PUTNAM VALLEY CENTRAL SCHOOL DISTRICT
PUTNAM VALLEY, NY

MS4PY5 STORMWATER PROGRAM

FACT SHEET # 5
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VEGETATED BIOSWALES FOR STORMWATER VOLUME REDUCTION AND WATER QUALITY IMPROVEMENTS

FOR MORE INFORMATION CONTACT YOUR STORMWATER COORDINATOR:

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1. A VEGETATED BIOSWALE

A bioswale accepts sheet flow from adjacent surfaces including parking lots. Swales have gently sloping sides and are used to convey overland flow of stormwater down a gentle sloping gradient to a stormwater destination such as a wetland or some other stormwater discharge destination. The stormwater functions of a vegetated swale are as follows:

- **Providing Directed Conveyance:** vegetated bioswales are well suited to areas adjacent to parking lots and impervious surfaces, where runoff can be conveyed and filtered, before it is discharged into a stormwater system or surface water body
- **Flood Control:** vegetated swales provide effective stormwater flood control by slowing down runoff and discharging the collected runoff to its final stormwater destination
- **Water Quality Improvements:** vegetated bioswales improve water quality by filtering pollutants from the stormwater (oils and greases, metals and sediments that can be picked up from paved surfaces)
- **Volume Reduction:** through plant adsorption and evapo-transpiration, bioretention systems reduce offsite stormwater runoff

2. EFFECTIVENESS

According to USEPA 1999 studies, vegetated bioswales can potentially remove from 20% to 40% of sediments and pollutants and sometimes as high as 80% of suspended solids.

3. DESIGN CONSIDERATIONS

A bioretention system should incorporate the following design implementation considerations:

- **Drainage Area Design and Swale Slope:** The bioswales should be used to treat relatively small, flat, drainage areas of less than 5 acres. If the swale is larger than 5 acres, with a channel slope of greater than 4%, the flow velocity in the swale may be too great for effective treatment, and channel erosion may occur
- **Inlet Slotted-Curbed Entrance:** the entrance to the swale should be designed with evenly spaced concrete curbs blocks to uniformly distribute stormwater into the channel from the collection area
- **Trapezoidal Cross Section:** The bioswale channel should have a trapezoidal cross section with relatively flat sides slopes of 2:1 or less, to allow stormwater to enter the swale without eroding the swale shoulder
- **Rip-Rap Swale Banks:** the channel banks should be lined with rip-rap rock, to protect the channel banks from erosion
- **Flat Channel bottom:** the channel bottom should be 4 feet to 6 feet wide, above the soil and gravel bed, to ensure sufficient filtering surface for water quality treatment
- **Soil and Gravel Bed:** the planting bed should be constructed with 24 inches of a permeable sandy soil, (70% sand and 30 % organic composted material). The gravel bed (below the planting bed and separated by a liner) should be designed with 12 inches of ¾ inch stone, containing a 12 inch PVC perforated underdrain pipe, to direct the runoff flow in the channel to its stormwater destination
- **Groundwater Table Depth:** the bottom of the swale should be at least 1 feet above the groundwater table to prevent the swale bottom from being too wet

4. LIMITATIONS

Vegetated bioswales have a few limitations:

- **Vegetative Cover:** The vegetative cover in the channel has to be maintained to control erosion
- **Channel Maintenance:** requires maintenance to remove trash and sediment in the channel, to permit infiltration into the soil and gravel bed beneath the channel