BEAR CABIN BRANCH STREAM RESTORATION

GRAFTON SHOP ROAD, FOREST HILL, MD 21050

OVERALL PLAN
SCALE: 1" = 300'

0 300 600 Feet

BEST MANAGEMENT PRACTICES FOR WORKING IN NONTIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS, AND 100-YEAR FLOODPLAINS

1. No excess fill, construction material, or debris shall be stockpiled or stored in nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
2. Place materials in a location and manner which does not adversely impact surface or subsurface water flow into or out of nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
3. Do not use the excavated material as backfill if it contains waste metal products, unsightly debris, toxic material, or any other deleterious substance. If additional backfill is required, use clean material free of waste metal products, unsightly debris, toxic material, or any other deleterious substance.
4. Place heavy equipment on mats or suitably operate the equipment to prevent damage to nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
5. Repair and maintain any serviceable structure or fill so there is no permanent loss of nontidal wetlands, nontidal wetland buffers, or waterways, or permanent modification of the 100-year floodplain in excess of that lost under the originally authorized structure or fill.
6. Rectify any nontidal wetlands, wetland buffers, waterways, or 100-year floodplain temporarily impacted by any construction.
7. All stabilization in the nontidal wetland and nontidal wetland buffer shall consist of the following species: Annual Ryegrass (Lolium multiflorum), Millet (Setaria italica), Barley (Hordeum sp.), Oats (Uniola sp.), and/or Rye (Secale cereale). These species will allow for the stabilization of the site while also allowing for the voluntary revegetation of natural wetland species. Other non-persistent vegetation may be acceptable, but must be approved by the Nontidal Wetlands and Waterways Division. **Kentucky 31 fescue shall not be utilized in wetland or buffer areas.** The area should be seeded and mulched to reduce erosion after construction activities have been completed.
8. After installation has been completed, make post-construction grades and elevations the same as the original grades and elevations in temporarily impacted areas.
9. To protect aquatic species, in-stream work is prohibited as determined by the classification of the stream:

Use IV waters: In-stream work shall not be conducted during the period March 1 through May 31, inclusive, during any year.

10. Stormwater runoff from impervious surfaces shall be controlled to prevent the washing of debris into the waterway.
11. Culverts shall be constructed and any riprap placed so as not to obstruct the movement of aquatic species, unless the purpose of the activity is to impound water.
12. A dewatering pump will be utilized in conjunction with a dirt bag to remove standing water in the project area during construction. The dirt bag will be placed on a vegetated area a sufficent distance from subject reach so that any sediment leaving the dirt bag has time/distance to settle out before reaching the waterway.

HARFORD COUNTY SEDIMENT CONTROL NOTES

1. A grading unit of 20 acres is the maximum contiguous area allowed to be graded at a given time.
2. A project is to be sequenced so that grading activities begin on one grading unit at a time. Work may proceed to a subsequent grading unit when at least 50 percent of the disturbed area in the proceeding grading unit has been stabilized and approved by DPW. No more than thirty acres cumulatively may be disturbed at any given time.
3. The contractor/owner is responsible for obtaining all necessary permits. Further, no construction activity shall take place until all required permits have been obtained.
4. The limits of disturbance shall be clearly delineated in the field prior to grading of the site to ensure compliance with approved plans. All Forest Retention areas will be delineated with Blaze Orange Fence as well as any SWM infiltration practice prior to any clearing. Work beyond the limits of disturbance and in any area inside the Forest Retention and SWM infiltration area is considered to be a violation of this plan.
5. All sediment control practices must be installed prior to any construction activity. Upon completion of the installation of perimeter sediment control practices the site must be inspected by the Department of Public Works (DPW). No additional construction activity will be authorized without the approval from DPW.
6. All points of ingress and egress shall be protected to prevent tracking of mud into public ways. During construction, every means will be taken to control soil erosion and siltation. If necessary a wash rack may need to be established.
7. Earth dikes, sediment traps, etc. will be located as shown on these drawings. Field changes and minor adjustments are permissible as long as the installation functions and conforms to specifications. The site inspector prior to installation must approve all such changes. Major changes to the approved plan will require re-approval by the Harford Soil Conservation District.
8. Following initial soil disturbance or re-disturbance permanent or temporary stabilization shall be completed within:
   a) Three calendar days on slopes greater than 3:1, all waterways and to the surface of all perimeter controls.
   b) Seven calendar days as to all other disturbed or graded areas of the project site.
9. Dust control must be managed as part of all Sediment Control plans. Failure to do so is a violation of this plan.
10. Sediment basins must be built to design specifications shown on the plan. If the basin is to be used as a future SWM facility, the basin will be built in accordance with the latest MD-378 standards and specifications. Specified materials must be used. No changes or modifications will be made without written authorization of the Harford Soil Conservation District.
11. Temporary fencing shall be placed around all sediment basins, traps, and ponds during construction and site grading.
12. At the end of each working day all sediment control practices will be inspected and left operational. A weekly log will be kept in accordance with NOI/NPDES regulations. A copy of the approved sediment control plans shall be available at the site at all times.
13. Ensure positives drainage to all road inlets during all phases of road construction to ensure positive flow to traps and or basins.
14. Cut and/or fill shall be done in conformance with 2011 Erosion and Sediment Control Standards and Specifications for land grading.
15. Surface flows over cut and fill slopes shall be controlled by either redirecting flows from traversing the slopes or by installing mechanical devices to safely convey water down slopes without causing erosion.
16. Off-site waste or borrow areas shall have an approved erosion and sediment control plan prior to the import or export of material to/from the project site.
17. All material originating from the development of the property and deposited on the public right-of-way shall be immediately removed.
18. Storm drain inlets and outlets shall be protected per 2011 Erosion and Sediment Control standards and specifications.
19. Topsoil, liming, fertilizing, seeding, mulching, sod, etc. are all essential parts of the sediment control plan and must be completed along with all other practices.
20. Traps to be removed shall be dewatered as per the 2011 Erosion and Sediment Control standards and specifications.
21. Prior removal of traps or conversion of sediment basins to SWM facilities, the storm drains will be flushed.
22. Sediment control practices will be maintained until all disturbed areas for which the practices were installed have been stabilized. Sediment control practices may be removed only with the authorization of the DPW inspector. All disturbed areas resulting from the removal of sediment control devices shall be stabilized immediately. Removal prior to inspectors's approval constitutes a violation.

GENERAL NOTES

1. This Plan has been prepared for the purpose of restoring Bear Cabin Branch located on Grafton Shop Road in the Forest Hill area of Harford County, Maryland. The proposed restoration is a Use IV stream.
2. Existing one (1) foot topography derived from C.F. Kreutter & Associates (October, 2016) and merged with two (2) foot Harford County GIS.
3. Wetlands shown herein were delineated by Ecotone in November, 2016.
4. The Contractor is responsible for the location of all underground utilities prior to the start of construction.
5. Any damages to utilities as a result of grading or other activities will be the sole responsibility of the Contractor and shall be repaired at the Contractors expense.
6. The Contractor will be responsible for any damage to private property, including but not limited to fences and private roads resulting from the execution of this contract. Repairs for any such damage will be made at the Contractors expense to the satisfaction of the private property owner and Ecotone, Inc.
7. All machinery, equipment and supplies for the project shall be stored in an upland location so as not to disturb any environmentally sensitive areas on the site.

SEQUENCE OF CONSTRUCTION

1. An on-site, pre-construction meeting shall be held prior to construction with Harford County, Harford County Soil Conservation District (SCD), Maryland Department of the Environment (MDE), Project Engineer, and Ecotone to discuss the project objectives, on-site conditions, access and necessary grading practices to protect existing vegetation, jurisdictional resources, and property boundaries.
2. Contractor shall notify owner, Harford County Soil Conservation District, and Harford County at least 48 hours prior to beginning work and the Maryland Department of the Environment Inspection and Compliance Program (410-537-3510) at least 5 says prior to beginning any work.
3. LOD, access routes, and staging and stockpiling areas shall be staked and reviewed in the field with the Project Engineer prior to construction to allow for adjustments. Any adjustments must be approved by the Engineer and Harford County prior to construction.
4. With approval from the sediment and erosion control inspector, hand clear and install orange safety fence along the entire length of the LOD.
5. Clear and grub any area that is necessary to install sediment and erosion control measures.
6. Install stabilized construction entrances and silt fence as required around staging and stockpiling areas.
7. With approval from the sediment and erosion control inspector, clear and grub remainder of work area that is needed to complete the project.
8. Install pump around practices. The exact location of pump around, pipes, and filter bags may be modified, within the LOD, in the field based on existing conditions.
9. Complete channel grading and structure installation by means of a downstream to upstream method and in accordance with grading plan sheets 2-4.
10. Stabilize all areas associated with the restoration in accordance with the Sediment Control Notes.
11. Once project site is entirely stabilized with established vegetation and with approval form the sediment and erosion control inspector, remove sediment control devices and stabilize those areas disturbed by this process.
12. Install bioengineering during appropriate planting dates.

100-YEAR FLOODPLAIN NOTE

FEMA mapped floodplain is present on-site according to FEMA mapping and Harford County GIS data. FIRM panel #24025C0142E

MAINTENANCE NOTE

Contractor shall inspect and maintain all sediment control measures and devices after every storm event. Maintenance shall include, but not be limited to the removal of all accumulated sediment. Geotextile fabric shall be replaced as needed to ensure proper function.

TEMPORARY STOCKPILE NOTE

If necessary, a temporary stockpile shall be provided within the limits of disturbance. The stockpile shall be located such that any runoff will drain to an existing sediment control device (i.e., super silt fence). The stockpile may not protrude upon nor alter drainage divides to the sediment control device at any time.

TEMPORARY CROSSING NOTE

Contractor to field determine location of temporary crossing as needed.

DESIGN INFORMATION

HYDROLOGY	REACH STATIONING 0+00 - 18+25	REACH STATIONING 18+25 - 26+74
DRAINAGE AREA (SQ MI)	3.18	3.18
BANKFULL DISCHARGE (CFS)	425	425
BANKFULL SLOPE (%)	.62%	0.78%
AVG VELOCITY (FT/S)	5.3	5.7
AVG SHEAR STRESS (LBS/SF)	0.77	0.91
BASEFLOW DISCHARGE (CFS)	2	2
2-YR DISCHARGE (CFS)	515	515
100-YR DISCHARGE (CFS)	3740	3740
100-YR FLOODPRONE WIDTH (FT)	300 - 400	300 - 400

DIMENSIONS	KEY	REACH STATIONING 0+00 - 18+25			REACH STATIONING 12+44 - 29+70		
		MEAN	MIN	MAX	MEAN	MIN	MAX
RIFFLE WIDTH AT BANKFULL (FT)	A	36.5	34.5	39.5	35.5	33.0	38.0
INNER BERM BANKFULL WIDTH (FT)	A'	22	21.0	23.0	22.0	21.0	23.0
RIFFLE BASEFLOW WIDTH (FT)	B	12.2	11.5	13.2	11.8	11.0	12.7
RIFFLE MEAN DEPTH (FT)	C	2.20	2.10	2.30	2.10	2.00	2.20
WIDTH/DEPTH RATIO	D	16.6	15.0	18.8	16.9	15.0	19.0
RIFFLE CROSS-SECTIONAL AREA (SF)	E	80.3	78.2	83.0	74.6	72.6	76.0
RIFFLE MAX DEPTH (FT)	F	2.6	2.4	2.9	2.5	2.3	2.7
INNER BERM MAX DEPTH (FT)	F'	1.5	1.4	1.7	1.5	1.4	1.7
RIFFLE LENGTH (FT)	G	73.0	36.5	109.5	71.0	35.5	106.5
RIFFLE SLOPE (%)	H	1.67	1.24	2.48	2.11	1.56	2.34
POOL WIDTH AT BANKFULL (FT)	I	43.8	40.2	47.5	42.6	39.1	46.2
POOL BASEFLOW WIDTH (FT)	J	14.6	13.4	15.8	14.2	13.0	15.4
POOL CROSS-SECTIONAL AREA (SF)	K	104.4	86.4	120.5	97.0	89.5	111.9
POOL MAX DEPTH (FT)	L	5.50	4.40	6.60	5.25	4.20	6.30
POOL LENGTH (FT)	M	100.4	54.8	146.0	97.6	53.3	142.0

TEMPORARY BENCHMARKS		
TBM 101	283.63'	REBAR & CAP
TBM 102	286.36'	REBAR & CAP
TBM 203	302.64'	REBAR & CAP
TBM 204	304.64'	REBAR & CAP

PROPERTY OWNER INFORMATION
HARFORD COUNTY MARYLAND
220 S MAIN STREET
BEL AIR, MD 21014
HARFORD COUNTY

SITE DATA
DEED REF. 07720/00568
MAP 40, GRID 3D, PARCEL 450
ELECTION DISTRICT 3
EXISTING ZONING: EXEMPT
SITE ACREAGE: ±52.88 AC.
8 DIGIT HUC: 02060003
MD 8 DIGIT BASIN: 02130703
(ATKISSON RESERVOIR)

SITE ANALYSIS
TOTAL SITE AREA: ± 2,303,453 SF. / 52.88 AC.
TOTAL DISTURBED AREA: ±790,221 SF. / 18.14 AC.
AREA TO BE PAVED: ±0 SF. / 0 AC.
AREA TO BE STABILIZED: ±790,221 SF. / 18.14 AC.
CUT: 14,771 CY.
FILL: 12,473 CY.
TOP SOIL: 9,534 CY.

NPDES ID PT. N: 1483717.0944 E: 684719.7403

COUNTY CONTACT INFORMATION
CHRISTINE BUCKLEY - WATERSHED
PROTECTION AND RESTORATION OFFICE
PROGRAM MANAGER
410-638-3217 EXT. 1176

STREAM RESTORATION PLAN

Bear Cabin Branch, the Use IV stream shown on this plan, is exhibiting signs of accelerated bed and bank erosion and meander migration. The stream bank on the property exhibit high to extreme bank erodibility, with very little rooting depth or density, bank angles greater than 70 degrees, and are devoid of any effective surface protection. The channel has become incised, leading to high shear stresses along the near bank region during high flow events. Potential causes of the degradation to the channel originates from lack of riparian and streambank vegetation and changes in the watershed characteristics.

Bear Cabin Branch will be stabilized by realigning portions of the stream channel using natural design concepts and legacy sediment removal techniques. Approximately 3,675 linear feet of stream channel will be re-aligned to a more stable planform geometry while the floodplain elevation is lowered and channel invert is raised. The resulting increased groundwater connection to the floodplain will provide hydrology to proposed wetlands (± 5.4 AC) and enhance existing wetlands (± 7.2 AC) within the floodplain.

The proposed structural stabilization measures include installing toe wood on the meander bends to add roughness to the near bank and reduce shear stress. Bioengineering practices including sod matting, warm season grass plantings, and live stake installation will accompany structural stabilization methods to provide additional stability, shade, and improved aquatic habitat. Trees and shrub species will be planted to replace previously planted reforestation plantings that were disturbed during construction.

20 years from now, the stream restoration area along this reach of Bear Cabin Branch will be fully vegetated with herbaceous wetland vegetation and grasses that provide a dense buffer from adjacent residential runoff. Live stakes and willow fascines will provide shade and bank protection to the stream channel. The stream channel will be a C4 stream channel that will be reconnected to its floodplain to help restore and enhance existing and created wetlands. This reach of Bear Cabin Branch will be transformed from a nutrient/sediment degradation area to a nutrient/sediment aggradation area reducing nutrient and sediment loads to downstream receiving waters.

MATERIALS LIST

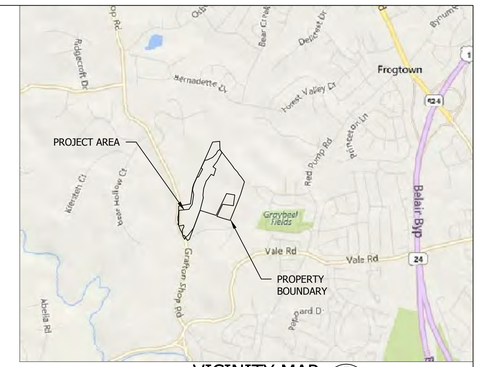
MATERIAL	SALVAGED / FURNISHED	QUANTITY
ROOTWADS FOR TOEWOOD	SALVAGED/ FURNISHED	61 EA
BRUSH FOR TOEWOOD	SALVAGED/ FURNISHED	671 EA
FOOTER LOGS FOR TOEWOOD	SALVAGED/ FURNISHED	168 EA
TOP LOGS FOR TOEWOOD	SALVAGED/ FURNISHED	84 EA
RIFFLE SUBSTRATE MATERIAL (TOP OF RIFFLE)	SALVAGED/ FURNISHED	233 TON
RIFFLE SUBSTRATE MATERIAL (BOTTOM OF RIFFLE)	SALVAGED/ FURNISHED	151 TON
LOGS (CROSS VANES)	SALVAGED/ FURNISHED	4.5 EA
LOGS (LOG SILLS)	SALVAGED/ FURNISHED	1 EA
CLASS II RIPRAP	FURNISHED	33 TON
NON-WOVEN GEOTEXTILE	FURNISHED	682 SY
WOVEN GEOTEXTILE	FURNISHED	2 SY
STRAW	FURNISHED	1600 BALES
SOD	SALVAGED/ FURNISHED	8,068 SY
TEMPORARY SEED	FURNISHED	360 LBS
PERMANENT SEED	FURNISHED	2,700 LBS
#2 STONE	FURNISHED	85 TON
LUMBER 4x6	FURNISHED	4 EA
PLYWOOD 4x8	FURNISHED	3 EA
TIMBER MATS FOR ACCESS BRIDGE	FURNISHED	5 EA
SILT FENCE	FURNISHED	284 LF

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

COORDINATE NOTE
PLAN IS IN NAD 83 MARYLAND STATE PLANE FIPS 1900 COORDINATE SYSTEM.

UTILITY NOTIFICATION

"Ecotone, Inc. makes no representation as to the existence or non-existence of any utilities at the construction site. Shown on these construction drawings are those utilities which have been identified. It is the responsibility of the landowners or operators and contractors to assure themselves that no hazard exists or damage will occur to utilities. It is suggested that Miss Utility be contacted at: 1-800-257-7777."



VICINITY MAP
SCALE: 1" = 2000'

EROSION AND SEDIMENT CONTROL
PLAN #:59830

RECOMMENDED FOR APPROVAL:

_____
HARFORD COUNTY, DPW

TECHNICAL CONCURRENCE:

_____
HARFORD SOIL CONSERVATION DISTRICT

APPROVED:

_____
HARFORD SOIL CONSERVATION DISTRICT

Note: The purpose of this plan is to address sediment control for mass grading, road and utility construction only. Individual or collective home/commercial building construction will require a separate sediment control plan. The developer/contractor shall comply with all stabilization requirementsof this plan. Temporary buildings may be permitted with the approval of the Harford County DPW.

OWNER'S CERTIFICATION

I/we certify that all development and construction will be done according to this plan of development and plan from erosion and sediment control and that any responsible personnel involved in the construction project will have a certification of attendance at a Department of Natural Resources Approved Training Program for the control of sediment and erosion before beginning the project. I also authorize periodic onsite inspection by the Harford Soil Conservation District or their authorized agents, or as deemed necessary.

_____ _____
Owner Date

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. 50819, Expiration Date: 04/17/19.

_____
Engineer Date

ENGINEER'S CERTIFICATION

I certify that this plan for erosion and sediment control and stormwater management represents a practical and workable plan based on my personal knowledge of the site conditions and that it was prepared in accordance with the *2011 Maryland Standard and Specifications for Soil Erosion and Sediment Control.*

_____
Engineer Date

BEAR CABIN BRANCH
STREAM RESTORATION
COVER SHEET
GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
NO.	DATE	DESCRIPTION	REV. BY
1	10/27/17	ADDED OXBOWS AND SIDE CHANNELS	ASR

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET: 1 of 14

Ecotone Inc.
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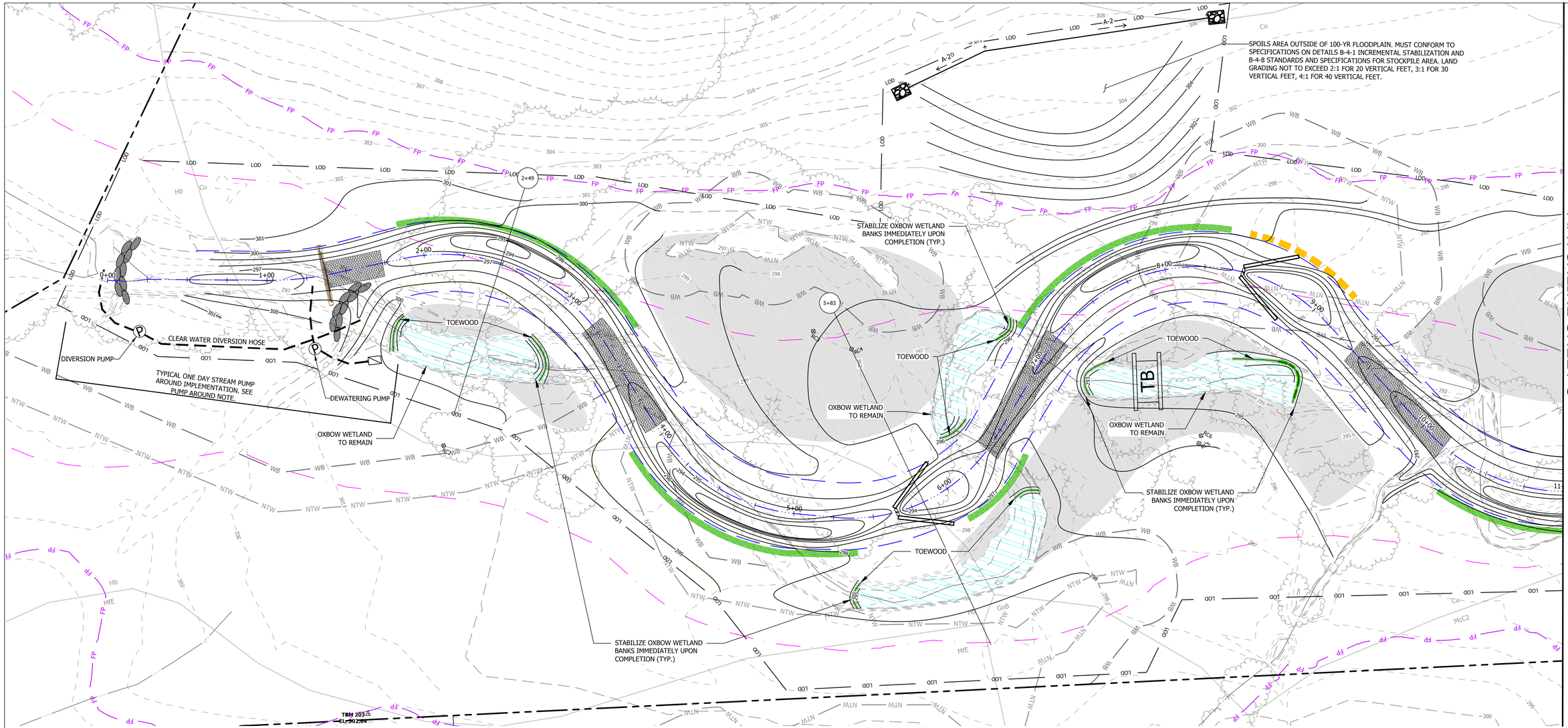
2120 High Point Road • Forest Hill, Maryland 21050
(410) 420 2600 • Fax (410) 420 6983 • www.ecotoneinc.com



MATCHLINE SHEET 3

LEGEND

- PROPERTY BOUNDARY
- EX. CONTOURS
- EX. STREAM CENTERLINE
- EX. SOIL BOUNDARY
- EX. ROADS
- EX. TREELINE
- EX. FEMA FLOODPLAIN - 100 YR
- EX. FEMA FLOODWAY
- EX. WETLAND
- EX. WETLAND BUFFER (25 FT)
- EX. FENCELINE
- EX. OVERHEAD ELECTRIC
- LIMIT OF DISTURBANCE
- RADIUS OF CURVATURE
- PROPOSED RIFFLE GRADE CONTROL SUBSTRATE 1
- PROPOSED RIFFLE GRADE CONTROL SUBSTRATE 2
- TEMPORARY ACCESS CULVERT
- TEMPORARY ACCESS BRIDGE
- PROPOSED CONTOURS
- PROPOSED STREAM CENTERLINE
- PROPOSED TOP OF BANK
- PROPOSED TOE WOOD
- PROPOSED BIOENGINEERING
- PROPOSED LOG SILL
- PROPOSED LOG CROSS VANE
- PROPOSED LOG CROSS VANE WITH ROCK SILL
- PROPOSED OXBOW WETLAND
- PROPOSED WETLAND
- PROPOSED A-2 EARTH DIKE
- PROPOSED SUPER SILT FENCE
- PUMP AROUND PRACTICE

PUMP-AROUND NOTE

1. PUMP AROUND SHOWN TYPICAL ONE DAY STREAM PUMP AROUND IMPLEMENTATION. ACTUAL PUMP AROUND OF STREAM SHOULD BE LIMITED TO THAT LENGTH OF STREAM WORK AND BEYOND THE BANK DISTURBANCES THAT CAN BE COMPLETED BY THE END OF EACH WORKING DAY. DAILY WORK AREA SHALL BE LIMITED TO THE AREA CONTROLLED BY THE PUMP AROUND PRACTICE.

TEMPORARY BRIDGE CROSSING NOTES

1. TEMPORARY BRIDGE CROSSING LOCATION TO BE ADJUSTED IN THE FIELD TO MEET SITE CONDITIONS.
2. TEMPORARY BRIDGE TO CONSIST OF TIMBER MATS.

SITE PLAN
SCALE: 1" = 30'

0 30 60 Feet

REALIGNMENT	RADIUS OF CURVATURE #	REALIGNMENT STATIONING	RADIUS OF CURVATURE	RADIUS OF CURVATURE/ BANKFULL WIDTH
REACH	RC1	0+99 - 1+42	200 FT	5.48
REACH	RC2	1+87 - 3+35	120 FT	3.29
REACH	RC3	3+95 - 5+02	115 FT	3.15
REACH	RC4	5+26 - 6+45	106 FT	2.90
REACH	RC5	7+07- 8+48	111 FT	3.04
REACH	RC6	8+48 - 9+10	106 FT	2.90

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

SOILS LEGEND	
SYMBOL	SOIL DESCRIPTION
CcC2	Chester silt loam, 8-15% slopes, moderately eroded
Cu	Codorus silt loam
GnB	Glenville silt loam, 0-3% slopes
Hb	Hatboro silt loam
MbD3	Manor loam, 15-25% slopes, severely eroded
McC2	Manor channery loam, 8-15% slopes, moderately eroded
McD3	Manor channery loam, 15-25% slopes, severly eroded
MfE	Manor soils, 25-45% slopes

HARFORD COUNTY MARYLAND

BEAR CABIN BRANCH

STREAM RESTORATION PLAN

STA. 0+00 - 11+00

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
NO.	DATE	DESCRIPTION	REV. BY
1	10/27/17	ADDED OXBOWS AND SIDE CHANNELS	ASR

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET: 2 of 14

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MATCHLINE SHEET 2

MATCHLINE SHEET 4

OXBOW WETLAND TO REMAIN

STABILIZE OXBOW WETLAND BANKS IMMEDIATELY UPON COMPLETION (TYP.)

SEE SIDE CHANNEL NOTE FOR CONSTRUCTION. INVERT AT +291.0

SEE SIDE CHANNEL NOTE FOR CONSTRUCTION

OXBOW WETLAND TO REMAIN

TOEWOOD

SEE SIDE CHANNEL NOTE FOR CONSTRUCTION

SEE SIDE CHANNEL NOTE FOR CONSTRUCTION

OXBOW WETLAND TO REMAIN

STABILIZE BANKS IMMEDIATELY UPON COMPLETION

TOEWOOD

DIVERSION PUMP

TYPICAL ONE DAY STREAM PUMP AROUND IMPLEMENTATION. SEE PUMP AROUND NOTE.

CLEAN WATER DIVERSION HOSE

DEWATERING PUMP

OXBOW WETLAND TO REMAIN

RC7 RC8 RC9 RC10 RC11 RC12 RC13

12+00 13+00 13+52 14+00 15+00 15+90 16+80 17+00 18+00 20+00 21+00 21+01

TAC

LEGEND

- PROPERTY BOUNDARY
- EX. CONTOURS
- EX. STREAM CENTERLINE
- EX. SOIL BOUNDARY
- EX. ROADS
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SCALE: 1" = 30'
0 30 60 Feet

PUMP-AROUND NOTE

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SIDE CHANNEL NOTES

1. SIDE CHANNEL AS SHOWN ON PLANS REPRESENTS A GRASS LINED SWALE TO BE USED AS OVER FLOW FOR OXBOW WETLANDS.
2. CHANNEL SHOULD HAVE A MAXIMUM DEPTH OF 0.5', BOTTOM WIDTH OF **10'-15'**, AND 3:1 SIDE SLOPES.
3. LOCATION OF SIDE CHANNELS CAN BE ADJUSTED IN FIELD TO MEET ON-SITE CONDITIONS.

TEMPORARY ACCESS CULVERT NOTES

1. TEMPORARY ACCESS CULVERT LOCATION TO BE ADJUSTED IN THE FIELD TO MEET SITE CONDITIONS.

REALIGNMENT	RADIUS OF CURVATURE #	REALIGNMENT STATIONING	RADIUS OF CURVATURE	RADIUS OF CURVATURE/ BANKFULL WIDTH
REACH	RC7	10+03 - 11+36	120 FT	3.29
REACH	RC8	12+21 - 13+37	182 FT	5.13
REACH	RC9	13+50 - 15+51	170 FT	4.79
REACH	RC10	15+90 - 16+80	180 FT	5.07
REACH	RC11	18+03 - 18+86	137 FT	3.86
REACH	RC12	19+63 - 20+68	106 FT	2.99
REACH	RC13	20+96 - 22+22	190 FT	5.35

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

SOILS LEGEND

SYMBOL	SOIL DESCRIPTION
Cu	Codorus silt loam
Hb	Hatboro silt loam
McC2	Manor channery loam, 8-15% slopes, moderately eroded
McD3	Manor channery loam, 15-25% slopes, severly eroded

HARFORD COUNTY MARYLAND

BEAR CABIN BRANCH

STREAM RESTORATION PLAN

STA. 11+00 - 21+75

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS

NO.	DATE	DESCRIPTION	REV. BY
1	10/27/17	ADDED OXBOWS AND SIDE CHANNELS	ASR

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET: 3 of 14

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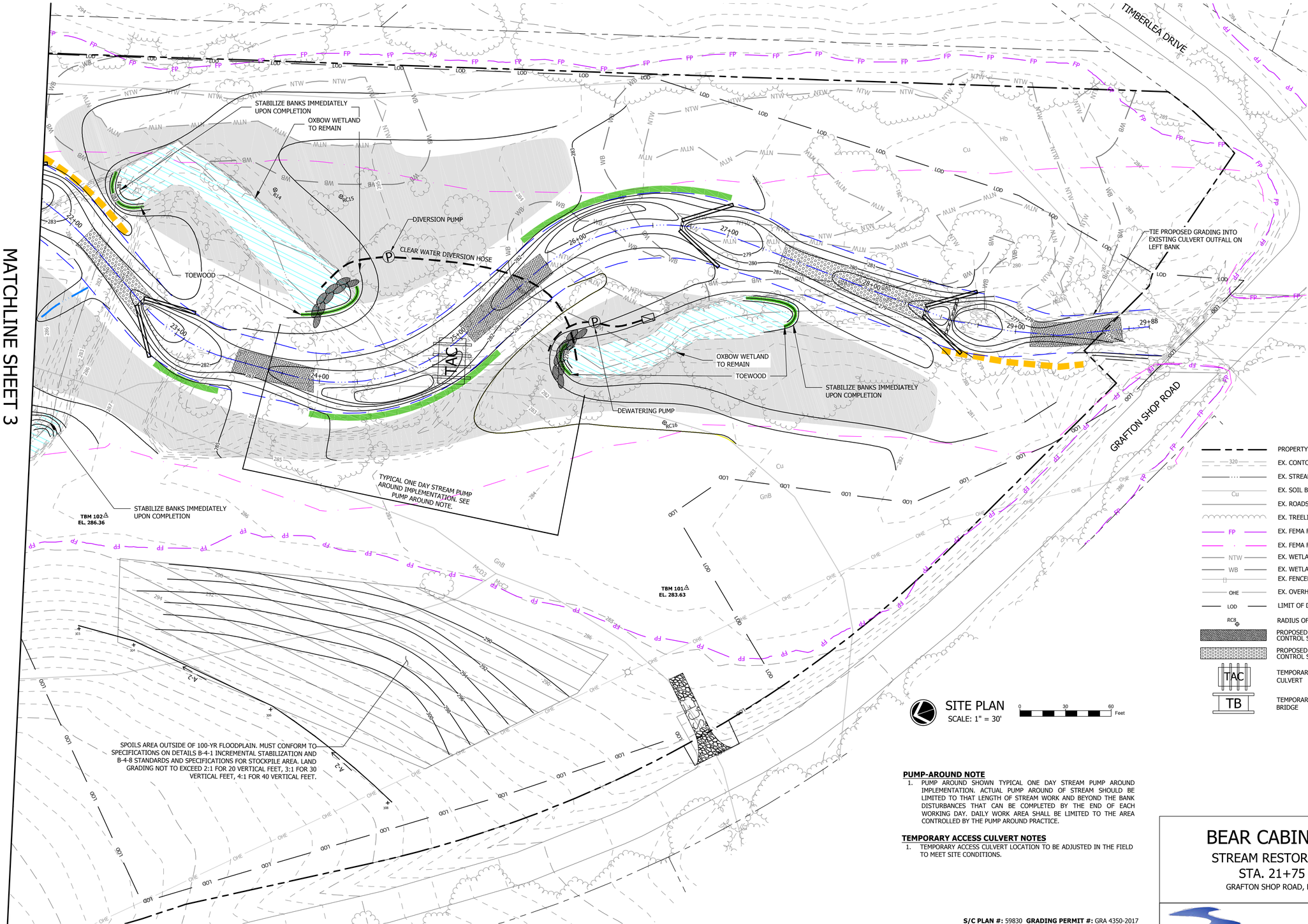
MATCHLINE SHEET 3



SITE PLAN
SCALE: 1" = 30'
0 30 60 Feet

LEGEND

- PROPERTY BOUNDARY
- EX. CONTOURS
- EX. STREAM CENTERLINE
- EX. SOIL BOUNDARY
- EX. ROADS
- EX. TREELINE
- EX. FEMA FLOODPLAIN - 100 YR
- EX. FEMA FLOODWAY
- EX. WETLAND
- EX. WETLAND BUFFER (25 FT)
- EX. FENCELINE
- EX. OVERHEAD ELECTRIC
- LIMIT OF DISTURBANCE
- RADIUS OF CURVATURE
- PROPOSED RIFFLE GRADE CONTROL SUBSTRATE 1
- PROPOSED RIFFLE GRADE CONTROL SUBSTRATE 2
- TEMPORARY ACCESS CULVERT
- TEMPORARY ACCESS BRIDGE
- PROPOSED CONTOURS
- PROPOSED STREAM CENTERLINE
- PROPOSED TOP OF BANK
- PROPOSED TOE WOOD
- PROPOSED BIOENGINEERING
- PROPOSED LOG SILL
- PROPOSED LOG CROSS VANE
- PROPOSED LOG CROSS VANE WITH ROCK SILL
- PROPOSED OXBOW WETLAND
- PROPOSED WETLAND
- PROPOSED A-2 EARTH DIKE
- PROPOSED SUPER SILT FENCE
- PUMP AROUND PRACTICE

PUMP-AROUND NOTE

1. PUMP AROUND SHOWN TYPICAL ONE DAY STREAM PUMP AROUND IMPLEMENTATION. ACTUAL PUMP AROUND OF STREAM SHOULD BE LIMITED TO THAT LENGTH OF STREAM WORK AND BEYOND THE BANK DISTURBANCES THAT CAN BE COMPLETED BY THE END OF EACH WORKING DAY. DAILY WORK AREA SHALL BE LIMITED TO THE AREA CONTROLLED BY THE PUMP AROUND PRACTICE.

TEMPORARY ACCESS CULVERT NOTES

1. TEMPORARY ACCESS CULVERT LOCATION TO BE ADJUSTED IN THE FIELD TO MEET SITE CONDITIONS.

REALIGNMENT	RADIUS OF CURVATURE #	REALIGNMENT STATIONING	RADIUS OF CURVATURE	RADIUS OF CURVATURE/ BANKFULL WIDTH
REACH	RC14	22+70 - 23+39	115 FT	3.24
REACH	RC15	23+82 - 25+02	122 FT	3.44
REACH	RC16	25+64 - 27+05	130 FT	3.66

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

SOILS LEGEND	
SYMBOL	SOIL DESCRIPTION
Cu	Codorus silt loam
GnB	Glenville silt loam, 0-3% slopes
Hb	Hatboro silt loam
McC2	Manor channery loam, 8-15% slopes, moderately eroded
McD3	Manor channery loam, 15-25% slopes, severly eroded
MgD	Manor and Glenelg very stony loams, 15-25% slopes

BEAR CABIN BRANCH

STREAM RESTORATION PLAN

STA. 21+75 - 29+88

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
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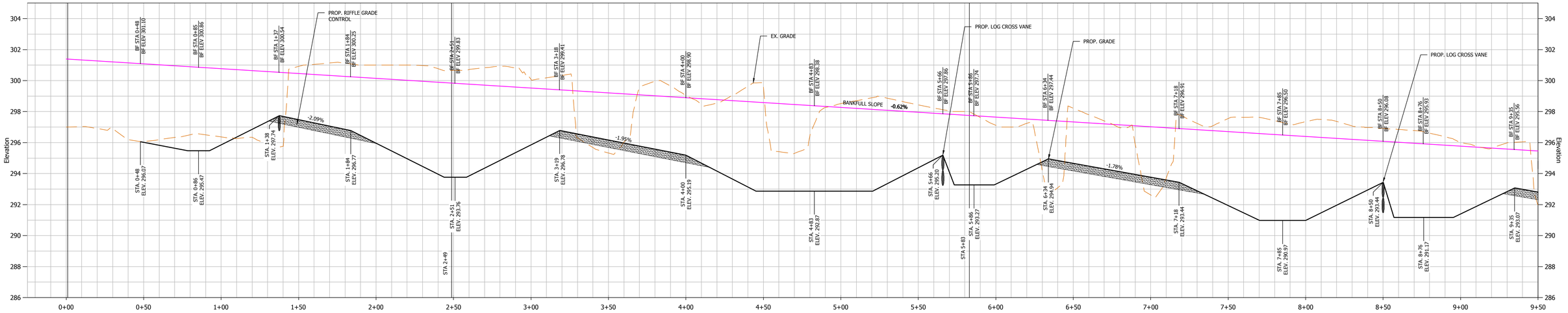
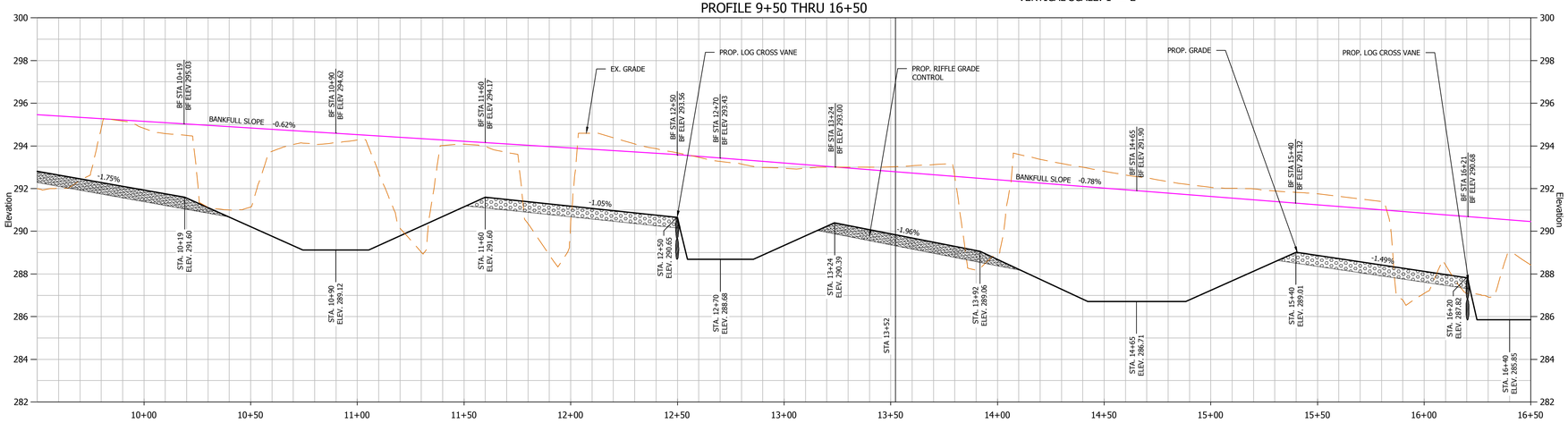
PROFILE -0+25 THRU 9+50



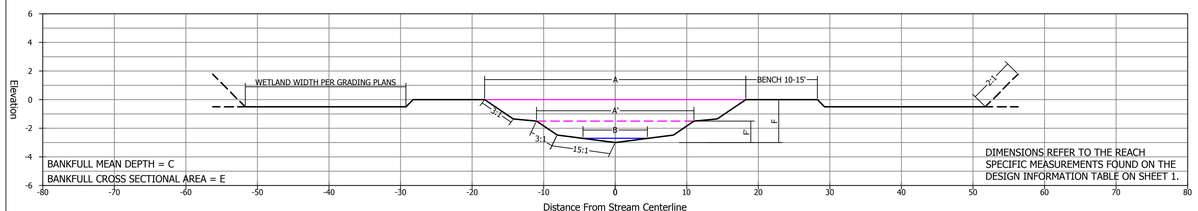
DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

PROFILE 9+50 THRU 16+50



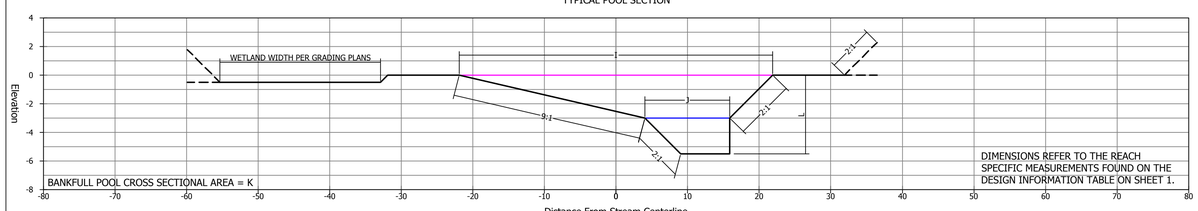
DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

TYPICAL RIFFLE SECTION



Distance From Stream Centerline
Horizontal Scale: 1" = 10'
Vertical Scale: 1" = 5'

TYPICAL POOL SECTION



Distance From Stream Centerline
Horizontal Scale: 1" = 10'
Vertical Scale: 1" = 5'

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH

PROFILES & CROSS SECTIONS

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
NO.	DATE	DESCRIPTION	REV. BY

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DESIGNED: CEH/CTS
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PROJECT No.: 1638
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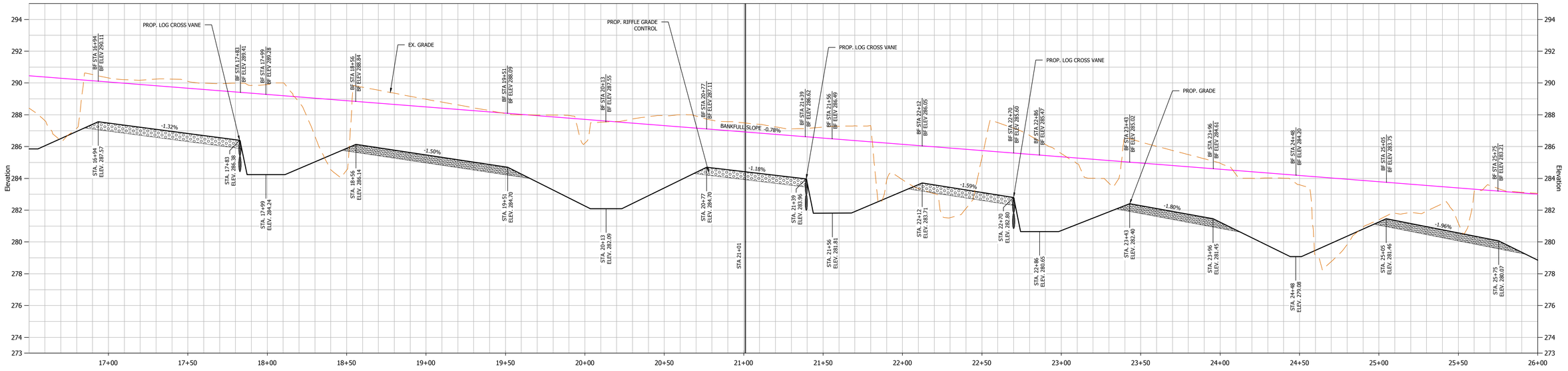
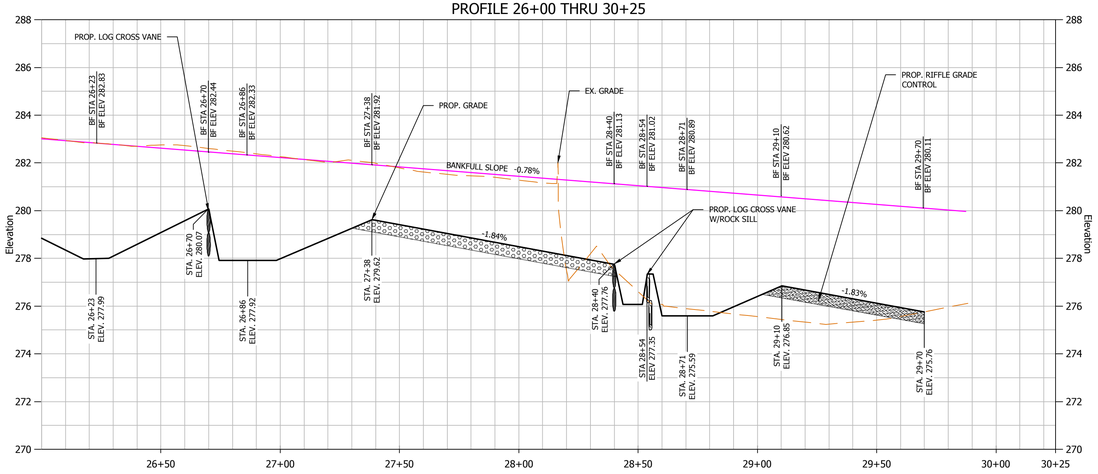
PROFILE 16+50 THRU 26+00



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

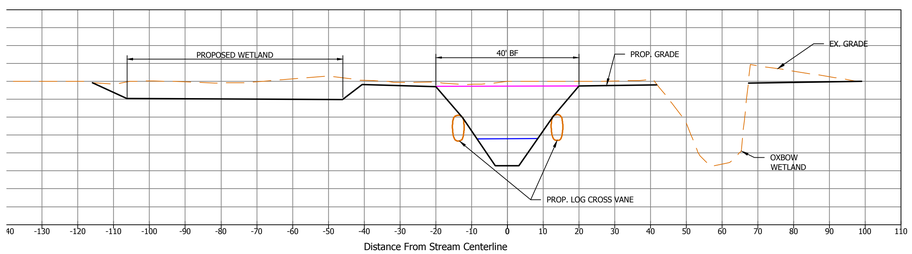
PROFILE 26+00 THRU 30+25



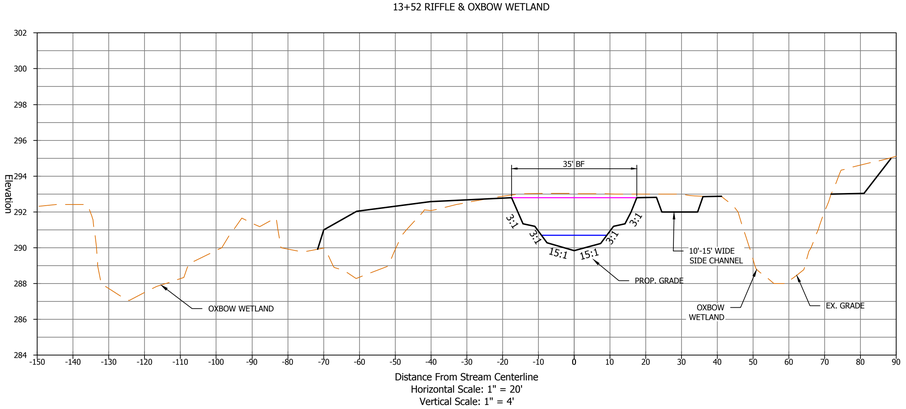
DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'

21+01 RIFFLE & OXBOW WETLAND

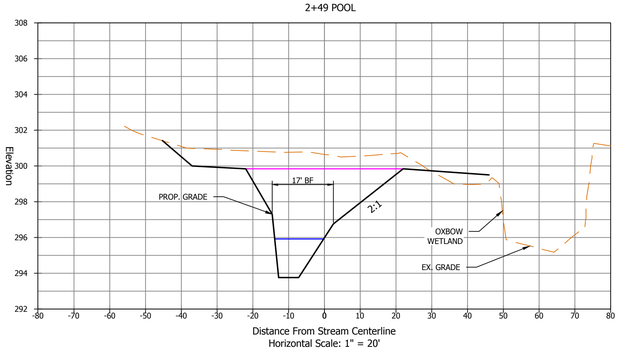
5+83 LOG VANE POOL



13+52 RIFFLE & OXBOW WETLAND



2+49 POOL



S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH

PROFILES & CROSS SECTIONS

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
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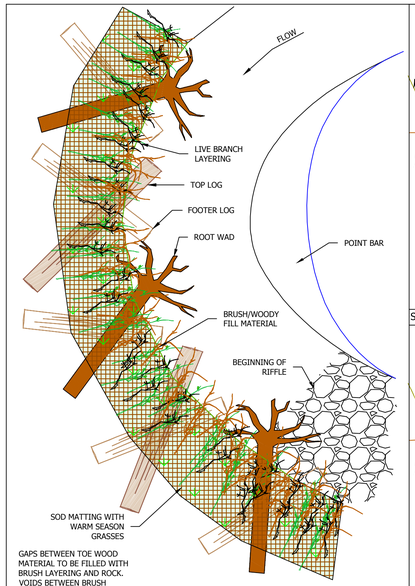
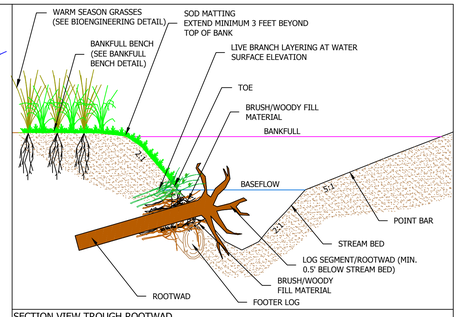
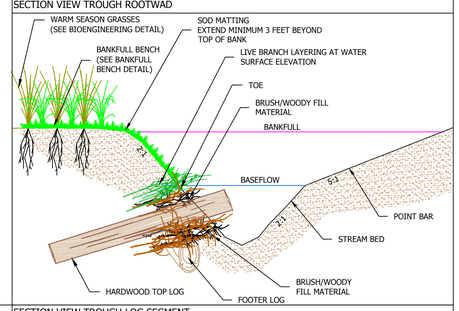


PLAN VIEW



SECTION VIEW TROUGH ROOTWAD



SECTION VIEW TROUGH LOG SEGMENT

TOE WOOD WITH SOD MATTING N.T.S

TOE WOOD WITH SOD MATTING INSTALLATION

DESCRIPTION
This work shall consist of installing toe wood structure to provide bank stability, minimize near bank stress, maintain low width/depth ratio, and enhance aquatic habitat.

MATERIALS
Woody Material
Material shall consist of woody material such as large limbs, branches, brush, logs and rootwads. Logs and rootwads shall be solid hardwood with minimum trunk diameter of 10 inches. Logs shall have a minimum length of 10 feet. All material shall be free of rot and evidence of pests.

Live Branch Material
1. Live branch cuttings shall be approximately 1.5 inch in diameter.
2. Cuttings shall be 24-36" in length and long enough to extend a minimum of 1 foot and maximum of 18 inches from the rebuilt slope face. Side branches and bark shall remain intact prior to installation.
3. Live branch cuttings shall consist of a mix of three or more of the following species as shown on the "Live Branch Plant List" shown on Planting Plans, with at least one willow (salix) and one dogwood (cornus) species included. Each species shall comprise no more than 50% and no less than 20% of the mix.

NOTE: When not in dormancy period (Dec. 1 to Apr.1), livestakes shall be substituted with tubelings spaced 1 per foot.

Soil
Soil material shall consist of top soil salvaged from within the construction limits or supplied topsoil that meets the specifications for topsoil in the Sediment and Erosion Control Plans.

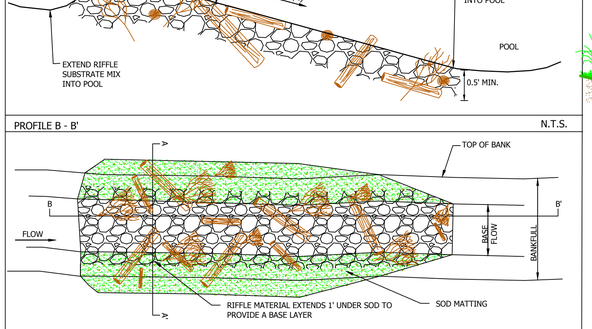
Sod Matting
1. Sod matting shall be harvested from native material available on-site, within the limits of disturbance when available.
2. Sod matting shall not be stockpiled, but installed immediately after harvest (See "Sod Matting Detail" for specifications).

CONSTRUCTION
Live Branch Material Preparation:
1. All cuts shall be smooth and the cut surface kept small. The use of large pruning shears or power saws may be required.
2. Live materials not installed within 8 hours of harvesting shall be protected against drying out and overheating. Protection against drying out shall be accomplished by keeping the material covered, transported in unheated vehicles, moistened and/or kept in soak pits.
3. Storage of live materials shall include continuous shade by covering with evergreen branches or plastic sheeting. Proper storage shall also include sheltering live plant material from the wind and protection from drying by being heeled into moist soils and/or sprayed with anti-transpirant chemicals. Where water is available, live branch cuttings shall be sprayed or immersed.
4. Live materials shall be installed the same day that the cuttings are harvested. If installation of live materials cannot be accomplished on the same day and storage is required, live materials shall be stored for a period no longer than 2 days in cold storage.

Toe Wood and Branch Layering Installation
1. Excavate channel bed and outside bank to a subgrade depth that allows for the thickness of footer logs and stacked rootwads and top log segments (when complete, Baseflow water height should match or be slightly higher than height of the rootwad and top log). Excavation into the bank shall be atleast wide enough to place log sections and rootwads at a 20-30° angle.
2. Place footer logs into expanded area so that log ends face downstream at approximately a 20-30° angle. Logs shall be spaced roughly 8-10 feet apart and the ends shall protrude past the proposed toe no more than 2'.
3. Place rootwads and top log segments on top of the footer logs in a criss-cross fashion so that the ends face up stream at a 20-30° angle. Installed angles shall be field adjusted/determined so as logs and rootwads face directly into the flow/energy vectors. Rootwads and top logs shall be spaced per the spacing chart. Smaller supplemental logs shall be placed in between rootwads and top logs to fill voids.
4. Small material (limbs, branches, brush) shall be forced into large voids so that backfill will not slough. Woody debris shall not protrude more than 12" beyond the toe where the bank meets the bed.
5. Place a thin layer of backfill (0.2' max) over woody material to form a planting bed for live branch material.
6. Place live branch material over backfill such that 2/3 of the branch will be covered with soil and 1/3 of the branch is exposed, extending out beyond the face of the bank. Live branches placed minimum 3/ft with growing tops facing out.
7. A layer of topsoil backfill shall be placed on top of the branches and compacted such that soil completely fills all voids between all the branches.
8. Regrade stream bank above branch layering to a subgrade elevation that allows for the placement of sod matting (0.5'-0.75' typ.). Create a 2:1 slope (typ.) on the face and also a bankfull bench per the detail above and typical cross sections.
9. Install sod matting beginning at the start of the woody fill material to the end of the bankfull bench.
10. On the opposite side (inside of the meander) of the toe wood, grade point bar to match typical pool cross section. Seed and straw to stabilize.
11. Warm season grasses will be installed during the appropriate growing season.

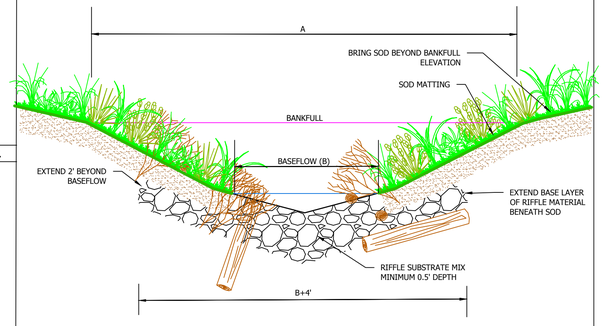
NOTE: The spacing of root wads will vary on each meander based on the following table:

Ratio of Radius to Bankfull Width	Root Wad Spacing
<2x bankfull width	8-10'
2-2.5x bankfull width	10-14'
>2.5x bankfull width	15-20'



PROFILE B - B' N.T.S.

PLAN VIEW N.T.S.



CROSS SECTION A - A' N.T.S.

RIFFLE GRADE CONTROL STRUCTURE WITH SOD MATTING DETAIL

RIFFLE GRADE CONTROL STRUCTURE WITH SOD INSTALLATION

DESCRIPTION
Work shall consist of furnishing and installing stone and woody materials for the creation of riffle grade control structures within the proposed stream bed. Riffle grade control structures are to be utilized at every riffle along the proposed stream alignment.

MATERIALS

Sod Matting
1. Sod matting shall be harvested from native material available on-site, within the limits of disturbance when available. See "Sod Matting Detail" for specifications.

Riffle Substrate Mix
1. Riffle substrate mix material shall consist of salvaged natural field rock or furnished crushed rock from a quarry and shall be sound, tough, dense, resistant to the action of air and water, and suitable in all respects for the purpose intended.
2. The Construction Manager shall review riffle material for review and approval prior to beginning construction.
3. Substrate shall be a mixture conforming to the "Riffle Substrate Specifications".
4. Not to exceed 50% Angular Quarry Rock
5. Incorporate with salvaged material when available. Mix material prior to placing in stream.
6. All material shall meet the approval of the Construction Manager. While no specific gradation is required, the various sizes of the rock shall be equally distributed within the required size range. The size of an individual rock particle shall be determined by measuring its diameter across the intermediate axis.

Woody Material
1. Woody material shall be 1-8" in diameter (maximum) and 18-48 inches in length.
2. Woody material shall be from native trees and shrubs. No exotic or invasive species are to be used.
3. No willow (Salix) or shrub dogwood (Cornus sericea, Cornus mas or Cornus racemosa) species are to be used.

CONSTRUCTION
1. Salvageable material within any given work area shall be harvested and stockpiled for later use.
2. Excavate proposed channel to form subgrade of proposed riffle sequence.
3. Place a portion of woody debris in the excavated riffle. Woody material shall be placed in a manner in which it is keyed into the proposed banks, proposed riffle material, and/or driven into the substrate prior to riffle material placement.
4. Place random Class II riprap habitat stones throughout riffle. Not to exceed 0.3" from Invert.
5. Thoroughly mix appropriate quantities of Class I, Class 0, cobble and salvaged material.
6. Add base layer of compacted Class I, Class 0, cobble and salvaged material. Extend substrate mix 2-ft beyond base flow width and a minimum of 0.4' below finished grade.
7. Regrade stream banks to the proposed slope and at a subgrade elevation that allows for the placement of sod.
8. Place sod matting along stream banks, starting at the edge of baseflow and carry up past the edge of bankfull. Sod should be a minimum of 0.75' thick.
9. Tamp sod down with bottom edge of excavator bucket.
10. Place the remaining substrate mix within base flow and bring to final elevation, making sure to cover and protect the edge of newly installed sod.
11. Any woody material that extends up from the channel more than 0.4' should be trimmed or tamped lower.

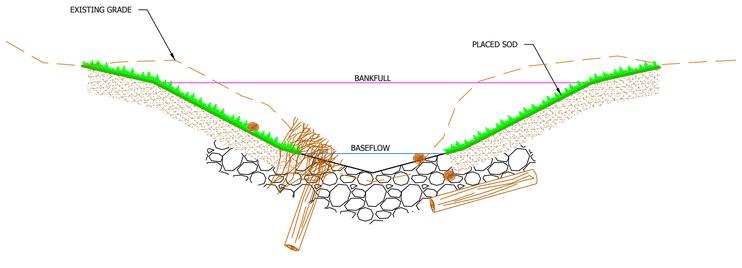
RIFFLE SUBSTRATE MATERIAL SPECIFICATIONS
Different riffle substrate material sizes should be used for the top of riffle (top third of riffle) and bottom of riffle (bottom two-thirds of riffle). Use existing stream bed material where existing material meets the following size specifications. Where existing material does not meet the following size specifications, supplement with angular quarry rock so that the D84 is made to meet the following size.

Riffle Grade Control Substrate #1:
Top third of riffle - Salvaged material with a D84 ≥ 8.9"/225mm
*If salvaged material with a D84 ≥ 8.9"/225mm is not available supplement with angular quarry rock with a D84 of 6"/152mm

Bottom two-thirds of riffle - Salvaged material with a D84 ≥ 3.2"/82mm
*If salvaged material with a D84 ≥ 3.2"/82mm is not available supplement with angular quarry rock with a D84 of 3"/76mm

Riffle Grade Control Substrate #2:
Top third of riffle - Salvaged material with a D84 ≥ 8.9"/225mm
*If salvaged material with a D84 ≥ 8.9"/225mm is not available supplement with angular quarry rock with a D84 of 6"/152mm

Bottom two-thirds of riffle - Salvaged material with a D84 ≥ 6.2"/156mm
*If salvaged material with a D84 ≥ 8.9"/225mm is not available supplement with angular quarry rock with a D84 of 6"/152mm



SOD HARVESTED ON-SITE AT DESIGNATED LOCATIONS (0.5' MINIMUM THICKNESS)

SOD MATTING DETAIL N.T.S.

SOD MATTING INSTALLATION
1. All sod shall be harvested on-site. On-site sod harvesting areas are available in areas where new grading or wetland enhancement is proposed. It is the responsibility of the Contractor to avoid impacting these areas prior to salvaging sod. Specialized harvesting equipment can be used. The use of an excavator or skid loader at a minimum is necessary to accomplish the sod transplanting. Equipment used, harvesting locations, and placement of sod will be accomplished under the direct supervision of the Designated Specialist. On-site borrow areas for sod will be identified and flagged by the Designated Specialist in the field. All sod materials to be placed along the streambank must be approved by the Designated Specialist prior to placement.
2. Sod should be harvested in pieces no less than 2' wide by 2' long by 0.5' - 0.75' deep with an excavator. Smaller sod pieces shall not be allowed.
3. Transport the sod to the proposed installation location and immediately place the sod along the bank. Setting the sod down temporarily, or stockpiling the sod shall not be allowed.
4. Place the sod carefully along the bank, and compact the sod immediately after placement with three tamps of the bottom of the excavator bucket, being careful not to damage the sod.
5. Adjacent sod pieces shall butt together with no gaps and sod pieces shall not overlap.
6. Sod placement is required on all streambanks indicated on the plans from the toe of slope to the top of slope at the elevation of the floodplain. Seeding and mulching may be used at the top of bank back into the floodplain, but not on sloped streambanks.
7. Sod should be watered immediately.

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH
STREAM RESTORATION PLAN
NOTES & DETAILS
GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS

NO.	DATE	DESCRIPTION	REV. BY

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
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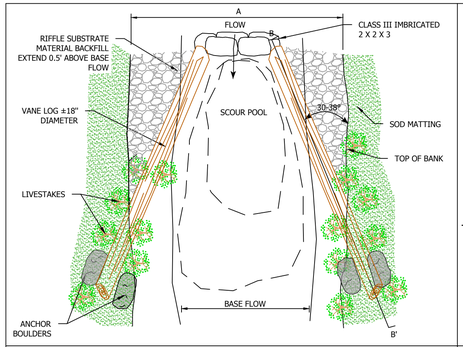
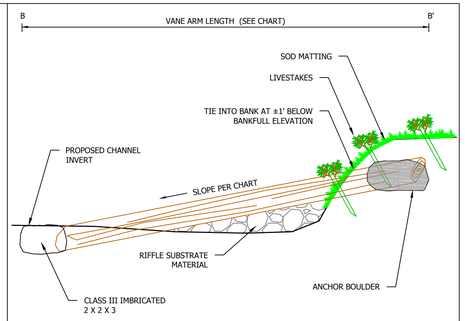
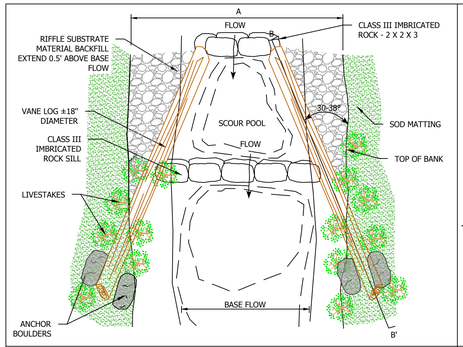


PLAN VIEW

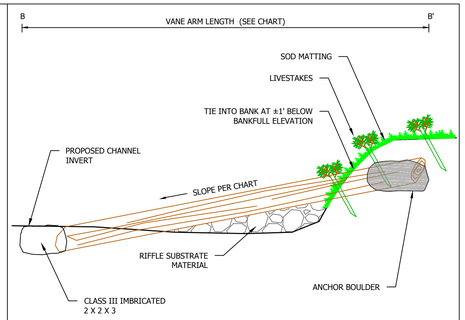


ARM PROFILE B-B'

LOG CROSS VANE WITH ROCK THROAT DETAIL N.T.S.



PLAN VIEW



ARM PROFILE B-B'

LOG CROSS VANE WITH ROCK THROAT AND ROCK SILL DETAIL N.T.S.

LOG CROSS VANE WITH ROCK THROAT AND ROCK SILL INSTALLATION

DESCRIPTION
This work shall consist of installing a log cross vane structure to provide grade control, bank stability, and minimize near bank stress.

MATERIALS
Logs
Logs shall be hardwood species, have a minimum length as indicated on the "Log Cross Vane Chart", and a minimum diameter of 12 inches. All material shall be free of rot and evidence of pests. All branches and root mass shall be removed.

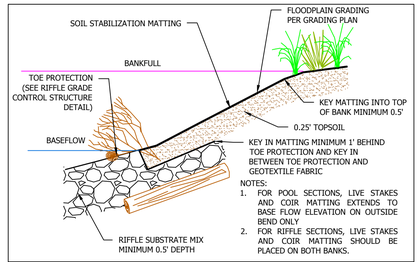
Backfill Substrate Material
Backfill material shall conform to riffle substrate specifications.

Anchor Boulders
Anchor boulders shall consist of Class II Riprap or equivalent salvaged boulders found on site.

Soil Stabilization Matting
1. Matting shall be woven machine spun bristle coir twine made of coir fiber obtained from fresh water cured coconut husks.
2. Soil stabilization matting shall conform to the "Soil Stabilization Matting Specifications" chart.

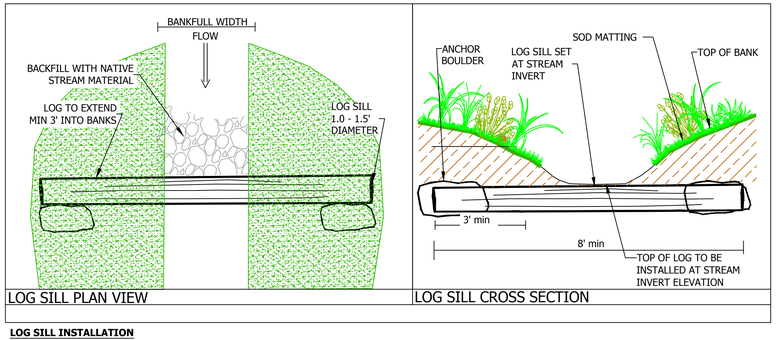
CONSTRUCTION
1. Rough grade channel and floodplain areas prior to installing logs.
2. Excavate trench for vane log so that tip of log will be flush with proposed stream bed elevation at thalweg and log ties into the bank at approximately 0.5' below bankfull elevation.
3. Install vane log and backfill with riffle substrate material. Ensure that all voids have been filled on the upstream side of log and beneath.
4. Excavate trench for opposing vane log and rock throat.
5. Install rock throat at the same elevation as previously installed log. Install opposing log at the same elevation as rock throat and bank tie in point at same elevation as first log. Secure long tips with a 3 foot section of rebar.
8. Install rock sill at elevation specified on profile when installing log cross vane with a rock sill.
9. Backfill remaining areas with riffle substrate material, ensuring that all voids have been filled.
10. Grade banks, seed and mulch per bank treatment specifications and details.

LOG CROSS VANE CHART		
REACH	LENGTH (FT)	SLOPE (%)
REACH 1 & 2	18-25	10-14
DESIGN NOTE: STRUCTURE ELEMENTS TO BE ADJUSTED IN THE FIELD BY THE CONTRACTOR'S DESIGNATED STREAM SPECIALIST WITH THE APPROVAL FROM COUNTY INSPECTOR IN ORDER TO MEET SITE CONDITIONS.		



SOIL STABILIZATION MATTING DETAIL N.T.S

Soil Stabilization Matting Specifications		
Property	Test Method	CoirMat 700
Weight	ASTM D 3776	20.6 oz/SY
Thickness	ASTM D 1777	0.3 inch
Dry Tensile Strength		
Machine Direction	ASTM D 4595	1512 lbs/sf
Cross Direction		1032 lbs/sf
Wet Tensile Strength		
Machine Direction	ASTM D 4595	924 lbs/sf
Cross Direction		684 lbs/sf
Open Area	Calulated	50%



LOG SILL PLAN VIEW LOG SILL CROSS SECTION

LOG SILL INSTALLATION

1. DESCRIPTION
This work shall consist of installing a log sill structure to provide grade control, bank stability and minimize near bank stress.

2. MATERIALS
Logs
Logs shall be hardwood species, have a minimum length of 8 feet, and a minimum diameter of 12 inches.
All material shall be free of rot and evidence of pests. All branches and root mass shall be removed.
Backfill Substrate
1. Riffle substrate material shall be from salvaged streambed material located onsite.
2. The organic content of material shall be less than 5 percent by weight.
Anchor Boulders
Anchor boulders shall be consist of Class II Riprap or equivalent.

3. CONSTRUCTION
1. Excavate trench for log sill so that top of log lies at the existing stream invert elevation with the log tying into the bank a minimum of 3'.
2. Backfill behind sill with existing stream bed materials. Ensure that all voids have been filled on the upstream side of log, compacting with equipment on site.
3. Grade banks, seed and mulch per bank treatment specifications and details.

BEAR CABIN BRANCH
STREAM RESTORATION PLAN
NOTES & DETAILS
GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
NO.	DATE	DESCRIPTION	REV. BY

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET: 9 of 14

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

Ecotone Inc.
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B-4-1 STANDARDS AND SPECIFICATIONS

FOR

INCREMENTAL STABILIZATION

Definition

Establishment of vegetative cover on cut and fill slopes.

Purpose

To provide timely vegetative cover on cut and fill slopes as work progresses.

Conditions Where Practice Applies

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

Criteria

A. Incremental Stabilization - Cut Slopes

1. Excavate and stabilize cut slopes in increments not to exceed 15 feet in height. Prepare seedbed 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 necessary.
   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.

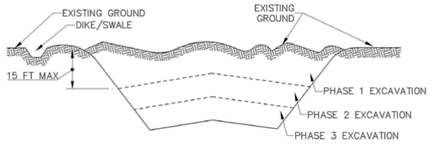

Figure B.1: Incremental Stabilization – Cut

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

Note: Once the placement of fill 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.

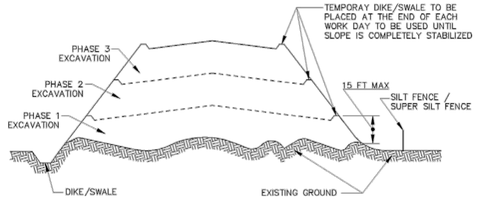

Figure B.2: Incremental Stabilization – Fill

B-4-2 STANDARDS AND SPECIFICATIONS

FOR

SOIL PREPARATION, TOPSOILING, AND SOIL AMENDMENTS

Definition

The process of preparing the soils to sustain adequate vegetative stabilization.

Purpose

To provide a suitable soil medium for vegetative growth.

Conditions Where Practice Applies

Where vegetative stabilization is to be established.

Criteria

A. Soil Preparation

1. Temporary Stabilization
   a. 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 rippers 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.
   b. Apply fertilizer and lime as prescribed on the plans.
   c. Incorporate lime and fertilizer into the top 3 to 5 inches of soil by disking or other suitable means.
2. 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. An exception: if lovegrass will be planted, then a sandy soil (less than 30 percent silt 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.
   b. Application of amendments or topsoil is required if on-site soils do not meet the above conditions.
   c. 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.

   d. Apply soil amendments as specified on the approved plan or as indicated by the results of a soil test.
   e. 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.

B. Topsoiling

1. 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 gradation.
2. 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 USDA-NRCS.
3. 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.
   b. 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.
   c. The original soil to be vegetated contains material toxic to plant growth.
   d. The soil is so acidic that treatment with limestone is not feasible.
4. Areas having slopes steeper than 2:1 require special consideration and design.
5. Topsoil Specifications: Soil to be used as topsoil must meet the following criteria:
   a. 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.
   b. 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.
   c. 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.
6. Topsoil Application
   a. Erosion and sediment control practices must be maintained when applying topsoil.
   b. 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.
   c. 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

B-4-8 STANDARDS AND SPECIFICATIONS

FOR

STOCKPILE AREA

Definition

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

Purpose

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 Applies

Stockpile areas are utilized when it is necessary to salvage and store soil for later use.

Criteria

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.

Maintenance

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.

and seedbed preparation.

C. Soil Amendments (Fertilizer and Lime Specifications)

1. 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.
2. 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.
3. 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.
4. 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.
5. 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 topsoil.

PERMANENT VEGETATIVE STABILIZATION

ALL DISTURBED AREAS, WHICH ARE NOT TO BE PAVED, SHALL BE PERMANENTLY STABILIZED AS FOLLOWS:

A) SEEDBED PREPARATION:
Loosen upper three inches by raking, discing, or other acceptable means after spreading four inches of topsoil.

B) SOIL AMENDMENTS:
Apply 500 lbs per acre of 10-10-10 fertilizer and two tons per acre of lime.

C) SEEDING:*
FOR PERIODS OF MARCH 1 TO MAY 15 AND AUGUST 15 TO OCTOBER 15: Seed with 125 lbs per acre of Tall Fescue, 15 lbs per acre of Perennial Ryegrass, and 10 lbs of Kentucky Bluegrass.

FOR PERIOD OF MAY 16 TO AUGUST 14: Seed with 110 lbs per acre of Tall Fescue and 3 lbs per acre of Weeping Lovegrass.

FOR PERIOD OF OCTOBER 16 TO FEBRUARY 28, PROTECT SITE BY: Option 1: 2 tons per acre of well anchored straw mulch and seed as soon as possible in the spring, Option 2: use sod, or Option 3: seed with 60 lbs per acre of tall fescue and mulch with 2 tons per acre of well anchored straw.
NOTE: For quick cover with tall fescue, add 2 lbs of small grain per 1,000 sq. ft.

D) MULCHING SPECIFICATIONS:
Mulch shall be applied to all seeded areas immediately after seeding.

Apply 2 tons per acre of straw over all seeded areas. If a mulch anchoring tool is to be used, the rate shall be increased to 2.5 tons per acres.**

Mulch anchoring shall be performed immediately following mulch application to minimize loss by wind and water. the type of mulch anchoring used must comply with the 2011 MARYLAND STANDARD AND SPECIFICATIONS.

* IF OTHER SEED MIXES ARE TO BE SUBSTITUTED, THEY MUST COMPLY WITH THE 2011 MARYLAND STANDARD AND SPECIFICATIONS, CHAPTER B, TABLE B-3(PAGES B 26 TO B 31)
** IF A DIFFERENT TYPE OF MULCH IS TO BE USED, IT MUST COMPLY WITH THE 2011 MARYLAND STANDARD AND SPECIFICATION, CHAPTER B: MULCHING (PAGES B 6 & B 7)

TEMPORARY VEGETATION STABILIZATION

A) SEEDBED PREPARATION:
Loosen upper three inches by discing, raking or other acceptable means.

B) SOIL AMENDMENTS:
Apply 600 lbs per acre of 10-10-10 fertilizer and two tons per acre of lime.

C) SEEDING: *
FOR PERIODS OF MARCH 1 TO APRIL 30 AND AUGUST 15 TO NOVEMBER 15: Seed with 2.5 bu. per acre of Cereal Rye plus 30 lbs per acre of Tall Fescue or 5 lbs per acre of Redtop or 20 lbs per acre of Perennial Ryegrass.

FOR PERIOD OF MAY 1 TO AUGUST 14: Seed with 3 lbs per acre of Weeping Lovegrass or 40 lbs per acre of Japanese or Foxtail Millet.

FOR THE PERIOD OF NOVEMBER 16 TO FEBRUARY 28: Protect the site by applying two tons per acre of well anchored straw mulch and seed as soon as possible in the spring or use sod.

D) MULCHING SPECIFICATIONS:
Mulch shall be applied to all seeded areas immediately after seeding.

Apply 2 tons per acre of straw over all seeded areas. If a mulch anchoring tool is to be used, the rate shall be increased to 2.5 tons per acre.**

Mulch anchoring shall be performed immediately following mulch application to minimize loss by wind and water. The type of mulch anchoring used must comply with the 2011 MARYLAND STANDARD AND SPECIFICATIONS.

*IF OTHER SEED MIXES ARE TO BE SUBSTITUTED, THEY MUST COMPLY WITH THE 2011MARYLAND STANDARD AND SPECIFICATIONS, CHAPTER B, TABLE B-1(PAGE B 20).
** IF A DIFFERENT TYPE OF MULCH IS TO BE USED, IT MUST COMPLY WITH THE 2011 MARYLAND STANDARD AND SPECIFICATION, CHAPTER B: MULCHING (PAGES B 6& B 7)

WETLAND / RIPARIAN SEED MIX

MIX	PERCENT	SCIENTIFIC NAME	COMMON NAME	VARIETY
30.0%	22.0%	Panicum clandestinum	Deertongue	Tioga
	20.0%	Elymus riparius	Riverbank Wildrye	PA Ecotype
	17.0%	Andropogon gerardii	Big Bluestem	Niagara
	15.0%	Echinochloa crusgalli var. frumentacea	Japanese Millet	Frumentacea
	10.0%	Carex vulpinoidea	Fox Sedge	PA Ecotype
	8.0%	Panicum virgatum	Switchgrass	Shawnee
	3.0%	Chamaecrista fasciculata	Partridge Pea	PA Ecotype
	2.7%	Desmodium paniculatum	Panicledleaf Ticktrefoil	PA Ecotype
	1.0%	Verbena hastata	Blue Vervain	PA Ecotype
	0.5%	Eupatorium fistulosum	Joe Pye Weed	PA Ecotype
	0.5%	Juncus tenuis	Path Rush	PA Ecotype
	0.3%	Asclepias incarnata	Swamp Milkweed	PA Ecotype
35.0%	100.0%	Elymus virginicus	Virginia Wildrye	N/A
35.0%	100.0%	Dactylis glomerata	Orchardgrass	N/A
Seeding Rate: 10 lb per acre, or ½ lb per 1,000				

SEEDING NOTES
Temporary vegetative stabilization seed to be utilized everywhere on the site. Wetland/riparian seed mix to be utilized within wetland areas. Permanent vegetative stabilization seed to be utilized within all upland areas.

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH

STREAM RESTORATION PLAN
NOTES & DETAILS

GRAFTON SHOP ROAD, FOREST HILL, MD

Ecotone Inc.
FORESTS • WETLANDS • RIVERS • WILDLIFE
2120 High Point Road • Forest Hill, Maryland 21050
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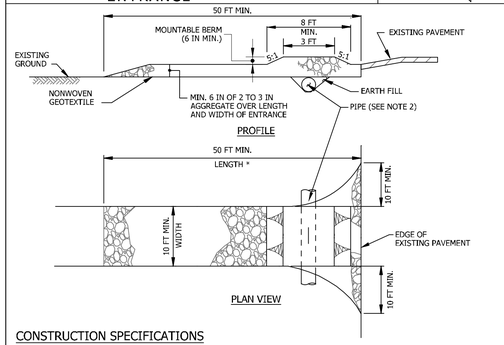
REVISIONS			
NO.	DATE	DESCRIPTION	REV. BY

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET:

DETAIL B-1 STABILIZED CONSTRUCTION ENTRANCE

STANDARD SYMBOL: SCE



CONSTRUCTION SPECIFICATIONS

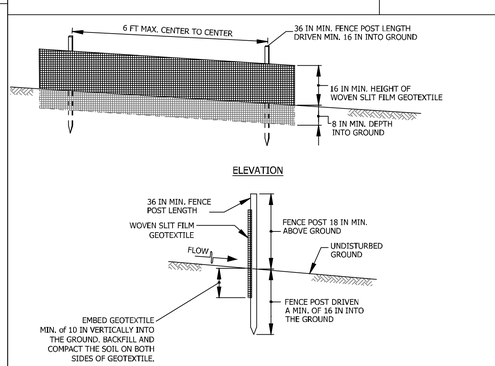
1. PLACE STABILIZED CONSTRUCTION ENTRANCE IN ACCORDANCE WITH THE APPROVED PLAN. VEHICLES MUST TRAVEL OVER THE ENTIRE LENGTH OF THE SCE. USE MINIMUM LENGTH OF 50 FEET (*30 FEET FOR SINGLE RESIDENCE LOT). USE MINIMUM WIDTH OF 10 FEET. FLARE SCE 10 FEET MINIMUM AT THE EXISTING ROAD TO PROVIDE A TURNING RADIUS.
2. PIPE ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD THE SCE UNDER THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE. PROTECT PIPE INSTALLED THROUGH THE SCE WITH A MOUNTABLE BERM WITH 5:1 SLOPES AND A MINIMUM OF 12 INCHES OF STONE OVER THE PIPE. PROVIDE PIPE AS SPECIFIED ON APPROVED PLAN. WHEN THE SCE IS LOCATED AT A HIGH SPOT AND HAS NO DRAINAGE TO CONVEY, A PIPE IS NOT NECESSARY. A MOUNTABLE BERM IS REQUIRED WHEN SCE IS NOT LOCATED AT A HIGH SPOT.
3. PREPARE SUBGRADE AND PLACE NONWOVEN GEOTEXTILE, AS SPECIFIED IN SECTION H-1 MATERIALS.
4. PLACE CRUSHED AGGREGATE (2 TO 3 INCHES IN SIZE) OR EQUIVALENT RECYCLED CONCRETE (WITHOUT REBAR) AT LEAST 6 INCHES DEEP OVER THE LENGTH AND WIDTH OF THE SCE.
5. 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.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL E-1 SILT FENCE

STANDARD SYMBOL: SF



1 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL E-1 SILT FENCE

STANDARD SYMBOL: SF

CONSTRUCTION SPECIFICATIONS

1. USE WOOD POSTS 1¾ X 1¾ ± 1/16 INCH (MINIMUM) SQUARE CUT OF SOUND QUALITY HARDWOOD. AS AN ALTERNATIVE TO WOODEN POST USE STANDARD "T" OR "U" SECTION STEEL POSTS WEIGHING NOT LESS THAN 1 POUND PER LINEAR FOOT.
2. USE 36 INCH MINIMUM POSTS DRIVEN 16 INCH MINIMUM INTO GROUND NO MORE THAN 6 FEET APART.
3. USE WOVEN SLIT FILM GEOTEXTILE AS SPECIFIED IN SECTION H-1 MATERIALS AND FASTEN GEOTEXTILE SECURELY TO UPSLOPE SIDE OF FENCE POSTS WITH WIRE TIES OR STAPLES AT TOP AND MID-SECTION.
4. PROVIDE MANUFACTURER CERTIFICATION TO THE AUTHORIZED REPRESENTATIVE OF THE INSPECTION/ENFORCEMENT AUTHORITY SHOWING THAT THE GEOTEXTILE USED MEETS THE REQUIREMENTS IN SECTION H-1 MATERIALS.
5. EMBED GEOTEXTILE A MINIMUM of 10 INCHES VERTICALLY INTO THE GROUND. BACKFILL AND COMPACT THE SOIL ON BOTH SIDES OF FABRIC.
6. WHERE TWO SECTIONS OF GEOTEXTILE ADJOIN: OVERLAP, TWIST, AND STAPLE TO POST IN ACCORDANCE WITH THIS DETAIL.
7. EXTEND BOTH ENDS OF THE SILT FENCE A MINIMUM OF FIVE HORIZONTAL FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT TO PREVENT RUNOFF FROM GOING AROUND THE ENDS OF THE SILT FENCE.
8. REMOVE ACCUMULATED SEDIMENT AND DEBRIS WHEN BULGES DEVELOP IN SILT FENCE OR WHEN SEDIMENT REACHES 25% OF FENCE HEIGHT. REPLACE GEOTEXTILE IF TORN. IF UNDERMINING OCCURS, REINSTALL FENCE.

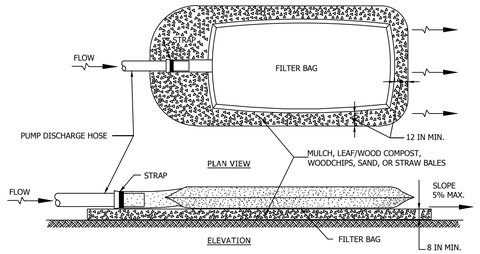
2 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL F-4 FILTER BAG

STANDARD SYMBOL: FB



CONSTRUCTION SPECIFICATIONS

1. TIGHTLY SEAL SLEEVE AROUND THE PUMP DISCHARGE HOSE WITH A STRAP OR SIMILAR DEVICE.
2. PLACE FILTER BAG ON SUITABLE BASE (E.G., MULCH, LEAF/WOOD COMPOST, WOODCHIPS, SAND, OR STRAW BALES) LOCATED ON A LEVEL OR 5% MAXIMUM SLOPING SURFACE. DISCHARGE TO A STABILIZED AREA. EXTEND BASE A MINIMUM OF 12 INCHES FROM EDGES OF BAG.
3. CONTROL PUMPING RATE TO PREVENT EXCESSIVE PRESSURE WITHIN THE FILTER BAG IN ACCORDANCE WITH THE MANUFACTURER RECOMMENDATIONS. AS THE BAG FILLS WITH SEDIMENT, REDUCE PUMPING RATE.
4. REMOVE AND PROPERLY DISPOSE OF FILTER BAG UPON COMPLETION OF PUMPING OPERATIONS OR AFTER BAG HAS REACHED CAPACITY, WHICHEVER OCCURS FIRST. SPREAD THE DEWATERED SEDIMENT FROM THE BAG IN AN APPROVED UPLAND AREA AND STABILIZE WITH SEED AND MULCH BY THE END OF THE WORK DAY. RESTORE THE SURFACE AREA BENEATH THE BAG TO ORIGINAL CONDITION UPON REMOVAL OF THE DEVICE.
5. USE NONWOVEN GEOTEXTILE WITH DOUBLE STITCHED SEAMS USING HIGH STRENGTH THREAD. SIZE SLEEVE TO ACCOMMODATE A MAXIMUM 4 INCH DIAMETER PUMP DISCHARGE HOSE. THE BAG MUST BE MANUFACTURED FROM A NONWOVEN GEOTEXTILE THAT MEETS OR EXCEEDS MINIMUM AVERAGE ROLL VALUES (MARV) FOR THE FOLLOWING:

GRAB TENSILE	250 LB	ASTM D-4632
PUNCTURE	150 LB	ASTM D-4833
FLOW RATE	70 GAL/MIN/FT²	ASTM D-4491
PERMITTIVITY (SEC^{-1})	1.2 SEC^{-1}	ASTM D-4491
UV RESISTANCE	70% STRENGTH @ 500 HOURS	ASTM D-4355
APPARENT OPENING SIZE (AOS)	0.15-0.18 MM	ASTM D-4751
SEAM STRENGTH	90%	ASTM D-4632

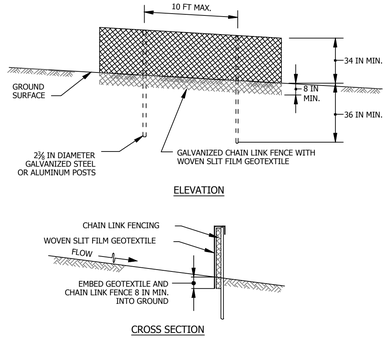
6. REPLACE FILTER BAG IF BAG CLOGS OR HAS RIPS, TEARS, OR PUNCTURES. DURING OPERATION KEEP CONNECTION BETWEEN PUMP HOSE AND FILTER BAG WATER TIGHT. REPLACE BEDDING IF IT BECOMES DISPLACED.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL E-3 SUPER SILT FENCE

STANDARD SYMBOL: SSF



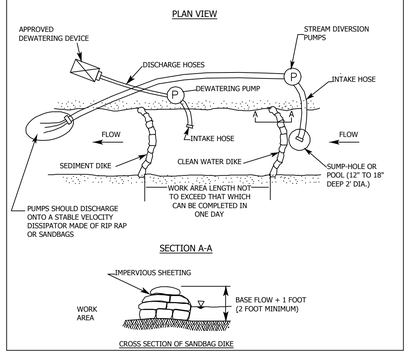
CONSTRUCTION SPECIFICATIONS

1. INSTALL 2½ INCH DIAMETER GALVANIZED STEEL POSTS OF 0.095 INCH WALL THICKNESS AND SIX FOOT LENGTH SPACED NO FURTHER THAN 10 FEET APART. DRIVE THE POSTS A MINIMUM OF 36 INCHES INTO THE GROUND.
2. FASTEN 9 GAUGE OR HEAVIER GALVANIZED CHAIN LINK FENCE (2⅜ INCH MAXIMUM OPENING) 42 INCHES IN HEIGHT SECURELY TO THE FENCE POSTS WITH WIRE TIES OR HUG RINGS.
3. FASTEN WOVEN SLIT FILM GEOTEXTILE AS SPECIFIED IN SECTION H-1 MATERIALS, SECURELY TO THE UPSLOPE SIDE OF CHAIN LINK FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP AND MID SECTION. EMBED GEOTEXTILE AND CHAIN LINK FENCE A MINIMUM OF 8 INCHES INTO THE GROUND.
4. WHERE ENDS OF THE GEOTEXTILE COME TOGETHER, THE ENDS SHALL BE OVERLAPPED BY 6 INCHES, FOLDED, AND STAPLED TO PREVENT SEDIMENT BY PASS.
5. EXTEND BOTH ENDS OF THE SUPER SILT FENCE A MINIMUM OF FIVE HORIZONTAL FEET UPSLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT TO PREVENT RUNOFF FROM GOING AROUND THE ENDS OF THE SUPER SILT FENCE.
6. PROVIDE MANUFACTURER CERTIFICATION TO THE INSPECTION/ENFORCEMENT AUTHORITY SHOWING THAT GEOTEXTILE USED MEETS THE REQUIREMENTS IN SECTION H-1 MATERIALS.
7. 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

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL 1.2: PUMP-AROUND PRACTICE



PUMP-AROUND PRACTICE

DESCRIPTION:

The work shall consist of installing a temporary pump and supporting measures to divert flow around instream construction sites.

IMPLEMENTATION SEQUENCE:

Sediment control measures, pump-around practices, and associated channel and bank construction shall be completed in the following sequence (refer to Detail 1.2): PUMP-AROUND PRACTICE.

1. Construction activities including the installation of erosion and sediment control measures shall not begin until all necessary easements and/or right-of-ways have been acquired. All existing utilities shall be marked in the field prior to construction. The contractor will be responsible for any damage to existing utilities that may result from construction and shall repair the damage at his/her own expense to the county's or utility company's satisfaction.
2. The contractor shall notify the Maryland Department of the Environment or WMA sediment control inspector at least 5 days before beginning construction. Additionally, the contractor shall inform the local environmental protection and resource management inspection and enforcement division and the provider of local utilities a minimum of 48 hours before starting construction.
3. The contractor shall conduct a pre-construction meeting on site with the WMA sediment control inspector, the county project manager, and the engineer to review the limits of disturbance, erosion and sediment control requirements, and the sequence of construction. The contractor shall stake out all limits of disturbance prior to the pre-construction meeting so they may be reviewed. The participants will also designate the contractor's staging areas and flag all trees within the limit of disturbance which will be removed for construction access. Trees shall not be removed within the limit of disturbance without approval from the WMA or local authority.
4. Construction shall not begin until all sediment and erosion control measures have been installed and approved by the engineer and the sediment control inspector. The contractor shall stay within the limits of the disturbance as shown on the plans and minimize disturbance within the work area whenever possible.
5. Upon installation of all sediment control measures and approval by the sediment control inspector and the local environmental protection and resource management inspection and enforcement division, the contractor shall begin work at the upstream section and proceed downstream beginning with the establishment of stabilized construction entrances. In some cases, work may begin downstream if appropriate. The sequence of construction must be followed unless the contractor gets written approval for deviations from the WMA or local authority. The contractor shall only begin work in an area which can be completed by the end of the day including grading adjacent to the channel. At the end of each work day, the work area must be stabilized and the pump-around removed from the channel. Work shall not be conducted in the channel during rain events.
6. Sandbag dikes shall be situated at the upstream and downstream ends of the work area as shown on the plans, and stream flow shall be pumped around the work area. The pump shall discharge onto a stable velocity dissipater of riprap or sandbags.
7. Water from the work area shall be pumped to a sediment filtering measure such as a dewatering basin, sediment bag, or other approved source. The measure shall be located such that the water drains back into the channel below the downstream sandbag dike.
8. Traversing a channel reach with equipment within the work area where no work is proposed shall be avoided. If equipment has to traverse such a reach for access to another area, then timber mats or similar measures shall be used to minimize disturbance to the channel. Temporary stream crossing shall be used only when necessary and only where noted on the plans or specified. (See Section 4, Stream Crossings, Maryland Guidelines to Waterway Construction).
9. All stream restoration measures shall be installed as indicated by the plans and all banks graded in accordance with the grading plans and typical cross-sections.
10. After an area is completed and stabilized, the clean water dike shall be removed. After the first sediment flush, anew clean water dike shall be established upstream from the old sediment dike. Finally, upon establishment of a new sediment dike below the old one, the old sediment dike shall be removed.
11. A pump-around must be installed on any tributary or storm drain outfall which contributes baseflow to the work area. This shall be accomplished by locating a sandbag dike at the downstream end of the tributary or storm drain outfall and pumping the stream flow around the work area. This water shall discharge onto the same velocity dissipater used for the main stem pump-around.
12. If a tributary is to be restored, construction shall take place on the tributary before work on the main stem reaches the tributary confluence. Construction in the tributary, including pump-around practices, shall follow the same sequence as for the main stem of the river or stream. When construction on the tributary is completed, work on the main stem shall resume. Water from the tributary shall continue to be pumped around the work area in the main stem.
13. The contractor is responsible for providing access to and maintaining all erosion and sediment control devices until the sediment control inspector approves their removal.
14. After construction, all disturbed areas shall be regraded and revegetated.

	WOVEN SLIT FILM GEOTEXTILE		WOVEN MONOFILAMENT GEOTEXTILE		NON WOVEN GEOTEXTILE	
	MINIMUM AVERAGE ROLL VALUE 1					
PROPERTY	TEST METHOD	MD	CD	MD	CD	MD	CD
Grab Tensile Strength	ASTM D-4632	200 lb	200 lb	370 lb	250 lb	200 lb	200 lb
Grab Tensile Elongation	ASTM D-4632	15%	10%	15%	15%	50%	50%
Trapezoidal Tear Strength	ASTM D-4533	75 lb	75 lb	100 lb	90 lb	80 lb	80 lb
Puncture Strength	ASTM D-6241	450 lb		990 lb		450 lb	
Apparent Opening Size2	ASTM D-4751	U.S. Sieve 30 (0.59 mm)		U.S. Sieve 70 (0.21 mm)		U.S. Sieve 70 (0.21 mm)	
Permittivity	ASTM D-4491	0.05 sec -1		0.28 sec -1		1.1 sec -1	
Ultraviolet Resistance Retained at 500 hours	ASTM D-4355	70% strength		70% strength		70% strength	

1. All numeric values except apparent opening size (AOS) represent minimum average roll values (MARV). MARV is calculated as the typical minus two standard deviations. MD is machine direction; CD is cross direction.

2. Values for AOS represent the average maximum opening.

Geotextiles must be evaluated by the National Transportation Product Evaluation Program (NTPEP) and conform to the values in Table H.1.

The geotextile must be inert to commonly encountered chemicals and hydrocarbons and must be rot and mildew resistant. The geotextile must be manufactured from fibers consisting of long chain synthetic polymers and composed of a minimum of 105 percent by weight of polyolefins or polyesters, and formed into a stable network so the filaments or yarns retain their dimensional stability relative to each other, including selvages.

When more than one section of geotextile is necessary, overlap the sections by at least one foot. The geotextile must be pulled taut over the applied surface. Equipment must not run over exposed fabric. When placing riprap on geotextile, do not exceed a one foot drop height.

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH

STREAM RESTORATION
E&S NOTES & DETAILS

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS			
NO.	DATE	DESCRIPTION	REV. BY

CHECKED BY: SGM

DESIGNED: CEH/CTS

DRAWN: CTS/SJM

PROJECT No.: 1638

DATE: 10/30/2017

SHEET:

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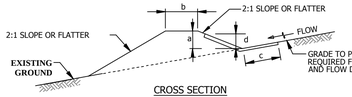
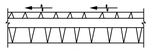
DETAIL C-1 EARTH DIKE

STANDARD SYMBOL: A-1
PLACE DESIGNATION (e.g. A-1) ON FLOW CHANNEL SIDE OF DIKE.



CROSS SECTION

CONTINUOUS GRADE
0.5% MIN. TO 10% MAX. SLOPE



PLAN VIEW

	DIKE TYPE A	DIKE TYPE B
a - DIKE HEIGHT	18 IN MIN.	30 IN MIN.
b - DIKE WIDTH	24 IN MIN.	36 IN MIN.
c - FLOW WIDTH	4 FT MIN.	6 FT MIN.
d - FLOW DEPTH	12 IN MIN.	24 IN MIN.

FLOW CHANNEL STABILIZATION

A-1	SEED WITH STRAW MULCH AND TACK. (NOT ALLOWED FOR CLEAR WATER DIVERSION.)
A-2/B-2	SEED WITH SOIL STABILIZATION MATTING OR LINE WITH SOD.
A-3/B-3	4 TO 7 INCH STONE OR EQUIVALENT RECYCLED CONCRETE PRESSED INTO SOIL A MINIMUM OF 7 INCHES AND FLUSH WITH GROUND.

CONSTRUCTION SPECIFICATIONS

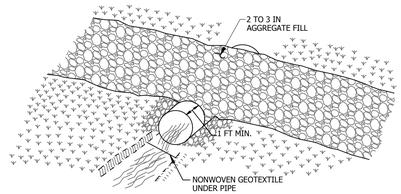
1. REMOVE AND DISPOSE OF ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SO AS NOT TO INTERFERE WITH PROPER FUNCTION OF EARTHDIKE.
2. EXCAVATE OR SHAPE EARTH DIKE TO LINE, GRADE, AND CROSS SECTION AS SPECIFIED. BANK PROJECTIONS OR OTHER IRREGULARITIES ARE NOT ALLOWED.
3. COMPACT FILL.
4. CONSTRUCT FLOW CHANNEL ON AN UNINTERRUPTED, CONTINUOUS GRADE, ADJUSTING THE LOCATION DUE TO FIELD CONDITIONS AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE.
5. PROVIDE OUTLET PROTECTION AS REQUIRED ON APPROVED PLAN.
6. STABILIZE EARTH DIKE WITHIN THREE DAYS OF INSTALLATION. STABILIZE FLOW CHANNEL FOR CLEAR WATER DIVERSION WITHIN 24 HOURS OF INSTALLATION.
7. MAINTAIN LINE, GRADE, AND CROSS SECTION. REMOVE ACCUMULATED SEDIMENT AND DEBRIS, AND MAINTAIN POSITIVE DRAINAGE. KEEP EARTH DIKE AND POINT OF DISCHARGE FREE OF EROSION, AND CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
8. UPON REMOVAL OF EARTH DIKE, GRADE AREA FLUSH WITH EXISTING GROUND. WITHIN 24 HOURS OF REMOVAL STABILIZE DISTURBED AREA WITH TOPSOIL, SEED, AND MULCH, OR AS SPECIFIED ON APPROVED PLAN.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

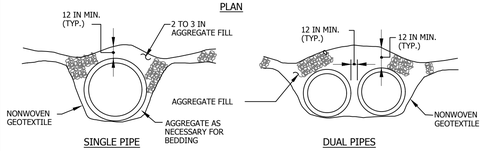
U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL H-4-2 TEMPORARY ACCESS CULVERT

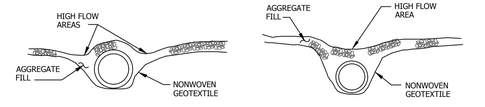
STANDARD SYMBOL: TAC



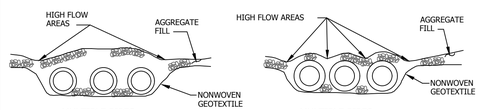
PLAN



SINGLE PIPE — DUAL PIPES



SINGLE PIPE — SINGLE PIPE



MULTIPLE PIPES — MULTIPLE PIPES

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MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL H-4-2 TEMPORARY ACCESS CULVERT

STANDARD SYMBOL: TAC

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCTION OR REMOVAL OF A TEMPORARY ACCESS CULVERT WILL NOT BE PERMITTED DURING THE FOLLOWING PERIODS:

USE I AND IP	MARCH 1 - JUNE 15
USE II	JUNE 1 - SEPTEMBER 30 AND DECEMBER 16 - MARCH 14
USE III AND IIIP	OCTOBER 1 - APRIL 30
USE IV	MARCH 1 - MAY 31
SAV* (ALL FLOWING STREAMS)	APRIL 15 - OCTOBER 15
*SUBMERGED AQUATIC VEGETATION	

2. EXTEND THE CULVERT(S) A MINIMUM OF ONE FOOT BEYOND THE UPSTREAM AND DOWNSTREAM TOE OF THE AGGREGATE PLACED AROUND THE CULVERT.
3. PLACE NONWOVEN GEOTEXTILE ON THE STREAM BED AND STREAM BANKS PRIOR TO PLACEMENT OF THE PIPE CULVERT(S) AND AGGREGATE. COVER THE STREAM BED WITH THE GEOTEXTILE AND EXTEND IT A MINIMUM SIX INCHES AND A MAXIMUM OF ONE FOOT BEYOND THE END OF THE CULVERT AND BEDDING MATERIAL. USE NONWOVEN GEOTEXTILE AS SPECIFIED IN SECTION H-1 MATERIALS. GEOTEXTILE REDUCES SETTLEMENT AND IMPROVES CROSSING STABILITY.
4. PLACE CULVERT(S) ON THE NATURAL STREAM BED GRADE TO MINIMIZE INTERFERENCE WITH FISH PASSAGE.
5. COVER THE CULVERT WITH A MINIMUM OF ONE FOOT OF WASHED AGGREGATE. FOR MULTIPLE CULVERTS PROVIDE AT LEAST 12 INCHES OF COMPACTED AGGREGATE FILL BETWEEN CULVERTS.
6. STABILIZE ALL AREAS DISTURBED DURING CULVERT INSTALLATION WITHIN 24 HOURS OF THE DISTURBANCE IN ACCORDANCE WITH STANDARDS FOR PERMANENT STABILIZATION, SECTION B-4-5, OR TEMPORARY STABILIZATION, SECTION B-4-4, AS APPLICABLE.
7. STABILIZE APPROACH TO CROSSING AND KEEP FREE OF EROSION. REPLACE DISPLACED STONE, AND MAINTAIN HIGH FLOW AREAS. REMOVE DEBRIS TRAPPED BY CULVERT. REPLACE DAMAGED PIPE(S). MAINTAIN AREAS ADJACENT TO CROSSING TO CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
8. AFTER THE TEMPORARY CROSSING IS NO LONGER NEEDED, REMOVE IT WITHIN 14 CALENDAR DAYS.
IF SUBJECT TO THE USE DESIGNATION CLOSURE, REMOVE AT THE END OF CLOSURE PERIOD. PROTECT STREAM BANKS DURING CULVERT REMOVAL AND STABILIZE ALL DISTURBED AREAS WITH EROSION CONTROL MATTING. ACCOMPLISH REMOVAL OF THE CULVERT AND CLEAN UP OF THE AREA WITHOUT CONSTRUCTION EQUIPMENT WORKING IN THE WATERWAY CHANNEL. STORE ALL REMOVED MATERIALS IN AN APPROVED STAGING AREA.

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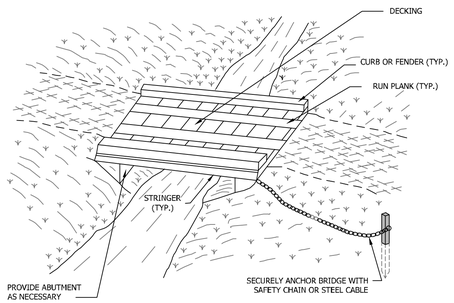
MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL H-4-1 TEMPORARY ACCESS BRIDGE

STANDARD SYMBOL: TB



LOCATION PLAN

NOTE:
TIME OF YEAR RESTRICTIONS DO NOT APPLY TO THE CONSTRUCTION OR REMOVAL OF A TEMPORARY ACESS BRIDGE UNLESS THERE IS DISTURBANCE TO THE STREAM CHANNEL.

1 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL H-4-1 TEMPORARY ACCESS BRIDGE

STANDARD SYMBOL: TB

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT TEMPORARY BRIDGE STRUCTURE AT OR ABOVE THE BANK ELEVATION TO PREVENT IMPACTS FROM FLOATING MATERIALS AND DEBRIS.
2. PLACE ABUTMENTS PARALLEL TO, AND ON, STABLE BANKS.
3. CONSTRUCT BRIDGE TO SPAN ENTIRE CHANNEL UNLESS OTHERWISE INDICATED ON APPROVED PLAN.
4. USE STRINGERS CONSISTING OF LOGS, SAWN TIMBER, PRESTRESSED CONCRETE BEAMS, METAL BEAMS, OR OTHER APPROVED MATERIALS.
5. SELECT DECKING MATERIALS TO PROVIDE SUFFICIENT STRENGTH TO SUPPORT THE ANTICIPATED LOAD. PLACE ALL DECKING MEMBERS PERPENDICULAR TO THE STRINGERS. BUTT TIGHTLY, AND SECURELY FASTEN. DECKING MATERIALS MUST BE BUTTED TIGHTLY TO PREVENT ANY SOIL MATERIAL TRACKED ONTO THE BRIDGE FROM FALLING INTO THE WATERWAY BELOW.
6. SECURELY FASTEN OPTIONAL RUN PLANKING FOR THE LENGTH OF THE SPAN. PROVIDE A RUN PLANK FOR EACH TRACK OF THE EQUIPMENT WHEELS. ALTHOUGH RUN PLANKS ARE OPTIONAL, THEY MAY BE NECESSARY TO PROPERLY DISTRIBUTE LOADS.
7. INSTALL CURBS THE ENTIRE LENGTH OF THE OUTER SIDES OF THE DECK TO PREVENT SEDIMENT FROM ENTERING THE STREAM CHANNEL.
8. ANCHOR BRIDGE SECURELY AT ONLY ONE END USING STEEL CABLE OR CHAIN. ANCHORING AT ONLY ONE END WILL PREVENT CHANNEL OBSTRUCTION IN THE EVENT THAT FLOODWATERS FLOAT THE BRIDGE. ACCEPTABLE ANCHORS ARE LARGE TREES, LARGE BOULDERS, OR DRIVEN STEEL POSTS. ANCHOR MUST BE SUFFICIENT TO PREVENT THE BRIDGE FROM FLOATING DOWNSTREAM.
9. AREAS DISTURBED DURING BRIDGE INSTALLATION AND/OR REMOVAL MUST NOT BE LEFT UNSTABILIZED OVERNIGHT UNLESS THE RUNOFF IS DIRECTED TO AN APPROVED SEDIMENT CONTROL DEVICE.
10. STABILIZE APPROACH TO BRIDGE AND KEEP FREE OF EROSION. CLEAN SEDIMENT FROM DECKING AND CURBS DAILY BY SCRAPING, SWEEPING, AND/OR VACUUMING. ENSURE THAT DECKING AND CURBS REMAIN TIGHTLY BUTTED WITHOUT GAPS. REMOVE DEBRIS TRAPPED BY BRIDGE. MAINTAIN AREAS ADJACENT TO CROSSING TO CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
11. AFTER THE TEMPORARY CROSSING IS NO LONGER NEEDED, REMOVE IT WITHIN 14 CALENDAR DAYS.
IF SUBJECT TO THE USE DESIGNATION CLOSURE, REMOVE AT THE END OF CLOSURE PERIOD. PROTECT STREAM BANKS DURING BRIDGE REMOVAL AND STABILIZE ALL DISTURBED AREAS WITH EROSION CONTROL MATTING. ACCOMPLISH REMOVAL OF THE BRIDGE AND CLEAN UP OF THE AREA WITHOUT CONSTRUCTION EQUIPMENT WORKING IN THE WATERWAY CHANNEL. STORE ALL REMOVED MATERIALS IN AN APPROVED STAGING AREA.

2 OF 2

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH

STREAM RESTORATION PLAN
NOTES & DETAILS

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS

NO.	DATE	DESCRIPTION	REV. BY

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET:

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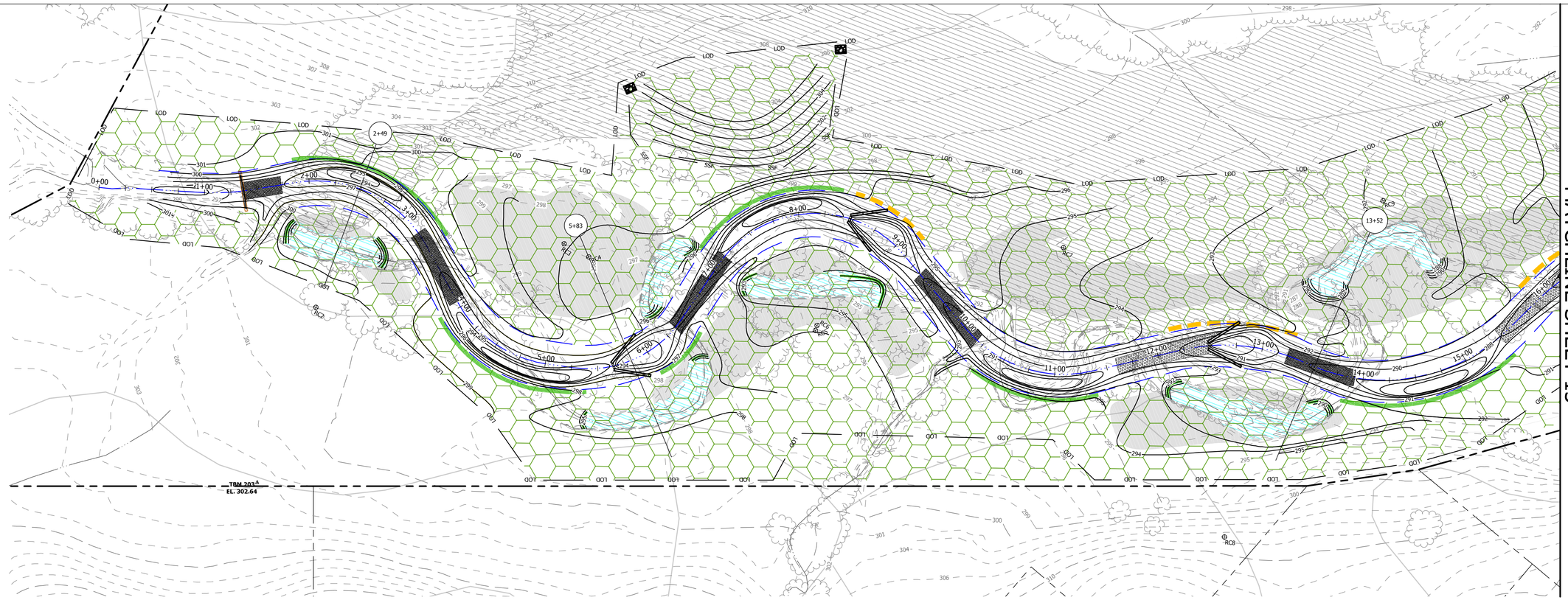
HARFORD COUNTY MARYLAND



PLANTING PLAN
SCALE: 1" = 50'

0 50 100 Feet

PLANTING NOTES

1. Prior to planting, contractor shall meet with Ecotone's designated planting specialist to discuss the planting plan.
2. Spacing and location of plant material shall be determined by the designated planting specialist to meet post-construction site conditions.

PLANTING PROCEDURES

1. Planting shall be performed in accordance with the current edition of the Landscape Contractors Association "Landscape Specification Guidelines" and as specified below.
2. Plants shall be randomly installed within the planting area, using the plant spacing specified in the plant schedule as a guide.
3. Container-grown stock shall be planted during the periods of September 1 - November 15 or April 1 - June 15. Planting outside of these specified dates is not permissible without approval from Ecotone, Inc.
4. Planting shall not occur during periods of sub-freezing temperatures, when the ground is frozen or excessively wet or dry, or when other conditions not generally accepted as suitable for planting persist.
5. For each plant to be installed, excavate a planting hole at least 12 inches wider than the width of the root ball and to a depth which leaves approximately 1/8 of the root ball above existing grade.
6. Remove the plant by cutting or inverting the container.
7. Using a knife or sharp blade, make 4 to 5 one-inch deep vertical cuts along the root ball.
8. Install plant in the center of the hole, with approximately 1/8 of the root ball above surrounding grade.
9. Backfill planting hole with native soil. Any surplus soil remaining after planting shall be evenly scattered around plants.
10. Water each plant thoroughly after backfilling until the backfilled soil is saturated.
11. All woody material must be planted erect. Plants leaning greater than 10 degrees from perpendicular must be straightened or replanted by the Contractor.

PLANTING SPECIFICATIONS

GENERAL

1. The Contractor shall notify Ecotone, Inc. and the land owner's representative at least two (2) weeks prior to start of planting within the project area so that planting zones may be marked in the field and the land owner can make any necessary preparations related to the agricultural activities on the areas surrounding the project site.
2. The Contractor is responsible for the location of all underground utilities prior to the start of construction. Any damages to utilities as a result of planting or other activities will be the sole responsibility of the Contractor and shall be repaired at the Contractors expense.

STANDARDS

1. Planting material will conform to the current issue of the "American Standards for Nursery Stock", published by the American Association of Nurseryman.
2. The root system of container-grown plant material shall be white, well-developed, and well-distributed throughout the growing media, with the roots extending to the inside face of the container, and the container size must conform to the size specified. Plants not meeting these criteria will be rejected.
3. Foliage of non-dormant plants shall appear healthy, with no leaf spots, damage, discoloration, or wilting, and no evidence of insects on the plant. Plants not meeting these criteria will be rejected.
4. Planting materials may be substituted upon written approval from Ecotone, Inc. and the Maryland Department of the Environment and U.S. Army Corps of Engineers.

STORAGE AND DELIVERY

1. Seed shall be delivered in containers having labels reporting the origin, purity, and germination percentage of the seed, and the date of germination testing of the seed.
2. All container-grown plants shall be clearly and correctly labeled to allow confirmation of species and quantities. At least 25% of each species in every shipment shall have legible labels securely attached prior to delivery to the site.
3. All plants delivered to the project site must have thoroughly moist soil/root masses. Dry or light-weight plants shall be rejected.
4. All rejected material shall be immediately removed from the project site.
5. All plants delivered to the project site shall be stored in a cool, shaded location, and watered regularly so that roots are kept moist until time of planting.

PRODUCTS

1. Straw shall be from small grain species such as wheat or barley, and shall be free of rot, mildew, and noxious weed seeds.

RIPARIAN PLANTING SCHEDULE (15.5 ACRES)

	QUANTITY	SCIENTIFIC NAME	COMMON NAME	SIZE	CONDITION	SPACING
	603	Platanus occidentalis	American Sycamore	2-4'	bare-root	11x11
	603	Quercus bicolor	Swamp White Oak	2-4'	bare-root	11x11
	603	Populus deltoides	Eastern Cottonwood	2-4'	bare-root	11x11
	603	Betula nigra	River Birch	2-4'	bare-root	11x11
	603	Liriodendron tulipifera	Tulip poplar	2-4'	bare-root	11x11
	603	Quercus ellipsoidalis	Pin Oak	2-4'	bare-root	11x11
	603	Alnus serrulata	Hazel Alder	2-4'	bare-root	11x11
	602	Salix nigra	Black Willow	2-4'	bare-root	11x11
	602	Quercus phellos	Willow Oak	2-4'	bare-root	11x11
TOTAL TREES	5425					

BIOENGINEERING PLANTING SCHEDULE (3,770 LF)

	QUANTITY	SCIENTIFIC NAME	COMMON NAME	CONDITION	SPACING
LIVE STAKES	625	Cornus ammomum	Silky Dogwood	Live stake	2-3' Triangular
	625	Salix exigua	Sandbar Willow	Live stake	2-3' Triangular
	625	Salix nigra	Black Willow	Live stake	2-3' Triangular
	625	Salix purpurea	Streamco Willow	Live stake	2-3' Triangular
TOTAL	2,500				

PLANTING NOTE

1. TREES WITHIN THE COUNTY FOREST CONSERVATION ACT COMPLIANCE EASEMENT WILL BE REPLACED AT A 1:1 RATIO IF REMOVED.

PLANTING LEGEND

- EXISTING FOREST CONSERVATION EASEMENT
- PROPOSED BIOENGINEERING
- PROPOSED RIPARIAN PLANTING AREA - 15.5 AC
- PROPOSED OXBOW WETLAND
- PROPOSED WETLAND

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

BEAR CABIN BRANCH

STREAM RESTORATION
PLANTING PLAN

GRAFTON SHOP ROAD, FOREST HILL, MD

REVISIONS

NO.	DATE	DESCRIPTION	REV. BY

CHECKED BY: SGM
DESIGNED: CEH/CTS
DRAWN: CTS/SJM
PROJECT No.: 1638
DATE: 10/30/2017
SHEET: 13 of 14

Ecotone Inc.
FORESTS • WETLANDS • RIVERS • WILDLIFE
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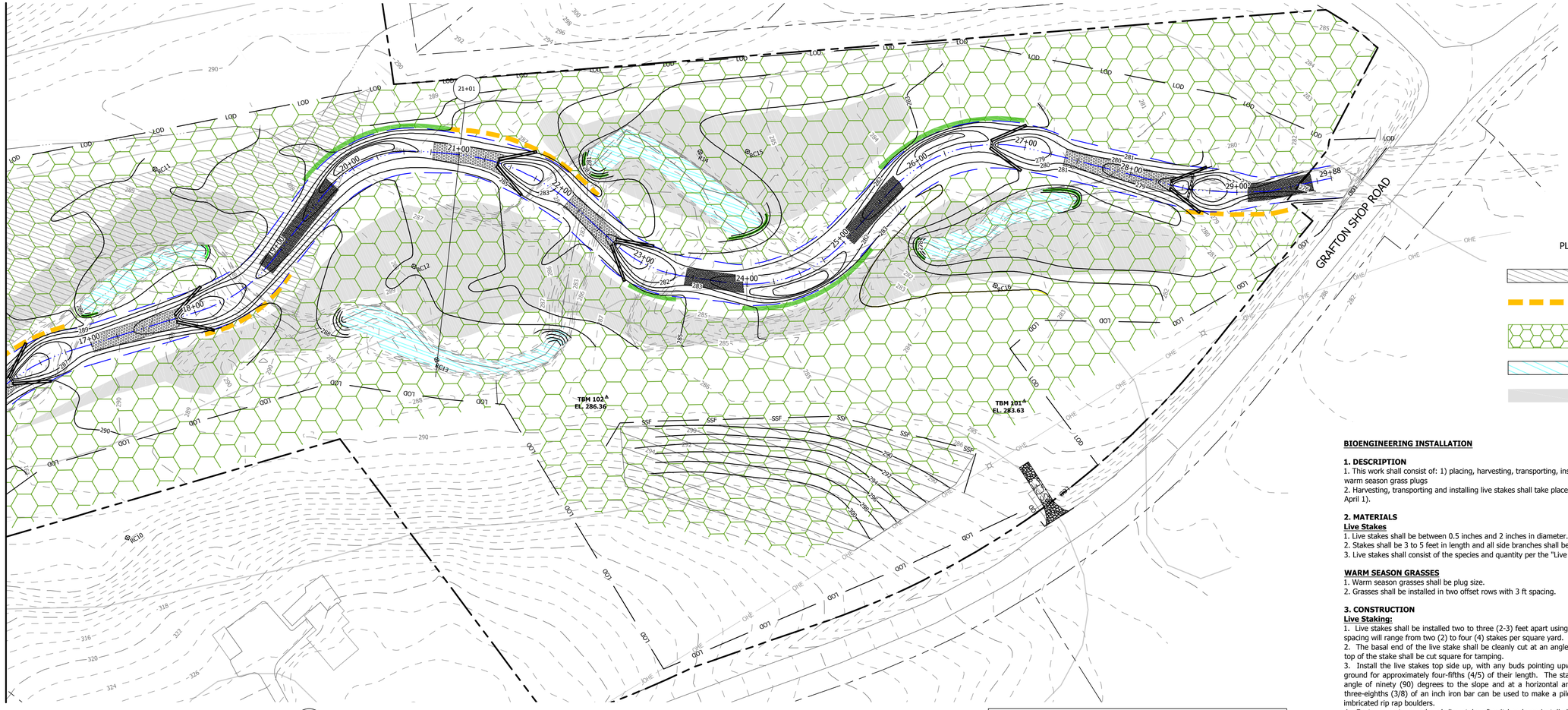
MATCHLINE SHEET 12



PLANTING LEGEND

- EXISTING FOREST CONSERVATION EASEMENT
- PROPOSED BIOENGINEERING
- PROPOSED RIPARIAN PLANTING AREA - 15.5 AC
- PROPOSED OXBOW WETLAND
- PROPOSED WETLAND

PLANTING PLAN
SCALE: 1" = 50'

0 50 100 Feet

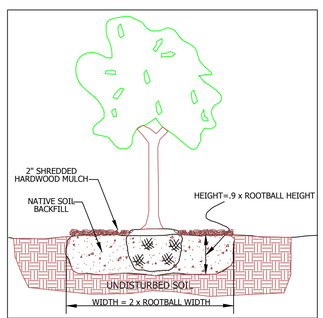
BIOENGINEERING INSTALLATION

1. DESCRIPTION
1. This work shall consist of: 1) placing, harvesting, transporting, installing and maintaining live stake materials and warm season grass plugs
2. Harvesting, transporting and installing live stakes shall take place when plants are dormant (December 1 through April 1).

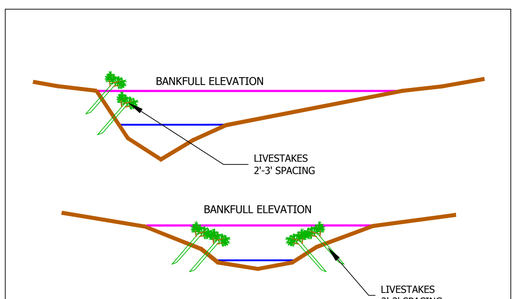
2. MATERIALS
Live Stakes
1. Live stakes shall be between 0.5 inches and 2 inches in diameter.
2. Stakes shall be 3 to 5 feet in length and all side branches shall be clipped flush with stem.
3. Live stakes shall consist of the species and quantity per the "Live Stake Planting List" table found on this sheet.

WARM SEASON GRASSES
1. Warm season grasses shall be plug size.
2. Grasses shall be installed in two offset rows with 3 ft spacing.

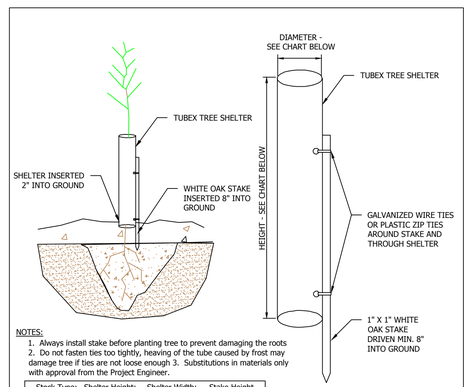
3. CONSTRUCTION
Live Staking:
1. Live stakes shall be installed two to three (2-3) feet apart using random, triangular spacing. The density of the spacing will range from two (2) to four (4) stakes per square yard. Site variations may require spacing adjustments.
2. The basal end of the live stake shall be cleanly cut at an angle immediately before insertion into the soil. The top of the stake shall be cut square for tamping.
3. Install the live stakes top side up, with any buds pointing upward. The live stakes shall be tamped into the ground for approximately four-fifths (4/5) of their length. The stakes shall be tamped into the ground at vertical angle of ninety (90) degrees to the slope and at a horizontal angle of forty-five (45) degrees downstream. A three-eighths (3/8) of an inch iron bar can be used to make a pilot hole in compacted or rocky soils, or between imbricated rip rap boulders.
4. Foot compact around each live stake after it has been installed. Any live stakes that split during tamping shall be pulled out and replaced.
5. The top of the live stake shall be cut square again after installation, to remove the damaged mushroom top.
6. See "Live Stake Planting List", on this sheet for species and quantity specifications.



TREE AND SHRUB PLANTING DETAIL:
Container Grown and Balled and Burlapped Stock
NOT TO SCALE



BIOENGINEERING DETAIL N.T.S

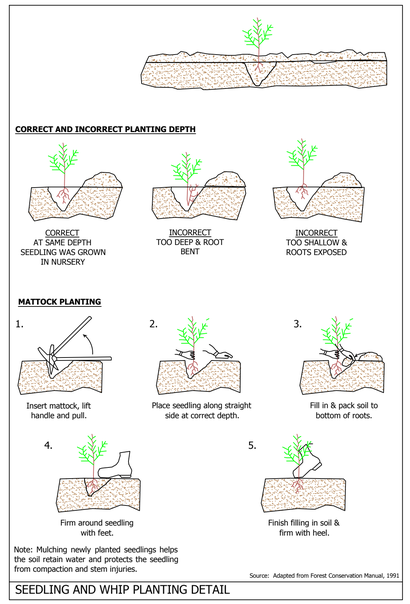


NOTES:
1. Always install stake before planting tree to prevent damaging the roots
2. Do not fasten ties too tightly, heaving of the tube caused by frost may damage tree if ties are not loose enough 3. Substitutions in materials only with approval from the Project Engineer.

Stock Type:	Shelter Height:	Shelter Width:	Stake Height
Tree	48 inches	4 inches (avg.)	48 inches
Shrub	24 inches	5 inches (min.)	30 inches

INSTALLATION SEQUENCE:
1. Drive wooden stake 8 inches into the ground on the windward side of proposed tree location.
2. Plant tree as shown in TREE PLANTING DETAIL.
3. Place the tree shelter tube over tree and insert it 2 inches into the ground.
4. Fasten the tree shelter tube to the stake with galvanized wire or plastic zip ties.

TREE SHELTER DETAIL



Note: Mulching newly planted seedlings helps the soil retain water and protects the seedling from compaction and stem injuries.

Source: Adapted from Forest Conservation Manual, 1991

SEEDLING AND WHIP PLANTING DETAIL

S/C PLAN #: 59830 **GRADING PERMIT #:** GRA 4350-2017

HARFORD COUNTY MARYLAND

BEAR CABIN BRANCH
STREAM RESTORATION PLANTING PLAN
GRAFTON SHOP ROAD, FOREST HILL, MD

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