

<b>PROJECT NAME:</b>	Hawk Ridge Bioretention Retrofit	<b>DATE:</b>	12/14/07
<b>ADDRESS/BLOCK &amp; LOT</b>	Bethlehem Township Block 35, Lot 6.16 – 5 Hawk Ridge Road		
<b>FACILITY TYPE:</b>	Existing Stormwater Outlet/Vegetated Swale	<b>PRIORITY:</b>	>6

**1. ISSUES AND CONCERNS:**

The existing stormwater discharge and swale at the Hawk Ridge development provides an opportunity to develop a high level water quality stormwater treatment design using a combination of wetland and infiltration best management practice techniques. There does not appear to be any significant stormwater management control issues related to erosion or downstream impacts. Sediment from the roadways and drives has collected in the system over several years and should be removed. While sediment deposited in the swale is slowing and restricting discharge from the system, the property owner has taken on responsibility for maintaining an open channel through the wetland vegetation to keep higher flows moving across the property and into the receiving water way. The owner appears to appreciate the diversity in the landscape and the opportunity for wetland habitat to develop in the system and mentioned that small amphibians do use the site on an annual basis. While no significant threats to water quality, property, or overall watershed health are a concern, the site provides a significant opportunity to design and install a BMP that combines water quality treatment, habitat enhancement, as well as meets aesthetic requirements for managed residential landscapes.

**2. EXISTING CONDITION BASED ON FIELD EVALUATION:**

The Hawk Ridge residential subdivision located in Bethlehem contains seven homes located along an 1,200-foot cul-de-sac road. The homes are situated on 2-acre lots and stormwater from the road and properties is collected in a curb and gutter system within the road right-of-way and directed to the low point in the road near the mid-point of the road length. The system then carries stormwater approximately 200 feet and discharges at grade in a drainage easement flowing overland to a small ditch which flows into a pond on the adjacent property. No stormwater detention basin or outlet control structure is provided and the flows discharge into a shallow swale that has filled in with sediment. The property owner is annually cleaning out the swale to minimize ponding and improve flow. The swale has become established with wetland rushes and sedges. Near the outlet, the swale appears to remain wet throughout much of the year. Further sedimentation could become a significant issue if stormwater can no longer flow through the swale and ponding as well as nuisance flooding should occur. This could potentially lead to issues with nearby septic systems, mosquito breeding, and wet basements.

**3. PROPOSED SOLUTIONS:**

Stormwater wetland systems and bioretention swales provide a high degree of water quality treatment for stormwater runoff. These systems provide for not only settling of sediment, but filtering, nutrient uptake, as well as trapping and removal of pollutants through soil media and plantings used in the system. In addition, if properly designed, these systems can be integrated into the existing landscape as a visually attractive amenity and maintained as a landscaped feature by a property owner. Often these systems are referred to as rain gardens and planted with native flowering trees, shrubs, and wildflowers. A rain garden can also provide habitat and food sources for small desirable wildlife species and songbirds. For the Hawk Ridge development, the plan recommends working closely with the property owner to design and install a rain garden system providing for wetland and/or bioretention treatment depending upon groundwater elevations and proximity to adjacent septic system drainfields. The BMP would provide pollutant removal from stormwater runoff generated by roadways and drives, reduce runoff volume and increase recharge at the site. The wetland/bioretention area should be sized to capture and treat the water quality design storm (1.25") runoff volume. The NJDEP Stormwater BMP Manual has adopted a TSS removal rate of 90% for this BMP system. The system should be designed to capture larger sediment in an easily accessible location (forebay) for routine removal and then allow stormwater to flow through prepared soil media and plantings for pollutant removal and infiltration.

**4. ANTICIPATED BENEFITS:**

Preliminary calculations estimate that the system at Hawk Ridge receives runoff from a 9.1 acre drainage area that can be predominately classified as residential landscape with an expected Total Suspended Solid (TSS) load of 100 lbs/acre/yr and Total Phosphorus (TP) load of 0.6 lbs/acre/yr (NJDEP 2004 – The NJSW BMP Manual). This traditional stormwater management approach does little to minimize impacts to water quality. Water is collected from the development and conveyed to an open channel and discharged off-site. This type of channelized flow does not detain runoff, filter pollutants, or allow for infiltration, most significant during smaller water quality storm events. The proposed rain garden would detain, treat, and infiltrate the water quality storm event. Based on mass loading rates, it is estimated that a total of 910 lbs/yr of TSS and 5.46 lbs/yr of TP are generated by the site. While the existing system has little runoff quality benefit, the proposed bioretention/wetland would remove 819 lbs/yr of TSS and 3.276 lbs/yr of TP.

**5. MAJOR IMPLEMENTATION ISSUES:**

The owner of Lot 6.16 in the Hawk Ridge Development will need to endorse the project and allow project partners to install and maintain the stormwater BMP within the drainage easement located on their property. A close partnership should be established so that the design blends into the existing landscape and the homeowner understands the importance of the system and need for routine maintenance.

**6. RETROFIT/REPAIR OPPORTUNITIES AND COSTS**

TASK	DESCRIPTION			ESTIMATED COSTS	
1	Prepare concept plan and present to homeowner.			\$5,000.00	
2	Complete site topographic survey and soils testing.			\$6,000.00	
3	Prepare final design plans.			\$5,000.00	
4	Prepare Stormwater BMP Maintenance Plan per NJDEP requirements			\$2,000.00	
5	Prepare construction documents and solicit quotes from contractors.			\$4,000.00	
6	<b>Install Stormwater BMP retrofits</b>				
		QUANTITY	UNITS	UNIT PRICE	
	Mobilization/Erosion Control	1	LS	\$ 5,000.00	\$5,000.00
	Outlet and Piping Repair	1	LS	\$ 3,500.00	\$3,500.00
	Wetland/Bioretention Construction	2000	SF	\$ 6.00	\$12,000.00
	Vegetation Mngmt/Plantings	1	LS	\$ 3,000.00	\$3,000.00
	Closeout/Contingency (20%)	1	LS	\$ 4,700.00	\$4,700.00
	<b>Total Construction Cost</b>				<u>\$33,200.00</u>
			<b>TOTAL COST:</b>	\$55,200.00	
			<b>ANNUAL O&amp;M COST:</b>	\$1,000.00	



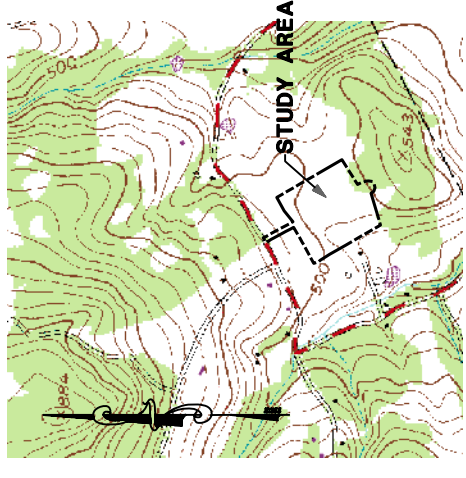
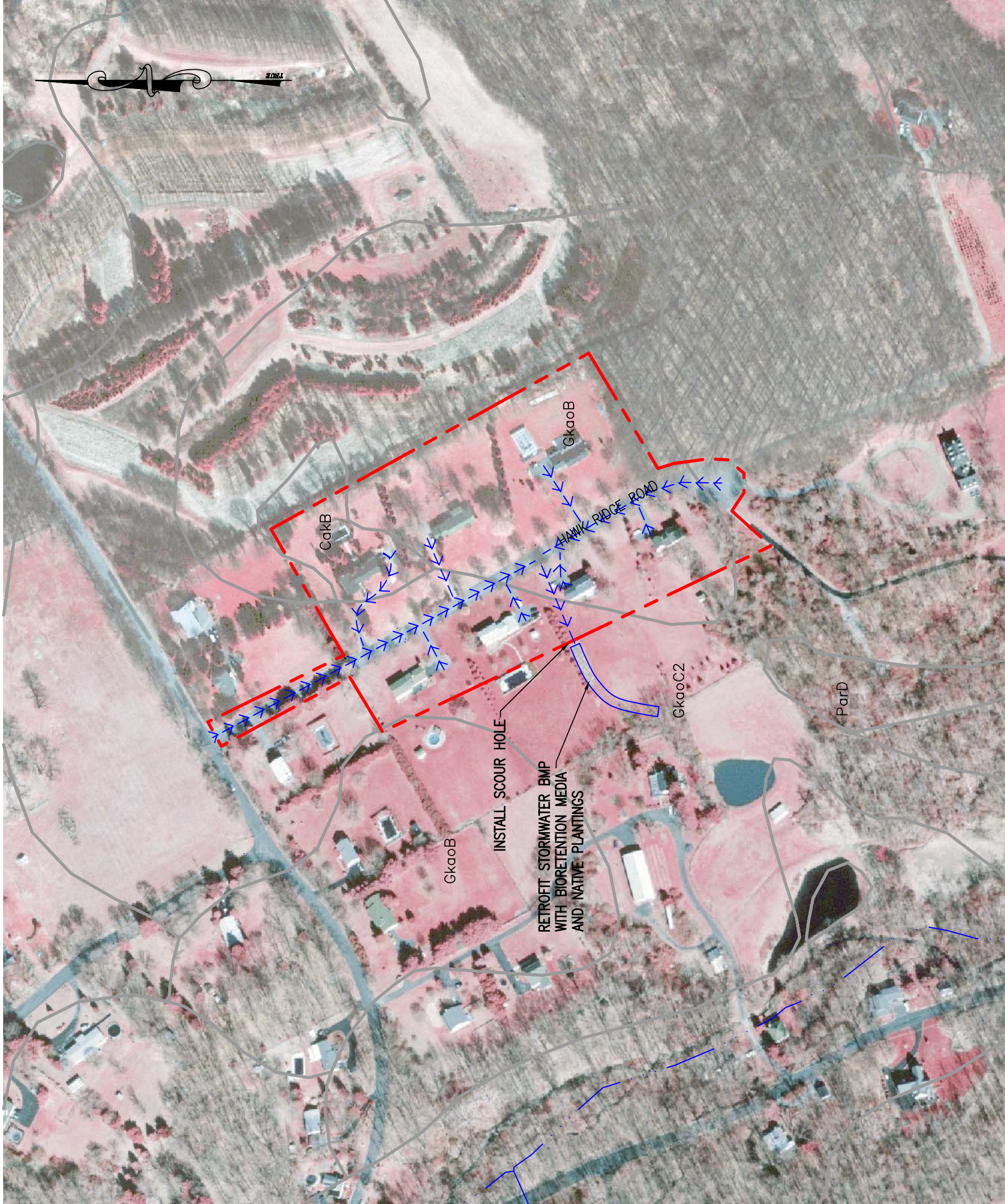
**Vegetated stormwater discharge**



**Stormwater discharge filled in with debris**



**Vegetated stormwater discharge**



**USGS QUAD LOCATION MAP**  
(HIGH BRIDGE, NOT TO SCALE)

**LEGEND**

- - - DRAINAGE AREA
- · - · - STREAM
- SOILS
- PROPOSED BMP RETROFIT LOCATION
- → → → RUNOFF FLOW DIRECTION

**SOILS:**  
 CakB - Califton Loam, 3-8% Slopes  
 GkaoB - Gladstone Gravelly Loam, 3-8% Slopes  
 GkaoC2 - Gladstone Gravelly Loam, 8-15% Slopes, eroded  
 ParD - Parker Cobbly Loam, 15-25% Slopes



<b>SITE PLAN</b>	
<b>HAWK RIDGE BIORETENTION RETROFIT</b>	
DATE: DECEMBER 14, 2007	BLOCK 35, LOT 6:16 BETHLEHEM TOWNSHIP HUNTERDON COUNTY, NEW JERSEY
SCALE: 1" = 200'	OMNI ENVIRONMENTAL
SHT. NO. 1 of 1	321 WALL STREET PRINCETON, NJ 08540 PH: (609) 924-4821 FAX: (609) 924-4851

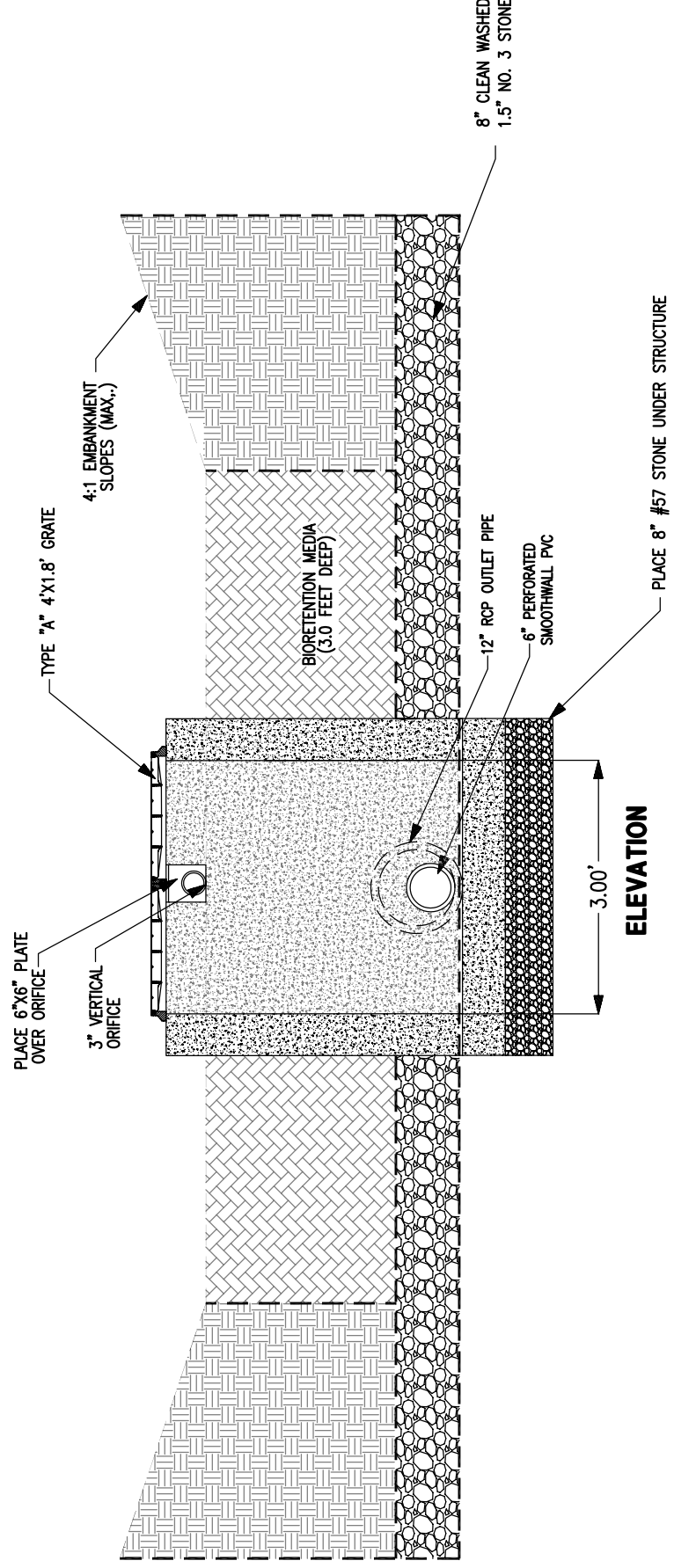
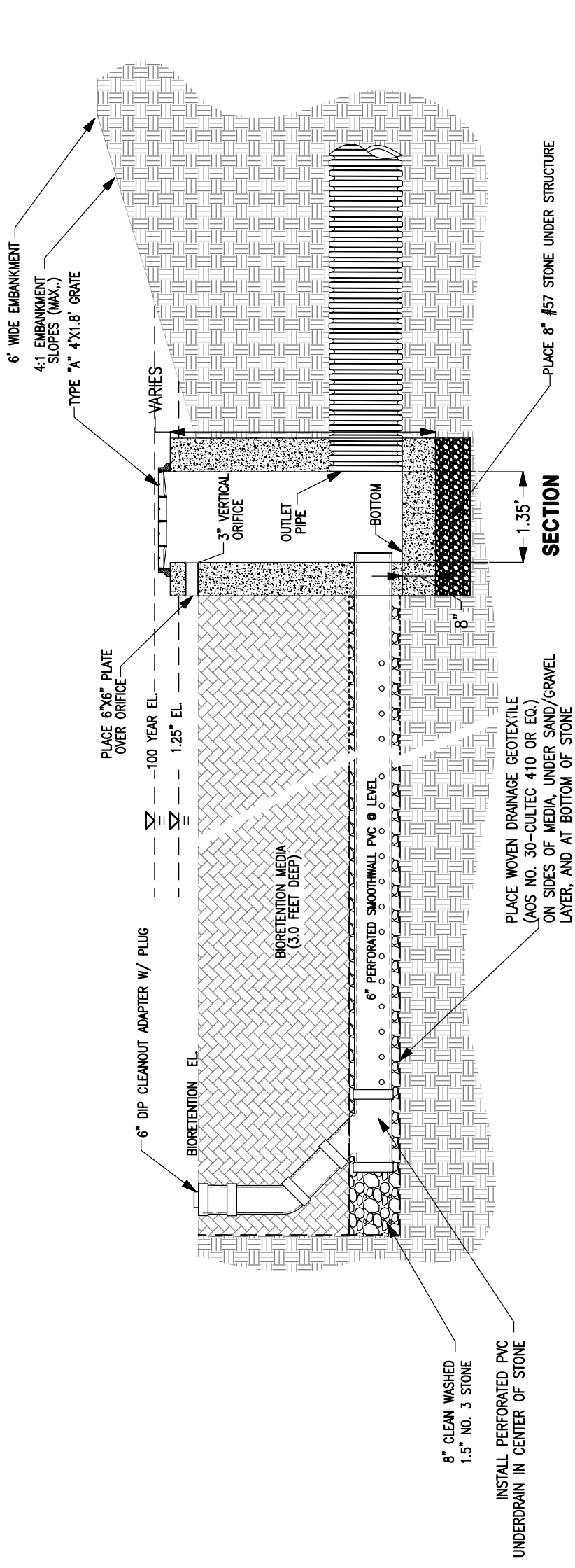
**BIORETENTION BASIN AND SWALE SEED MIX**

QTY (PLS)	BOTANICAL NAME	COMMON NAME
20 lb/acre	Festuca Rubra	Creeping Red Fescue
10 lb/acre	Agrostis perennans	Autumn Bentgrass
2 lb/acre	Eragrostis trichodes	Sand Lovegrass

**PLANTING NOTES:**

- CONTACT VENDORS FOR SEED PRICING AND AVAILABILITY.
- ALL SEEDED AREAS ON SLOPES SHALL BE STABILIZED WITH A BIODEGRADABLE EROSION CONTROL BLANKET SUCH AS LANDLOCK C2, NORTH AMERICAN GREEN S150, OR EQUIVALENT MATERIAL, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. SEE SEDIMENT AND EROSION CONTROL PLAN FOR LOCATION OF EROSION CONTROL BLANKET.
- TURF MAY BE SUBSTITUTED FOR THE NATIVE SEED MIX, ALTHOUGH THE SWALE SEED MIX IS RECOMMENDED.

**BIORETENTION SEED MIX (TYP.)  
N.T.S.**



NOTE: BMP DETAILS ARE GENERIC AND ARE NOT MEANT FOR DETAILED BMP DESIGN.

<b>BIORETENTION BASIN &amp; RAIN GARDEN DETAILS</b>	
<b>MULHOCKAWAY CREEK STORMWATER BMP RETROFITS</b>	
DATE: DECEMBER 14, 2007	
SCALE: NTS	OMNI/ENVIRONMENTAL
SHT. NO. 1 of 1	321 WALL STREET PRINCETON, NJ 08540 PH: (609) 924-8821 FAX: (609) 924-8851

**BIORETENTION BASIN AND RAIN GARDEN DETAILS (TYP.)  
N.T.S.**