

SHEET INDEX	
NO.	DESCRIPTION
1	SITE DEVELOPMENT AND GRADING PLAN
2	SEDIMENT & EROSION CONTROL AND STORMWATER MANAGEMENT PLAN
3	SEDIMENT AND EROSION CONTROL NOTES AND DETAILS
4	STORMWATER MANAGEMENT NOTES AND DETAILS

GENERAL NOTES

- SUBJECT PROPERTY IS ZONED R-12 PER THE 10-6-2013 COMPREHENSIVE ZONING PLAN.
- THIS PROJECT IS SUBJECT TO THE AMENDED FIFTH EDITION OF THE SUBDIVISION AND LAND DEVELOPMENT REGULATIONS, DATED OCTOBER 7, 2007.
- PROJECT LIMITS ARE BASED ON A BOUNDARY SURVEY PERFORMED BY BENCHMARK ENGINEERING, INC., ON OR ABOUT APRIL 2015.
- TOPOGRAPHY SHOWN HEREON IS BASED ON A FIELD RUN SURVEY PREPARED BY BENCHMARK ENGINEERING, INC., DATED APRIL 2015, CONTOUR INTERVAL IS 2'.
- THE COORDINATES SHOWN HEREON ARE BASED UPON THE HOWARD COUNTY GEODETIC CONTROL WHICH IS BASED UPON THE MARYLAND STATE PLANE COORDINATE SYSTEM. HOWARD COUNTY MONUMENTS 3805 & 3806 WERE USED FOR THIS PROJECT.
- NO GRADING, REMOVAL OF VEGETATIVE COVER OR TREES, PAVING AND NEW STRUCTURES SHALL BE PERMITTED WITHIN THE STREAMS, OR THEIR REQUIRED BUFFERS AND FLOODPLAIN UNLESS DEMED NECESSARY BY THE DEPARTMENT OF PLANNING AND ZONING.
- THERE ARE NO STEEP SLOPES (25% OR GREATER) IN EXCESS OF 20,000 SF ON THIS SITE.
- THERE IS NO NEED FOR A FLOOD STUDY FOR THIS PROJECT. THERE ARE NO FLOODPLAINS, STREAMS OR WETLANDS LOCATED ON-SITE.
- TO THE BEST OF OUR KNOWLEDGE THERE ARE NO CEMETERIES OR HISTORIC STRUCTURES LOCATED ON THIS SITE.
- A NOISE STUDY IS NOT REQUIRED FOR THIS PLAN.
- THIS SITE IS LOCATED WITHIN THE METROPOLITAN DISTRICT AND THE PLANNED SERVICE AREA. WATER AND SEWER WILL BE PUBLIC CONNECTIONS PROPOSED TO CONTRACT W-108-B-34740. THE SITE AREA IS LESS THAN 20,000 SF. THEREFORE, THE SITE SHALL BE EXEMPT FROM THE REQUIREMENTS OF SECTION 16.12000 OF THE HOWARD COUNTY CODE FOR FOREST CONSERVATION PER SECTION 18.1202(B)(1)(i) OF THE SUBDIVISION REGULATIONS FOR DEVELOPMENT ON LAND WHICH IS LESS THAN 40,000 SF IN SIZE.
- PREVIOUS DPZ FILES: PLAT BOOK 60 FOLIO 115, ECP-16-028
- PERIMETER LANDSCAPING IS NOT REQUIRED FOR THIS PROPERTY AS ALL LINES ARE INTERNAL TO THE SUBDIVISION.
- DRIVEWAYS SHALL BE PROVIDED PRIOR TO RESIDENTIAL OCCUPANCY TO INSURE SAFE ACCESS FOR FIRE AND EMERGENCY VEHICLES PER THE FOLLOWING MINIMUM REQUIREMENTS:
 - WIDTH - 12' (16' SERVING MORE THAN ONE RESIDENCE).
 - SURFACE - 6" OF COMPACT CRUSHER RUN BASE WITH TAR AND CHIP COATING (1-1/2" MIN.)
 - GEOMETRY - MAXIMUM 15% GRADE, MAXIMUM 10% GRADE CHANGE AND MINIMUM 45' TURNING RADIIUS.
 - STRUCTURES (CULVERTS/BRIDGES) - CAPABLE OF SUPPORTING 25 GROSS TONS (H25 LOADING).
 - DRAINAGE ELEMENTS - CAPABLE OF SAFELY PASSING 100 YEAR FLOODPLAIN WITH NO MORE THAN 1 FOOT DEPTH OVER DRIVEWAY.
 - STRUCTURE CLEARANCES - MINIMUM 12 FEET.
 - MAINTENANCE - SUFFICIENT TO INSURE ALL WEATHER USE.
- IN ACCORDANCE WITH SECTION 128 OF THE HOWARD COUNTY ZONING REGULATIONS, BAY WINDOWS, CHIMNEYS, OR EXTERIOR STAIRWAYS NOT MORE THAN 16 FEET IN WIDTH MAY PROJECT NOT MORE THAN 4 FEET INTO ANY SETBACKS, PORCHES OR DECKS, OPEN OR ENCLOSED, MAY PROJECT NOT MORE THAN 10 FEET INTO THE FRONT OR REAR YARD SETBACK.
- A PRE-SUBMISSION COMMUNITY MEETING FOR THIS PROJECT IS NOT REQUIRED.
- THE CONTRACTOR SHALL NOTIFY THE DEPARTMENT OF PUBLIC WORKS/BUREAU OF ENGINEERING/CONSTRUCTION INSPECTION DIVISION AT (410) 313-1880 AT LEAST FIVE (5) WORKING DAYS PRIOR TO THE START OF WORK.
- THE CONTRACTOR SHALL NOTIFY "MISS UTILITY" AT 1-800-257-7777 AT LEAST 48 HOURS PRIOR TO ANY EXCAVATION WORK BEING DONE.
- EXISTING UTILITIES SHOWN ARE BASED ON A FIELD SURVEY, HOWARD COUNTY GIS, AND INFORMATION OF RECORD.
- ANY DAMAGE TO THE COUNTY'S RIGHT-OF-WAY SHALL BE CORRECTED AT THE BUILDER'S EXPENSE. CONTRACTOR SHALL ADJUST ELEVATIONS OF STRUCTURES AS NECESSARY.
- SHC SHALL BE THE RESPONSIBILITY OF THE OWNER.
- STORMWATER MANAGEMENT METHODS WERE DESIGNED BASED ON THE 2000 MARYLAND STORMWATER DESIGN MANUAL, VOLUMES I AND II. TREATMENT IS PROVIDED USING ENVIRONMENTAL SITE DESIGN METHODS, INCLUDING MICRO-BIORETENTION PRACTICE. THE FACILITY SHALL BE OWNED AND MAINTAINED BY LOT OWNER.
- BRL INDICATES ZONING BUILDING RESTRICTION LINE, OTHER RESTRICTIONS MAY APPLY.
- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST STANDARDS AND SPECIFICATIONS OF HOWARD COUNTY.
- THE STAKING OF FOUNDATIONS PRIOR TO CONSTRUCTION TO ENSURE COMPLIANCE WITH REGULATORY BUILDING RESTRICTION LINES IS RECOMMENDED.
- THE SUBJECT PROPERTY IS LOCATED WITHIN THE BWI AIRPORT ZONING DISTRICT. AIRPORT ZONING PERMITS No. 15-191 (LOTS 446 AND 447) AND No. 15-192 (LOTS 448 AND 449) WERE ISSUED ON MARCH 21, 2016.
- SEWER SERVICE TO EXISTING LOT 447 FROM EXISTING SEWER CONSTRUCTED BY CONTRACT 23-S ONLY PROVIDES GRAVITY SEWER SERVICE TO THE FIRST FLOOR. IF BASEMENT SERVICE IS DESIRED AN EJECTOR PUMP FOR THE BASEMENT ONLY WILL BE NECESSARY. A WAIVER WILL BE REQUIRED TO ALLOW BASEMENT SERVICE.**

SITE DEVELOPMENT PLAN

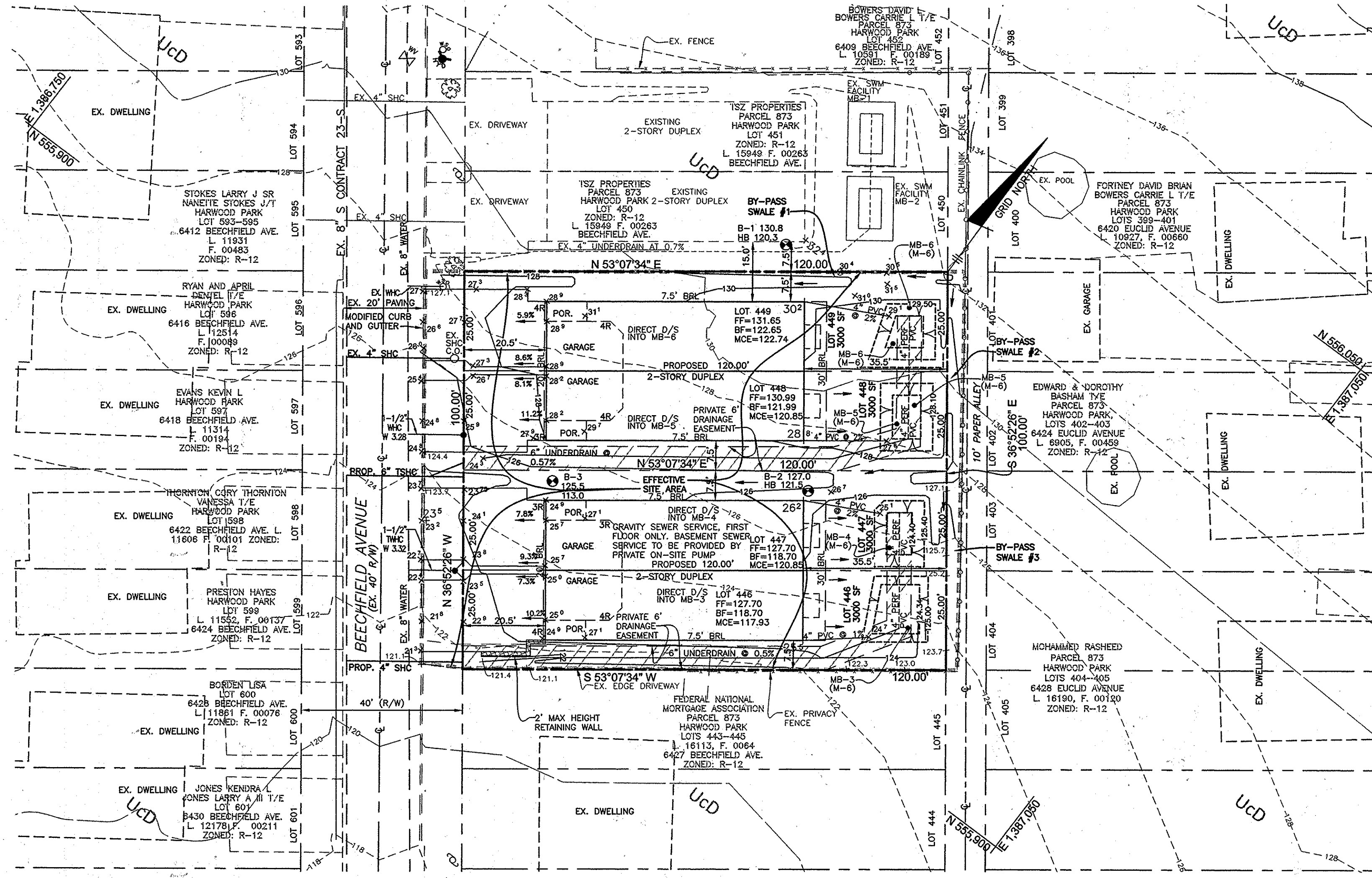
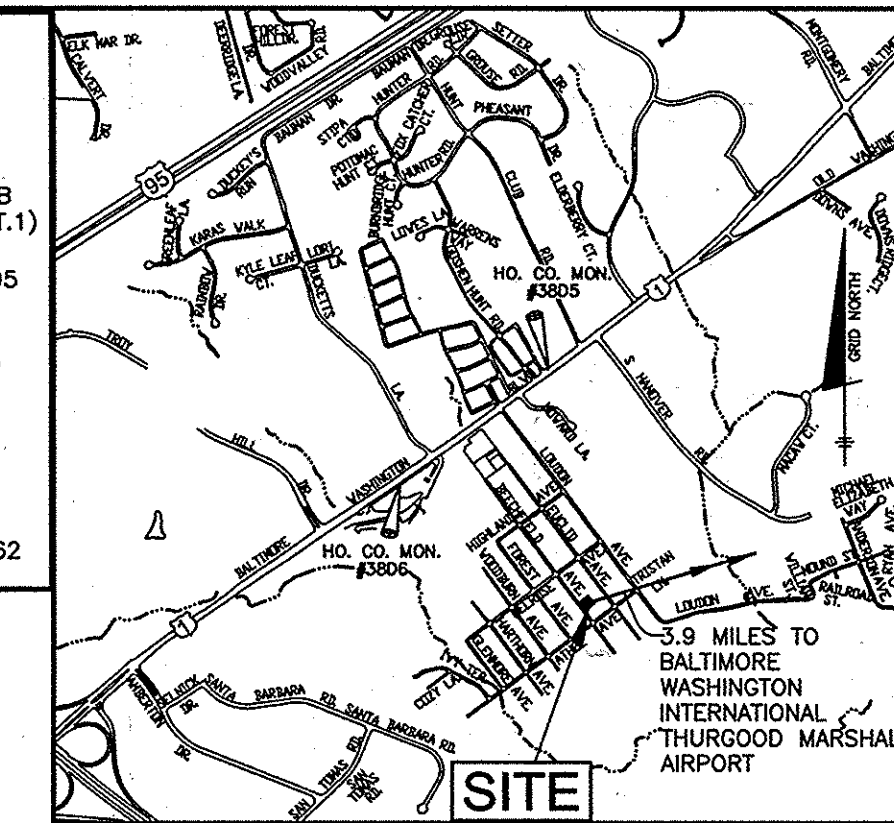
HARWOOD PARK

LOTS 446 - 449

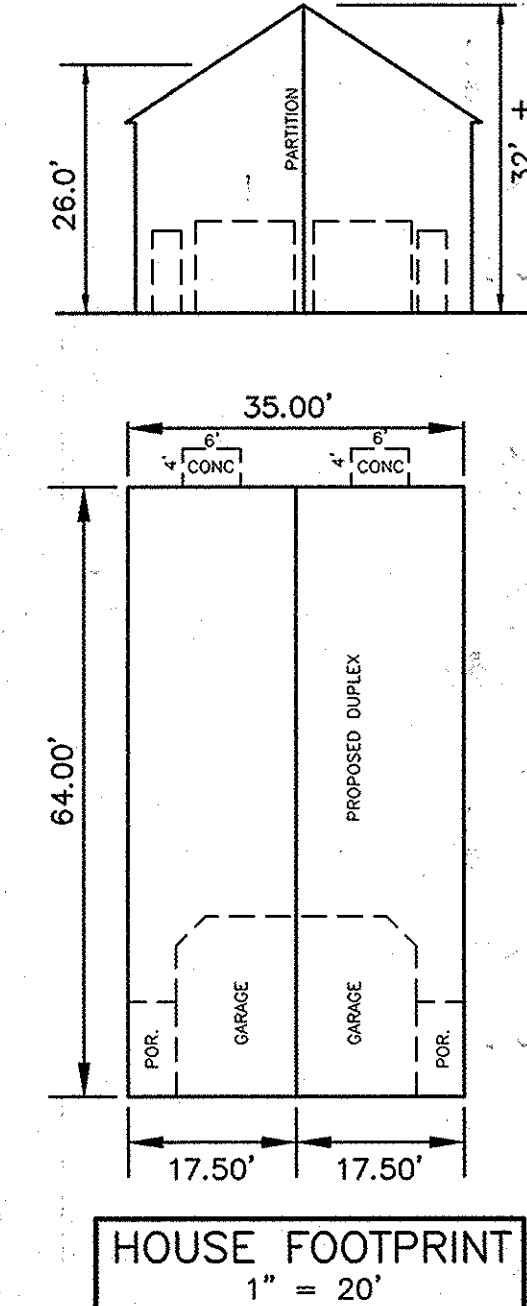
1st ELECTION DISTRICT

HOWARD COUNTY, MARYLAND

BENCH MARKS	
HO. CO. #3805 (NAD '83)	ELEV. 193.71
STAMPED DISC ON CONCRETE MONUMENT BEING 38.8' SOUTHEAST OF A FIRE HYDRANT, 5.6' NORTH OF THE EXISTING CONCRETE CURB ALONG NORTH SIDE OF WASHINGTON BLVD (RT.1)	
N 558,378.581	E 1,386,524.195
HO. CO. #3806 (NAD '83)	ELEV. 175.23
STAMPED DISC ON CONCRETE MONUMENT BEING 44' SOUTHWEST OF A LIGHT POLE & 148' NORTH OF THE GATE AT ATLANTIC SUPPLY CO.	
N 557,155.459	E 1,384,992.262



PLAN VIEW



SITE ANALYSIS DATA CHART

- | | |
|--|---|
| A) TOTAL PROJECT AREA | 0.28 AC. |
| B) AREA OF THIS PLAN SUBMISSION | 0.28 AC. |
| C) APPROXIMATE LIMIT OF DISTURBANCE | 0.31 AC. |
| D) PRESENT ZONING: | R-12 |
| E) PROPOSED USE OF SITE: | RESIDENTIAL SINGLE FAMILY SEMI-DETACHED |
| F) TOTAL NUMBER OF UNITS ALLOWED AS SHOWN ON FINAL PLAT(S) | 4 |
| G) TOTAL NUMBER OF UNITS PROPOSED | 4 |
| H) REQUIRE PARKING PER UNIT: | 2.5 SPACES |
| I) PROVIDED PARKING PER UNIT: | 3 (1 GARAGE AND 2 DRIVEWAY) |
| J) APPLICABLE DPZ FILE REFERENCES: | PB 60 FOLIO 115, ECP-16-028 |
| K) PROPOSED WATER AND SEWER SYSTEMS: | <input checked="" type="checkbox"/> PUBLIC <input type="checkbox"/> PRIVATE |

LEGEND

- B-1 SOIL BORING
- N 53°07'34" E 120.00' SUBMISSION LIMITS
- UcD SOILS SYMBOL
- SOILS LINES
- LIMIT OF DISTURBANCE
- PRIVATE 6" DRAINAGE EASEMENT
- RETAINING WALL

SHC TABLE		
LOT NO.	INVERT AT EASEMENT	MCE
446	113.61	117.93
447	116.53	120.85
448	116.53	120.85
449	118.42	122.74

ADDRESS CHART	
LOT NO.	ADDRESS
446	6425 BEECHFIELD AVE.
447	6423 BEECHFIELD AVE.
448	6421 BEECHFIELD AVE.
449	6419 BEECHFIELD AVE.

NO.	DATE	REVISION

BENCHMARK
ENGINEERS & LAND SURVEYORS & PLANNERS
ENGINEERING, INC.

8480 BALTIMORE NATIONAL PIKE & SUITE 315 & ELLICOTT CITY, MARYLAND 21043
(P) 410-465-8105 (F) 410-465-8844
WWW.BE-ENGINEERING.COM

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. 45571. Date: 06-08-2016.

[Signature]
3/31/16

APPROVED: DEPARTMENT OF PLANNING AND ZONING

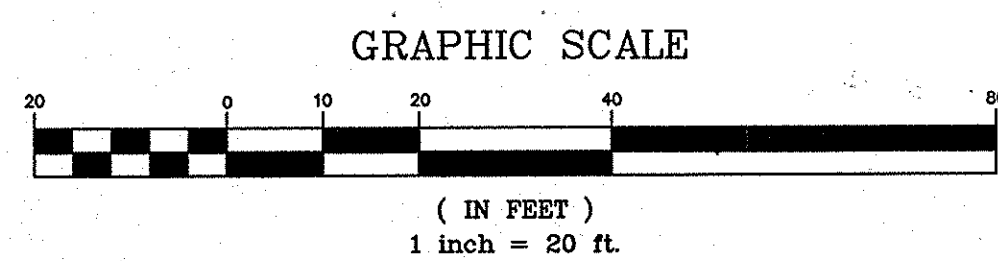
[Signature] 5-10-16
CHIEF, DIVISION OF LAND DEVELOPMENT DATE

[Signature] 5-10-16
CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE

[Signature] 5-11-16
DIRECTOR DATE

SOILS LEGEND			
MAP SYMBOL	SOIL TYPE	MAPPING UNIT	Kw FACTOR
UcD	D	Urban land-Chillum-Beltsville complex, 0 to 5 percent slopes	0.37

USDA - NRCS WEBSITE - SOIL SURVEY MAP No. 25 - NO HYDRIC SOILS



PERMIT INFORMATION CHART					
SUBDIVISION NAME:		SECTION/AREA:		LOT/PARCEL #	
HARWOOD PARK		N/A		LOTS 446-449	
PLAT No.	GRID No.	ZONE	TAX MAP	ELECTION DISTRICT	CENSUS TRACT
PB 60	13	R-12	38	1ST	601204
FOLIO 115					

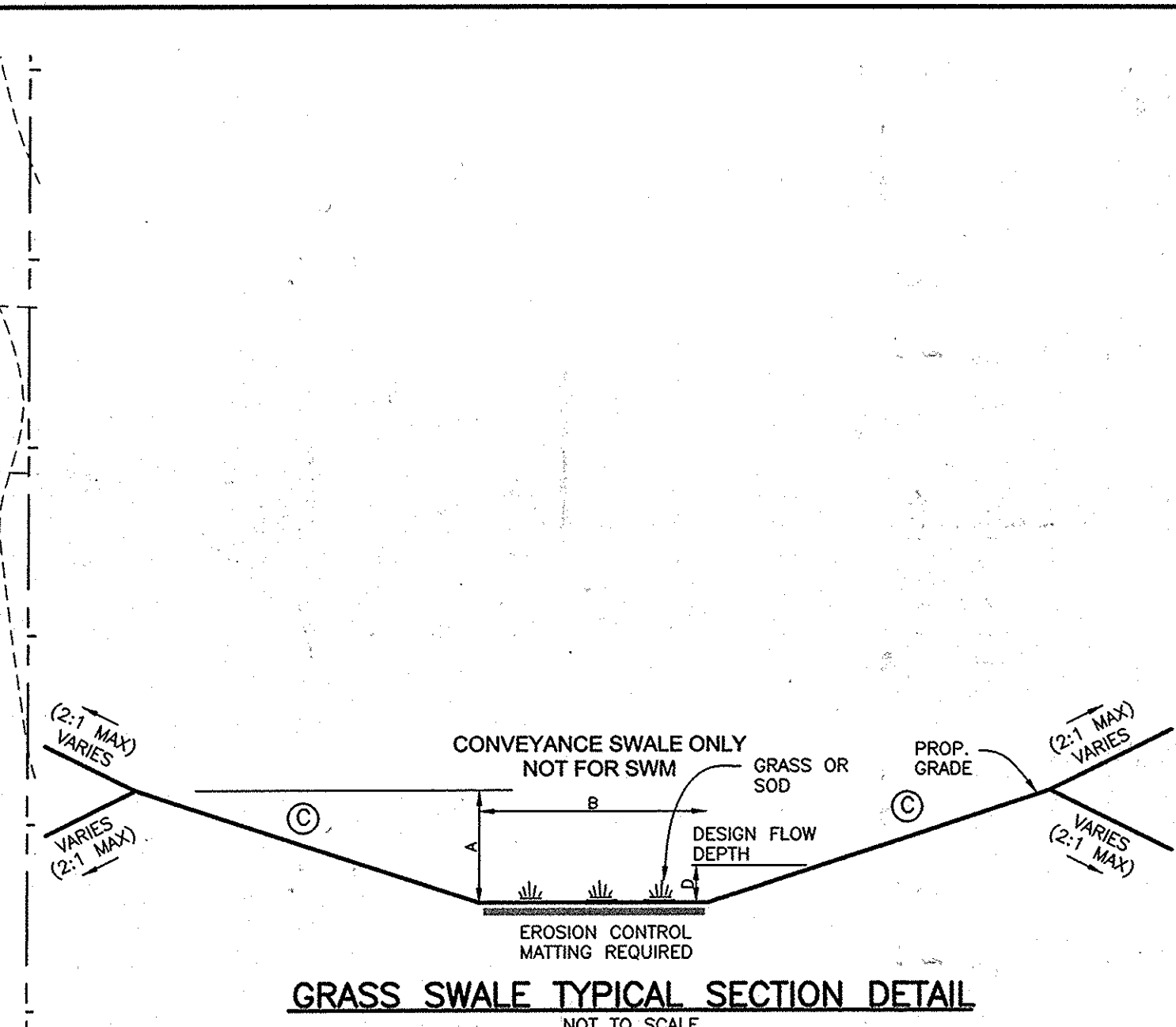
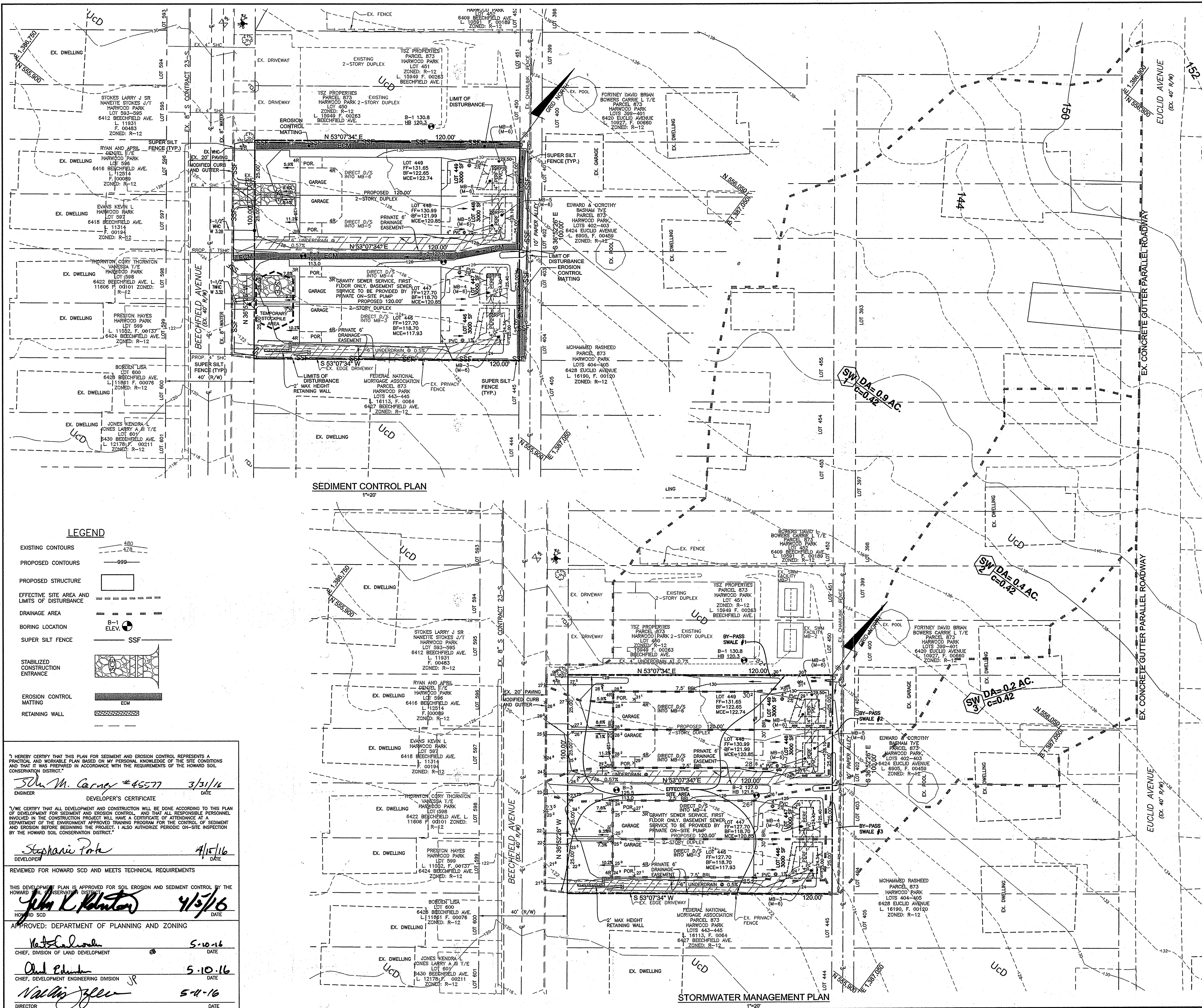
OWNER/DEVELOPER:

TSZ PROPERTIES
10382 BALTIMORE NATIONAL PIKE
ELLICOTT CITY, MARYLAND 21042
410-465-4103
c/o STEPHANIE PORTA

HARWOOD PARK
LOTS 446-449
PLAT BOOK 60 FOLIO 115
SINGLE FAMILY SEMI-DETACHED DUPLEX UNITS

TAX MAP: 38 GRID: 13 PARCEL: P/O 873
ZONED: R-12
BEECHFIELD AVENUE
ELECTION DISTRICT NO. 1, HOWARD COUNTY, MARYLAND
SITE DEVELOPMENT AND GRADING PLAN

DATE: MARCH, 2016 BEI PROJECT NO. 2672
SCALE: 1" = 20' SHEET 1 OF 4



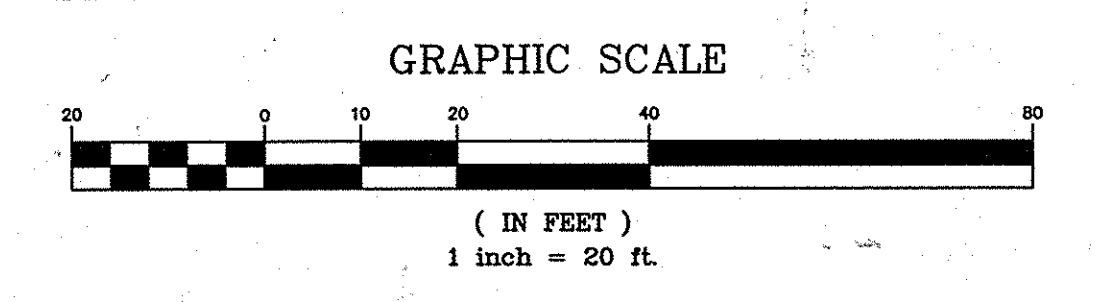
SWALE #1	SWALE #2	SWALE #3
A 1.0'	A 1.0'	A 1.0'
B 1.0'	B 1.0'	B 1.0'
C 3.1'	C 3.1'	C 3.1'
D 0.22'	D 0.22'	D 0.14'
SLOPE 3.0%	SLOPE 5.0%	SLOPE 6.7%
BOTTOM DIMS	BOTTOM DIMS	BOTTOM DIMS
LENGTH 132'	LENGTH 177'	LENGTH 44'
WIDTH 1.0'	WIDTH 1.0'	WIDTH 1.0'

STORM Q (RUNOFF) VELOCITY	STORM Q (RUNOFF) VELOCITY	STORM Q (RUNOFF) VELOCITY
2 YR 1.70 CFS 2.92 FPS	2 YR 0.76 CFS 2.80 FPS	2 YR 0.38 CFS 2.53 FPS
10 YR 2.49 CFS 3.23 FPS	10 YR 1.11 CFS 3.12 FPS	10 YR 0.55 CFS 2.83 FPS

GRASS SWALE DESIGN TABLES

NOTE: ELEVATIONS LISTED IN CHART ARE ELEVATIONS AT BOTTOM OF THE SWALES. THESE SWALES DO NOT PROVIDE STORMWATER MANAGEMENT.

Swale Flow Designs			
	Swale 1	Swale 2	Swale 3
Area =	0.9	0.4	0.2 Acres
c =	0.42	0.42	0.42
I2 =	4.5	4.5	4.5 In/Hr
I10 =	6.6	6.6	6.6 In/Hr
Q2 =	1.70	0.76	0.38 CFS
Q10 =	2.49	1.11	0.55 CFS



SOILS LEGEND		
MAP SYMBOL	SOIL TYPE	MAPPING UNIT
UCD	D	Urban land-Chillum-Beltville complex, 0 to 5 percent slopes
		Kw FACTOR 0.37

USDA - NRCS WEBSITE - SOIL SURVEY MAP NO. 25 - NO HYDRIC SOILS

LEGEND	
EXISTING CONTOURS	480 478
PROPOSED CONTOURS	999
PROPOSED STRUCTURE	[Symbol]
EFFECTIVE SITE AREA AND LIMITS OF DISTURBANCE	[Symbol]
DRAINAGE AREA	[Symbol]
BORING LOCATION	B-1 ELEV.
SUPER SILT FENCE	SSF
STABILIZED CONSTRUCTION ENTRANCE	[Symbol]
EROSION CONTROL MATTING	ECM
RETAINING WALL	[Symbol]

I HEREBY 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.

John M. Carnoy #4577 3/31/16
ENGINEER DEVELOPER'S CERTIFICATE DATE

I HEREBY CERTIFY THAT ALL DEVELOPMENT AND CONSTRUCTION WILL BE DONE ACCORDING TO THIS PLAN OF DEVELOPMENT 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.

Stephanie Porta 4/15/16
DEVELOPER DATE

REVIEWED FOR HOWARD SCD AND MEETS TECHNICAL REQUIREMENTS

THIS DEVELOPMENT PLAN IS APPROVED FOR SOIL EROSION AND SEDIMENT CONTROL BY THE HOWARD SOIL CONSERVATION DISTRICT.

John K. Robertson 4/15/16
HOWARD SCD DATE

APPROVED: DEPARTMENT OF PLANNING AND ZONING

John A. ... 5-10-16
CHIEF, DIVISION OF LAND DEVELOPMENT DATE

Paul ... 5-10-16
CHIEF, DEVELOPMENT ENGINEERING DIVISION DATE

Natalie ... 5-11-16
DIRECTOR DATE

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 #5577, Expiration Date: 6-8-2016.

BENCHMARK ENGINEERING, INC.
6840 BALTIMORE NATIONAL PIKE SUITE 315 ELLICOTT CITY, MARYLAND 21043
(P) 410-465-6105 (F) 410-465-6644
WWW.BE-ENGINEERING.COM

OWNER/DEVELOPER: TSZ PROPERTIES 10382 BALTIMORE NATIONAL PIKE ELLICOTT CITY, MARYLAND 21042 410-455-4103 c/o STEPHANIE PORTA

HARWOOD PARK
LOTS 446-449
PLAT BOOK 60 FOLIO 115
SINGLE FAMILY SEMI-DETACHED DUPLEX UNITS
TAX MAP: 38 GRID: 13 PARCEL: P/O 873
ZONED: R-12
ELECTION DISTRICT NO. 1, HOWARD COUNTY, MARYLAND

SEDIMENT & EROSION CONTROL AND STORMWATER MANAGEMENT PLAN

DATE: JANUARY, 2016 BEI PROJECT NO. 2672
SCALE: 1" = 20' SHEET 2 OF 4

SDP-16-023

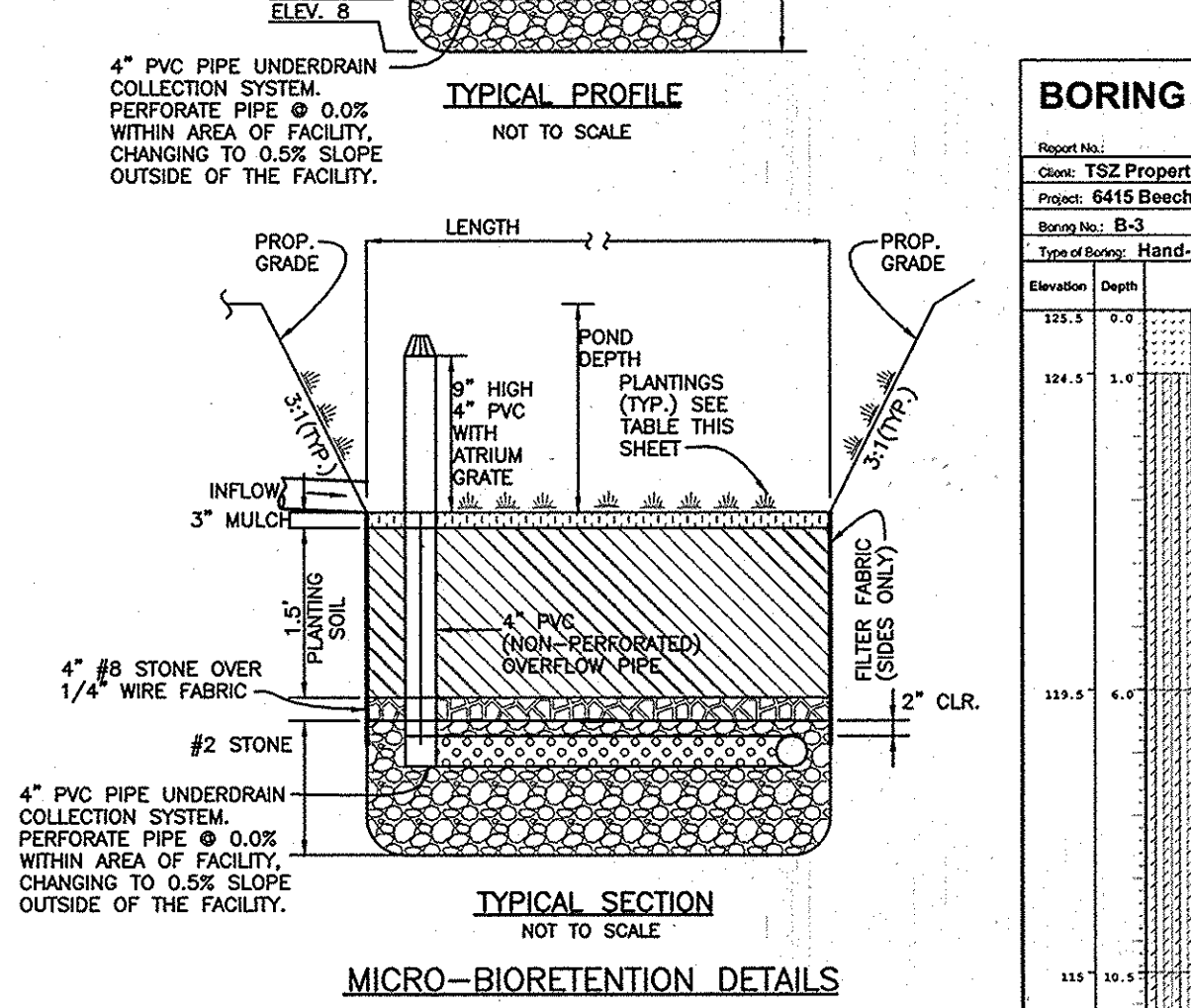
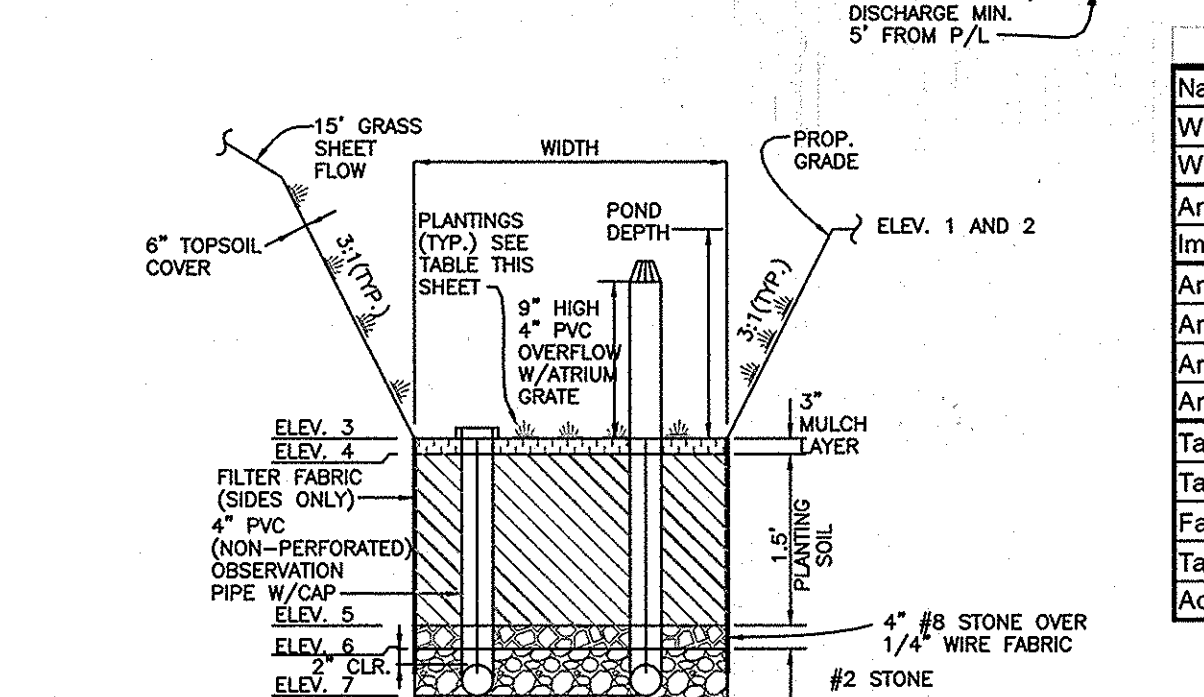
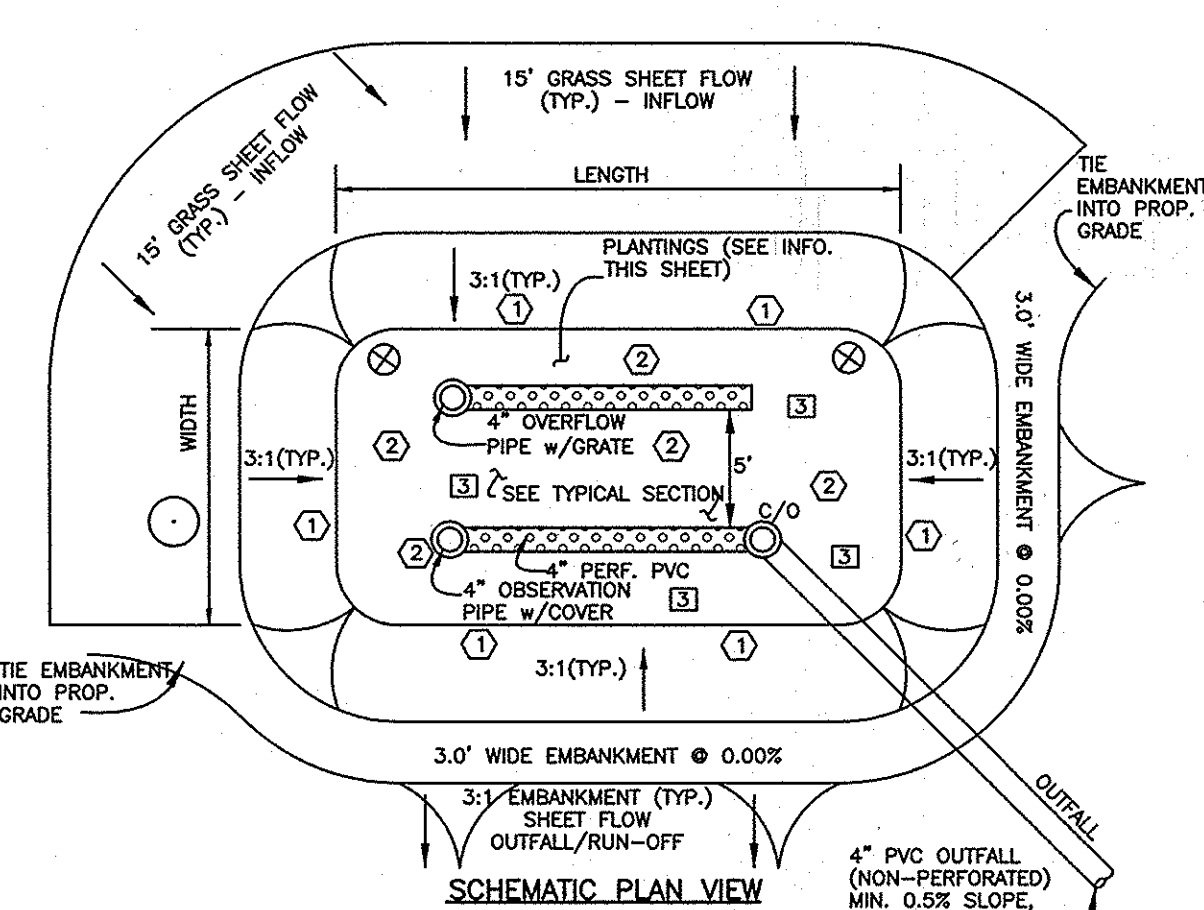
MICROBIORETENTION PLANTING SCHEDULE

(SPECIFIC NUMBER OF PLANTINGS SHALL BE DETERMINED WITH FINAL DESIGN AT PLOT PLAN PHASE)

- 1. RUBEBECKIA SUBTOMENTOSA (sweet coneflower)
- 2. IRIS VERSICOLOR (iris)
- 3. LOBELIA CARDINALIS (cardinal flower)
- 4. CALLUNA VULGARIS (heather)
- 5. ACER RUBRUM (Red Sunset Red Maple)

MICROBIORETENTION PLANTING DATA

- PLANTINGS WITHIN THE PONDING AREA OF THE MICRO-BIORETENTION FACILITY ARE TO BE OF A MEDIUM TO HIGH WATER TOLERANCE
- PLANTINGS ALONG THE PERIMETER (BERM) AREA OF THE MICRO-BIORETENTION FACILITY ARE TO BE OF A LOW TO MEDIUM WATER TOLERANCE
- AVOID PLANTING WITH EXCESSIVE ROOT MASS IN POND AREA OF THE MICRO-BIORETENTION FACILITY NEAR O.S. PIPE AND UNDERDRAIN.



ALL FACILITIES ARE A CUT SITUATION

CONTRACTOR IS TO OBTAIN A SOIL MIX THAT SATISFIES TABLE B.4.1 AND THE MATERIALS AND SPECIFICATIONS TABLE ON THIS PLAN AND ALSO PROVIDES AN FILTRATION RATE = 0.5 INCHES PER HOUR AT 80% COMPACTION. THIS WILL RESULT IN A DRAW DOWN TIME = 18 HOURS, LESS THAN 1.0 DAYS, FOR THE PONDING DEPTH OF 9".

APPROVED: DEPARTMENT OF PLANNING AND ZONING
 CHIEF, DIVISION OF LAND DEVELOPMENT
 CHIEF, DEVELOPMENT ENGINEERING DIVISION
 DIRECTOR

ESD Practices Summary Table

Lot No.	Practice	MDE	Number	Ownership/Maintenance
Lot 449	Micro-Bioretenment	(M-6)	1	Private
Lot 448	Micro-Bioretenment	(M-6)	1	Private
Lot 447	Micro-Bioretenment	(M-6)	1	Private
Lot 446	Micro-Bioretenment	(M-6)	1	Private

MB 3 (M-6) Micro-Bioretenment

Elevation	125.00	125.00	124.34	124.17	122.67	122.01	119.76
Dimensions							
A width	10.64						
B length	12.30						

MB 4 (M-6) Micro-Bioretenment

Elevation	125.40	125.40	124.40	124.23	122.73	122.40	122.07
Dimensions							
A width	6.38						
B length	10.50						

MB 5 (M-6) Micro-Bioretenment

Elevation	128.10	128.10	127.20	127.03	125.53	125.20	124.87
Dimensions							
A width	11.00						
B length	7.00						

MB 6 (M-6) Micro-Bioretenment

Elevation	129.50	129.50	128.50	128.33	126.83	126.50	126.17
Dimensions							
A width	8.00						
B length	8.10						

BORING LOG GEOLAB, INC.

Elevation (feet)	Description of Materials (Standard)	Remarks
131.5	Sod with root (organic) matter and organic soil	Groundwater was encountered at a depth of 12.4 feet.
131.4	Light brown clayey SILT, moist (ML, Silty Loam)	
131.3	Light brown to reddish-orange clayey SILT with fine sand, moist (ML, Silty Clay Loam)	
131.2	Light brown to reddish-orange clayey SILT with fine sand, moist to wet (ML, Silty Clay Loam)	
131.1	Light brown/grey clayey SILT with fine sand, moist to wet (ML, Silty Clay Loam)	
131.0	End of boring	

Lot	Quantity	Lot	Quantity	Lot	Quantity	Lot	Quantity
MB 3	13	MB 4	6	MB 5	7	MB 6	6
MB 4	11	MB 5	6	MB 6	5		
MB 5	6	MB 6	3				
MB 6	4						
MB 3	1						

B.4.C Specifications for Micro-Bioretenment, 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-bioretenment practices 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 sand (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 textual 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 excavators 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 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 tillage operation such as a chisel plow, ripper, or subsolter. These tilling operations are to restructure 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-bioretenment 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 1/8" of the ball is above final grade surface. The diameter of the pot 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, de-fats, or at a minimum, impede 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 (ASTM F 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 3/8" diameter located 6" on center with a minimum of four holes per row. Pipe shall be wrapped with a 36" (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.
- The main collector pipe shall be at a minimum 0.5% slope.
- A rigid, non-perforated observation well must be provided (one per every 1,000 square feet) to provide a clean-out port and monitor performance of the filter.
- A 4" layer of pea gravel (3/4" to 3/8" 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. Miscellaneous

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

BORING LOG Geolab, Inc.

Elevation (feet)	Description of Materials (Standard)	Remarks
131.0	Sod with root (organic) matter and organic soil	Boring dry during drilling and at completion.
130.9	Tan silty CLAY with little fine sand, moist (CL, Silty Clay Loam)	
125.8		
120.3	Auger Refusal	

BORING LOG GEOLAB, INC.

Elevation (feet)	Description of Materials (Standard)	Remarks
131.0	Topsoil/loam	Boring dry during drilling and at completion.
130.9	Light brown clayey SILT, moist (ML)	
130.8	Light brown/grey clayey SILT with little fine sand	
130.7	End of Boring (Auger refusal)	

MICRO-BIORETENTION (M-6) CONSTRUCTION SPECIFICATIONS

- THE SUBGRADE FOR ALL BIORETENTION COMPONENTS SHALL BE PREPARED TO THE REQUIRED LINES AND GRADES. ANY FILL REQUIRED IN THE SUBGRADE SHALL BE COMPACTED TO A DENSITY OF APPROXIMATELY THAT OF THE SURROUNDING UNDISTURBED MATERIAL. EMBANKMENTS SHALL BE PREPARED BY STRIPPING TOPSOIL AND ANY OTHER UNSUITABLE MATERIALS FROM THE AREAS, AND BE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DRY DENSITY REFERENCED TO AASHTO T-99 (STANDARD PROCTOR).
- THE ROCK OR GRAVEL SHALL CONFORM TO THE SPECIFIED GRADING LIMITS WHEN INSTALLED RESPECTIVELY IN THE RIP-RAP OR FILTER.
- GEOTEXTILE CLASS C28 OR BETTER SHALL BE PROTECTED FROM PUNCHING, CUTTING, OR TEARING. ANY DAMAGE OTHER THAN AN OCCASIONAL SMALL HOLE SHALL BE REPAIRED BY PLACING ANOTHER PIECE OF GEOTEXTILE FABRIC OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE GEOTEXTILE FABRIC ALL OVERLAPS.
- WHETHER FOR REPAIRS OR FOR JOINING TWO PIECES OF GEOTEXTILE FABRIC SHALL BE A MINIMUM OF ONE FOOT.
- STONE FOR THE RIP-RAP OR LEVEL SPREADERS MAY BE PLACED BY EQUIPMENT. THEY SHALL BE CONFINED TO THE FULL COURSE THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING MATERIALS. THE STONE FOR THE RIP-RAP OR LEVEL SPREADERS SHALL BE DELIVERED AND PLACED IN A MANNER THAT WILL ENSURE THAT IT IS REASONABLY HOMOGENEOUS WITH THE SMALLER STONES AND SHALL FILL THE VOIDS BETWEEN THE LARGER STONES. STONES SHALL BE PLACED IN A MANNER TO PREVENT DAMAGE TO THE FILTER BLANKET OR GEOTEXTILE FABRIC. HAND PLACEMENT WILL BE REQUIRED TO THE EXTENT NECESSARY TO PREVENT THE STONE LINER FROM BEING PLACED SO THAT IT BLENDS IN WITH THE EXISTING GROUND. IF THE STONE IS PLACED TOO HIGH THEN THE FLOW WILL BE FORCED OUT OF THE CHANNEL, AND SCOUR ADJACENT TO THE STONE WILL OCCUR.

OPERATION AND MAINTENANCE SCHEDULE FOR MICRO-BIORETENTION (M-6)

- Annual maintenance of plant material, mulch layer and soil layer is required. Maintenance of mulch and soil is limited to correcting areas of erosion or wash out. Any such replacement shall be done in the spring. Plant material shall be checked for disease and insect infestation and maintenance will address dead material and ground cover. Acceptable replacement plant material is limited to the following: 2000 Maryland Stormwater Design Manual Volume II, Table A.4.1 and 2.
- Schedule of plant inspection will be twice a year in spring and fall. This inspection will include removal of dead and diseased vegetation considered beyond treatment, treatment of all diseased trees and shrubs and replacement of all deficient stakes and wires.
- Mulch shall be inspected each spring. Remove previous mulch layer before applying new layer once every 2 to 3 years.
- Soil erosion to be addressed on an as needed basis, with a minimum of once per month and after heavy storm events.
- The top few inches of the filter media is to be removed and replaced with fresh material if water remains on the surface of the filter bed for longer than 24 hours following any rain event.

CONSTRUCTION SPECIFICATIONS

These specifications are appropriate to all ponds within the scope of the Standard for Practice MD-378. All references to ASTM and ASHTO specifications apply to the most recent version.

Site Preparation

Areas designated for borrow areas, embankment, and structural works shall be cleared, grubbed and stripped to topsoil. All trees, vegetation, roots and other objectionable material shall be removed. Channel banks and sharp breaks shall be sloped to no steeper than 1:1. All trees shall be cleared and grubbed within 15 feet of the toe of embankment.

All connection shall use a rubber or neoprene gasket when joining pipe sections. The end of each pipe shall be re-rolled on adequate number of corrugations to accommodate the bolted pipe connection unless otherwise designated on the plans. Trunks, brush, and stumps shall be cut approximately level with the ground surface. For dry stormwater management ponds, a minimum of a 25-foot radius around the inlet structure shall be maintained.

All cleared and grubbed material shall be disposed of outside and below the limits of the dam and reservoir as directed by the owner or his representative. When specified, a sufficient quantity of topsoil will be stockpiled in a suitable location for use on the embankment and other designated areas.

Earth Fill

The fill material shall be taken from approved designated borrow areas. It shall be free of roots, stumps, wood, rubbish, stones greater than 6", frozen or other objectionable material. Fill material for the center of the embankment, and cut off trench shall conform to Unified Soil Classification GC, SC, CL, or CL and must have at least 30% passing the #200 sieve. Consideration may be given to the use of other materials in the embankment if designed by a geotechnical engineer. Such special designs must have construction supervised by a geotechnical engineer.

Materials used in the outer shell of the embankment must have the capability to support vegetation of the quality required to prevent erosion of the embankment.

Placement - Areas on which fill is to be placed shall be scarified prior to placement of fill. Fill materials shall be placed in maximum 6 inch thick (before compaction) layers which are to be continuous over the entire length of the fill. The most permeable borrow material shall be placed in the downstream portions of the embankment. The principal spigot must be installed concurrently with fill placement and not excavated into the embankment.

Compaction - The movement of the hauling and spreading equipment over the fill shall be controlled so that the entire surface of each lift shall be traversed by not less than one road truck of heavy equipment or compaction shall be achieved by a minimum of four complete passes of a sheepsfoot, rubber tired or vibratory roller. Fill material shall contain sufficient moisture to ensure that the compaction will be obtained with wet hauled fill. The fill material shall contain sufficient moisture so that if formed into a ball it will not crumble, yet not be so wet that water can be squeezed out.

When required by the reviewing agency the minimum required density shall not be less than 92% of maximum dry density with a moisture content within 2% of the optimum. Each layer of fill shall be compacted as necessary to obtain that density, and is to be certified by the Engineer at the time of construction. All compaction is to be determined by ASHTO Method T-99 (Standard Proctor).

Cut Off Trench

The cutoff trench shall be excavated into impervious material along or parallel to the centerline of the embankment as shown on the plans. The bottom width of the trench shall be governed by the equipment used for excavation, with the minimum width being four feet. The depth shall be a least four feet below existing grade or as shown on the plans. The side slopes shall be 1 to 1 or flatter. The core shall be compacted with hand tamper, equipment, rollers, or hand tampers to assure maximum density and minimum permeability. In addition, the core shall be placed concurrently with the outer shell of the embankment.

Structure Backfill

Backfill adjacent to pipes or structures shall be of the type and quality conforming to that specified for the adjoining fill material. The fill shall be placed in horizontal layers not to exceed four inches in thickness and compacted by hand tampers or other manually directed compaction equipment. The material shall be placed in layers under and over the pipe. At no time during the backfilling operation shall driven equipment be allowed to operate closer than four feet, measured horizontally, to any part of a structure. Under no circumstances shall equipment be driven over any part of a concrete structure or pipe, unless there is a compacted fill of 24" or greater over the structure or pipe.

Structure backfill may be flowable fill meeting the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 313.02 modified. The mixture shall have a 100-200 blow 25 gpc 25 gpc unconfined compressive strength. The flowable fill shall have a minimum pH of 4.0 and a minimum resistivity of 2,000 ohm-cm. Materials shall be placed such that a minimum of 6" (measured perpendicular to the outside of the pipe) of flowable fill shall be under (bedding), over, and on the sides of the pipe. It only needs to extend up to the spring line for rigid conduits. Average density of the shell shall be 7 to ensure flexibility of the material. Adequate measures shall be taken (sand bags, etc.) to prevent floating the pipe. When using flowable fill, all metal pipe shall be bituminous coated. Any adjoining soil fill shall be placed in horizontal layers not to exceed four inches in thickness and compacted by hand tampers or other manually directed compaction equipment. The material shall completely fill all voids adjacent to the flowable fill zone. No time shall the backfilling operation shall driven equipment be allowed to operate closer than four feet, measured horizontally, to any part of a structure. Under no circumstances shall equipment be driven over any part of a structure or pipe unless there is a compacted fill of 24" or greater over the structure or pipe. Backfill material outside the structural backfill (flowable fill) zone shall be of the type and quality conforming to that specified for the core of the embankment or other embankment materials.

Pipe Conduits

All pipes shall be circular in cross section.
 Corrugated Metal Pipe - all of following criteria shall apply for corrugated metal pipe:
 1. Materials - (Polymer Coated Steel Pipe) - Steel pipes with polymeric coatings shall have a minimum coating thickness of 0.01 inch (10 mil) on both sides of the pipe. This pipe and its appurtenances shall conform to the requirements of ASHTO Specifications M-245 & M-246 with water-tight coupling bands or flanges.
 Materials - (Aluminum Coated Steel Pipe) - This pipe and its appurtenances shall conform to the requirements of ASHTO Specification M-274 with watertight coupling bands or flanges. Aluminum Coated Steel Pipes, when used with flowable fill or when used for water conditions warrant the need for increased durability, shall be fully bituminous coated per requirements of ASHTO Specification M-190 Type A. Any aluminum coating damaged or otherwise removed shall be replaced with cold applied bituminous coating compound. Aluminum surfaces that are to be in contact with concrete shall be pointed with one coat of zinc chromate primer or two coats of asphaltic.
 Materials - (Aluminum Pipe) - This pipe and its appurtenances shall conform to the requirements of ASHTO Specification M-198 or M-211 with watertight coupling bands or flanges. Aluminum Pipes, when used with flowable fill or when soil and/or water conditions warrant for increased durability, shall be fully bituminous coated per requirements of ASHTO Specification M-190 Type A. Aluminum surfaces that are to be in contact with concrete shall be pointed with one coat of zinc chromate primer or two coats of asphaltic. Hot dip galvanized bolts may be used for connections. The pH of the surrounding soils shall be 4.0 or greater.
 2. Coupling bands, anti-seep collars, and sections, etc., must be composed of the same material and coatings as the pipe. Metals must be insulated from dissimilar materials with use of rubber or plastic insulating materials at least 24 mils in thickness.

Concrete

Concrete shall meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 414, Mix No. 3.

Rock Riprap

Rock riprap shall meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 311.

Geotextile shall be placed under all riprap and shall meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 921.09, Class C.

Care of Water during Construction

All work on permanent structures shall be carried out in areas free from water. The contractor shall construct and maintain all temporary dikes, levees, cofferdams, drainage channels, and stream diversions necessary to protect the area to be occupied by the permanent works. The contractor shall also furnish, install, operate, and maintain all necessary pumping and other equipment required for removal of water from various parts of the work or for maintaining the structures, foundation, and other parts of the work free from water as required or directed by the engineer for constructing each part of the work. After having served their purpose, all temporary protective works shall be removed or leveled and graded to the extent required to prevent obstruction in any degree whatsoever of the flow of water to the spillway or outlet works and so as not to interfere in any way with the operation or maintenance of the structure. Stream diversions shall be maintained until the full flow can be passed through the permanent works. The removal of water from the required excavation and the foundation shall be accomplished in a manner and to the extent that will maintain stability of the excavated slopes and bottom required excavations and will allow satisfactory performance of all construction operations. During the placing and compaction of materials, the water level at the location being refilled shall be maintained below the bottom of the excavation at such locations which may require draining the water pumps from which the water shall be pumped.

Stabilization

All borrow areas shall be graded to provide proper drainage and left in a slightly condition. All exposed surface of the embankment, spillway, spoil and borrow areas, and berms shall be stabilized by seeding, lining, fertilizing and mulching in accordance with the Natural Resources Conservation Service Standards and Specifications for Critical Area Planting (MD-342) or as shown on the accompanying drawings.

Erosion and Sediment Control

Construction operations will be carried out in such a manner that erosion will be controlled and water and air pollution minimized. State and local laws concerning pollution abatement will be followed. Construction plans shall detail erosion and sediment control measures.

Drainage Area	ESD Micro-Scale Practices Summary Table			
	Target Pcp	1.80 inches	Target ESD = 0.00 inches	Target ESD = 0.99 in
Lot 449	MB 6 (M-6)	1,736	1,120	1,144
Lot 448	MB 5 (M-6)	1,886	1,120	1,052
Lot 447	MB 4 (M-6)	1,807	1,120	1,090
Lot 446	MB 3 (M-6)	1,726	1,120	1,144
Totals		7,154	4,480	4,480

NO.	DATE	REVISION

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HARWOOD PARK
 LOT 446-449
 PLAT BOOK 60 FOLIO 115
 SINGLE FAMILY SEMI-DETACHED DUPLEX UNIT

TAX MAP: 38 GRID: 13 PARCEL: 873
 ZONED: R-12
 DISTRICT: ELECTRON DISTRICT NO. 1
 ELICOTT CITY, MARYLAND

STORMWATER MANAGEMENT NOTES AND DETAILS

DATE: JANUARY, 2016 BEI PROJECT NO. 2672
 SCALE: N/A SHEET 4 OF 4

SDP-16-023