

B-4 STANDARDS AND SPECIFICATIONS VEGETATIVE STABILIZATION

Conditions Where Practice Applies

Using vegetation as cover to protect exposed soil from erosion.

To promote the establishment of vegetation on exposed soil.

On all disturbed areas not stabilized by other methods. This specification is divided into sections on stabilization; soil preparation, soil amendments and topsoiling; seeding and mulching; temporary stabilization

and permanent stabilization. Effects on Water Quality and Quantity Stabilization practices are used to promote the establishment of vegetation on exposed soil. When soil is stabilized with vegetation, the soil is less likely to erode and more likely to allow infiltration of rainfall,

reducing sediment loads and runoff to downstream areas. Planting vegetation in disturbed areas will have an effect on the water budget, especially on volumes and

runoff, infiltration, evaporation, transpiration, percolation, and groundwater recharge. Over time, vegetation

increase organic matter content and improve the water holding capacity of the soil and subsequent plant Vegetation will help reduce the movement of sediment, nutrients, and other chemicals carried by runoff to receiving waters. Plants will also help protect groundwater supplies by assimilating those substances

Sediment control practices must remain in place during grading, seedbed preparation, seeding, mulching, and vegetative establishment Adequate Vegetative Establishment

Inspect seeded areas for vegetative establishment and make necessary repairs, replacements, and reseedings within the

planting season. 1. Adequate vegetative stabilization requires 95 percent groundcover.

2. If an area has less than 40 percent groundcover, restabilize following the original recommendations for lime, fertilizer, seedbed preparation, and seeding. 3. If an area has between 40 and 94 percent groundcover, over-seed and fertilize using half of the rates

4. Maintenance fertilizer rates for permanent seeding are shown in Table B.6.

B-4-1 STANDARDS AND SPECIFICATIONS

INCREMENTAL STABILIZATION

Establishment of vegetative cover on cut and fill slopes.

originally specified.

To provide timely vegetative cover on cut and fill slopes as work progresses. Conditions Where Practice Applies

A. Incremental Stabilization - Cut Slopes 1. Excavate and stabilize cut slopes in increments not to exceed 15 feet in height. Prepare seedbed

Any cut or fill slope greater than 15 feet in height. This practice also applies to stockpiles.

and apply seed and mulch on all cut slopes as the work progresses. 2. Construction sequence example (Refer to Figure B.1):

a. Construct and stabilize all temporary swales or dikes that will be used to convey runoff around the excavation.

b. Perform Phase 1 excavation, prepare seedbed, and stabilize. c. Perform Phase 2 excavation, prepare seedbed, and stabilize. Overseed Phase 1 areas as d. Perform final phase excavation, prepare seedbed, and stabilize. Overseed previously

seeded areas as necessary. Note: Once excavation has begun the operation should be continuous from grubbing through the completion of grading and placement of topsoil (if required) and permanent seed and mulch. Any

interruptions in the operation or completing the operation out of the seeding season will necessitate the application of temporary stabilization B. Incremental Stabilization - Fill Slopes 1. Construct and stabilize fill slopes in increments not to exceed 15 feet in height. Prepare seedbed

and apply seed and mulch on all slopes as the work progresse 2. Stabilize slopes immediately when the vertical height of a lift reaches 15 feet, or when the grading operation ceases as prescribed in the plans.

3. At the end of each day, install temporary water conveyance practice(s), as necessary, to intercept surface runoff and convey it down the slope in a non-erosive manner. 4. Construction sequence example (Refer to Figure B.2): a. Construct and stabilize all temporary swales or dikes that will be used to divert runoff around

the fill. Construct silt fence on low side of fill unless other methods shown on the plans address this area. b. At the end of each day, install temporary water conveyance practice(s), as necessary, to

intercept surface runoff and convey it down the slope in a non-erosive manner. c. Place Phase 1 fill, prepare seedbed, and stabilize. d. Place Phase 2 fill, prepare seedbed, and stabilize

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e. Place final phase fill, prepare seedbed, and stabilize. Overseed previously seeded areas as

Note: Once the placement of fill has begun the operation should be continuous from grubbing through the C. Soil Amendments (Fertilizer and Lime Specifications) completion of grading and placement of topsoil (if required) and permanent seed and mulch. Any application of temporary stabilization. Figure B.

B-4-2 STANDARDS AND SPECIFICATIONS

SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS The process of preparing the soils to sustain adequate vegetative stabilization.

To provide a suitable soil medium for vegetative growth. Conditions Where Practice Applies Where vegetative stabilization is to be established.

Soil Preparation Temporary Stabilization

Seedbed preparation consists of loosening soil to a depth of 3 to 5 inches by means of suitable agricultural or construction equipment, such as disc harrows or chisel plows or riopers mounted on construction equipment. After the soil is loosened, it must not be rolled or dragged smooth but left in the roughened condition. Slopes 3:1 or flatter are to be tracked with ridges running parallel to the contour of the slope.

Apply fertilizer and lime as prescribed on the plans. Incorporate lime and fertilizer into the top 3 to 5 inches of soil by disking or other suitable means.

Permanent Stabilization

a. A soil test is required for any earth disturbance of 5 acres or more. The minimum soil conditions required for permanent vegetative establishment are: i. Soil pH between 6.0 and 7.0.

ii. Soluble salts less than 500 parts per million (ppm). iii. Soil contains less than 40 percent clay but enough fine grained material (greater than 30 percent silt plus clay) to provide the capacity to hold a moderate amount of moisture.

plus clay) would be acceptable. iv. Soil contains 1.5 percent minimum organic matter by weight. v. Soil contains sufficient pore space to permit adequate root penetration.

An exception; if lovegrass will be planted, then a sandy soil (less than 30 percent silt

Application of amendments or topsoil is required if on-site soils do not meet the above Graded areas must be maintained in a true and even grade as specified on the

approved plan, then scarified or otherwise loosened to a depth of 3 to 5 inches. Apply soil amendments as specified on the approved plan or as indicated by the results of a soil test.

Mix soil amendments into the top 3 to 5 inches of soil by disking or other suitable means. Rake lawn areas to smooth the surface, remove large objects like stones and branches, and ready the area for seed application. Loosen surface soil by dragging with a heavy chain or other equipment to roughen the surface where site conditions will not permit normal seedbed preparation. Track slopes 3:1 or flatter with tracked equipment leaving the soil in an irregular condition with ridges running parallel to the contour of the slope. Leave the top 1 to 3 inches of soil loose and friable. Seedbed loosening may be unnecessary on newly disturbed areas.

Topsoiling Topsoil is placed over prepared subsoil prior to establishment of permanent vegetation. The purpose is to provide a suitable soil medium for vegetative growth. Soils of concern have low moisture content, low nutrient levels, low pH, materials toxic to plants, and/or unacceptable soil

Topsoil salvaged from an existing site may be used provided it meets the standards as set forth in these specifications. Typically, the depth of topsoil to be salvaged for a given soil type can be found in the representative soil profile section in the Soil Survey published by

Topsoiling is limited to areas having 2:1 or flatter slopes where: a. The texture of the exposed subsoil/parent material is not adequate to produce vegetative growth.

The soil material is so shallow that the rooting zone is not deep enough to support plants or furnish continuing supplies of moisture and plant nutrients. The original soil to be vegetated contains material toxic to plant growth. The soil is so acidic that treatment with limestone is not feasible

Areas having slopes steeper than 2:1 require special consideration and design. Topsoil Specifications: Soil to be used as topsoil must meet the following criteria: Topsoil must be a loam, sandy loam, clay loam, silt loam, sandy clay loam, or loamy sand. Other soils may be used if recommended by an agronomist or soil scientist and approved by the appropriate approval authority. Topsoil must not be a mixture of contrasting textured subsoils and must contain less than 5 percent by volume of cinders,

stones, slag, coarse fragments, gravel, sticks, roots, trash, or other materials larger than 1½ inches in diameter Topsoil must be free of noxious plants or plant parts such as Bermuda grass, quack grass, Johnson grass, nut sedge, poison ivy, thistle, or others as specified. Topsoil substitutes or amendments, as recommended by a qualified agronomist or soil

scientist and approved by the appropriate approval authority, may be used in lieu of

natural topsoil. Topsoil Application

Erosion and sediment control practices must be maintained when applying topsoil. Uniformly distribute topsoil in a 5 to 8 inch layer and lightly compact to a minimum thickness of 4 inches. Spreading is to be performed in such a manner that sodding or seeding can proceed with a minimum of additional soil preparation and tillage. Any irregularities in the surface resulting from topsoiling or other operations must be corrected in order to prevent the formation of depressions or water pockets.

Topsoil must not be placed if the topsoil or subsoil is in a frozen or muddy condition when the subsoil is excessively wet or in a condition that may otherwise be detrimental to proper grading and seedbed preparation.

Soil tests must be performed to determine the exact ratios and application rates for both lime and fertilizer on sites having disturbed areas of 5 acres or more. Soil analysis may be performed by a recognized private or commercial laboratory. Soil samples taken for engineering purposes may also be used for chemical analyses

Fertilizers must be uniform in composition, free flowing and suitable for accurate application by appropriate equipment. Manure may be substituted for fertilizer with prior approval from the appropriate approval authority. Fertilizers must all be delivered to the site fully labeled according to the applicable laws and must bear the name, trade name or trademark and warranty of the producer.

Lime materials must be ground limestone (hydrated or burnt lime may be substituted except when hydroseeding) which contains at least 50 percent total oxides (calcium oxide plus magnesium oxide). Limestone must be ground to such fineness that at least 50 percent will pass through a #100 mesh sieve and 98 to 100 percent will pass through a #20 mesh sieve Lime and fertilizer are to be evenly distributed and incorporated into the top 3 to 5 inches of

soil by disking or other suitable means. Where the subsoil is either highly acidic or composed of heavy clays, spread ground limestone at the rate of 4 to 8 tons/acre (200-400 pounds per 1,000 square feet) prior to the placement of

B-4-3 STANDARDS AND SPECIFICATIONS

SEEDING AND MULCHING

The application of seed and mulch to establish vegetative cover. To protect disturbed soils from erosion during and at the end of construction. Conditions Where Practice Applies

To the surface of all perimeter controls, slopes, and any disturbed area not under active grading.

1. Specifications

a. All seed must meet the requirements of the Maryland State Seed Law. All seed must be subject to re-testing by a recognized seed laboratory. All seed used must have been tested within the 6 months immediately preceding the date of sowing such material on any project. Refer to Table B.4 regarding the quality of seed. Seed tags must be available upon request to the inspector to verify type of seed and seeding rate. b. Mulch alone may be applied between the fall and spring seeding dates only if the ground is

frozen. The appropriate seeding mixture must be applied when the ground thaws. c. Inoculants: The inoculant for treating legume seed in the seed mixtures must be a pure culture of nitrogen fixing bacteria prepared specifically for the species. Inoculants must not be used later than the date indicated on the container. Add fresh inoculants as directed on the package. Use four times the recommended rate when hydroseeding. Note: It is very important to keep inoculant as cool as possible until used. Temperatures above 75 to 80 degrees Fahrenheit can weaken bacteria and make the inoculant less

d. Sod or seed must not be placed on soil which has been treated with soil sterilants or chemicals used for weed control until sufficient time has elapsed (14 days min.) to permit dissipation of phyto-toxic materials.

a. Dry Seeding: This includes use of conventional drop or broadcast spreaders. I. Incorporate seed into the subsoil at the rates prescribed on Temporary Seeding Table B.1, Permanent Seeding Table B.3, or site-specific seeding summaries. ii. Apply seed in two directions, perpendicular to each other. Apply half the seeding rate in each direction. Roll the seeded area with a weighted roller to provide good

seed to soil contact. b. Drill or Cultipacker Seeding: Mechanized seeders that apply and cover seed with soil. i. Cultipacking seeders are required to bury the seed in such a fashion as to provide at least 1/4 inch of soil covering. Seedbed must be firm after

ii. Apply seed in two directions, perpendicular to each other. Apply half the seeding rate in each direction. c. Hydroseeding: Apply seed uniformly with hydroseeder (slurry includes seed and

i. If fertilizer is being applied at the time of seeding, the application rates should not exceed the following: nitrogen, 100 pounds per acre total of soluble nitrogen; P2O5 (phosphorous), 200 pounds per acre; K2O (potassium), 200 pounds per acre

ii. Lime: Use only ground agricultural limestone (up to 3 tons per acre may be applied by hydroseeding). Normally, not more than 2 tons are applied by hydroseeding at any one time. Do not use burnt or hydrated time when

iii. Mix seed and fertilizer on site and seed immediately and without interruption. iv. When hydroseeding do not incorporate seed into the soil.

1. Mulch Materials (in order of preference) a. Straw consisting of thoroughly threshed wheat, rye, oat, or barley and reasonably bright in color. Straw is to be free of noxious weed seeds as specified in the Maryland Seed Law and not musty, moldy, caked, decayed, or excessively dusty. Note: Use only sterile straw mulch in areas where one species of grass is desired. b. Wood Cellulose Fiber Mulch (WCFM) consisting of specially prepared wood cellulose processed into a uniform fibrous physical state.

i. WCFM is to be dyed green or contain a green dye in the package that will provide an appropriate color to facilitate visual inspection of the uniformly spread slurry.

ii. WCFM, including dye, must contain no germination or growth inhibiting iii. WCFM materials are to be manufactured and processed in such a

manner that the wood cellulose fiber mulch will remain in uniform suspension in water under agitation and will blend with seed. fertilizer and other additives to form a homogeneous slurry. The mulch material must form a blotter-like ground cover, on application having moisture absorption and percolation properties and must cover and hold grass seed in contact with the soil without inhibiting the growth of the grass seedlings.

iv. WCFM material must not contain elements or compounds at concentration levels that will be phyto-toxic v. WCFM must conform to the following physical requirements: fiber length of approximately 10 millimeters, diameter approximately 1 millimeter pH range of 4.0 to 8.5, ash content of 1.6 percent maximum and

water holding capacity of 90 percent minimum.

a. Apply mulch to all seeded areas immediately after seeding.

STABILIZATION MATTING PSMC - * 0.8 ib/ft* CHANNEL APPLICATION (* include shear stress)

b. When straw mulch is used, spread it over all seeded areas at the rate of 2 tons per acre to a uniform loose depth of 1 to 2 inches. Apply mulch to achieve a uniform distribution and depth so that the soil surface is not exposed. When using a mulch anchoring tool, increase the application rate to 2.5 tons per acre. c. Wood cellulose fiber used as mulch must be applied at a net dry weight of 1500 pounds per

acre. Mix the wood cellulose fiber with water to attain a mixture with a maximum of 50 pounds of wood cellulose fiber per 100 gallons of water.

a. Perform mulch anchoring immediately following application of mulch to minimize loss by wind or water. This may be done by one of the following methods (listed by preference), depending upon the size of the area and erosion hazard:

i. A mulch anchoring tool is a tractor drawn implement designed to punch and anchor mulch into the soil surface a minimum of 2 inches. This practice is most effective on large areas, but is limited to flatter slopes where equipment can operate safely. If used on sloping land, this practice should follow the contour. ii. Wood cellulose fiber may be used for anchoring straw. Apply the fiber binder at a net

dry weight of 750 pounds per acre. Mix the wood cellulose fiber with water at a maximum of 50 pounds of wood cellulose fiber per 100 gallons of water. iii. Synthetic binders such as Acrylic DLR (Agro-Tack), DCA-70, Petroset, Terra Tax II, Terra Tack AR or other approved equal may be used. Follow application rates as specified by the manufacturer. Application of liquid binders needs to be heavier at the edges where wind catches mulch, such as in valleys and on crests of banks.

Use of asphalt binders is strictly prohibited. Iv. Lightweight plastic netting may be stapled over the mulch according to manufacturer recommendations. Netting is usually available in rolls 4 to 15 feet wide and 300 to

B-4-5 STANDARDS AND SPECIFICATIONS

PERMANENT STABILIZATION

To stabilize disturbed soils with permanent vegetation. To use long-lived perennial grasses and legumes to establish permanent ground cover on disturbed soils. Conditions Where Practice Applies

Exposed soils where ground cover is needed for 6 months or more. A Seed Mixtures

1. General Use a Select one or more of the species or mixtures listed in Table B.3 for the appropriate Plant Hardiness Zone (from Figure B.3) and based on the site condition or purpose found on Table B.2. Enter selected mixture(s), application rates, and seeding dates in the Permanent Seeding Summary. The Summary is to be placed on the plan. b Additional planting specifications for exceptional sites such as shorelines, stream banks, or dunes or

for special purposes such as wildlife or aesthetic treatment may be found in USDA-NRCS Technical Field Office Guild, Section 342 - Critical Area Planting, c For sites having disturbed areas over 5 acres, use and show the rates recommended by the soil

d For areas receiving low maintenance, apply urea form fertilizer (46-0-0) at 3 ½ pounds per 1000 square feet (150 pounds per acre) at the time of seeding in addition to the soil amendments shown in the Permanent Seeding Summary 2. Turfgrass Mixtures

a. Areas where turfgrass may be desired include lawns, parks, playgrounds, and commercial sites which will receive a medium to high level of maintenance. b. Select one or more of the species or mixtures listed below based on the site conditions or purpose. Enter selected mixture(s), application rates, and seeding dates in the Permanent Seeding Summary.

The summary is to be placed on the plan. i. Kentucky Bluegrass: Full sun Mixture: For use in areas that receive intensive management. Irrigation required in the areas of central Maryland and Eastern Shore, Recommended Certified Kentucky Bluegrass Cultivars Seeding Rate: 1.5 to 2.0 pounds per 1000 square feet. Choose a minimum of three Kentucky Bluegrass Cultivars with each ranging from 10 to 35 percent of the total mixture by weight.

ii. Kentucky Bluegrass/Perennial Rye: Full Sun Mixture: For use in full sun areas where rapid establishment is necessary and when turf will receive medium to intensive management. Certified Perennial Ryegrass Cultivars/Certified Kentucky Bluegrass Seeding Rate: 2 pounds mixture per 1000 square feet. Choose a minimum of three Kentucky Bluegrass Cultivars with each ranging from 10 to 35 percent of the total mixture by weight.

iii. Tall Fescue/Kentucky Bluegrass: Full Sun Mixture: For use in drought prone areas and/or for areas receiving low to medium management in full sun to medium shade. Recommended mixture includes; Certified Tall Fescue Cultivars 95 to 100 percent, Certified Kentucky Bluegrass Cultivars 9 to 5 percent. Seeding Rate: 5 to 8 pounds per 1000 square feet. One or more cultivars may be blended. iv. Kentucky Bluegrass/Fine Fescue: Shade Mixture: For use in areas with shade in Bluegrass lawns.

For establishment in high quality, intensively managed turf area. Mixture includes Certified Kentucky

Bluegrass Cultivars 30 to 40 percent and Certified Fine Fescue and 60 to 70 percent. Seeding Rate: 1 1/2 to 3 pounds per 1000 square feet. Notes: Select turfgrass varieties from those listed in the most current University of Maryland Publication, Agronomy Memo #77, "Turfgrass Cultivar Recommendations for Maryland" Choose certified material. Certified material is the best guarantee of cultivar purity. The certification program of the Maryland Department of Agriculture, Turf and Seed Section, provides a reliable means of consumer protection and assures a pure genetic line.

c. Ideal Times of Seeding for Turf Grass Mixtures Western MD: March 15 to June 1, August 1 to October 1 (Hardiness Zones: 5b, 6a) Central MD:March 1 to May 15, August 15 to October 15 (Hardiness Zone: 6b) Southern MD, Eastern Shore: March 1 to May 15, August 15 to October 15

(Hardiness Zones: 7a, 7b) d. Till areas to receive seed by disking or other approved methods to a depth of 2 to 4 inches, level and rake the areas to prepare a proper seedbed. Remove stones and debris over 1 1/2 inches in diameter. The resulting seedbed must be in such condition that future mowing of grasses will pose e. If soil moisture is deficient, supply new seedings with adequate water for plant growth (1/2 to 1 inch

every 3 to 4 days depending on soil texture) until they are firmly established. This is not especially

true when seedings are made late in the planting season, in abnormally dry or hot seasons, or on B. Sod: to provide quick cover on disturbed areas (2:1 grade or flatter).

General Specifications

a. Class of turfgrass must be Maryland State Certified. Sod labels must be made available to the job

b. Sod must be machine cut at a uniform soil thickness of % inch, plus or minus 1/2 inch, at the time of cutting. Measurement for thickness must exclude top growth and thatch. Broken pads and or uneven ends will not be acceptable c. Standard size sections of sod must be strong enough to support their own weight and retain their

size and shape when suspended vertically with a firm grasp on the upper 10 percent of the section. d. Sod must not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival. e. Sod must be harvested, delivered, and installed within a period of 36 hours. Sod not transplanted

within this period must be approved by an agronomist or soil scientist prior to its installation. a. During periods of excessively high temperature or in areas having dry subsoil, lightly irrigate the

subsoil immediately prior to laying the sod. b. Lay the first row of sod in a straight line with subsequent rows placed parallel to it and tightiv wedged against each other. Stagger lateral joints to promote more uniform growth and strength. Ensure that sod is not stretched or overlapped and that all joints are butted tight in order to prevent

voids which would cause air drying of the roots. Roll and tamp, peg or otherwise secure the sod to prevent slippage on slopes. Ensure solid contact exists between sod roots and the underlying soil surface. d. Water the sod immediately following rolling and tamping until the underside of the new sod pad and

soil surface below the sod are thoroughly wet. Complete the operations of laying, tamping and irrigating for any piece of sod within eight hours. a. In the absence of adequate rainfall, water daily during the first week or as often and sufficiently as

necessary to maintain moist soil to a depth of 4 inches. Water sod during the heat of the day to b. After the first week, sod watering is required as necessary to maintain adequate moisture content. c. Do not mow until the sod is firmly rooted. No more than 1/3 of the grass leaf must be removed by the initial cutting or subsequent cuttings. Maintain a grass height of at least 3 inches unless

B-4-4 STANDARDS AND SPECIFICATIONS

TEMPORARY STABLIZATION

To stabilize disturbed soils with vegetation for up to 6 months.

To use fast growing vegetation that provides cover on disturbed soils. Conditions Where Practice Applies

exposed soils where ground cover is needed for a period of 6 months or less. For longer duration of time, permanent stabilization practices are required.

1. Select one or more of the species or seed mixtures listed in Table B.1 for the appropriate Plant Hardiness Zone (from Figure B.3), and enter them in the Temporary Seeding Summary below along with application rates, seeding dates and seeding depths. If this Summary is not put on the plan and completed, then Table B.1 plus fertilizer and lime rates must be put on the plan. 2. For sites having soil tests performed, use and show the recommended rates by the testing agency

Soil tests are not required for Temporary Seeding. 3. When stabilization is required outside of a seeding season, apply seed and mulch or straw mulch alone as prescribed in Section B-4-3.A.1.b and maintain until the next seeding season.

B-4-8 STANDARDS AND SPECIFICATIONS STOCKPILE AREA

A mound or pile of soil protected by appropriately designed erosion and sediment control measures

To provide a designated location for the temporary storage of soil that controls the potential for erosion, sedimentation, and changes to drainage patterns. Conditions Where Practice Applie

Stockpile areas are utilized when it is necessary to salvage and store soil for later use. 1. The stockpile location and all related sediment control practices must be clearly indicated on the

erosion and sediment control plan 2. The footprint of the stockpile must be sized to accommodate the anticipated volume of material and based on a side slope ratio no steeper than 2:1. Benching must be provided in

accordance with Section B-3 Land Grading. 3. Runoff from the stockpile area must drain to a suitable sediment control practice. 4. Access the stockpile area from the upgrade side.

5. Clear water runoff into the stockpile area must be minimized by use of a diversion device such as an earth dike, temporary swale or diversion fence. Provisions must be made for discharging concentrated flow in a non-erosive manner.

6. Where runoff concentrates along the toe of the stockpile fill, an appropriate erosion/sediment control practice must be used to intercept the discharge. 7. Stockpiles must be stabilized in accordance with the 3/7 day stabilization requirement as well as

Standard B-4-1 Incremental Stabilization and Standard B-4-4 Temporary Stabilization. 8. If the stockpile is located on an impervious surface, a liner should be provided below the stockpile to facilitate cleanup. Stockpiles containing contaminated material must be covered with impermeable sheeting.

The stockpile area must continuously meet the requirements for Adequate Vegetative Establishment in accordance with Section B-4 Vegetative Stabilization. Side slopes must be maintained at no steeper than a 2:1 ratio. The stockpile area must be kept free of erosion. If the vertical height of a stockpile exceeds 20 feet for 2:1 slopes, 30 feet for 3:1 slopes, or 40 feet for 4:1 slopes, benching must be provided in accordance with Section B-3 Land Grading.

1.	PROVIDE STORAGE VOLUME AS SPECIFIED ON APPROVED PLANS.
2.	USE NONWOVEN GEOTEXTILE ON INTERFACE BETWEEN GROUND AND STONE.
3.	PERFORATE BAFFLE BOARD WITH 3 ROWS OF 1 INCH DIAMETER HOLES 6 INCHES ON CENTER, EMBED A MINIMUM OF 4 INCHES INTO GROUND, AND EXTEND BAFFEL BOARD MINIMUM OF 12 INCHES INTO EARTH DIKE.
4.	USE CLEAN 2 TO 3 INCH STONE OR EQUIVALENT RECYCLED CONCRETE, PLACE WOVEN MONOFILAMENT GEOTEXTILE ON UPSTREAM FACE AND COVER WITH A MINIMUM OF 6 INCHES OF ADDITIONAL STONE.
5.	USE NONWOVEN AND WOVEN MONOFILAMENT GEOTEXTILES AS SPECIFIED IN SECTION H-1 MATERIALS.
6.	SET WEIR CREST OF STONE 6 INCHES LOWER THAN THE TOP OF EARTH DIKE, USE MINIMUM LENGTH OF 6 FEET FOR WEIR CREST.
7.	REMOVE SEDIMENT WHEN IT HAS ACCUMULATED TO WITHIN 6 INCHES OF WEIR CREST. REPLACE GEOTEXTILE AND STONE FACING WHEN STRUCTURE CEASES TO DRAIN. MAINTAIN LINE, GRADE, AND CROSS SECTION.
8.	UPON REMOVAL OF STONE OUTLET STRUCTURE, GRADE AREA FLUSH WITH EXISTING GROUND. WITHIN 24 HOURS STABILIZE DISTURBED AREA WITH TOPSOIL, SEED, AND MULCH, OR AS SPECIFIED ON APPROVED PLAN.
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-	MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

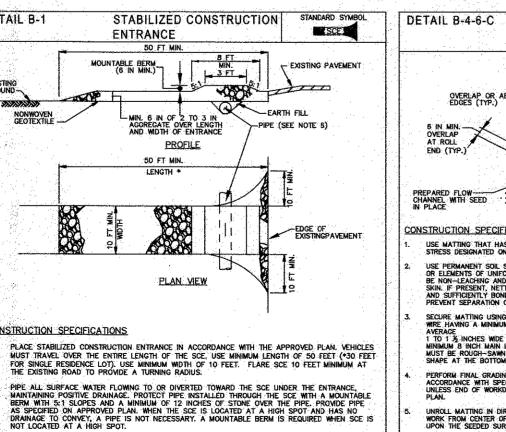
TEMPORARY STONE

CONSTRUCTION SPECIFICATIONS

OUTLET STRUCTURE

TSOS

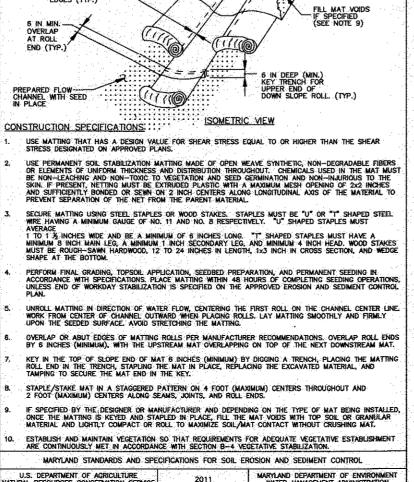
STABILIZED CONSTRUCTION ENGINEER'S CERTIFICATE **ENTRANCE** "I CERTIFY THAT THIS PLAN FOR SEDIMENT AND EROSION CONTROL REPRESENTS A PRACTICAL AND WORKABLE PLAN BASED ON MY PERSONAL KNOWLEDGE OF THE SITE CONDITIONS AND THAT IT WAS PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE HOWARD SOIL CONSERVATION DISTRICT. -PIPE (SEE NOTE 6) PROFILE ENGINEER: JOHN M. CARNEY #4557 LENGTH 4 DEVELOPER'S CERTIFICATE "I/WE CERTIFY THAT ALL DEVELOPMENT AND CONSTRUCTION WILL BE DONE ACCORDING TO THIS PLAN FOR SEDIMENT AND EROSION CONTROL, AND THAT ALL RESPONSIBLE PERSONNE INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE AT A DEPARTMENT OF THE ENVIRONMENT APPROVED TRAINING PROGRAM FOR THE CONTROL OF SEDIMENT AND EROSION BEFORE BEGINNING THE PROJECT. I ALSO AUTHORIZE PERIODIC ON-SITE INSPECTION BY THE HOWARD SOIL CONSERVATION DISTRICT." PLAN VIEW CONSTRUCTION SPECIFICATIONS THIS DEVELOPMENT PLAN IS APPROVED FOR SOIL EROSION AND SEDIMENT CONTROL BY

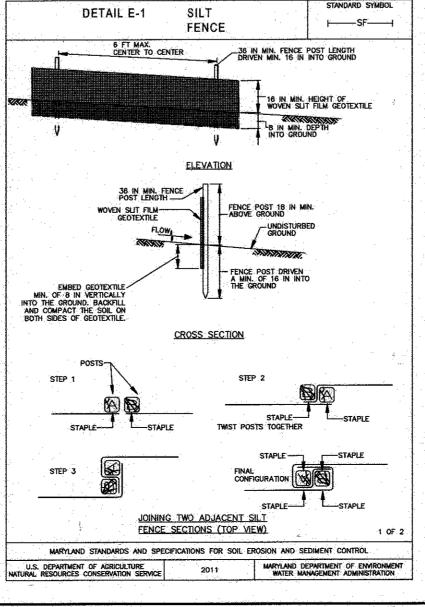


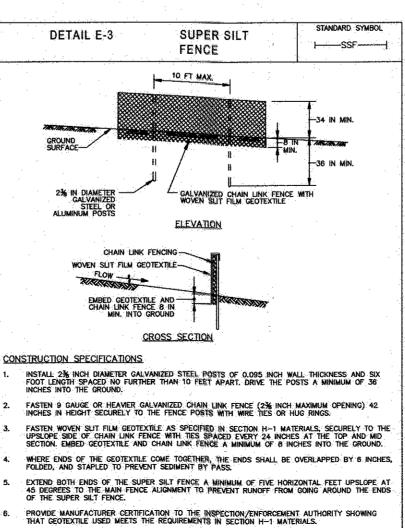
PLACE CRUSHED AGGREGATE (2 TO 3 INCHES IN SIZE) OR EQUIVALENT RECYCLED CONCRETE

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

MAINTAIN ENTRANCE IN A CONDITION THAT MINIMIZES TRACKING OF SEDIMENT. ADD STONE OR MAKE OTHER REPAIRS AS CONDITIONS DEMAND TO MAINTAIN CLEAN SURFACE, MOUNTABLE BERM, AND SPECIFIED DIMENSIONS. IMMEDIATELY REMOVE STONE AND/OR SEDIMENT SPILLED, DROPPED, OR TRACKED ONTO ADJACENT ROADWAY BY VACUUMING, SCRAPING, AND/OR SWEEPING. WASHING ROADWAY TO REMOVE MUD TRACKED ONTO PAVEMENT IS NOT ACCEPTABLE UNLESS WASH WATER IS DIRECTED TO AN APPROVED SEDIMENT CONTROL PRACTICE.

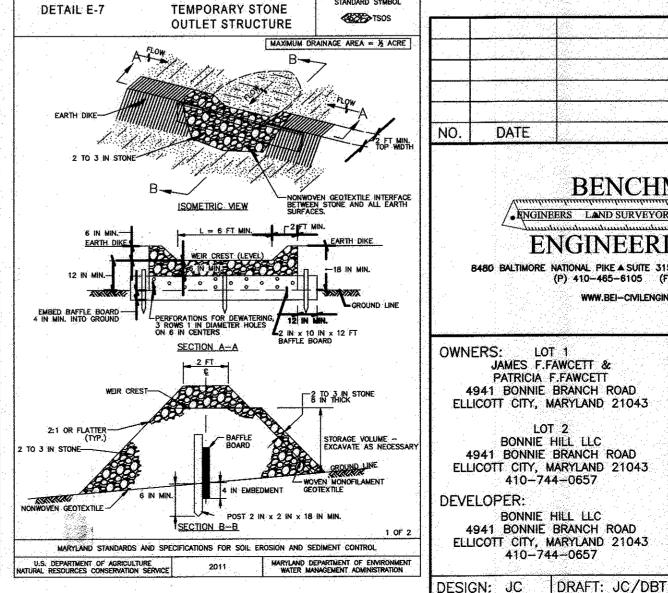






REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP IN FENCE OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT, REPLACE GEOTEXTILE IF TORN, IF UNDERMINING OCCURS REINSTALL CHAIN LINK FENCING AND GEOTEXTILE,

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL



REVISION BENCHMARK ENGINEERS LAND SURVEYORS PLANNERS ENGINEERING, INC 8480 BALTIMORE NATIONAL PIKE A SUITE 315 A ELLICOTT CITY, MARYLAND 21043 (P) 410-465-6105 (F) 410-465-6644 WWW.BEI-CIVILENGINEERING.COM OWNERS: JAMES F.FAWCETT & PATRICIA F.FAWCETT 4941 BONNIE BRANCH ROAD ELLICOTT CITY, MARYLAND 21043 BONNIE HILL LLC TAX MAP: 31 - GRID: 9 - PARCEL: 321 4941 BONNIE BRANCH ROAD ELECTION DISTRICT NO. 1 - HOWARD COUNTY, MARYLAND ELLICOTT CITY, MARYLAND 21043 ZONED: R-20 (SINGLE FAMILY DETACHED) 410-744-0657 DEVELOPER: BONNIE HILL LLC 4941 BONNIE BRANCH ROAD ELLICOTT CITY, MARYLAND 21043 410-744-0657 BEI PROJECT NO. 2735 JUNE, 2017

SCALE:

AS SHOWN

with the 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL for topsoil (Sec. B-4-2), permanent seeding (Sec. B-4-5), temporary seeding Sec. B-4-4) and mulching (Sec. B-4-3). Temporary stabilization with mulch alone can only be applied between the fall and spring seeding dates if the ground is frozen. Incremental stabilization (Sec. B-4-1) specifications shall be enforced in areas with >15' of cut and/or

fill. Stockpiles (Sec. B-4-8) in excess of 20 feet must be benched with stable outlet. All concentrated flow, steep slope, and highly erodible areas shall receive soil stabilization matting (Sec. B-4-6). 5. All sediment control structures are to remain in place, and are to be maintained in

HOWARD SOIL CONSERVATION DISTRICT (HSCD)

1. A pre-construction meeting must occur with the Howard County Department of Public

protected areas are marked clearly in the field. A minimum of 48 hours notice to CID must

b. Upon completion of the installation of perimeter erosion and sediment controls, but

before proceeding with any other earth disturbance or grading, c. Prior to the start of another phase of construction or opening of another grading

2. All vegetative and structural practices are to be installed according to the provisions of

3. Following initial soil disturbance or re-disturbance, permanent or temporary stabilization is

swales, ditches, perimeter slopes, and all slopes steeper than 3 horizontal to 1 vertical (3:1);

4. All disturbed areas must be stabilized within the time period specified above in accordance

and seven (7) calendar days as to all other disturbed areas on the project site except for

required within three (3) calendar days as to the surface of all perimeter controls, dikes,

Works, Construction Inspection Division (CID), 410-3133-1855 after the future LOD and

d. Prior to the removal or modification of sediment control practices

this plan and are to be in conformance with the <u>2011 MARYLAND STANDARDS AND</u>
SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, and revisions thereto.

be given at the following stages:

hose areas under active grading.

a. Prior to the start of earth disturbance,

ANDARD SEDIMENT CONTROL NOTES

operative condition until permission for their removal has been obtained from the CID

2.33_ Acres Total Area of Site: 1.35_ Acres Area Disturbed: 0.22 *CUT/FILL NUMBERS ARE FOR SEDIMENT 1.13 CONTROL PURPOSES Area to be vegetatively stabilized: Acres ONLY. CONTRACTOR 3.800 * Total cut: _ Cu Yds TO VERIFY. 800 *

__ Cu Yds

SITE WITH AN ACTIVE GRADING PERMIT

Off-site waste/borrow area location: 7. Any sediment control practice which is disturbed by grading activity for placement of utilities must be repaired on the same day of disturbance.

8. Additional sediment control must be provided, if deemed necessary by the CID. The site and all controls shall be inspected by the contractor weekly, and the next day after each rain event. A written report by the contractor, made available upon request, is part of every

•Inspection type (routine, pre-storm event, during rain event) • Weather information (current conditions as well as time and an=mount of last recorded Brief description of project's status (e.g. percent complete) and/or current activities

• Identification of sediment controls that require maintenance Identification of missing or improperly installed sediment controls • Compliance status regarding the sequence of construction and stabilization requirements

Monitoring/sampling Maintenance and/or corrective action performed •Other inspection items as required by the General Permit for Stormwater Associated with Construction Activities (NPDES, MDE).

10. Any major changes or revisions to the plan or sequence of construction must be reviewed and approved by the HSCD prior to proceeding with construction. Minor revisions may be allowed by the CID per the list of HSCD-approved field changes. 11. Disturbance shall not occur outside the L.O.D. A project is to be sequenced so that

and shall be back filled and stabilized by the end of each work day, whichever is shorter.

9. Trenches for the construction of utilities is limited to three pipe lengths or that which can

grading activities begin on one grading unit (maximum acreage of 20 ac. per grading unit) at a time. Work may proceed to a subsequent grading unit when at least 50 percent of the disturbed area in the preceding grading unit has been stabilized and approved by the CID. Unless otherwise specified and approved by the HSCD, no more than 30 acres cumulatively may be disturbed at a given time. 12. Wash water from any equipment, vehicles, wheels, pavement, and other sources must be

treated in a sediment basin or other approved washout structure. 13. Topsoil shall be stockpiled and preserved on-site for redistribution onto final grade. 14. All silt fence and super silt fence shall be placed on-the-contour, and be imbricated at

25' minimum intervals, with lower ends curied uphill by 2' in elevation 15. Stream channels must not be disturbed during the following restricted time periods

• Use 1 and IP March 1 - June 15 • Use III and IIIP October 1 - April 30 • Use IV March 1 - May 31

Controlling the suspension of dust particles from construction activities

not be irrigated to the point that runoff occurs.

16. A copy of this plan, the <u>2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL</u>, and associated permits shall be on-site and available when

H-5 STANDARDS AND SPECIFICATIONS DUST CONTROL

To prevent blowing and movement of dust from exposed soil surfaces to reduce on and off-site damage including health and traffic hazards. Conditions Where Practice Applies Areas subject to dust blowing and movement where on and off-site damage is likely without treatment Mulches: See Section B-4-2 Soil Preparation, Topsoiling, and Soil Amendments, Section B-4-3

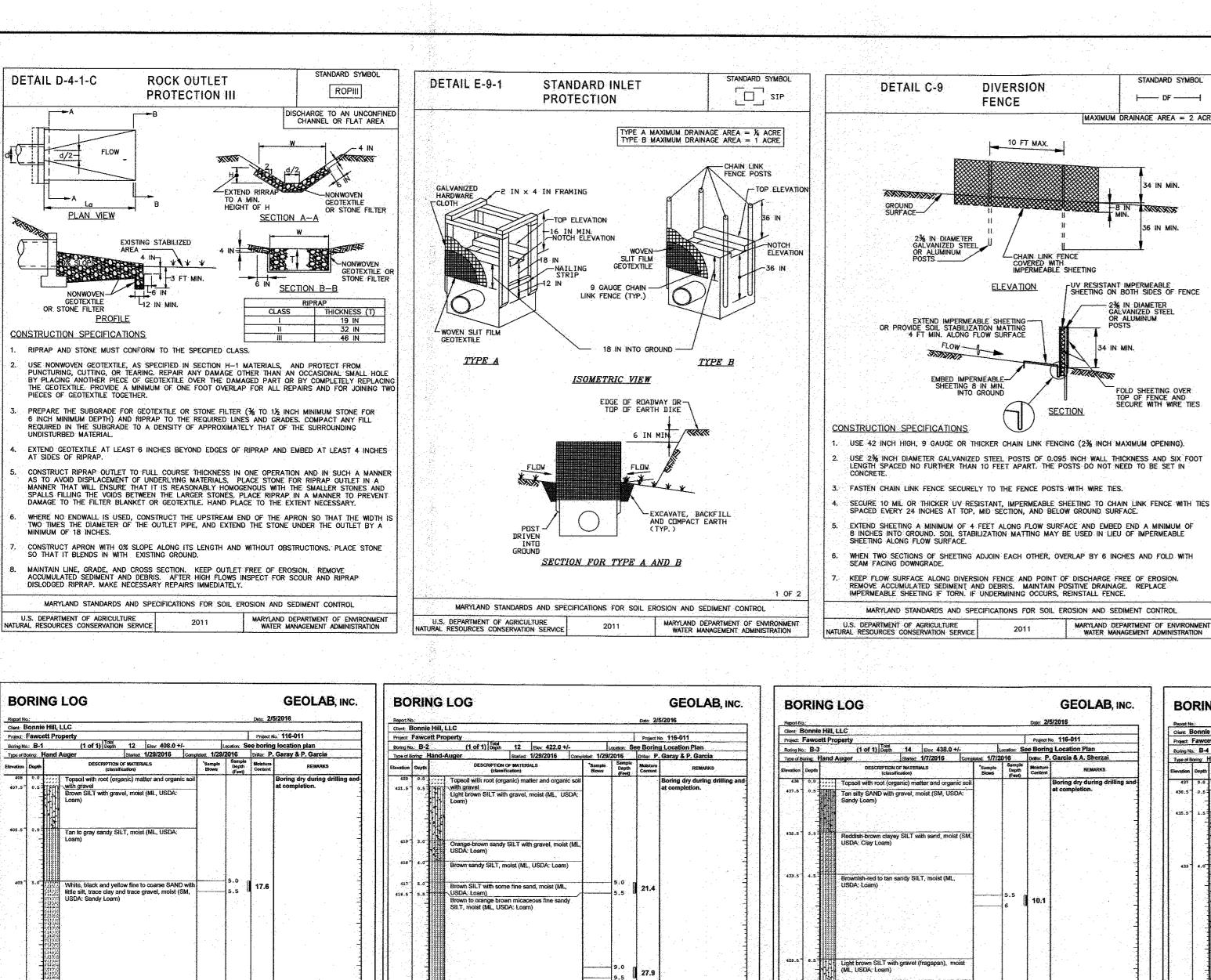
Seeding and Mulching, and Section B-4-4 Temporary Stabilization. Mulch must be anchored to

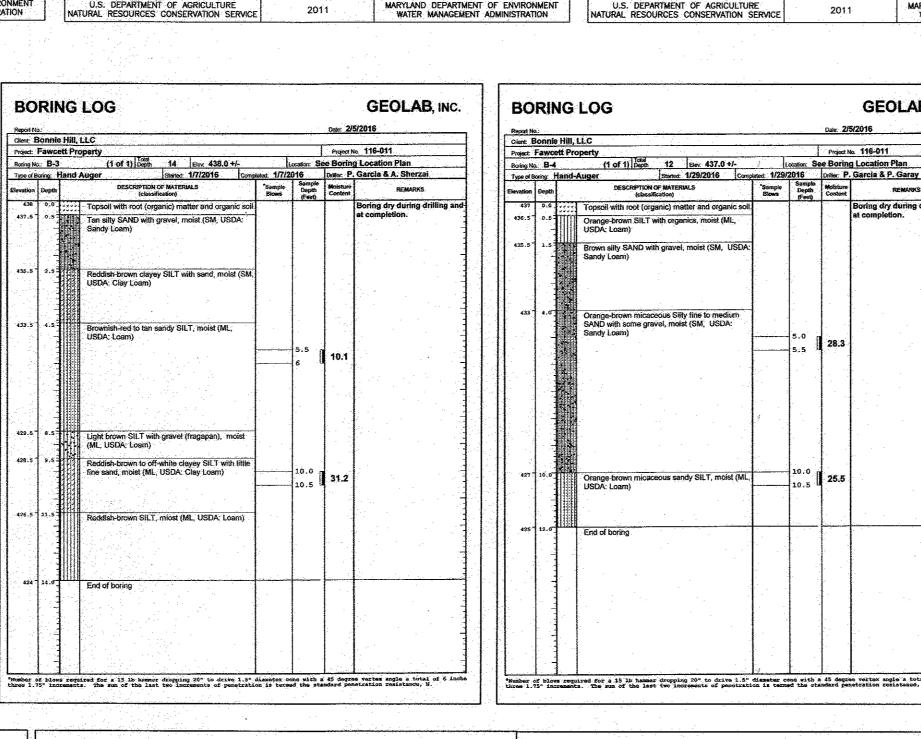
prevent blowing. Vegetative Cover: See Section B-4-4 Temporary Stabilization. illage: Till to roughen surface and bring clods to the surface. Begin plowing on windward side of site. Chisel-type plows spaced about 12 inches apart, spring-toothed harrows, and similar plows are examples of equipment that may produce the desired effect. Irrigation: Sprinkle site with water until the surface is moist. Repeat as needed. The site must

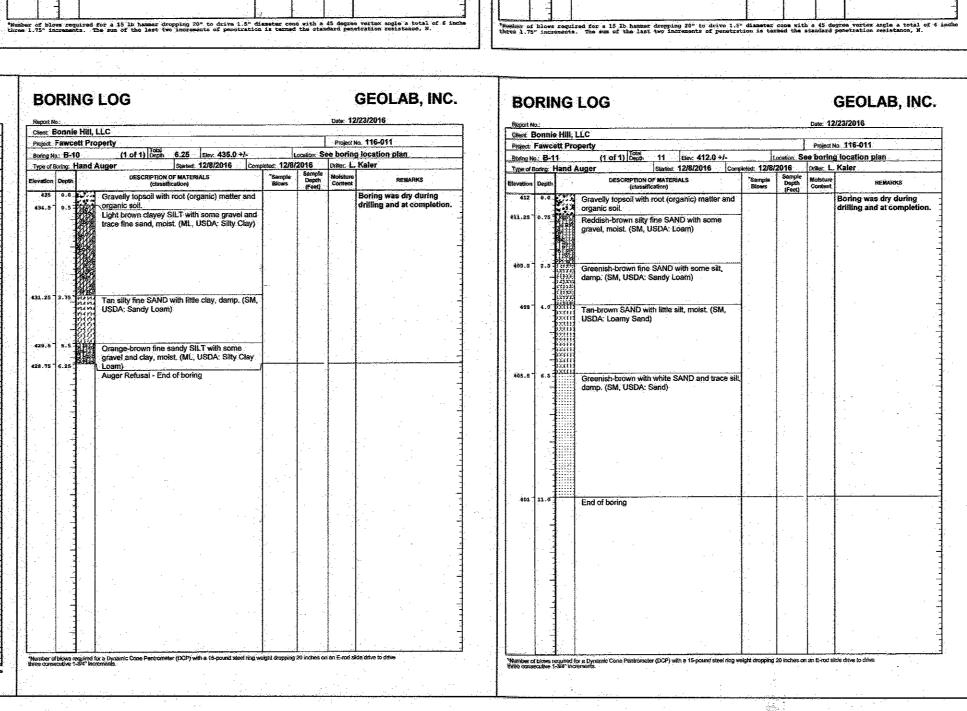
Barriers: Solid board fences, silt fences, snow fences, burlap fences, straw bales, and similar naterial can be used to control air currents and soil blowing. Chemical Treatment: Use of chemical treatment requires approval by the appropriate plan

EROSION AND SEDIMENT CONTROL NOTES AND DETAILS

> SHEET 3 of 7 F-17-058







Olaska Čera eta a	Seeding Rate 1/		Seeding	Recommended Seeding Dates by Plant Hardiness Zone 3/			
Plant Species	lb/ac	lb/1000 ft2	Depth 2/ (inches)	5b and 6a	6b	7a and 7b	
Cool-Season Grasses							
Annual Ryegrass (Lolium perenne ssp. Multiflorum	40	1.0	0.5		Mar 1 to May 15; Aug 1 to Oct 31		
Barley (Hordeum vulgare)	96	2.2	1.0		Mar 1 to May 15; Aug 1 to Oct 31		
Oats (Avena sativa)	72	1.7	1.0		Mar 1 to May 15; Aug 1 to Oct 31		
Wheat (Triticum aestivum)	120	2.8	1.0		Mar 1 to May 15; Aug 1 to Oct 31		
Cereal Rye (Secale cereale)	112	2.8	1.0		Mar 1 to May 15; Aug 1 to Nov 15		
Warm-Season Grasses							
Foxtail Millet (Serataria italica)	30	0.7	0.5		May 16 to Jul 31		
Pearl Millet (Pennisetum glaucum	20	0.5	0.5		May 16 to Jul 31		

Seeding rates for the warm season grasses are in pounds of Pure Live Seed (PLS). Actual planting rates shall be adjusted to reflect percent seed germination and purity, as tested. Adjustments are usually not needed for the cool-season grasses.

eeding rates listed above are for temporary seedings, when planted alone. When planted as a nurse crop with permanent seed mixes, use 1/3 of the seeding rate listed above for barley, oats, and wheat. For smaller-seeded grasses (annual ryegrass, pearl millet, foxtail millet), do not exceed more than 5% (by weight) of the overall permanent seeding mix. Cereal rve generally should not be used as a nurse crop, unless planting will occur very late fall beyond the seeding dates for other temporary seedings Cereal rye has allelopathic properties that inhibit the germination and growth of other plants. If it must be used as a nurse crop, seed at 1/3 of the rate listed above.

Oats are the recommended nurse crop for warm-season grasses

STANDARD SYMBOL

—4 TO 7 IN STONE (TYP.)

DETAIL D-2

4 TO 7 IN STONE

GEOTEXTILE 6 IN

CONSTRUCTION SPECIFICATIONS

APRON_/ (TYP.)

STONE CHECK

CHANNEL PROFILE

CROSS SECTION

PREPARE SWALES IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS DESCRIBED IN SECTION C-2, STANDARDS AND SPECIFICATIONS FOR TEMPORARY SWALE, OR AS SPECIFIED ON PLAN.

PLACE NONWOVEN GEOTEXTILE, AS SPECIFIED IN SECTION H-1 MATERIALS, UNDER THE BOTTOM AND SIDES OF THE DAM PRIOR TO PLACEMENT OF STONE, CONSTRUCT THE CHECK DAM WITH WASHED 4

TO 7 INCH STONE OR EQUIVALENT RECYCLED CONCRETE (WITHOUT REBAR) WITH SIDE SLOPES OF 2:1
OF FLATTER AND A MINIMUM TOP WIDTH OF 12 INCHES, PLACE THE STONE SO THAT IT COMPLETELY
COVERS THE WIDTH OF THE CHANNEL AND CHANNEL BANKS, FORM THE WEIR SO THAT TOP OF THE
OUTLET CREST IS APPROXIMATELY 6 INCHES LOWER THAN THE OUTER EDGES. LINE THE UPSTREAM

SET THE HEIGHT FOR THE WEIR CREST EQUAL TO ONE-HALF THE DEPTH OF THE CHANNEL OR DITCH. TO AVOID SCOUR THE MAXIMUM HEIGHT OF THE WEIR CREST MUST NOT EXCEED 2.0 FEET.

REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES ONE-HALF OF THE HEIGHT OF THE WEIR CREST.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

GEOLAB, INC.

REMARKS

MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

BORING LOG

Project: Fawcett Property

(1 of 1) Depth 15 Elev. 394.0 +/-

DESCRIPTION OF MATERIALS

Orange-brown fine sandy SILT, wet to moist (M

Off-white and tan sitty fine to medium SAND,

Light brown to tan fine to medium SAND with

Tan to light brown silty fine to medium SAND with

Being No. B-5

FACE OF THE DAM WITH A 1 FOOT THICK LAYER OF WASHED AGGREGATE (% TO 1% INCH).

DAM

2/ For sandy soils, plant seeds at twice the depth listed above The planting dates listed are averages for each Zone and may require adjustment to reflect local conditions, especially near the boundaries of the zone.

GEOLAB, INC.

Project No. 116-011

Location: See Boring Location Plan

Started 2/2/2016 | Completed 2/4/2016 | Driller A. Sherzal

Permanent Seeding Summan

Hardiness Zone (from Figure B.3): Seed Misture (from Table B.3):			6b Tall Fescue/Kentucky Blu	en commonte common de la common	Fertilizer Rate (10-20-20)		Lime Rate	
No.	Species	Application Rate (lb/ac.)	Seeding Dates	Seeding Depths	N	P205	K20	
	Fescue, Tali	60	Mar 1 to May 15 Aug 1 to Oct 15	1/4 - 1/2 în	45 pounds			
9 Bluegrass	Bluegrass, Kentucky	40	Mar 1 to May 15 Aug 1 to Oct 15	1/4 - 1/2 in	per acre (1.0 lb/	90 lb/ac (2 lb/	90 lb/ac 2 lb/	2 tons/a (90lb/
	Washing the same of the same o		- Western Control of the Control of	1/4 - 1/2 in	100 sf)	1000 sf)	1000 sf)	1000 sf

SEQUENCE OF CONSTRUCTION

NOTIFY SEDIMENT CONTROL DIVISION 48 HOURS PRIOR TO START OF WORK

1. OBTAIN GRADING PERMIT. (1 DAY)

2. HOLD ON-SITE PRE-CONSTRUCTION MEETING. (1 DAY)

3. CLEAR AND GRUB AS NECESSARY IN ORDER TO INSTALL TEMPORARY STONE OUTLET STRUCTURES, TEMPORARY GABION OUTLET STRUCTURE & PERIMETER CONTROLS (SUPER SILT FENCES AND DIVERSION FENCES. VERIFY THE STANDARD INLET PROTECTION (F-07-193) AT EXISTING CULVERT AT BONNIE BRANCH ROAD IS IN GOOD SHAPE. (3 DAYS)

4. BEGIN EXCAVATION AT PROPOSED DRIVEWAY ENTRANCES IN ORDER TO INSTALL STABILIZED CONSTRUCTION ENTRANCE. (2 DAYS)

5. UPON APPROVAL FROM SEDIMENT CONTROL INSPECTOR, PROCEED TO CLEAR, GRUB AND ROUGH GRADE. INSTALL WATER AND SEWER HOUSE CONNECTIONS FOR LOTS 3 AND 4 UP TO 10 FEET FROM FOUNDATIONS. PROVIDE TEMPORARY STABILIZATION OF ANY AREA THAT WILL NOT BE ACTIVELY GRADED WITHIN FOURTEEN (14) DAYS. INSTALL EROSION CONTROL MATTING, SILT FENCES, AND STONE CHECK DAMS IN SWALE TO MBR-2. (60 DAYS)

6. CONSTRUCT MBR #2 AND #3 & REMOVE TSOS #3. COVER SURFACE AREA WITH FILTER FABRIC. (21 DAYS)

7. CONSTRUCT HOUSE AND DRIVEWAY. ONCE FOUNDATION IS CONSTRUCTED STABILIZE LOT IN ACCORDANCE WITH TEMPORARY SEEDBED NOTES. (90 DAYS)

8. ONCE DOWNSPOUTS HAVE BEEN INSTALLED, CONSTRUCT DRYWELLS #1, #2, #3, AND #4. CONNECT ROOF DRAINS TO DRYWELLS. (90 DAYS)

9. PAVE INDIVIDUAL DRIVEWAYS FOR LOTS 3 AND 4. (3 DAYS)

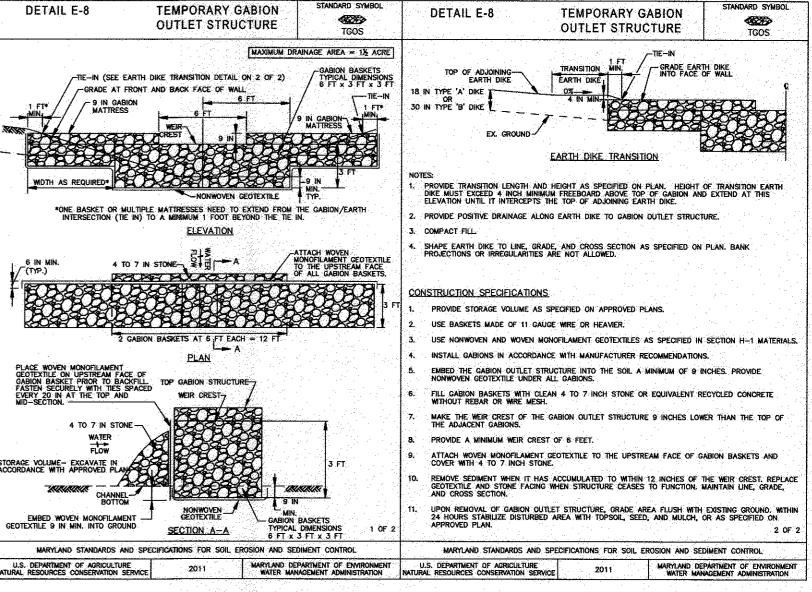
10. INSTALL MBR #1 AND #4. COVER SURFACE AREA WITH FILTER FABRIC. (7 DAYS)

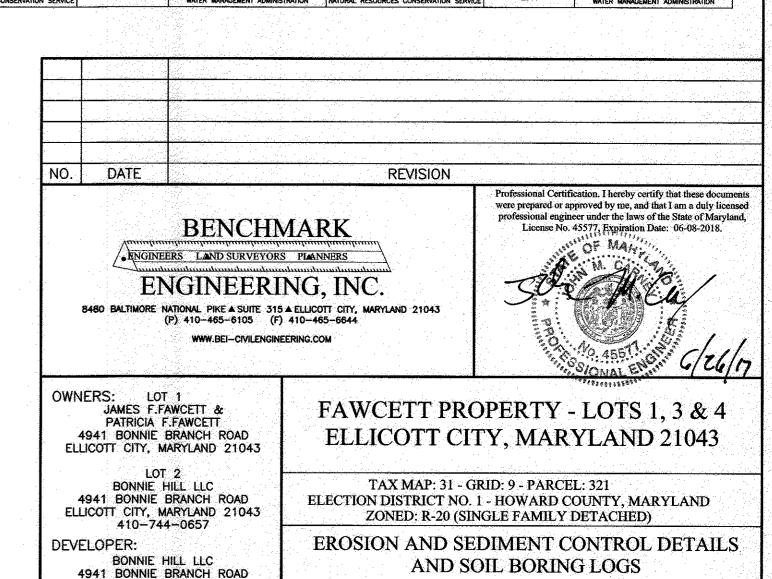
11. FINE GRADE LOTS AND STABILIZE IN ACCORDANCE WITH THE PERMANENT SEEDBED NOTES. (4 DAYS)

12. INSTALL PLANTINGS FOR PERIMETER OBLIGATION. (7 DAYS)

13. REMOVE STONE CHECK DAMS AND ASSOCIATED SILT FENCE. CONSTRUCT DRYWELLS 5, 6 AND 7 WITH WOOD CHECK DAMS AND STABILIZE IN ACCORDANCE WITH THE PERMANENT SEEDBED NOTES. (4 DAYS)

13. UPON APPROVAL FROM THE SEDIMENT CONTROL INSPECTOR. REMOVE ALL SEDIMENT CONTROL DEVICES AND STABILIZE ANY REMAINING DISTURBED AREAS. REMOVE FILTER FABRIC FROM MBR's AND INSTALL PLANTINGS. (7 DAYS)





JUNE, 2017

AS SHOWN

DATE:

SCALE:

ELLICOTT CITY, MARYLAND 21043

410-744-0657

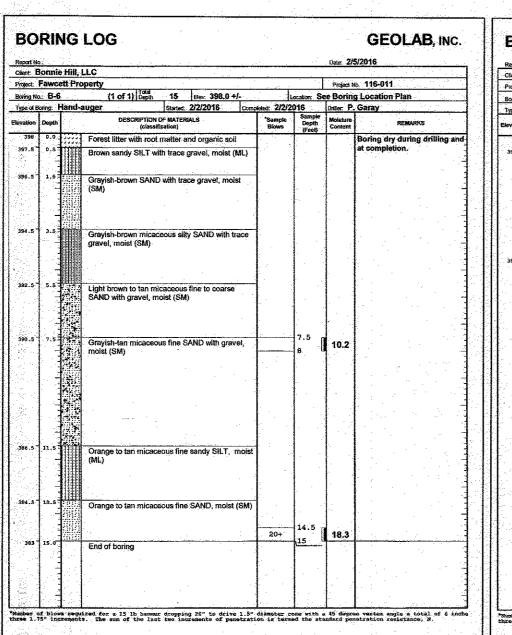
DESIGN: JC | DRAFT: JC/DBT

ENGINEER'S CERTIFICATE "I CERTIFY THAT THIS PLAN FOR SEDIMENT AND EROSION CONTROL REPRESENTS A PRACTICAL AND WORKABLE PLAN BASED ON MY PERSONAL KNOWLEDGE OF THE SITE CONDITIONS AND THAT IT WAS PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF HOWARD SOIL CONSERVATION DISTRICT DEVELOPER'S CERTIFICATE I/WE CERTIFY THAT ALL DEVELOPMENT AND CONSTRUCTION WILL BE DONE ACCORDING TO THIS PLAN FOR SEDIMENT AND EROSION CONTROL, AND THAT ALL RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE AT A DEPARTMENT OF THE ENVIRONMENT APPROVED TRAINING PROGRAM FOR THE CONTROL OF SEDIMENT AND EROSION BEFORE BEGINNING THE PROJECT. I ALSO AUTHORIZE PERIODIC ON-SITE INSPECTION BY THE HOWARD SOIL CONSERVATION DISTRICT." 6/28/17 DATE 8-3-17 7.24.17 CHIEF, DEVELOPMENT ENGINEERING DIVISION

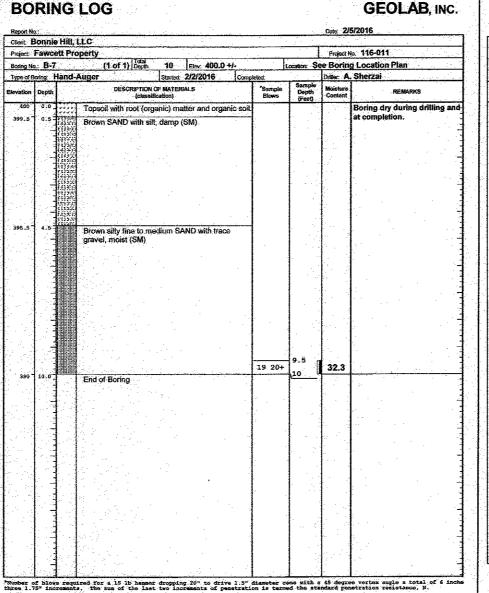
live brown micaceous sandy SILT, moist (ML,

*Number of blows required for a 15 1b hammer dropping 20" to drive 1.5" diameter come with a 45 degree vertex angle a total of three 1.75" increments. The sum of the lest two increments of penatration is tormed the standard penetration resistance, N.

End of Boring



*Number of blows required for a 15 1b hazmer dropping 26" to drive 1.5" diameter come with a 45 degree verter angle a total of 6 inches three 1.75" increments. The sum of the last two increments of penetration is termed the standard penetration resistance, N.



DETAIL C-9

2% IN DIAMETE GALVANIZED STI OR ALUMINUM

FLOW -

DIVERSION

ELEVATION

SECTION

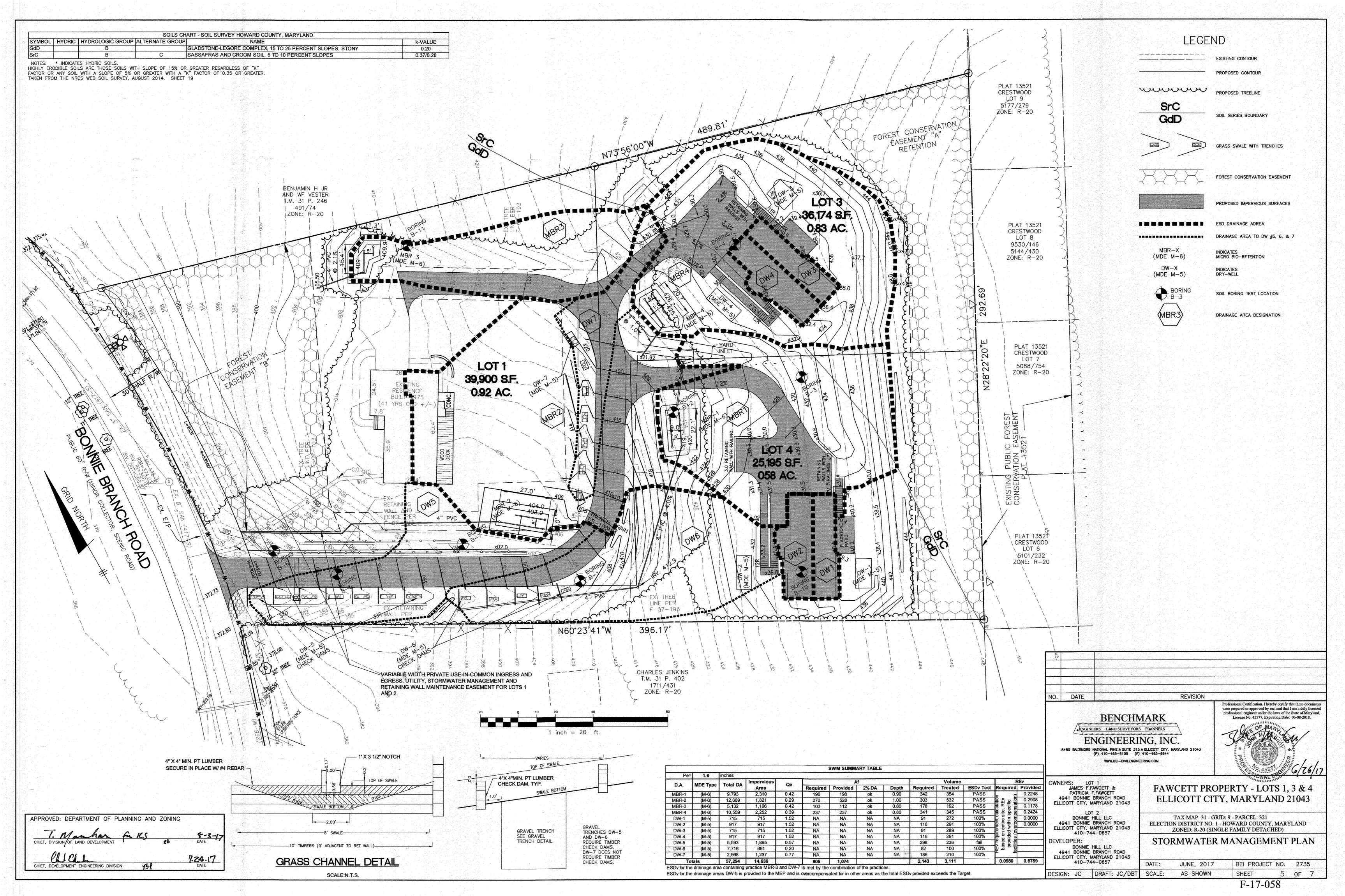
MAXIMUM DRAINAGE AREA = 2 ACRE

UV RESISTANT IMPERMEABLE.
SHEETING ON BOTH SIDES OF FENCE.

- 2% IN DIAMETER GALVANIZED STEI

FENCE

BEI PROJECT NO. 2735



CONSTRUCTION SPECIFICATIONS

B.4.C Specifications for Micro-Bioretention. Rain Gardens, Landscape Infiltration & Infiltration Berms

1. Material Specifications:

The allowable materials to be used in these practices are detailed in Table B.4.1.

2. Filtering Media or Planting Soil:

The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the micro-bioretention practice that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of Bermuda grass, Quackgrass, Johnson grass, or other noxious weeds as specified under COMAR 15.08.01.05.

The planting soil shall be tested and shall meet the following criteria:

- Soil Component Loamy Sand or Sandy Loam (USDA Soil Textural Classification)
- Organic Content Minimum 10% by dry weight (ASTM D 2974). In general, this can be met with a mixture of loamy and(60%-65%) and compost (35% to 40%) or sandy loam (30%), coarse sand (30%), and compost (40%).
- Clay Content Media shall have a clay content of less than 5%.
- pH Range Should be between 5.5 7.0. Amendments (e.g., lime, iron sulfate plus sulfur) may be mixed into the soil to increase or decrease pH.

There shall be at least one soil test per project. Each test shall consist of both the standard soil test for pH, and additional tests of organic matter, and soluble salts. A textural analysis is required from the site stockpiled topsoil. If topsoil is imported, then a texture analysis shall be performed for each location where the topsoil was excavated.

3. Compaction:

It is very important to minimize compaction of both the base of bioretention practices and the required backfill. When possible, use excavation hoes to remove original soil. If practices are excavated using a loader, the contractor should use wide track or marsh track equipment, or light equipment with turf type tires. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high-pressure tires will cause excessive compaction resulting in reduced infiltration rates and is not acceptable. Compaction will significantly contribute to design failure.

Compaction can be alleviated at the base of the bioretention facility by using a primary tilling operation such as a chisel plow, ripper, or subsoiler. These tilling operations are to refracture the soil profile through the 12 inch compaction zone. Substitute methods must be approved by the engineer. Rototillers typically do not till deep enough to reduce the effects of compaction from heavy equipment.

Rototill 2 to 3 inches of sand into the base of the bioretention facility before backfilling the optional sand layer. Pump any ponded water before preparing (rototilling) base.

When backfilling the topsoil over the sand layer, first place 3 to 4 inches of topsoil over the sand, then rototill the sand/topsoil to create a gradation zone. Backfill the remainder of the topsoil to final grade.

When backfilling the bioretention facility, place soil in lifts 12" to 18". Do not use heavy equipment within the bioretention basin. Heavy equipment can be used around the perimeter of the basin to supply soils and sand. Grade bioretention materials with light equipment such as a compact loader or a dozer/loader with marsh tracks.

4. Plant Material:

Recommended plant material for micro-bioretention practices can be found in Appendix A, Section A.2.3.

5. Plant Installation:

Compost is a better organic material source, is less likely to float, and should be placed in the invert and other low areas. Mulch should be placed in surrounding to a uniform thickness of 2" to 3". Shredded or chipped hardwood mulch is the only accepted mulch. Pine mulch and wood chips will float and move to the perimeter of the bioretention area during a storm event and are not acceptable. Shredded mulch must be well aged (6 to 12 months) for acceptance.

Rootstock of the plant material shall be kept moist during transport and on-site storage. The plant root ball should be planted so 1/8th of the ball is above final grade surface. The diameter of the planting pit shall be at least six inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water ground bed cover after installation.

Trees shall be braced using 2" by 2" stakes only as necessary and for the first growing season only. Stakes are to be equally spaced on the outside of the tree ball.

Grasses and legume seed should be drilled into the soil to a depth of at least one inch. Grass and legume plugs shall be planted following the non-grass ground cover planting specifications.

The topsoil specifications provide enough organic material to adequately supply nutrients from natural cycling. The primary function of the bioretention structure is to improve water quality. Adding fertilizers defeats, or at a minimum, impedes this goal. Only add fertilizer if wood chips or mulch are used to amend the soil. Rototill urea fertilizer at a rate of 2 pounds per 1000 square feet.

6. Underdrains:

Underdrains should meet the following criteria:

- Pipe- Should be 4" to 6" diameter, slotted or perforated rigid plastic pipe (ASTMF 758, Type PS 28, or AASHTO-M-278) in a gravel layer. The preferred material is slotted, 4" rigid pipe (e.g., PVC or HDPE).
- Perforations If perforated pipe is used, perforations should be % diameter located 6 on center with a minimum of four bales are say. Pipe about the unconsidered with a 1/2 (Ala 14 as 4x4) reliable to the located form.
- minimum of four holes per row. Pipe shall be wrapped with a ¼" (No. 4 or 4x4) galvanized hardware cloth.
 Gravel The gravel layer (No. 57 stone preferred) shall be at least 3" thick above and below the
- underdrain

APPROVED: DEPARTMENT OF PLANNING AND ZONING

CHIEF, DIVISION OF LAND DEVELOPMENT

CHIEF, DEVELOPMENT ENGINEERING DIVISION

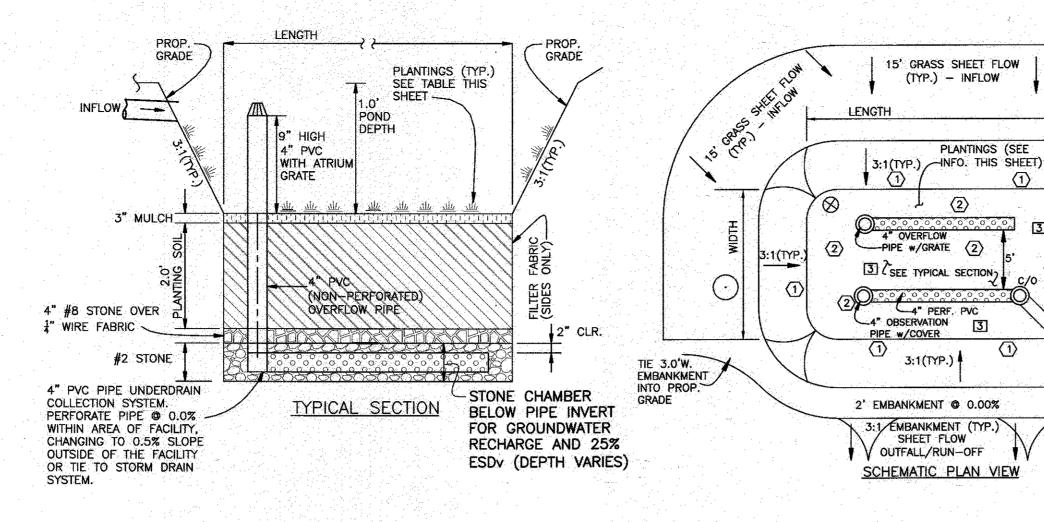
- The main collector pipe shall be at a minimum 0.5% slope.
 A rigid, non-perforated observation well must be provided (one per every 1,0000 square feet) to provide a
- clean-out port and monitor performance of the filter.
- A 4" layer of pea gravel (%" to %" stone) shall be located between the filter media and underdrain to
 prevent migration of fines into the underdrain. This layer may be considered part of the filter bed when bed
 thickness exceeds 24".

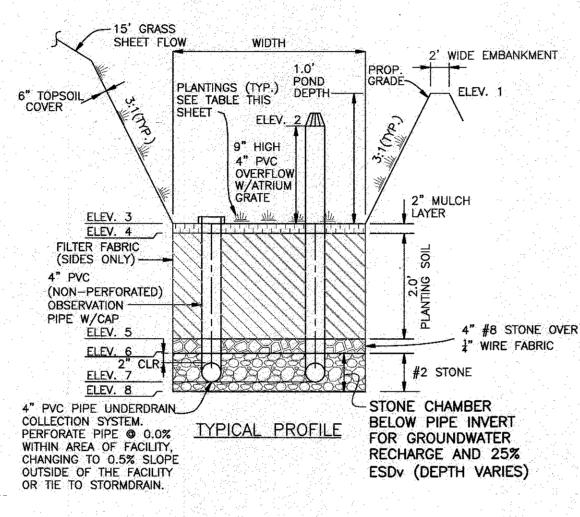
The main collector pipe for underdrain systems shall be constructed at a minimum slope of 0.5%. Observation wells and/or clean-out pipes must be provided (one minimum per every 1000 square feet of surface area).

7.24.17

7. Miscellaneous:

These practices may not be constructed until all contributing drainage area has been stabilized





TYPICAL MICRO-BIORETENTION DETAILS NOT TO SCALE

UNDERDRAIN, OVERFLOW AND OUTFALL NOTES

1. THE LAST CLEAN-OUT LOCATION WITHIN EACH MICRO-BIORETENTION FACILITY SHALL BE FITTED WITH A NON-CLOGGING SURFACE DRAIN (EXAMPLE: 4" ABS ROOF DRAIN W/CAST ALUMINUM DOME) AT THE POND SURFACE ELEVATION INDICATED IN THE CORRESPONDING TABLE

2. THE PVC WITHIN THE FACILITY SHALL BE PERFORATED.

3. THE UNDER-DRAIN AND PIPE TO OUTFALL SHALL BE INSTALLED TO A MINIMUM DEPTH OF 2' BELOW FINISHED GRADE AND SHALL MAINTAIN A MINIMUM 1% SLOPE AND MAINTAIN A MINIMUM OF 1' OF SEPARATION AT ALL CROSSINGS.

OPERATION AND MAINTENANCE SCHEDULE FOR PRIVATELY OWNED AND MAINTAINED (M-3) LANDSCAPE INFILTRATION (M-6) MICRO-BIORETENTION

- a. The Owner shall maintain the plant material, mulch layer and soil layer annually. Maintenance of mulch and soil is limited to correcting areas of erosion or wash out. Any mulch replacement shall be done in the spring. Plant material shall be checked for disease and insect infestation and maintenance will address dead material and pruning. Acceptable replacement plant material is limited to the following: 2000 Maryland Stormwater Design Manual Volume II, Table A.4.1 and 2.
- b. The Owner shall perform a plant inspection in the spring and in the fall of each year. During the inspection, the Owner shall remove dead and diseased vegetation considered beyond treatment, replace dead plant material with acceptable replacement plant material, treat diseased trees and shrubs, and replace all deficient stakes and wires.
- c. The Owner shall inspect the mulch each spring. The mulch shall be replaced every two to three years. The previous mulch layer shall be removed the new layer is
- d. The Owner shall correct soil erosion on an as needed basis, with a minimum of once per month and after each heavy storm.

OPERATION AND MAINTENANCE SCHEDULE FOR PRIVATELY OWNED AND MAINTAINED (M-5) DRY WELLS

1. The monitoring wells and structures shall be inspected on a quarterly basis and after every large storm event.

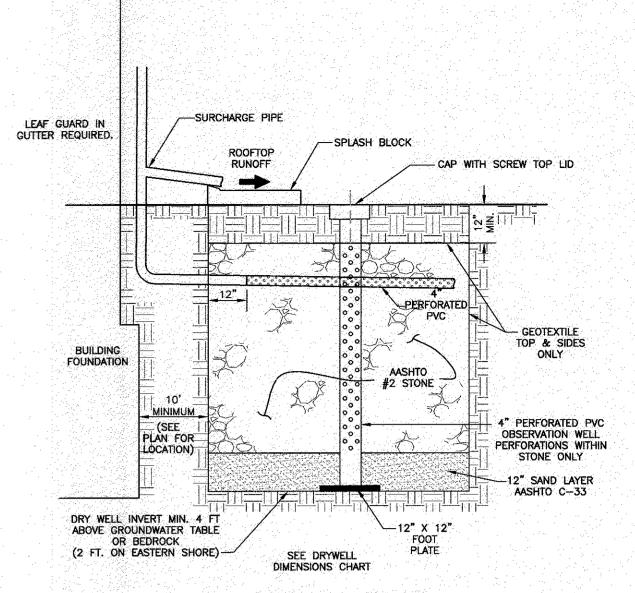
Water levels and sediment build up in the monitoring wells shall be recorded over a period of several days to insure trench drainage.

3. A log book shall be maintained to determine the rate at which the facility drains

When the facility becomes clogged so that it does not drain down within the 72 hour time period, corrective action shall be taken.

5. The maintenance log book shall be available to Howard County for inspection to insure compliance with operation and maintenance criteria.

6. Once the performance characteristics of the infiltration facility have been verified, the monitoring schedule can be reduced to an annual basis unless the performance data indicates that a more frequent schedule is required.



DRY WELL DETAIL

NOT TO SCALE

	Dry Well Dimension Chart								
	Dry Well	Length (ft)	Width (ft)	Depth of Stone (Ft)	Top of Stone Elevation	Bottom of Stone Elevation	Bottom of Sand Elevation		
	#1	15.8	8.6	5.0	437.5	433.50	432.50		
	#2	18.2	8.0	5.0	428.5	424.50	423.50		
	#3	12.8	10.6	5.0	433.5	429.50	428.50		
Г	#4	18.2	8.0	5.0	429.0	425.00	424.00		

8' TYP. DW-5 PLAN VIEW GRASS SWALE

SECTION VIEW

GRASS SWALE DRYWELL DETAIL

DW-6 PLAN VIEW

DW-7 PLAN VIEW

514.6	7740	004	00/		4.00	0.40	00	20		4
DW-5	5593	1895	34%	В	1.80	0.35	298	32	7	2
Designation	(sf)		Impervious		(Inches)	Runoff	(cf)	Trench (cf)	Trenches	Volume
Gravel Trench	Drainage Area	Impervious	Percent	Soils	Target Pe	Volumetric	Target ESDv	Volume per	Number of	Total
		1 74 1 17		4.14 Star (9.1				garage and the second		

SCALE: 1" = 5'

MICRO-BIORETENTION DESIGN TABLES

(2)

4" PVC OUTFALL

DISCHARGE MIN

5'MIN. FROM P/L

(NON-PERFORATED) MIN. 0.5% GRADE

MBR	#1	MBR	#2	MBR	#3	MBR #4		
ELEV. 1	420.00	ELEV. 1	404.00	ELEV. 1	409.90	ELEV. 1	426.20	
ELEV. 2	419.85	ELEV. 2	404.00	ELEV. 2	409.75	ELEV. 2	425.95	
ELEV. 3	419.10	ELEV. 3	403.00	ELEV. 3	409.00	ELEV. 3	425.20	
ELEV. 4	418.93	ELEV. 4	402.83	ELEV. 4	408.83	ELEV. 4	425.03	
ELEV. 5	416.93	ELEV. 5	400.83	ELEV. 5	406.83	ELEV. 5	423.03	
ELEV. 6	416.60	ELEV. 6	400.50	ELEV. 6	406.50	ELEV. 6	422.70	
ELEV. 7	416.02	ELEV. 7	399.92	ELEV. 7	405.92	ELEV. 7	422.12	
ELEV. 8	415.77	ELEV. 8	399.67	ELEV. 8	405.67	ELEV. 8	421.87	
SURFACE ARE	A: 198.1 SF	SURFACE AREA	A: , 270 SF	SURFACE ARE	A: 111.5 SF	SURFACE AREA	A: 236.8 SI	

NOTE: SEE SHEET 2 FOR SURFACE AREA DIMENSIONS

Appendix B.4. Construction Specifications for Environmental Site Design Practices

Material	Specification	Size	Notes
Plantings	see Appendix A, Table A.4	n/a	plantings are site-specific
Planting soil [2' to 4' deep]	loamy sand (60 - 65%) & compost (35 - 40%) or sandy loam (30%),	n/a	USDA soil types loamy sand or sandy loam; clay content < 5%
	coarse sand (30%) & compost (40%)		
Organic content	Min. 10% by dry weight (ASTM D 2974)		
Mulch	shredded hardwood		aged 6 months, minimum; no pine or wood chips
Pea gravel diaphragm	pea gravel: ASTM-D-448	NO. 8 OR NO. 9 (1/8" TO 3/8")	
Curtain drain	ornamental stone: washed cobbles	stone: 2" to 5"	
Geotextile		n/a	PE Type I nonwoven
Gravel (underdrains and infiltration berms)	AASHTO M-43	NO. 57 OR NO. 6 AGGREGATE (3/8" to 3/4")	
Underdrain piping	F 758, Type PS 28 or AASHTO M-278	4" to 6" rigid schedule 40 PVC or SDR35	Slotted or perforated pipe; 3/8" perf. @ 6" on center, 4 holes pe row; minimum of 3" of gravel over pipes; not necessary underneath pipes. Perforated pipe shall be wrapped with 1/4-inch galvanized hardware cloth
Poured in place concrete (if required)	MSHA Mix No. 3; f° _c = 3500 psl @ 28 days, normal weight, air-entrained; reinforcing to meet ASTM-615-60	n/a	on-site testing of poured-in-place concrete required: 28 day strength and slump test; all concrete design (cast-in-place or pre-cast) not using previously approved State or local standards requires design drawings sealed and approved by a professional structural engineer licensed in the State of Marylan design to include meeting ACI Code 350.R/89; vertical loading [H-10 or H-20]; allowable horizontal loading (based on soil pressures); and analysis of potential cracking
Sand	AASHTO-M-6 or ASTM-C-33	0.02" to 0.04"	Sand substitutions such as Diabase and Graystone (AASHTO) #10 are not acceptable. No calcium carbonated or dolomitic san substitutions are acceptable. No "rock dust" can be used for san

B.4.7

Supp. 1

NO. DATE

REVISION

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 45577, Expiration Date: 06-08-2018.

ENGINEER LAND SURVEYORS PIANNERS

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ENGINEER SUITE 315 & ELLICOTT CITY, MARYLAND 21043

(P) 410-485-8105 (F) 410-485-8644

WWW.BEI-CIVILENGINEERING.COM

OWNERS: LOT 1

DWNERS: LOT 1

JAMES F.FAWCETT & FAWCETT PROPERTY - LOTS 1, 3 & 4

PATRICIA F.FAWCETT

4941 BONNIE BRANCH ROAD
ELLICOTT CITY, MARYLAND 21043

LOT 2

BONNIE HILL LLC

4941 BONNIE BRANCH ROAD

ELECTION DISTRICT NO. 1 - HOWARD COUNTY, MARYLAND

4941 BONNIE BRANCH ROAD
ELLICOTT CITY, MARYLAND 21043
410-744-0657

DEVELOPER:

BONNIE HILL LLC
4941 BONNIE BRANCH ROAD
ELLICOTT CITY, MARYLAND 21043
410-744-0657

DATE: JUNE, 2017

BEI PROJECT NO. 1 - HOWARD COUNTY, MARYLAND
ZONED: R-20 (SINGLE FAMILY DETACHED)

STORMWATER MANAGEMENT DETAILS
DATE: JUNE, 2017

BEI PROJECT NO. 2735

AS SHOWN

SCALE:

DESIGN: JC DRAFT: JC/DBT

SHEET 6 OF 7 F-17-058

