National Engineering Manual, Technical Release No. 60, Pond (378) standard, and requirements of the Massachusetts Office of Dam Safety.

Excavated Ponds. Excavated ponds shall meet the requirements specified in the Pond (378) or Sediment Basin (350) standards, as appropriate.

Infiltration practices. Infiltration practices shall be based on soil suitability and estimated annual recharge volumes.

Infiltration practices shall provide at least 2 feet of separation between the bottom of the component and the seasonal high water table and/or the mean high tide.

Pretreatment to remove oil, grease, and sediments is required to ensure continued functioning of the infiltration practice. Typical pre-treatment devices include swirl concentrators, deep sump catch basins and oil-grit removal structures.

Soil permeability must be greater than 0.6 in/hr. The practice shall be designed so that the total infiltration time for the practice does not exceed 3 days.

Underground infiltration practices must be structurally capable of handling the anticipated loadings and be suited to the soils. Additional pretreatment for these practices may be required.

Underground Storage. This practice involves installing tanks or pipes underground, to hold water temporarily, thereby reducing peak discharge and flooding.

The tank or pipes must be structurally capable of handling the anticipated loadings and be suited to the soil.

All runoff shall be pretreated for sediment and debris removal prior to underground storage.

Cleanouts shall be installed to facilitate maintenance of the underground system.

Stormwater Wetlands. Constructed wetlands to treat stormwater runoff shall be designed according to the Constructed Wetland (656) standard. In addition, the following shall be included in the design for a stormwater wetland:

- The site and the quality of water to be treated shall be used to select the appropriate type of wetland. The four basic types are Shallow Marsh, Pond/Wetland, Extended Detention Wetland, and Pocket Wetland.
- At a minimum, provide 1 acre of stormwater wetland per 100 acres of contributing watershed (a minimum stormwater wetland to watershed ratio of 1%).
- Provide a depth and area allocation that maximizes the surface area to volume ratio. Shallower depths provide a greater variety of vegetation for nutrient uptake with less treatment volume, while deeper depths provide more treatment volume but provide a lesser variety of vegetation.
- The depths of various components of a wetland system are to be designed in accordance with the required degree of removal for the target pollutant.
- Pre-treat stormwater to remove sediments and contaminants that could damage wetland vegetation and decrease storage volume.
- Provide the longest possible flow path through the wetland system. Refer to the Constructed Wetland (656) standard for length to width ratios.
- Provide enough water to the wetland to maintain the water elevations needed to support the type of wetland designed. Liners may be needed in areas of limited water supply or highly permeable soils. A water budget shall be developed for each situation.
- Provide extended detention for smaller storms. In general, the volume of the extended detention should be no more than 50% of the entire stormwater wetland system. The extended detention time shall be at least 12 hours with a maximum water depth of 3 feet above the normal pool of the wetland.
- Provide adequate wetland plant soil medium, proper planting techniques, adequate water level controls, and suitable wetland plant species.

Stormwater Treatment Devices. These devices generally consist of oil-grit separators, swirl concentrators, deep sump catch basins and other structural measures that are retrofitted to an existing stormwater drainage system. These

devices improve the quality of stormwater runoff. Sediment and floatables are removed through frequent cleaning of the treatment device. Some soluble nutrients and bacteria are removed by infiltration, filtration, chemical, or biological treatment provided by a particular treatment device.

The design and application of any of these devices shall follow the manufacturer's design criteria and recommendations commensurate with the requirements in the Design Storms section of this standard and with any applicable state or local requirements.

CONSIDERATIONS

For infiltration components intended to improve water quality, consider installing observation wells prior to the design phase to monitor the high water level and ensure a minimum separation of 2 feet from the bottom of the system and seasonal high water table and/or mean high tide.

PLANS AND SPECIFICATIONS

Plans and specifications for runoff management systems shall be in keeping with this standard and shall describe the requirements for applying the practices to achieve their intended purpose.

OPERATION AND MAINTENANCE

A written operation and maintenance (O&M) plan is required for all practices installed with NRCS assistance. The O&M Plan shall be in a written form, as appropriate for the scope and complexity of the practice. The O&M plan shall be prepared during planning and design and prior to the installation of the practice. This plan shall include at a minimum:

- A brief description of the practices(s) to which a particular plan applies.
- A description of the O&M requirements for the practice(s).
- Special maintenance requirements found in manufacturers instructions and operator manuals for proprietary BMPs.
- Requirements of Federal, State and local regulations and bylaws.
- Environmental and cultural resource concerns that shall be considered during maintenance activities.
- A description of the hazards associated with potentially hazardous practices (e.g., fencing of retention/detention/infiltration basins).
- A schedule for conducting O&M inspections and a location of records for past inspections.
- Adequate rights-of–way must be provided for maintenance access.

REFERENCES

MA-DEP Stormwater Management Handbooks, Volumes I and II

MA-DEP Erosion and Sediment Control Guidelines for Urban and Suburban Areas

NRCS National Operation and Maintenance Manual

Massachusetts Stormwater Management Standards

MA-DEP will presume that projects meeting the Stormwater Management Standards satisfy regulatory requirements. When one or more of the Standards cannot be met, an applicant may demonstrate that an equivalent level of environmental protection will be provided.

1. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

2. Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

3. Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.[1]

4. For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when:
   (a) Suitable nonstructural practices for source control and pollution prevention are implemented;
   (b) Stormwater management best management practices (BMPs) are sized to capture the prescribed runoff volume; and
   (c) Stormwater management BMPs are maintained as designed.

5. Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pretreatment is prohibited.

6. Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries and recharge areas for public water supplies.

7. Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable1. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

8. Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

9. All stormwater management systems must have an operations and maintenance plan to ensure that systems function as designed.

[1] "To the extent practicable" means the applicant has made all reasonable efforts to meet the standards, including evaluation of alternative BMP designs and their locations.