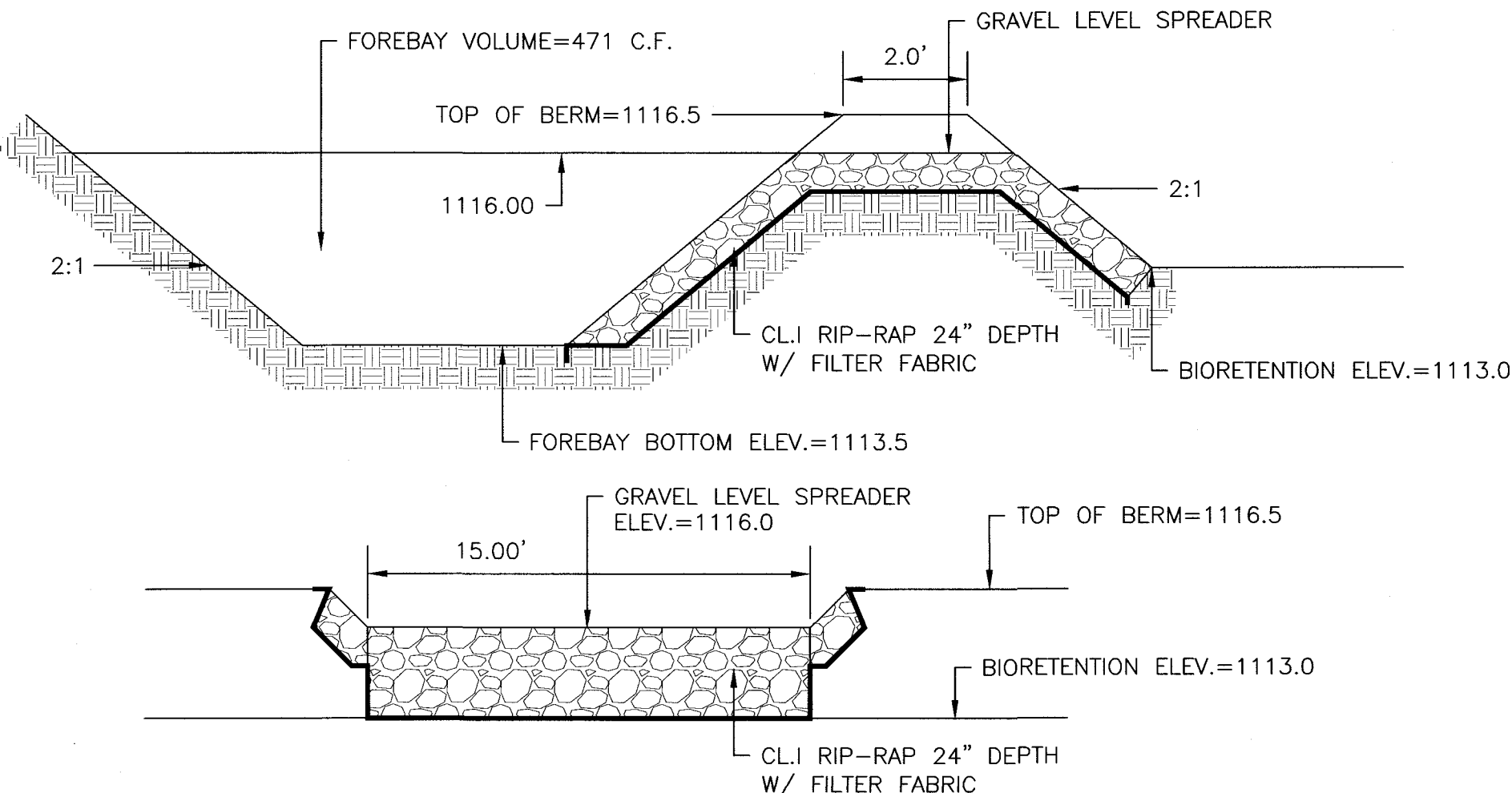
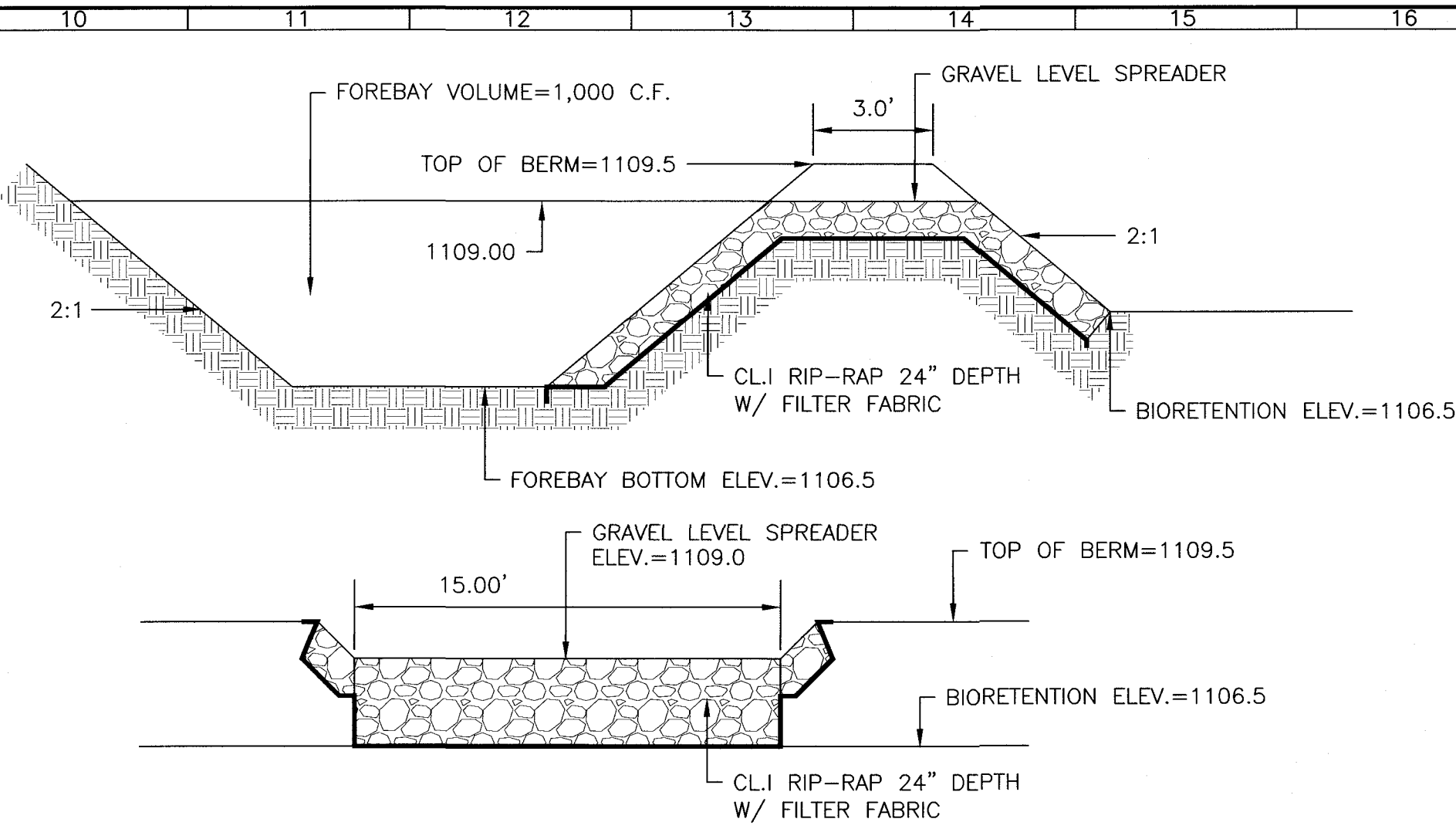


STANDARD BIORETENTION NOTES

1. THE BIORETENTION BASIN SHOWN IS BASED ON THE LEVEL 2 DESIGN ACCORDING TO "VA DCR STORMWATER DESIGN SPECIFICATION NO. 9" (2013).
2. FINISHED GRADE (TOP OF MEDIA) SHALL BE FLAT AT THE ELEVATIONS SHOWN. MINIMUM AREA FOR BIORETENTION A SHALL BE 3,312 S.F. AND FOR BIORETENTION B SHALL BE 1,687 S.F.
3. CLEAN SILICA BASED COARSE SAND SHALL BE USED IN THE CHOKING LAYER AND SHALL CONFORM TO AASHTO M-6/ASTM C-33.
4. MEDIA MIX SHALL CONFORM TO SPECIFICATIONS OUTLINED IN VA DCR STORMWATER DESIGN SPECIFICATION TABLE 9.6, ON THIS SHEET, AND THE COMPOSITION OF THE MEDIA MIX SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL WITH ROANOKE CITY BEFORE BEING TRANSPORTED TO THE SITE.
5. AS-BUILT INFORMATION SHALL BE SUBMITTED TO THE ENGINEER AS OUTLINED IN THE AS-BUILT NOTES ON THIS SHEET.
6. THE BIORETENTION BASIN SHALL BE PLANTED AS SHOWN ON THE LANDSCAPE PLAN AND SHALL MATCH SPACING SPECIFICATION ON TABLE 9.7, SHOWN ON THIS SHEET.

STORM SEWER/SWM/SWQ AS-BUILT NOTES:

1. G.C. SHALL BE RESPONSIBLE FOR COORDINATING ALL REQUIRED AS-BUILTS AT THE APPROPRIATE TIME DURING CONSTRUCTION WITH THE PROJECT ENGINEER/SURVEYOR FOR CONFIRMATION AS REQUIRED BY THE LOCALITY.
2. THE G.C. SHALL BE RESPONSIBLE FOR CONTACTING THE ENGINEER/SURVEYOR TO LOCATE ALL REQUIRED AS-BUILT STORM SEWER IMPROVEMENTS AS REQUIRED BY THE LOCALITY PRIOR TO ANY CURB, STONE, OR ASPHALT PLACEMENT. THIS INFORMATION SHALL BE FORWARDED TO THE LOCALITY FOR REVIEW/APPROVAL.
- ~~3. G.C. SHALL BE RESPONSIBLE FOR COORDINATING ANY MANUFACTURER REQUIRED START-UPS & PROVIDING ASSOCIATED PAPERWORK TO THE LOCALITY/ENGINEER ONCE THE MANUFACTURED BMP IS ACTIVE & FUNCTIONAL.~~
4. BIORETENTION FACILITY AS-BUILTS SHALL BE PROVIDED IN STEPS.
 - a. BIORETENTION MEDIA MIX SHALL CONFORM TO SPECIFICATIONS OUTLINED IN VA DCR STORMWATER DESIGN SPECIFICATION TABLE 9.6, ON THIS SHEET, AND THE COMPOSITION OF THE MEDIA MIX SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL WITH THE LOCALITY BEFORE TRANSPORTED TO THE SITE.
 - b. G.C. SHALL NOTIFY THE ENGINEER OF WHEN THE BIORETENTION FACILITY WILL BE AT SUBGRADE. THE SUBGRADE ELEVATION AND DIMENSIONS OF THE BIORETENTION FACILITY SHALL BE CONFIRMED BY THE ENGINEER PRIOR TO ANY MEDIA, STONE, OR UNDERDRAINS BEING INSTALLED WITHIN THE FACILITY.
 - c. THE G.C. SHALL TAKE PHOTOS DURING ALL PHASES OF THE CONSTRUCTION WITH REFERENCED MEASUREMENTS/ELEVATIONS SO VISUAL CONFIRMATION CAN BE PROVIDED TO THE ENGINEER/LOCALITY REGARDING THE BIORETENTION PROFILE ALONG WITH ALL REQUIRED LOCALITY INTERIM INSPECTIONS.
 - d. THE OWNER/CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING FINAL AS-BUILTS REQUIRED BY THE LOCALITY AS OUTLINED IN THE PROJECT CONTRACT.



STANDARD BIORETENTION CONSTRUCTION SEQUENCE

NOTE: PORTIONS OF THIS STANDARD CONSTRUCTION SEQUENCE MAY NOT APPLY TO THIS INSTALLATION.

1. CONSTRUCTION OF THE BIORETENTION AREA MAY ONLY BEGIN AFTER THE ENTIRE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED WITH VEGETATION. IT MAY BE NECESSARY TO BLOCK CERTAIN CURB OR OTHER INLETS WHILE THE BIORETENTION AREA IS BEING CONSTRUCTED. THE PROPOSED SITE SHOULD BE CHECKED FOR EXISTING UTILITIES PRIOR TO ANY EXCAVATION.
2. THE DESIGNER AND THE INSTALLER SHOULD HAVE A PRECONSTRUCTION MEETING, CHECKING THE BOUNDARIES OF THE CONTRIBUTING DRAINAGE AREA TO AND THE ACTUAL INLET ELEVATIONS TO ENSURE THEY CONFORM TO THE ORIGINAL DESIGN. SINCE OTHER CONTRACTORS MAY BE RESPONSIBLE FOR CONSTRUCTING PORTIONS OF THE SITE, IT IS QUITE COMMON TO FIND SUBTLE DIFFERENCES IN SITE GRADING, DRAINAGE, AND PAVING ELEVATIONS THAT CAN PRODUCE HYDRAULICALLY IMPORTANT DIFFERENCES FOR THE PROPOSED BIORETENTION AREA. THE DESIGNER SHOULD CLEARLY COMMUNICATE, IN WRITING, ANY PROJECT CHANGES DETERMINED DURING THE PRECONSTRUCTION MEETING TO THE INSTALLER AND THE PLAN REVIEW/INSPECTION AUTHORITY.
3. TEMPORARY E&S CONTROLS ARE NEEDED DURING CONSTRUCTION OF THE BIORETENTION AREA TO DIVERT STORMWATER AWAY FROM THE BIORETENTION AREA UNTIL IT IS COMPLETED. SPECIAL PROTECTION MEASURES SUCH AS EROSION CONTROL FABRICS MAY BE NEEDED TO PROTECT VULNERABLE SIDE SLOPES FROM EROSION DURING THE CONSTRUCTION PROCESS.
4. ANY PRETREATMENT CELLS SHOULD BE EXCAVATED FIRST AND THEN SEALED TO TRAP SEDIMENTS.
5. EXCAVATORS OR BACKHOES SHOULD WORK FROM THE SIDES TO EXCAVATE THE BIORETENTION AREA TO ITS APPROPRIATE DESIGN DEPTH AND DIMENSIONS. EXCAVATING EQUIPMENT SHOULD HAVE SCOOPS WITH ADEQUATE REACH SO THEY DO NOT HAVE TO SIT INSIDE THE FOOTPRINT OF THE BIORETENTION AREA. CONTRACTORS SHOULD USE A CELL CONSTRUCTION APPROACH IN LARGER BIORETENTION BASINS, WHEREBY THE BASIN IS SPLIT INTO 500 TO 1,000 SQ. FT. TEMPORARY CELLS WITH A 10-15 FOOT EARTH BRIDGE IN BETWEEN, SO THAT CELLS CAN BE EXCAVATED FROM THE SIDE.
6. IT MAY BE NECESSARY TO RIP THE BOTTOM SOILS TO A DEPTH OF 6 TO 12 INCHES TO PROMOTE GREATER INFILTRATION.
7. PLACE GEOTEXTILE FABRIC ON THE SIDES OF THE BIORETENTION AREA WITH A 6-INCH OVERLAP ON THE SIDES. IF A STONE STORAGE LAYER WILL BE USED, PLACE THE APPROPRIATE DEPTH OF #57 STONE ON THE BOTTOM, INSTALL THE PERFORATED UNDERDRAIN PIPE, PACK #57 STONE TO 3 INCHES ABOVE THE UNDERDRAIN PIPE, AND ADD APPROXIMATELY 3 INCHES OF CHOKER STONE/PEA GRAVEL AS A FILTER BETWEEN THE UNDERDRAIN AND THE SOIL MEDIA LAYER. IF NO STONE STORAGE LAYER IS USED, START WITH 6 INCHES OF #57 STONE ON THE BOTTOM, AND PROCEED WITH THE LAYERING AS DESCRIBED ABOVE.
8. DELIVER THE SOIL MEDIA FROM AN APPROVED VENDOR, AND STORE IT ON AN ADJACENT IMPERVIOUS AREA OR PLASTIC SHEETING. APPLY THE MEDIA IN 12-INCH LIFTS UNTIL THE DESIRED TOP ELEVATION OF THE BIORETENTION AREA IS ACHIEVED. WAIT A FEW DAYS TO CHECK FOR SETTLEMENT, AND ADD ADDITIONAL MEDIA, AS NEEDED, TO ACHIEVE THE DESIGN ELEVATION.
9. PREPARE PLANTING HOLES FOR ANY TREES AND SHRUBS, INSTALL THE VEGETATION, AND WATER ACCORDINGLY. INSTALL ANY TEMPORARY IRRIGATION.
10. PLACE THE SURFACE COVER IN BOTH CELLS (MULCH, RIVER STONE OR TURF), DEPENDING ON THE DESIGN. IF COIR OR JUTE MATTING WILL BE USED IN LIEU OF MULCH, THE MATTING WILL NEED TO BE INSTALLED PRIOR TO PLANTING (STEP 9), AND HOLES OR SLITS WILL HAVE TO BE CUT IN THE MATTING TO INSTALL THE PLANTS.
11. INSTALL THE PLANT MATERIALS AS SHOWN IN THE LANDSCAPING PLAN, AND WATER THEM DURING WEEKS OF NO RAIN FOR THE FIRST TWO MONTHS.
12. CONDUCT THE FINAL CONSTRUCTION INSPECTION. THEN LOG THE GPS COORDINATES FOR EACH BIORETENTION FACILITY AND SUBMIT THEM FOR ENTRY INTO THE LOCAL MAINTENANCE TRACKING DATABASE.

VA DCR STORMWATER DESIGN SPECIFICATION NO. 9 BIORETENTION

Table 9.7. Bioretention Material Specifications		
Material	Specification	Notes
Filter Media Composition	Filter Media to contain: <ul style="list-style-type: none"> • 80% - 90% sand • 10%-20% soil fines • 3%-5% organic matter Available P between L+ and M per DCR 2005 Nutrient Management Criteria.	The volume of filter media based on 110% of the plan volume, to account for settling or compaction.
Filter Media Testing		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, coir and jute matting, or turf cover.	Lay a 2 to 3 inch layer of to suppress weed growth.
Top Soil For Turf Cover	Leamy sand or sandy loam texture with less than 6% 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 karst 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 #89 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 no 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 with vented caps at the T's and Y's.
Plant Materials	Plant one tree per 250 square feet (15 feet on-center, minimum 1 inch caliper). Shrubs a minimum of 30 inches high planted a minimum of 10 feet on-center. Plant ground cover plugs at 12 to 18 inches on-center. Plant container-grown plants at 18 to 24 inches on-center, depending on the initial plant size and how large it will grow.	Establish plant materials as specified in the landscaping plan and the recommended plant list. In general, plant spacing must be sufficient to ensure the plant material achieves 80% cover in the proposed planting areas within a 3-year period. If seed mixes 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 BASIN MATERIAL SPECIFICATIONS:

FIRST YEAR MAINTENANCE OPERATIONS:

- INITIAL INSPECTIONS – FOR THE FIRST 6 MONTHS FOLLOWING CONSTRUCTION, THE SITE SHOULD BE INSPECTED FOR EROSION AFTER STORM EVENTS THAT EXCEED 1/2" OF RAINFALL.
- SPOT SEEDING – 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.
- FERTILIZATION – ONE-TIME, SPOT FERTILIZATION MAY BE NEEDED FOR INITIAL PLANTINGS.
- WATERING – WATERING IS NEEDED ONCE A WEEK DURING THE FIRST 2 MONTHS, AND THEN AS NEEDED DURING THE FIRST GROWING SEASON (APRIL–OCTOBER), DEPENDING ON RAINFALL.
- REMOVE AND REPLACE DEAD PLANTS – PLANTS THAT DO NOT SURVIVE THE FIRST GROWING SEASON SHALL BE REMOVE AND REPLACED AT NO COST TO THE OWNER.

MAINTENANCE INSPECTIONS:

THE BIORETENTION BASIN SHALL BE INSPECTED AND CLEANED EVERY SPRING AS FOLLOWS:

- CONFIRM THAT 90% OF THE SURFACE AREA IS COVERED WITH VEGETATION. REMOVE AND REPLACE DEAD PLANTS AS NECESSARY. IF IT IS DETERMINED THAT THE VEGETATION WAS KILLED BY SALT OR THROUGH THE WINTER, REPLACE WITH A HARDIER SPECIES.
- NOTE THE PRESENCE OF SEDIMENT, TRASH, ETC. IN THE PRE-TREATMENT BASIN AND REMOVE AS NECESSARY.
- INSPECT THE SIDE SLOPES FOR FOR EVIDENCE OF RILL OR GULLY EROSION. REPAIR THESE AREAS AS NECESSARY.
- INSPECT THE BIORETENTION AREA FOR EVIDENCE OF CONCENTRATED FLOW, EROSION, AND EXCESSIVE PONDING AND REPAIR AS NECESSARY.
- CHECK INFLOW POINTS FOR CLOGGING AND REMOVE SEDIMENT FROM INLET SUMPS AS NECESSARY.
- STABILIZE ANY BARE SOIL OR OTHER SOURCES OF SEDIMENT EROSION IN THE CONTRIBUTING DRAINAGE AREA IMMEDIATELY.
- OPEN THE UNDERDRAIN OBSERVATION WELL OR CLEANOUT AND POUR IN WATER TO VERIFY THAT THE UNDERDRAINS ARE FUNCTIONING AND NOT CLOGGED OR OTHERWISE IN NEED OF REPAIR. THE PURPOSE OF THIS CHECK IS TO SEE IF THERE IS STANDING WATER ALL THE WAY DOWN THROUGH THE SOIL. IF THE UNDERDRAIN AND STAND PIPE ARE FILLED WITH STANDING WATER, THEN THE UNDERDRAIN IS CLOGGED AND WILL NEED TO BE SNAKED. IF THERE IS STANDING WATER ON TOP, BUT NOT IN THE UNDERDRAIN, THEN THERE IS A CLOGGED SOIL LAYER AND THE FOLLOWING PROCEDURES SHOULD BE FOLLOWED TO REHABILITATE THE FILTER MEDIA.
 - REMOVE ACCUMULATED SEDIMENT AND TILL 2 TO 3 INCHES OF SAND INTO THE UPPER 8 TO 12 INCHES OF SOIL.
 - INSTALL SAND WICKS FROM 3 INCHES BELOW THE SURFACE TO THE UNDERDRAIN LAYER. SAND WICKS CAN BE INSTALLED BY EXCAVATING OR AUGERING (USING A TREE AUGER OR SIMILAR TOOL) DOWN TO THE GRAVEL STORAGE ZONE TO CREATE VERTICAL COLUMNS WHICH ARE THEN FILLED WITH CLEAN OPEN-GRADED COARSE SAND MATERIAL (COARSE SAND MIX SIMILAR TO THE GRADATION USED FOR THE SOIL MEDIA). A SUFFICIENT NUMBER OF WICK DRAINS OF SUFFICIENT DIMENSION SHOULD BE INSTALLED TO MEET THE DESIGN DEWATERING TIME FOR THE FACILITY. IF THE FILTER MEDIA CANNOT BE REHABILITATED, REMOVE AND REPLACE SOME OR ALL OF THE SOIL MEDIA.