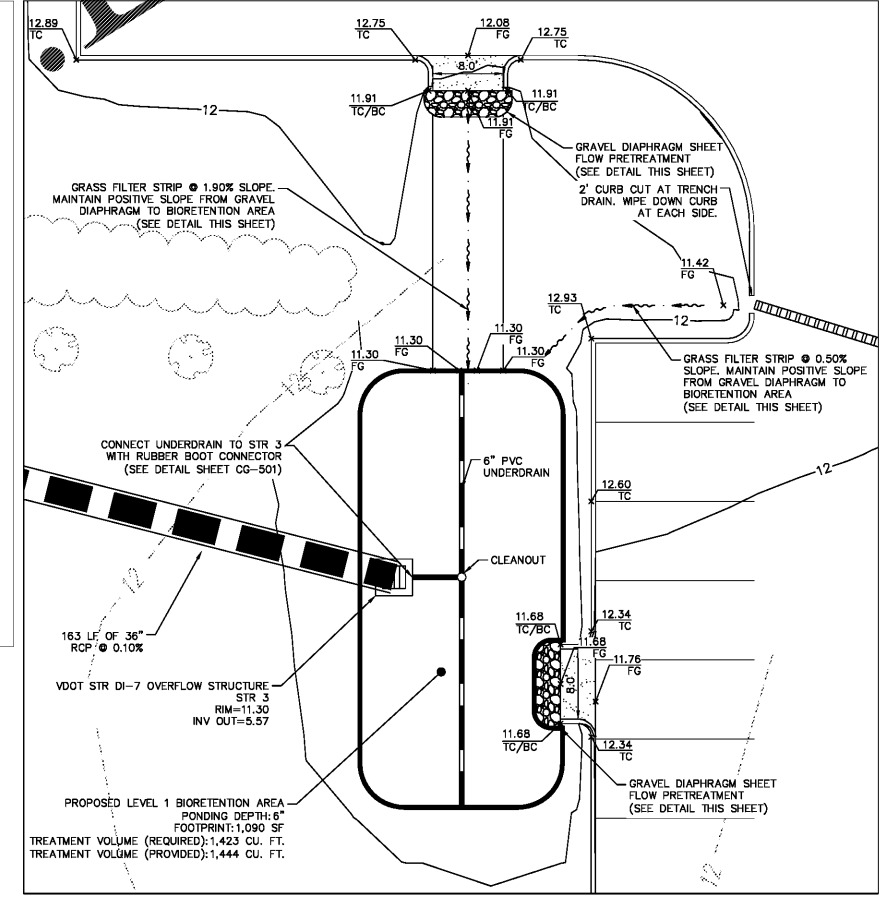
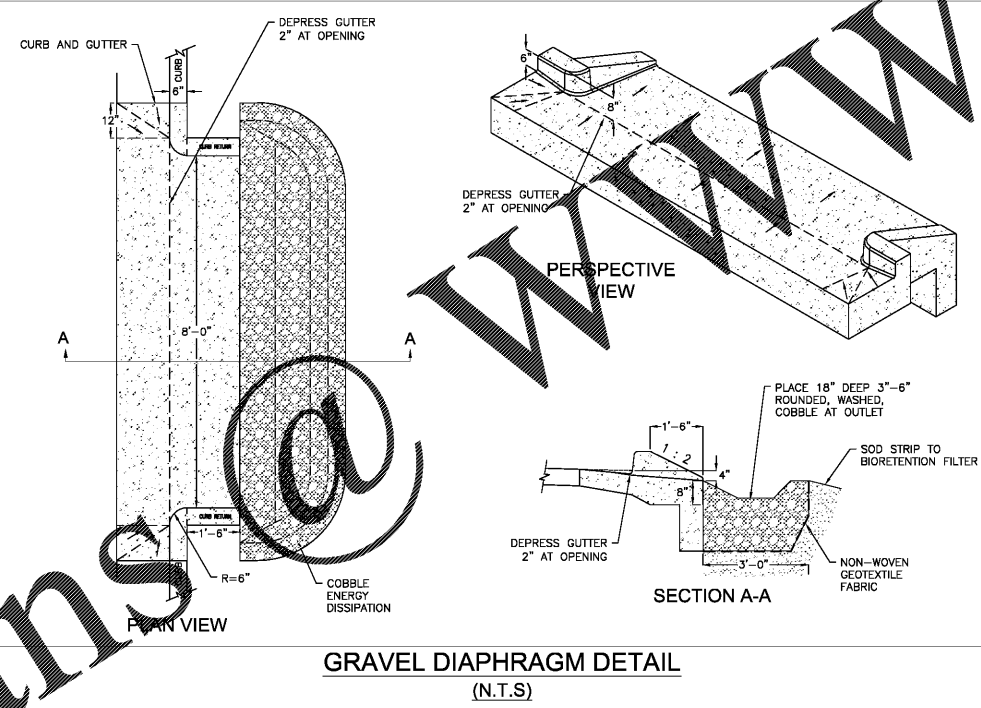


Table 9.7. Bioretention Material Specifications

Material	Specification	Notes
Filter Media Composition	Filter Media to contain: • 80% - 90% sand • 10% - 20% soil fines • 5% - 5% organic matter	The volume of filter media based on 110% of the clean volume, to account for settling or compaction.
Filter Media Testing	Available P between L+ and M per DCR 2005 Nutrient Management Criteria.	The media should be certified by the supplier.
Mulch Layer	Use aged, shredded hardwood bark mulch or stable coarse compost.	Lay a 2 to 3 inch layer on the surface of the filter bed.
Alternative Surface Cover	Use river stone or pea gravel, size and type meeting or exceeding:	Lay a 2 to 3 inch layer of to suppress weed growth.
Top Soil For Turf Cover	Loamy sand or sandy loam texture, with less than 5% clay content, pH corrected to between 6 and 7, and an organic matter content of at least 2%.	3 inch surface depth.
Geotextile Liner	Use a non-woven geotextile fabric with a flow rate of > 110 gal./min./sq. ft. (e.g., Geotex 351 or equivalent).	Apply only to the sides and directly above the underdrain. For hotspots and certain silt sites only, use an appropriate liner on bottom.
Choking Layer	Lay a 2 to 4 inch layer of sand over a 2 inch layer of choker stone (typically #8 or #10 washed gravel), which is laid over the underdrain stone.	
Stone Jacket for Underdrain and/or Storage Layer	1 inch stone should be double-washed and clean and free of all fines (e.g., VDOT #57 stone).	12 inches for the underdrain; 12 to 18 inches for the stone storage layer if needed.
Underdrains, Cleanouts, and Observation Wells	Use 6 inch rigid schedule 40 PVC pipe (or equivalent, corrugated HDPE for micro-bioretention), with 3/8-inch perforations at 6 inches on center; position each underdrain on a 1% or 2% slope located not more than 20 feet from the next pipe.	Lay the perforated pipe under the length of the bioretention cell, and install non-perforated pipe as needed to connect with the storm drain system. Install T's and Y's as needed depending on the underdrain configuration. Extend cleanout pipes to the surface. Extend observation wells to the top of the mulch layer. Establish materials as specified in the landscaping plan and the recommended feet on-center, minimum 3 feet (see detail sheet CO-501).
Plant Materials	Plant one tree per 250 square feet (15 feet on-center, minimum 3 feet on-center). Planting should be done in accordance with the landscaping plan. Establish a minimum of 30 trees high planted a minimum of 10 feet on-center. Plant ground cover plugs at 18 inches on-center. Plant cover grasses at 18 to 24 inch on-center depending on the initial site conditions and how large it will grow.	Establish plants as specified in the landscaping plan and the recommended feet on-center, minimum 3 feet (see detail sheet CO-501). If seed and plugs are used, they should be from a qualified supplier, should be appropriate for stormwater basin applications, and should consist of native species (unless the seeding is to establish maintained turf).

BIORETENTION SWALE MAINTENANCE

- MAINTENANCE AGREEMENT**
- SECTION 4 VAC 50-60-124 OF THE REGULATIONS SPECIFIES THE CIRCUMSTANCES UNDER WHICH A MAINTENANCE AGREEMENT MUST BE EXECUTED BETWEEN THE OWNER AND THE LOCAL PROGRAM. THIS SECTION SETS FORTH INSPECTION REQUIREMENTS, COMPLIANCE PROCEDURES IF MAINTENANCE IS NEGLECTED, NOTIFICATION OF THE LOCAL PROGRAM UPON TRANSFER OF OWNERSHIP, AND RIGHT-OF-ENTRY FOR LOCAL PROGRAM PERSONNEL.
- FOR BIORETENTION, MAINTENANCE AGREEMENTS MUST CONTAIN RECOMMENDED MAINTENANCE TASKS AND A COPY OF AN ANNUAL INSPECTION CHECKLIST. A DEED RESTRICTION, DRAINAGE EASEMENT OR OTHER MECHANISM ENFORCEABLE BY THE QUALIFYING LOCAL PROGRAM MUST BE IN PLACE TO HELP ENSURE THAT RAIN GARDENS AND BIORETENTION FILTERS ARE MAINTAINED AND NOT CONVERTED OR DISTURBED, AS WELL AS TO PASS THE KNOWLEDGE ALONG TO ANY SUBSEQUENT OWNERS. THE MECHANISM SHOULD, IF POSSIBLE, GRANT AUTHORITY FOR LOCAL AGENCIES TO ACCESS THE PROPERTY FOR INSPECTION OR CORRECTIVE ACTION.
- FIRST YEAR MAINTENANCE AGREEMENTS**
- FOR THE FIRST 6 MONTHS FOLLOWING CONSTRUCTION, THE SITE SHOULD BE INSPECTED AT LEAST TWICE AFTER STORM EVENTS THAT EXCEED 1/2 INCH OF RAINFALL.
 - INSPECTORS SHOULD LOOK FOR BARE OR ERODING AREAS IN THE CONTRIBUTING DRAINAGE AREA OR AROUND THE BIORETENTION AREA, AND MAKE SURE THEY ARE IMMEDIATELY STABILIZED WITH GRASS COVER.
 - ONE-TIME, SPOT FERTILIZATION MAY BE NEEDED FOR INITIAL PLANTINGS.
 - WATERING IS NEEDED ONCE A WEEK DURING THE FIRST 2 MONTHS, AND THEN AS NEEDED DURING FIRST GROWING SEASON (APRIL-OCTOBER), DEPENDING ON RAINFALL.
 - SINCE UP TO 10% OF THE PLANT STOCK MAY DIE OFF IN THE FIRST YEAR, CONSTRUCTION CONTRACTS SHOULD INCLUDE A CARE AND REPLACEMENT WARRANTY TO ENSURE THAT VEGETATION IS PROPERLY ESTABLISHED AND SURVIVES DURING THE FIRST GROWING SEASON FOLLOWING CONSTRUCTION. THE TYPICAL THRESHOLDS BELOW WHICH REPLACEMENT IS REQUIRED ARE 85% SURVIVAL OF PLANT MATERIAL AND 100% SURVIVAL OF TREES.
- MAINTENANCE INSPECTIONS**
- IT IS HIGHLY RECOMMENDED THAT A SPRING MAINTENANCE INSPECTION AND CLEANUP BE CONDUCTED ADDRESSING THE FOLLOWING KEY MAINTENANCE PROBLEMS:
- CHECK TO SEE IF 75% TO 90% COVER (MULCH PLUS VEGETATIVE COVER) HAS BEEN ACHIEVED IN THE BED, AND MEASURE THE DEPTH OF THE REMAINING MULCH.
 - CHECK FOR SEDIMENT BUILDUP AT CURB CUTS, GRAVEL DIAPHRAGMS OR PAVEMENT EDGES THAT PREVENTS FLOW FROM GETTING INTO THE BED, AND CHECK FOR OTHER SIGNS OF BYPASSING.
 - CHECK FOR ANY WINTER OR SALT-KILLED VEGETATION, AND REPLACE IT WITH HARDIER SPECIES.
 - NOTE PRESENCE OF ACCUMULATED SAND, SEDIMENT AND TRASH IN THE PRE-TREATMENT CELL OR FILTER BEDS, AND REMOVE IT.
 - INSPECT BIORETENTION SIDE SLOPES AND GRASS FILTER STRIPS FOR EVIDENCE OF ANY RILL OR GULLY EROSION, AND REPAIR IT.
 - CHECK THE BIORETENTION BED FOR EVIDENCE OF MULCH FLOTATION, EXCESSIVE PONDING, DEAD PLANTS OR CONCENTRATED FLOWS, AND TAKE APPROPRIATE REMEDIAL ACTION.
 - CHECK INFLOW POINTS FOR CLOGGING, AND REMOVE ANY SEDIMENT.
 - LOOK FOR ANY BARE SOIL OR SEDIMENT SOURCES IN THE CONTRIBUTING DRAINAGE AREA, AND STABILIZE THEM IMMEDIATELY.
 - CHECK FOR CLOGGED OR SLOW-DRAINING SOIL MEDIA, A CRUST FORMED ON THE TOP LAYER, INAPPROPRIATE SOIL MEDIA OR OTHER CAUSES OF INSUFFICIENT FILTERING TIME, AND RESTORE PROPER FILTRATION CHARACTERISTICS.

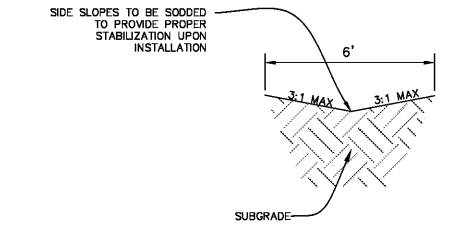
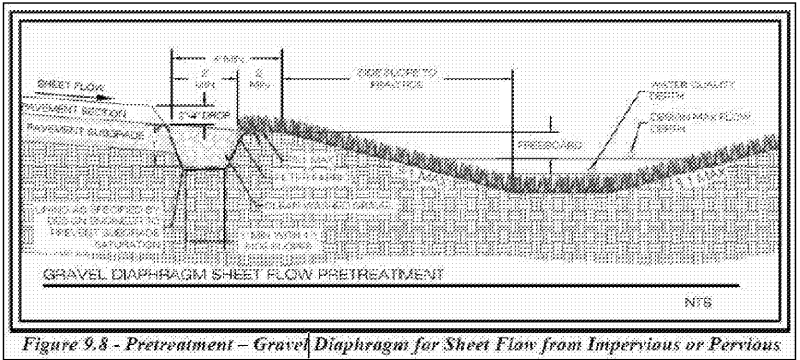


SUGGESTED ANNUAL MAINTENANCE ACTIVITIES FOR BIORETENTION

MAINTENANCE TASKS	FREQUENCY
MOWING OF GRASS FILTER STRIPS AND BIORETENTION TURF COVER	AT LEAST 4 TIMES PER YEAR
SPOT WEEDING, EROSION REPAIR, TRASH REMOVAL, AND MULCH RAKING	TWICE DURING GROWING SEASON AS NEEDED
ADD REINFORCEMENT PLANTING TO MAINTAIN DESIRED VEGETATION DENSITY	AS NEEDED
REMOVE INVASIVE PLANTS USING RECOMMENDED CONTROL METHODS	AS NEEDED
STABILIZE THE CONTRIBUTING DRAINAGE AREA TO PREVENT EROSION	AS NEEDED
SPRING INSPECTION AND CLEANUP	ANNUALLY
SUPPLEMENT MULCH TO MAINTAIN A 3 INCH LAYER	AS NEEDED
PRUNE TREES AND SHRUBS	AS NEEDED
REMOVE SEDIMENT IN PRE-TREATMENT CELLS AND FLOWS	EVERY 2 TO 3 YEARS
REPLACE THE MULCH LAYER	EVERY 2 TO 3 YEARS

GENERAL CONSTRUCTION SEQUENCE

- EXCAVATE THE CONTRIBUTING AREAS TO THE DESIGN CONDITIONS.
 - PLACE WASHED #57 TO A DEPTH OF 12 INCHES.
 - BACKFILL WITH BIO-RETENTION MIXTURE AS SPECIFIED IN THE CHART ON THIS SHEET TO A DEPTH OF 3 FEET. SOIL MUST NOT BE INSTALLED UNTIL ALL CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED AND APPROVED BY THE INSPECTOR.
 - INSTALL LANDSCAPING PRE-TREATMENT PLANTING PLAN AND PLANTING DETAILS. SEE SHEET CP-101 AND CP-501.
 - STABILIZE THE SLOPES OF THE BIO-RETENTION AREA WITH GRASS SOD OR SURROUND THE AREA WITH SILT FENCE TO PREVENT SEDIMENT FROM CONTAMINATING THE SOIL MIXTURE.
- REFER TO LOCAL SPEC. NO. FOR MORE DETAILS ON INSTALLATION



Issued: 08/23/17

A	BID SET	08/23/17
B		
C		
D		

Revisions: 05/11/2017

1	ADDRESS CITY COMMENTS	05/11/2017
2	ADDRESS CITY COMMENTS	07/11/2017
3		
4		
5		



Seal PROJECT ARCHITECT/ENGINEER DATE

PROJECT LEAD DATE

PROJECT DESIGNER DATE

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Project Name & Location:

BIORETENTION NOTES & DETAILS

Drawing Name: Project No. 113180024

Date: 02/08/17

Type:

Drawn By: SMP CG-502

Scale: As Noted Drawing No.