Pretreatment Swale

Stormwater BMP Type

Pretreatment BMP	■
Infiltration BMP	□
Filtering BMP	□
Stormwater Pond BMP	□
Stormwater Wetland BMP	□
Water Quality Conveyance BMP	□
Stormwater Reuse BMP	□
Proprietary BMP	□
Other BMPs and Accessories	□

Stormwater Management Suitability

Retention	□
Treatment	□
Pretreatment	■
Peak Runoff Attenuation	□

Pollutant Removal

Sediment*	**High**
Phosphorus	**Variable**
Nitrogen	**Variable**
Bacteria	**Low**

*Includes sediment-bound pollutants

Implementation

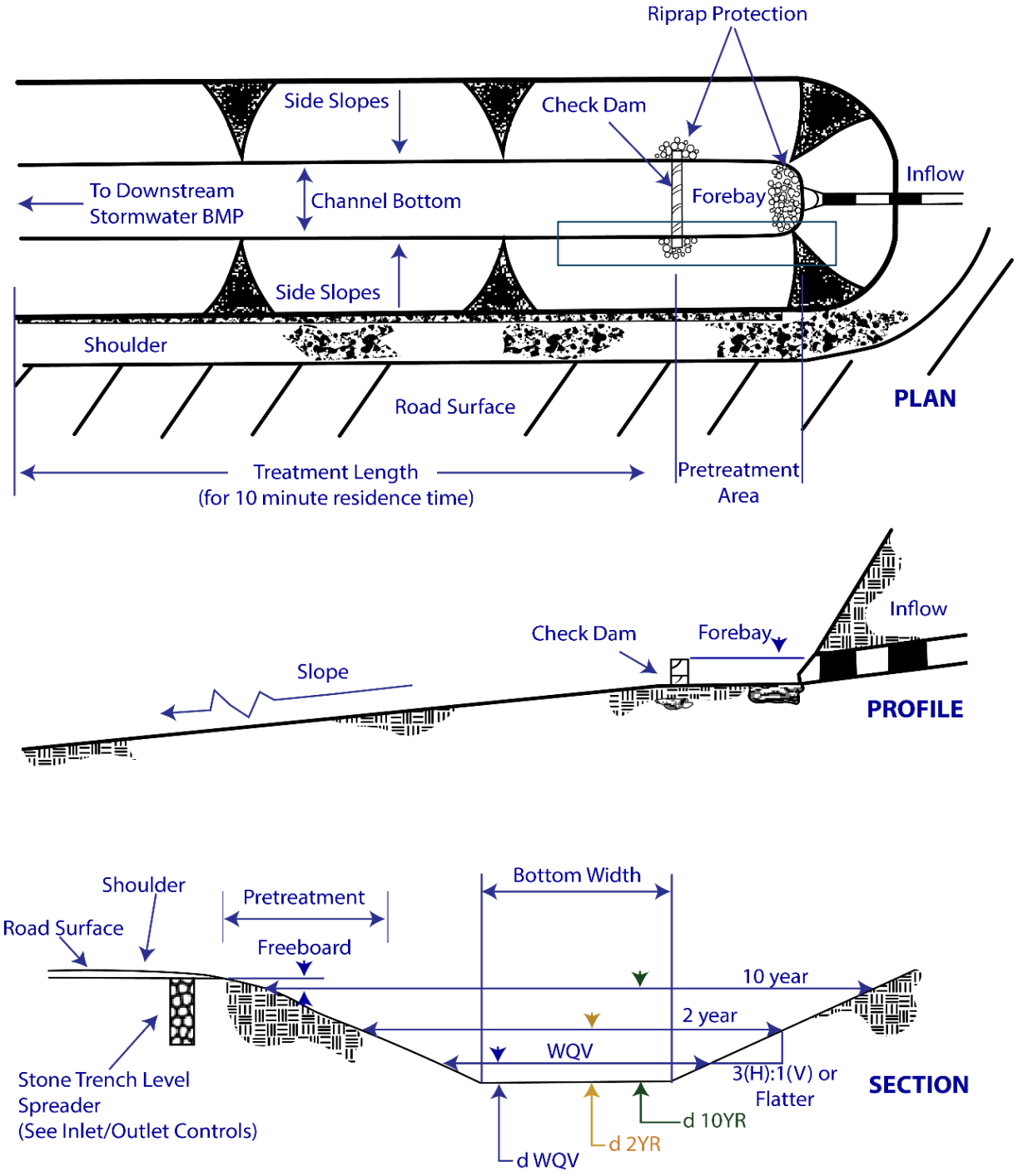
Capital Cost	**Low**
Maintenance Burden	**Low to Moderate**
Land Requirement	**Moderate**

Description

A pretreatment swale is a gradually sloped channel that increases travel time, reduces runoff velocity, and utilizes vegetation to filter coarse sediment and debris from runoff. Pretreatment swales provide both conveyance and pretreatment for downstream stormwater BMPs. Check dams may be utilized to increase pretreatment capacity by temporarily storing runoff, further reducing the runoff velocity in the swale. Pretreatment swales can be incorporated into highway and road drainage systems but can also be used in place of traditional curb and gutter drainage systems. Figure 13-3 shows a schematic of a pretreatment swale used for pretreatment of runoff from an adjacent road surface prior to discharge to a structural stormwater BMP.

Unlike the Water Quality Conveyance BMPs (Wet Water Quality Swale and Dry Water Quality Swale), which are suitable for providing stormwater retention and treatment credit, pretreatment swales are not stand-alone treatment practices due to their limited pollutant removal, runoff volume reduction, and groundwater recharge. Pretreatment swales should only be used upgradient of another structural stormwater BMP.

Figure 13-3. Pretreatment Swale Schematic



Note: Per the CTDOT MS4 Permit, linear projects have alternative standards and may take an alternative approach to address constraints that are different than those that affect traditional parcel development projects. These alternative linear project standards can be found in the CTDOT drainage manual, the CTDOT MS4 General Permit. the General Construction Permit and in the supporting materials that CTDOT has developed.

Siting Considerations

- Pretreatment swales can be used as an alternative conveyance mechanism to traditional curb and gutter systems.
- Adequate length to ensure sufficient filtering of runoff.
- Do not use in areas with:
  - Steep grades
  - In watersheds with high sediment loads
  - Unstable upgradient areas
- Should not be used for runoff from Land Uses with Higher Potential Pollutant Loads (LUHPPLs) unless the swales are lined to prevent infiltration.

Design Recommendations

Inlet

- A sediment forebay should be used at the upstream end of the channel to trap incoming coarse sediments and debris. A stone-filled trench level spreader and vegetated filter strip can also be used to pretreat sheet flow runoff that enters the sides of the channel.
- Design the inlet(s) in accordance with the Inlet and Outlet Controls section of Chapter 13.

Sizing and Dimensions

- Cross Section Channel Shape
  - Minimum Bottom Width: 2 feet
  - Shape: Trapezoidal or parabolic; maximize wetted perimeter to the extent possible to increase vegetation contact and reduce velocities
- Side Slope
  - Maximum: 3(H):1(V)
  - For enhanced pollutant removal, design the swale side slopes to serve as vegetated filter strips by accepting sheet flow runoff.
- Length
  - Provide minimum residence time of 10 minutes from inlet to outlet for the water quality storm. Where sheet flow enters the swale, residence time is measured from the mid-point between the upgradient-most part of the swale to the outlet.
- Longitudinal Slope
  - Optimal Range: 1% to 2%
  - Utilize check dams if necessary to ensure adequate residence time for steeper slopes.

- Velocity
  - Maximum velocity for water quality storm: 1 foot per second
  - Maximum velocity for 10-year, 24-hour design storm: 3 feet per second
  - If velocities are greater than the maximum velocities listed above, provide turf reinforcement matting (TRM).

Features

- Topsoil
  - Minimum Depth: 4 inches

- Check Dams
  - Can be installed to increase hydraulic residence time and promote additional infiltration.
  - Can be created using gabion baskets, concrete or granite curbing, or precast or cast-in-place concrete.
  - Maximum Height: 1/2 the height of swale bank
  - Spacing and height of check dams will depend on both the longitudinal slope of the swale and the runoff travel time.
  - Anchor check dams into swale side slopes to prevent washout. Each side of the dam must extend 2-3 feet into the swale side slopes and bottom.
  - Protect downstream side of check dam from scour with stabilized surface measure.
  - When check dams are used near the inlet to control the inlet flow velocity, protect the swale from scour with stabilized surface measure if inlet velocities are greater than 3 feet per second.

- Culverts can be used to maintain swale connectivity where a driveway, walkway, or roadway crosses the swale. The culvert should be sized to pass the 10-year, 24-hour design storm (at a minimum) without causing overtopping.

Materials

- Vegetation
  - Select vegetation with guidance provided in Appendix F of this Manual based on site-specific conditions.
  - Use non-erosive vegetation that can withstand relatively high velocity flows, and both wet and dry conditions.

- Turf Reinforcement Matting
  - If used, shall be a woven material included on the CTDOT Qualified Products List or equivalent that exceeds the design velocity of the design storm and allows for the growth of the proposed vegetative species.

- Curbing
  - If used, granite or concrete curbing shall conform to State of Connecticut Department of Transportation Standard Specifications, Section M.12.06 (Stone Curbing) and Section 8.11 (Concrete Curbing).

- Gabion Basket
  - If used, should conform to ASTM A-974-97 and US Federal Specification QQ-W-461H and coated in accordance with ASTM A641, Finish 5, Class 3.

- Poured-in-Place Concrete
  - If used, should be an appropriate class of concrete based on the application and conform to State of Connecticut Department of Transportation Standard Specifications, Section 6.01 (Concrete for Structures).

- Precast Concrete
  - If used, should be an appropriate class of concrete based on the application and conform to State of Connecticut Department of Transportation Standard Specifications, Section M.08.02-4 (Precast Concrete).

- Check Dams
  - If used, construct of gabions, granite or concrete curbing, or poured-in-place or precast concrete.

Maintenance Needs

- Inspect the pretreatment swale and any sediment forebay, check dams, and level spreaders twice a year. Measure the depth of accumulated sediment in the forebay and swale and inspect the vegetation for erosion, bare spots, and overall health.

- Remove sediment from the sediment forebay when it accumulates to a depth of more than 12 inches or 50% of the design depth. Clean outlet of sediment forebay when drawdown time exceeds 36 hours after the end of a storm event.

- Remove sediment from the swale and check dams when it accumulates to a depth of more than 50% of the design depth and reconfigure the channel to its original dimensions.

- Remove sediment from any level spreaders, as necessary.

- Mow the vegetation in the swale at least 2 times during the growing season to a height of 4 to 6 inches.

- If the surface of the grass channel becomes clogged to the point that standing water is observed on the surface 48 hours after the end of a storm event, the bottom of the swale should be roto-tilled or cultivated to break up any hard-packed sediment, and then re-seeded.