Chapter 5: Acceptable Stormwater Management Practices (SMPs)

This section presents a list of practices that are acceptable for water quality treatment. The practices on this list are selected based on the following criteria:

1. Can capture and treat the full water quality volume (WQ_v)
2. Are capable of 80% TSS removal and 40% TP removal.
3. Have acceptable longevity in the field.
4. Have a pretreatment mechanism.

It also provides data justifying the use of these practices, and minimum criteria for the addition of new practices to the list.

Section 5.1 Practice List

Practices on the following list will be presumed to meet water quality requirements set forth in this manual if designed in accordance with the sizing criteria presented in Chapter 4 and constructed in accordance with the performance criteria in Chapter 6. The practices must also be maintained properly in accordance with the prescribed maintenance criteria also presented in Chapter 6. Acceptable practices are divided into five broad groups, including:

I. **Stormwater Ponds** Practices that have either a permanent pool of water or a combination of permanent pool and extended detention capable of treating the WQ_v

II. **Stormwater Wetlands** Practices that include significant shallow marsh areas, and may also incorporate small permanent pools and extended detention storage to achieve the full WQ_v

III. **Infiltration Practices** Practices that capture and temporarily store the WQ_v before allowing it to infiltrate into the soil.

IV. **Filtering Practices** Practices that capture and temporarily store the WQ_v and pass it through a filter bed of sand, organic matter, soil, or other acceptable treatment media.

V. **Open Channel Practices** Practices explicitly designed to capture and treat the full WQ_v within dry or wet cells formed by check dams or other means.

Within each of these broad categories, select practices are presumed to meet the established water quality goals (see Table 5.1). It is important to note that several practices that are not on the list may be of value as pretreatment, or to meet water quantity requirements (see Section 5.2). Guidance on the performance criteria for each practice type and matrices for selecting practices are provided in Chapters 6 and 7.

Table 5.1 Stormwater Management Practices Acceptable for Water Quality		
Group	**Practice**	**Description**
Pond	Micropool Extended Detention Pond (P-1)	Pond that treats the majority of the water quality volume through extended detention, and incorporates a micropool at the outlet of the pond to prevent sediment resuspension.
	Wet Pond (P-2)	Pond that provides storage for the entire water quality volume in the permanent pool.
	Wet Extended Detention Pond (P-3)	Pond that treats a portion of the water quality volume by detaining storm flows above a permanent pool for a specified minimum detention time.
	Multiple Pond System (P-4)	A group of ponds that collectively treat the water quality volume.
	Pocket Pond (P-5)	A stormwater wetland design adapted for the treatment of runoff from small drainage areas that has little or no baseflow available to maintain water elevations and relies on ground water to maintain a permanent pool.
Wetland	Shallow Wetland (W-1)	A wetland that provides water quality treatment entirely in a wet shallow marsh.
	Extended Detention Wetland (W-2)	A wetland system that provides some fraction of the water quality volume by detaining storm flows above the marsh surface.
	Pond/ Wetland System (W-3)	A wetland system that provides a portion of the water quality volume in the permanent pool of a wet pond that precedes the marsh for a specified minimum detention time.
	Pocket Wetland (W-4)	A shallow wetland design adapted for the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.
Infiltration	Infiltration Trench (I-1)	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench before it is infiltrated into the ground.
	Infiltration Basin (I-2)	An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated it into the ground.
	Dry Well (I-3)	An infiltration practice similar in design to the infiltration trench, and best suited for treatment of rooftop runoff.
Filtering Practices	Surface Sand Filter (F-1)	A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a sand matrix.
	Underground Sand Filter (F-2)	A filtering practice that treats stormwater as it flows through underground settling and filtering chambers.
	Perimeter Sand Filter (F-3)	A filter that incorporates a sediment chamber and filer bed as parallel vaults adjacent to a parking lot.
	Organic Filter (F-4)	A filtering practice that uses an organic medium such as compost in the filter, in the place of sand.
	Bioretention (F-5)	A shallow depression that treats stormwater as it flows through a soil matrix, and is returned to the storm drain system.
Open Channels	Dry Swale (O-1)	An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.
	Wet Swale (O-2)	An open drainage channel or depression designed to retain water or intercept groundwater for water quality treatment.

Section 5.2 Structural Practices Suitable for Pretreatment or as Supplemental Practices Only

Several practices that are not capable of providing water quality treatment can nonetheless function in a pretreatment role or as a supplemental practice to the recommended practices in Table 5.1. These practices can often be incorporated into SMP design as pretreatment devices, to treat a small portion of a site, or in retrofit or redevelopment applications. Some of these practices, including dry ponds and underground storage vaults, can be used to meet water quantity goals such as channel protection and flood control requirements. In addition, some of these practices may be helpful to reduce the total volume of runoff from a site or to disconnect impervious surfaces, as indicated on the Fact Sheets presented in this chapter. Some practices not currently deemed effective for stand-alone water quality treatment include:

- Catch basin inserts
- Dry ponds
- Underground vaults (designed for flood control)
- Oil/grit separators and hydrodynamic structures
- Filter strips
- Grass channels (includes ditches designed primarily for conveyance as well as modified practices that can achieve some pollutant removal)
- Deep sump catch basins
- On-line storage in the storm drain network
- Porous pavement

Fact sheets for some of these practices (dry ponds, filter strips, porous pavement, and grass channels) have been provided following section 5.3.

Section 5.3 Criteria for Practice Addition

The stormwater field is always evolving, and new technologies constantly emerge. New practices can be included in future revisions to the stormwater design manual, provided they can prove that they meet the water quality goals established in the manual. These goals include the 80% TSS (defined as suspended organic and inorganic material) and 40% TP removal target and a proven record of longevity in the field. For a practice to receive consideration for addition to the manual, the following monitoring criteria must be met by supporting studies:

- Must be monitored in at least two locations.
- At least five storm events must be sampled at each site.
- Concentrations reported in the studies must be flow-weighted.
- The studies must be independent (i.e., may not be conducted by the vendor or designer).
- The studies must be conducted in the field, as opposed to laboratory testing.

- The practice must have been in the ground for at least one year at the time of monitoring (to assume the practice will be tested after a minimum amount of "in-service" time).
- At least one storm event in each study must be greater than the 90% storm event for the location.

Additional testing for new technologies based on the performance of practices with a similar design may be required before consideration. For example, if a practice has a very similar design to an oil/grit separator, which has consistently poor removal, then additional studies may be required to justify incorporation of that practice into the manual. The long-term performance of a practice based on field applications in New York or other regions with a similar climate or conditions may also determine if that practice will receive consideration for inclusion in the manual. A poor maintenance record is a valid justification for not including a practice in the manual.

Dry Ponds

Description: Dry extended detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins designed to temporarily detain runoff for some minimum time. Dry detention ponds are used for water quantity control only, and can also be used to provide flood control by including additional flood detention storage.

REASONS FOR LIMITED USE

- Controls stormwater quantity – not intended to provide water quality treatment

KEY CONSIDERATIONS

- Applicable for drainage areas up to 75 acres
- Typically less costly than stormwater (wet) ponds for equivalent flood storage, as less excavation is required
- May provide recreational and open space opportunities between storm runoff events

STORMWATER MANAGEMENT SUITABILITY

☐ **Water Quality**

☒ **Channel/Flood Protection**

SPECIAL APPLICATIONS

☐ **Pretreatment**

☐ **High Density/Ultra-Urban**

☐ **Runoff Reduction/Impervious Cover Disconnection**

Residential Subdivision Use: *Yes*

Filter Strip

Description: Grassed filter strips (a.k.a., vegetated filter strips, filter strips, and grassed filters) are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces and remove pollutants through filtration and infiltration.

REASONS FOR LIMITED USE

- Cannot alone achieve the 80% TSS removal target

KEY CONSIDERATIONS

- Runoff from an adjacent impervious area must be evenly distributed across the filter strip (i.e., sheet flow)
- Can be used as part of the runoff conveyance system to provide pretreatment
- Can provide groundwater recharge
- Reasonably low construction cost
- Large land requirement
- Requires periodic repair, regrading, and sediment removal to prevent channelization
- To size this practice, design a berm at the base of the filter strip. The volume to be treated should be captured behind the berm.

STORMWATER MANAGEMENT SUITABILITY

☐ **Water Quality**

☐ **Channel/Flood Protection**

SPECIAL APPLICATIONS

☒ **Pretreatment**

☐ **High Density/Ultra-Urban**

☒ **Runoff Reduction / Impervious Cover Disconnection**

☒ **Other:** Use in buffer system; treating runoff from pervious areas

Residential Subdivision Use: *Yes*

Modular Block Porous Pavement

Description: Modular block porous pavement is a permeable pavement surface with an underlying stone reservoir designed to temporarily store surface runoff before it infiltrates into the subsoil. Porous pavement options are primarily intended for low vehicle traffic areas such as spillover parking or simply the parking aisle portion of a parking lot.

REASONS FOR LIMITED USE

- Maintenance record is unclear, and pretreatment cannot be provided.
- Should not be applied on parking lots that are sanded or salted for snow control.

DESIGN CONSIDERATIONS

- Soil permeability between 0.5 and 3.0 inches per hour
- Do not locate on slopes > 15% or within fill soils
- Site at least 3 feet above the seasonally high groundwater table, and at least 100 feet away from drinking water wells
- Direct runoff from pervious or exposed areas away from pavement
- Size the gravel trench using the same equation provided in Section 6.3 for infiltration trenches.
- Provide conveyance for larger storms with raised inlet or perimeter gravel trench
- Sediment-laden runoff must be directed away from the porous pavement
- Maximum depth should not exceed 4 feet
- Ensure that the upland drainage is fully stabilized after construction;.
- Use permanent sign(s) containing a short list of maintenance requirements
- Do not use excavated stone reservoir as a sediment control device
- Avoid compacting subsoils during construction
- Ensure that paving dewaters between storms
- Periodically inspect the surface for deterioration or spalling

STORMWATER MANAGEMENT SUITABILITY

- [ ] **Water Quality**
- [ ] **Channel/Flood Protection**

SPECIAL APPLICATIONS

- [ ] **Pretreatment**
- [X] **High Density/Ultra-Urban**
- [X] **Runoff Reduction / Impervious Cover Disconnection**
- [X] **Other:** Overflow Parking

Grass Channel

Description: Vegetated channels designed to filter stormwater runoff and meet velocity targets for the water quality design storm and the two-year storm event.

REASONS FOR LIMITED USE

- Cannot alone achieve the 80% TSS removal target

KEY CONSIDERATIONS

- Can be used as part of the runoff conveyance system to provide pretreatment
- Grass channels can act to partially infiltrate runoff from small storm events if underlying soils are pervious
- Less expensive than curb and gutter systems
- Should not be used on slopes greater than 4%; slopes between 1% and 2% recommended
- Design as a parabola, or as a trapezoid with a bottom width of between 2' and 8', with 3:1 or flatter side slopes.
- Provide sufficient length to retain the treatment volume in the system for 10 minutes, to flow at no greater than 1.0 fps, and at a depth of no greater than 4".
- Design to maintain between 4.0 and 5.0 fps for the 2-year storm, and no greater than 7.0 fps for the 10-year storm event.
- Size the channel to safely convey the 10-year storm event.
- Size using Manning's Equation (US DOT, 1990). Us an "n" value of 0.15 for flow depths of 4" or smaller, and linearly increase to 0.03 for a depth of 12".

STORMWATER MANAGEMENT SUITABILITY

- [ ] **Water Quality**
- [ ] **Channel/Flood Protection**

SPECIAL APPLICATIONS

- [X] **Pretreatment**
- [ ] **High Density/Ultra-Urban**
- [X] **Runoff Reduction / Impervious Cover Disconnection**
- [X] **Other:** Curb and gutter replacement

Residential Subdivision Use: *Yes*