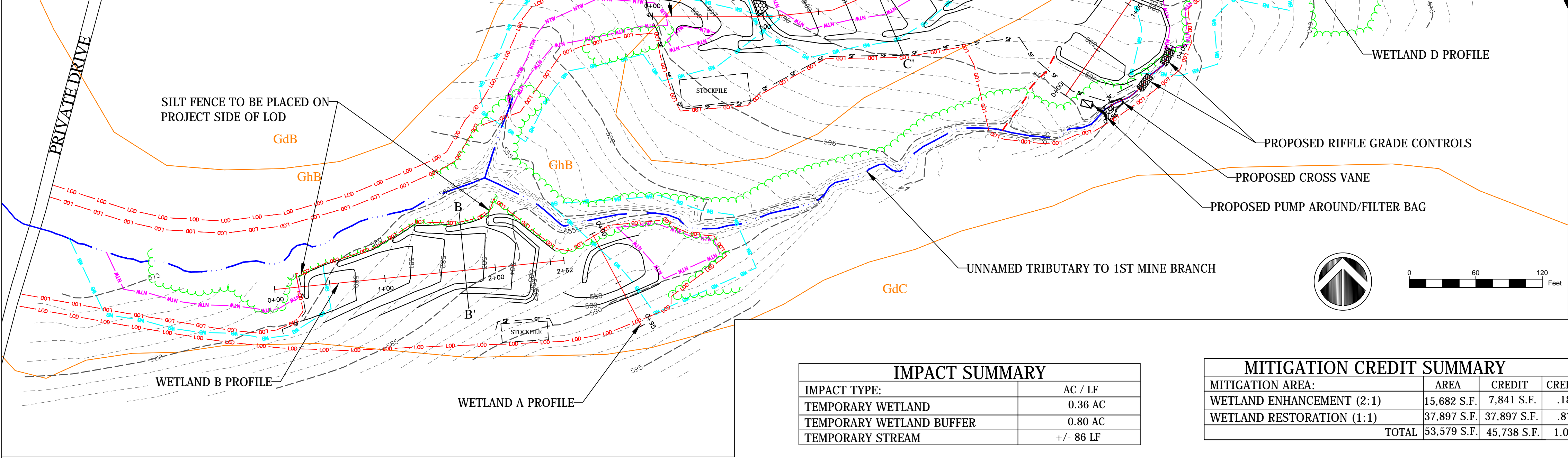
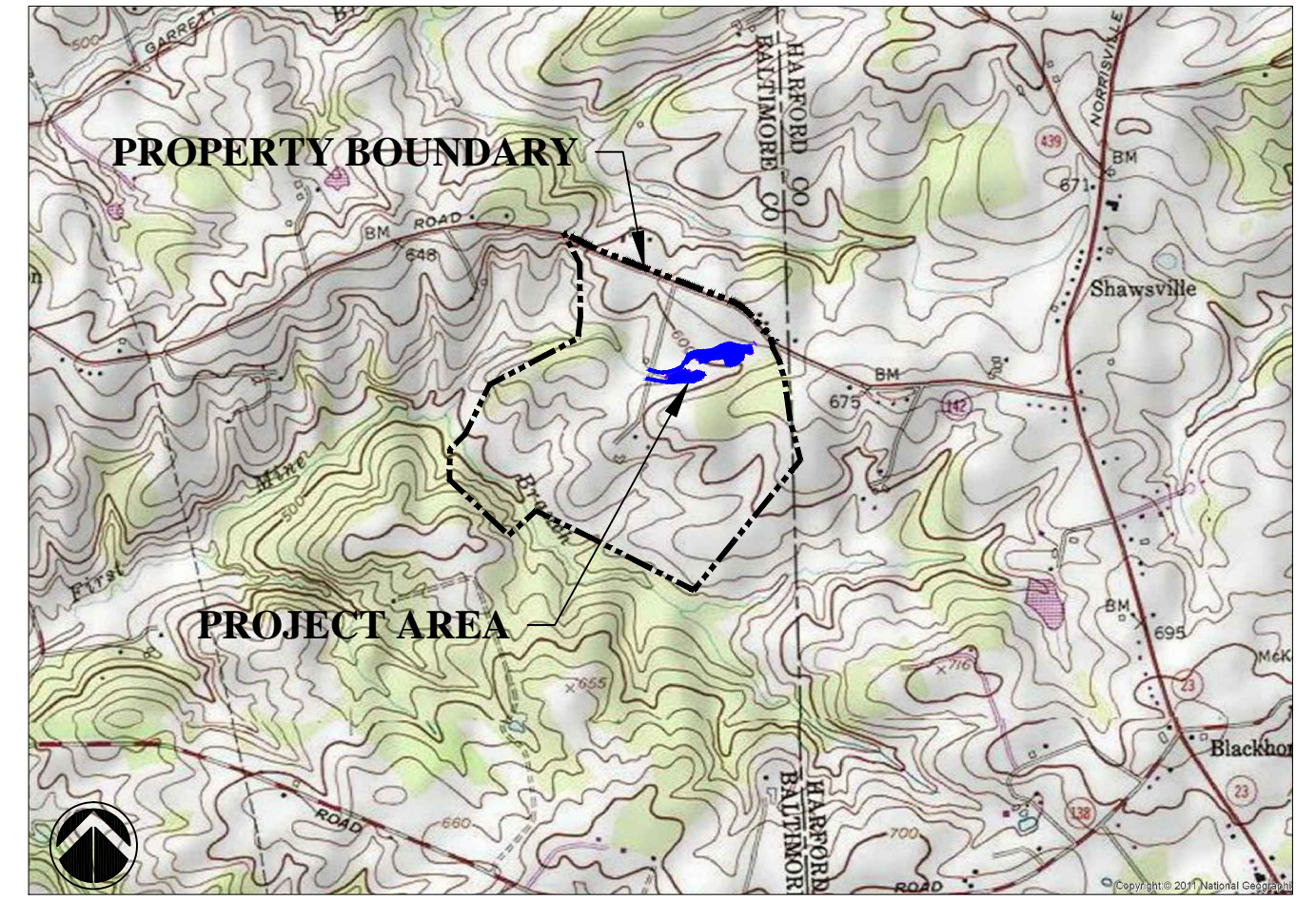


LEGEND	
	EXISTING PROPERTY LINE
	EXISTING ROAD
	EXISTING CONTOURS (1 FT)
	EXISTING TREE LINE
	EXISTING STREAMS
	EXISTING NON-TIDAL WETLANDS
	EXISTING WETLAND BUFFER (25 FT)
	EXISTING SOILS
	EXISTING DRAINAGE SWALE
	LIMITS OF DISTURBANCE
	PROPOSED CONTOURS (1 FT)
	PROPOSED WETLAND OUTLET STRUCTURE
	PROPOSED SILT FENCE (TYP.)
	PROPOSED PUMP AROUND/FILTER BAG
	PROPOSED RIFFLE GRADE CONTROL
	PROPOSED CROSS VANE



IMPACT SUMMARY	
IMPACT TYPE:	AC / LF
TEMPORARY WETLAND	0.36 AC
TEMPORARY WETLAND BUFFER	0.80 AC
TEMPORARY STREAM	+/- 86 LF

MITIGATION CREDIT SUMMARY			
MITIGATION AREA:	AREA	CREDIT	CREDIT(AC)
WETLAND ENHANCEMENT (2:1)	15,682 S.F.	7,841 S.F.	.18 AC
WETLAND RESTORATION (1:1)	37,897 S.F.	37,897 S.F.	.87 AC
TOTAL	53,579 S.F.	45,738 S.F.	1.05 AC



SOILS LEGEND	
SYMBOL	SOIL DESCRIPTION
GdB	Glengel loam, 3-8% slopes
GdC	Glengel loam, 8-15% slopes
GhB	Glenville silt loam, 3-8% slopes, partially hydric
MaC	Manor loam, 8-15% slopes

PROJECT SUMMARY	
OVERALL SITE DATA SIZE: +/- 196.20 AC PARCEL ID: MAP 18; PARCEL 31 DEED REF: LIBER 32198 FOLIO 456 EXISTING USE: AGRICULTURAL 8 DIGIT HUC: 02060003 (GUNPOWDER/PATAPSCO) MARYLAND 8 DIGIT HUC: (02130805) LOCH RAVEN RESERVOIR/GUNPOWDER	PROPERTY OWNER MINE RUN FARM, LLC 2838 BUTLER ROAD MIDDLE RIVER, MARYLAND 21220 MITIGATION USER NISOURCE GAS c/o CH2M HILL NORTHPARK 400, 1000 ABERNATHY ROAD ATLANTA, GA 30328 MDE/COE TRACKING NO. 12-NT-0433/201261660
DESCRIPTION OF MITIGATION AREAS	
MITIGATION AREA A - Enhancement of 0.05 acres and restoration of +/- 0.08 acres of forested wetland in an area of low-lying open field on the south side of unnamed tributary to First Mine Branch. Area exhibits marginal wetland hydrology and some hydrophytic vegetation; restoration would entail minor grading to enhance hydrology and establishment of emergent and woody hydrophytic species.	
MITIGATION AREA B - Restoration of +/- 0.31 acres of forested wetland in a riparian area previously impaired by agricultural activities. Restoration would entail minor grading to enhance and expand hydrology and establishment of emergent and woody hydrophytic species present within the existing emergent wetland situated adjacent (west) of the proposed restoration area.	
MITIGATION AREA C - Enhancement of 0.25 acres and restoration of 0.26 acres of forested wetland in a headwater seep area previously impaired by agricultural activities. Area contains small area of existing emergent wetlands which have been adversely affected and reduced in area by agricultural ditching/drainage and headcutting of the seep drainage. Restoration/enhancement would entail ditch plugging and minor grading to enhance and expand hydrology and establishment of emergent and woody hydrophytic species.	
MITIGATION AREA D - Restoration of +/- 0.23 acres and enhancement of 0.04 acres of forested wetland in an area of low-lying open field on the north side of unnamed tributary to First Mine Branch. Area exhibits marginal wetland hydrology and some hydrophytic vegetation; restoration would entail minor grading within the restoration area to enhance hydrology and establishment of emergent and woody hydrophytic species. Restoration would also entail stream restoration in the adjacent stream to elevate and stabilize the channel dimension and profile using riffle grade controls and a cross vane. Proposed restoration activities would not only restore and enhance the affected headwater wetlands, but would also improve conditions within the receiving stream which is becoming entrenched and scoured by accelerated run-off.	

GRADING PLAN

GENERAL NOTES

- This Phase II Wetland Mitigation Plan has been prepared for Columbia Gas Transmission's Line MB Extension Project for the purpose of providing 36,155 square feet (0.83 acres) of forested non-tidal wetland mitigation on the 1st Mine Run Property, located off of White Hall Road in the White Hall area of Baltimore County, Maryland. Within the overall property, four headwater riparian areas have been identified on an unnamed tributary to 1st Mine Branch (Use III-P) to provide a combination of wetland enhancement and restoration. The project is being performed to satisfy mitigation requirements associated with the proposed Columbia Gas Transmission project (MDE/COE Tracking 12-NT-0433/201261660).
- Topographic survey completed by C.F. Kreutter and Associates, Inc. in May 2013.
- The Contractor shall notify Ecotone, Inc. and the landowner's representative at least two (2) weeks prior to start of grading operations within the project areas.
- 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 grading or other activities will be the sole responsibility of the Contractor and shall be repaired at the Contractor's expense.
- Access to the wetland mitigation areas shall be from White Hall Road via existing private drive as indicated hereon. No disturbance is to occur between the public roads and the LOD for the wetland grading.
- 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 Contractor's expense to the satisfaction of the private property owner and Ecotone, Inc.
- All machinery, equipment and supplies for the project shall be stored in an upland location, preferably the staging area shown on this plan, so as not to disturb any environmentally sensitive areas or agricultural uses on the site.
- All rough and finish grading work will be started at the downstream end of the project.

SEQUENCE OF CONSTRUCTION NOTES

- An on-site pre-construction meeting will be held by Ecotone, Inc. with the grading contractor (including the equipment operators to be used on the project) and the landowner's representative to discuss project objectives, on-site conditions, and necessary grading practices to protect environmentally sensitive areas and agricultural uses on the site, and to minimize compaction of substrate within the wetland creation area.
- All necessary grading and erosion control permits must be obtained prior to start of construction.
- Install all necessary erosion and sediment control measures and devices as shown on the approved sediment and erosion control plans.
- Any standing water shall be removed from the wetland restoration/enhancement areas during grading and planting operations.
- Unless otherwise indicated by Ecotone, Inc. during the pre-construction meeting, strip the topsoil from the wetland areas A-D and stockpile as indicated on the grading plan. Rough grade the wetland restoration/enhancement areas to 6" below the proposed final grade. For wetland area D, adjacent stream restoration work consisting of minor grading and installation of woody riffle grade controls and cross vane will be completed concurrently with the wetland grading.
- Rough grade the upland buffer areas, tying into existing grades and maximizing disposal of excess cut materials.
- Any remaining excavated material from the wetland restoration areas shall be removed to a location specified by the landowner's representative.
- Following rough grading, Ecotone, Inc. will inspect grades for conformance with the plan and convey any necessary adjustments based on field conditions. Acceptance of rough grading will be given by Ecotone, Inc. upon satisfactory completion of the grading shown on these grading plans along with any required field adjustments.
- After acceptance of rough grades, evenly distribute 6" of stockpiled topsoil over the wetland restoration areas and loosen soil by discing or scarifying to a depth of at least 8 inches making sure to create microtopography and emplace woody debris.
- Acceptance of final grades for the wetland creation area shall be given by Ecotone, Inc. upon satisfactory completion of the grading shown on these grading plans along with any required field adjustments.
- Seed the wetland creation area and disturbed upland buffer areas as specified under the seeding specifications of this plan set.
- Remove erosion and sediment control devices after the project area is fully stabilized or when approved by Baltimore County.

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

- No excess fill, construction material, or debris shall be stockpiled or stored in nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
- 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.
- 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.
- 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.
- 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.
- Rectify any nontidal wetlands, wetland buffers, waterways, or 100-year floodplain temporarily impacted by any construction.
- All stabilization in the nontidal wetland and nontidal wetland buffer shall consist of the following species: Annual Bysgrass (Lolium multiflorum), Millet (Setaria italica), Barley (Hordeum sp.), Oats (Urtica 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.
- After installation has been completed, make post-construction grades and elevations the same as the original grades and elevations in temporarily impacted areas.
- To protect aquatic species, in-stream work is prohibited as determined by the classification of the stream:

Use I waters: In-stream work shall not be conducted during the period March 1 through June 15, inclusive, during any year.
 Use III waters: In-stream work shall not be conducted during the period October 1 through April 30, inclusive, during any year.
 Use IV waters: In-stream work shall not be conducted during the period March 1 through May 31, inclusive, during any year.

- Stormwater runoff from impervious surfaces shall be controlled to prevent the washing of debris into the waterway.
- 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.
- A dewatering pump will be utilized in conjunction with a dirt bag (see detail this sheet) to remove standing water in the project area during construction. The dirt bag will be placed on a vegetated area a sufficient distance from subject reach so that any sediment leaving the dirt bag has time/distance to settle out before reaching the waterway.

5-YEAR MONITORING AND PROTECTION MECHANISM:

- The wetland creation area will be permanently protected by means of Covenant and Restrictions recorded in the Land Records of Baltimore County, Maryland.
- The wetland creation area will be maintained by Ecotone, Inc. for a five-year period following completion of construction for the purpose of preventing the establishment of invasive/noxious weed plant species.
- Performance of monitoring for the wetland mitigation area will be performed in accordance with current CORPS and MDE requirements, with annual monitoring reports submitted for a period of five years from the completion of construction.

SEDIMENT CONTROL GENERAL NOTES:

- Refer to "2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control" for standard details and detailed specifications of each practice specified herein.
- With the approval of the sediment control inspector, minor field adjustments can and will be made to insure the control of any sediment. Changes in sediment control practices require prior approval of the sediment control inspector and the Baltimore County Soil Conservation District.
- At the end of each working day, all sediment control practices will be inspected and left in operational condition.
- Following initial soil disturbance or redistribution, permanent or temporary stabilization shall be completed within:
 - Three calendar days as to the surface of all perimeter controls, dikes, swales, ditches, perimeter slopes, and all slopes greater than three horizontal to one vertical (3:1), and
 - Seven days as to all other disturbed or graded areas on the project site which will remain idle over fourteen days.
- Any change to the grading proposed on this plan requires resubmission to Baltimore County Soil Conservation District for approval.
- Dust control will be provided for all disturbed areas. Refer to "2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control", pg. H-30-1, for acceptable methods and specifications for dust control.
- Any variations from the sequence of operations stated on this plan require the approval of the sediment control inspector prior to the initiation of the change.
- Excess cut or borrow material shall go to, or come from, respectively, a site with an open grading permit or approved agricultural ground.
- All work is to be completed "in the dry", see sequence of operations. After rainfall events during construction, the site is to be fully dewatered prior to proceeding with grading.
- Access to the site shall be from the existing farm road off of White Hall Road.
- The contractor must adhere to "Best Management Practices for Working in Nontidal Wetlands, Wetland Buffers, Waterways, and the 100-year Floodplain".

CONSTRUCTION SCHEDULE (tentative start date: Fall 2013 or Spring 2014)

- Mobilization to Site/Install E&S Controls (2 days)
- Grading of wetland cells and stream restoration work (12 days)
- Soil Preparation/Amendments, Seeding/Stabilization, & Planting (5 days)
- Remove E&S Controls/Planting/Demobilize (2 days)

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

Ecotone Inc.
 2120 HIGH POINT ROAD • FOREST HILL, MARYLAND 21050
 (410) 420-2600 • FAX (410) 420-6983 • WWW.ECOTONEINC.COM
 FORESTS • WETLANDS • RIVERS • WILDLIFE

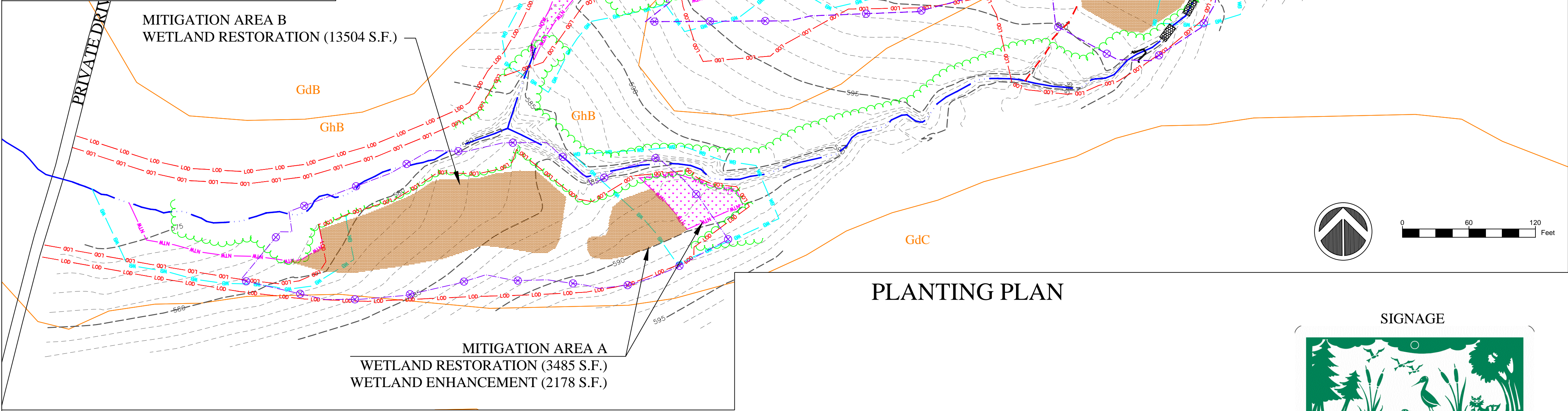
**NISOURCE GAS LINE MB OFF-SITE
 WETLAND MITIGATION @ 1ST MINE RUN
 PHASE II WETLAND MITIGATION PLAN**
 BALTIMORE COUNTY, MD
 MDE/COE PERMIT TRACKING NO. 12-NT-0433/201261660

REVISIONS				
NO.	DATE	DESCRIPTION	REV BY	APP BY
7/2/13		PER MDE COMMENTS	WJV	

PROJECT MANAGER: JBM
 DESIGNED: CKA
 DRAWN: CKA
 PROJECT NO. 1303
 DATE: 6/19/13
 SHEET: 1 of 3
 Cover/Grading Plan

LEGEND

- EXISTING PROPERTY LINE
- EXISTING ROAD
- EXISTING CONTOURS (1 FT)
- EXISTING TREE LINE
- EXISTING STREAMS
- EXISTING NON-TIDAL WETLANDS
- EXISTING WETLAND BUFFER (25 FT)
- EXISTING SOILS
- EXISTING DRAINAGE SWALE
- LIMITS OF DISTURBANCE
- PROPOSED CONTOURS (1 FT)
- PROPOSED EASEMENT
- PROPOSED SIGNAGE
- PROPOSED WETLAND ENHANCEMENT
- PROPOSED WETLAND RESTORATION
- PROPOSED RIFFLE GRADE CONTROL
- PROPOSED CROSS VANE



PLANTING PLAN

FORESTED WETLAND PLANT SCHEDULE - 1.23 acres

	Quantity	Botanical Name	Common Name	Indicator	Size	Condition	Spacing
Trees:	67	<i>Platanus occidentalis</i>	Sycamore	FACW	2-3'	Bare-root	9' Random Spacing
	67	<i>Acer rubrum</i>	Red Maple	FAC	2-3'	Bare-root	9' Random Spacing
	67	<i>Liquidambar styraciflua</i>	Sweet Gum	FAC	2-3'	Bare-root	9' Random Spacing
	67	<i>Salix nigra</i>	Black Willow	FACW	2-3'	Bare-root	9' Random Spacing
	67	<i>Nyssa sylvatica</i>	Black Gum	FAC	2-3'	Bare-root	9' Random Spacing
	67	<i>Quercus palustris</i>	Pin Oak	FACW	2-3'	Bare-root	9' Random Spacing
	68	<i>Quercus bicolor</i>	Swamp White Oak	FACW	2-3'	Bare-root	9' Random Spacing
	Total:	470					
Shrubs:	40	<i>Viburnum dentatum</i>	Southern Arrowwood	FAC	2-3'	Bare-root	9' Random Spacing
	40	<i>Aronia arbutifolia</i>	Red Chokeberry	FACW	2-3'	Bare-root	9' Random Spacing
	40	<i>Cornus amomum</i>	Silky Dogwood	FACW	2-3'	Bare-root	9' Random Spacing
	41	<i>Vaccinium corymbosum</i>	Highbush Blueberry	FACW	2-3'	Bare-root	9' Random Spacing
	41	<i>Cornus amomum</i>	Silky Dogwood	FACW	3' Live Stake	Bare-root	9' Random Spacing
Total:	202						

PLANTING SPECIFICATIONS:

GENERAL

- 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.
- 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 Contractor's expense.

STANDARDS

- Planting material will conform to the current issue of the "American Standards for Nursery Stock", published by the American Association of Nurseryman.
- 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.
- 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.
- 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

- 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.
- 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.
- All plants delivered to the project site must have thoroughly moist soil/root masses. Dry or light-weight plants shall be rejected.
- All rejected material shall be immediately removed from the project site.
- 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

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

TOPSOIL SPECIFICATIONS:

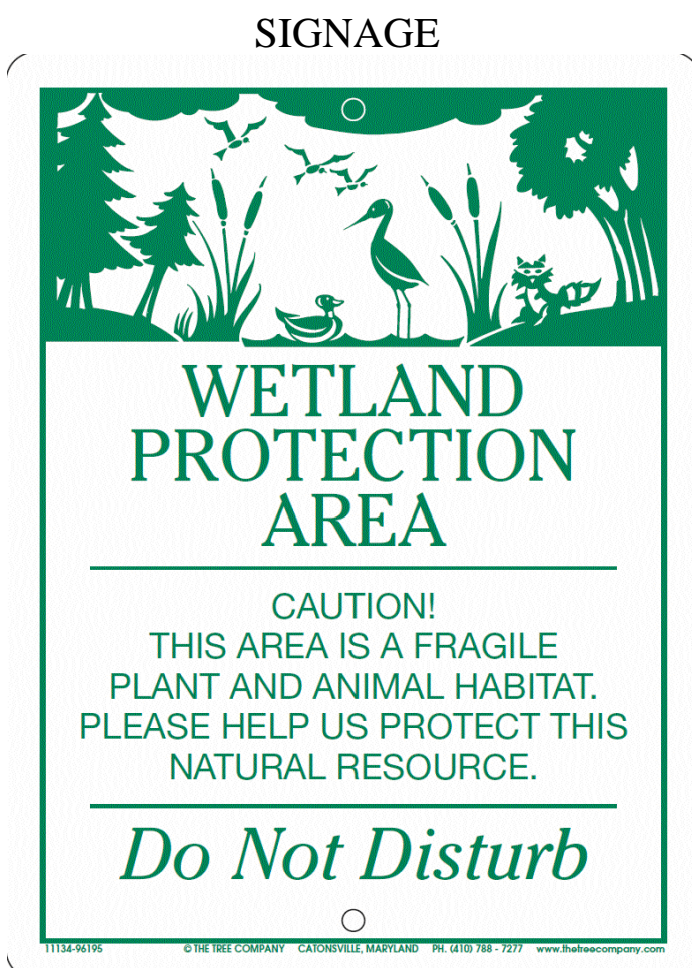
- Topsoil shall be salvaged and replaced whenever possible to a depth of at least six (6) inches. Site should be graded to below six (6) inches of final grade, then six (6) inches of topsoil spread over the work area. Topsoil shall be amended with organic material to attain a minimum 10 percent organic content.
- A minimum of 60 cubic yards of organic matter per acre is required. Large woody debris is to be harvested from work areas only, woody debris should not be from on-site trees that were cut for that sole purpose. Non native invasive species shall not be used.
- If there is not enough available woody debris on-site, this should be delivered from an off-site source. Large woody debris should be added at a minimum rate of three dump truck loads per acre.
- Prior to installation of topsoil and large woody debris, subsoil should be scarified or chisel plowed to a depth of eight inches to ensure against compaction.
- Install topsoil and bring grades to final elevations shown on design plans.
- Upon acceptance of grades by the project Engineer, create microtopography using a tracked loader, dozer, or skid steer machine.
- Microtopography variations shall be up to 0.5 feet from design elevation, with no more than 25 percent of each wetland cell remaining at the design elevation.

PLANTING PROCEDURES

- Planting shall be performed in accordance with the current edition of the Landscape Contractors Association "Landscape Specification Guidelines" and as specified below.
- Plants shall be randomly installed within the planting area, using the plant spacing specified in the plant schedule as a guide.
- 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.
- 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.
- 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.
- Remove the plant by cutting or inverting the container.
- Using a knife or sharp blade, make 4 to 5 one-inch deep vertical cuts along the root ball.
- Install plant in the center of the hole, with approximately 1/8 of the root ball above surrounding grade.
- Backfill planting hole with native soil. Any surplus soil remaining after planting shall be evenly scattered around plants.
- Water each plant thoroughly after backfilling until the backfilled soil is saturated.
- All woody material must be planted erect. Plants leaning greater than 10 degrees from perpendicular must be straightened or replanted by the Contractor.

MAINTENANCE AND GUARANTEE

- Plant material shall be maintained by the Contractor for a period of five growing seasons from the date of final inspection and acceptance by Ecotone, Inc. Maintenance shall include the removal and of all dead or diseased woody vegetation.
- The Contractor shall guarantee a 85% survival of all plants for the five year period stated above, except in the case of damage by fire, animal damage, vandalism, or other events beyond the Contractor's ability to control.
- Plants which are 25% dead or more shall be considered dead.
- Replacement plants shall be of the same type, size, and variety as the plants specified herein, or substitutions approved by Ecotone, Inc. Replacement plants shall be provided and installed subject to the requirements of these plans and specifications.
- At the end of the five year period all tree stakes and shelters shall be removed from plantings.



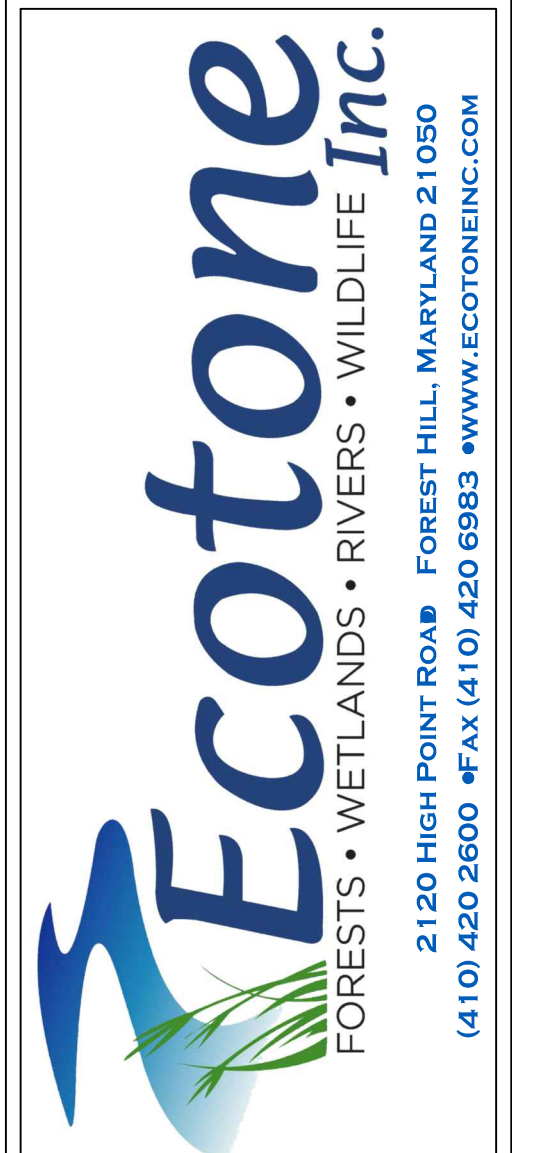
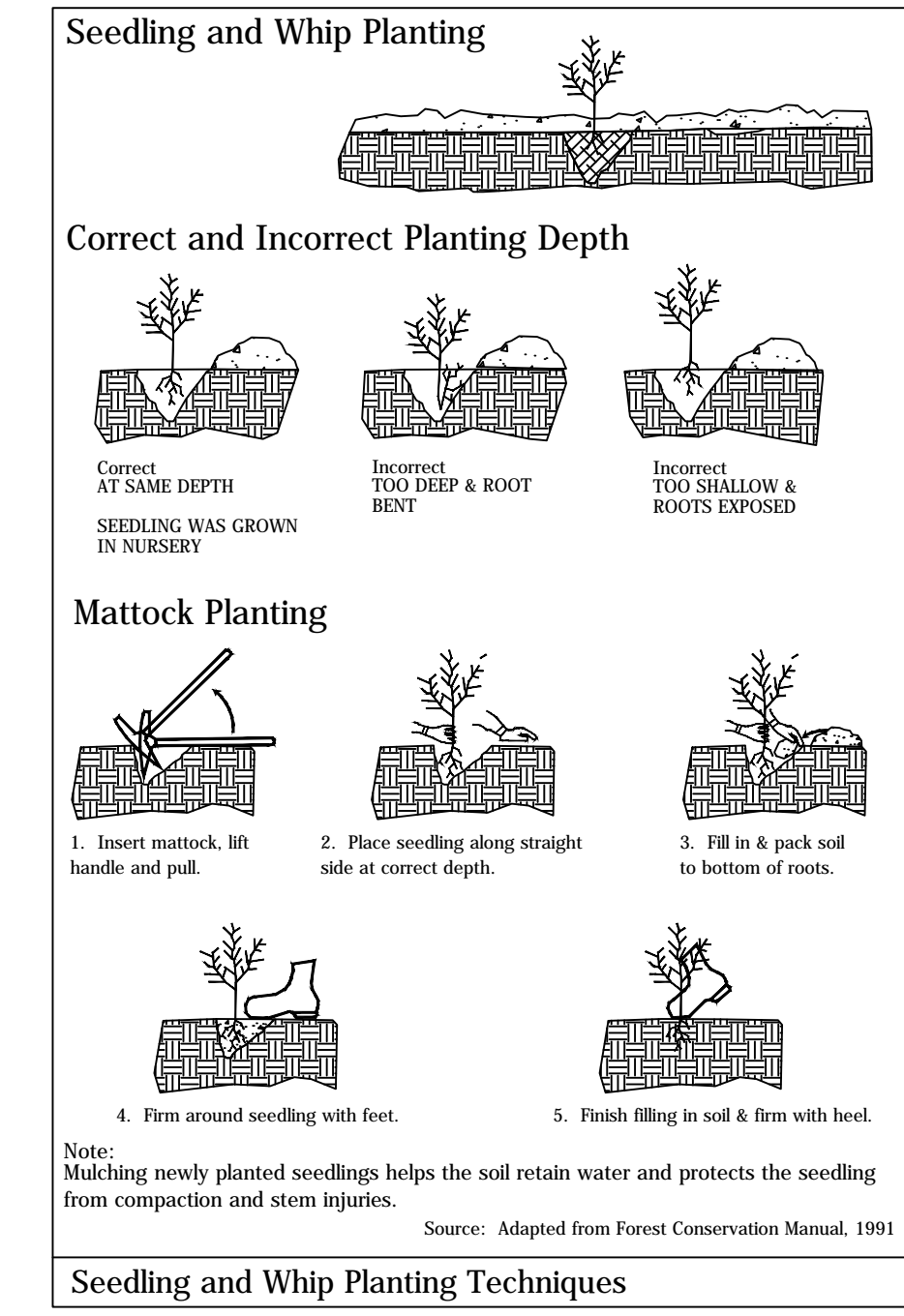
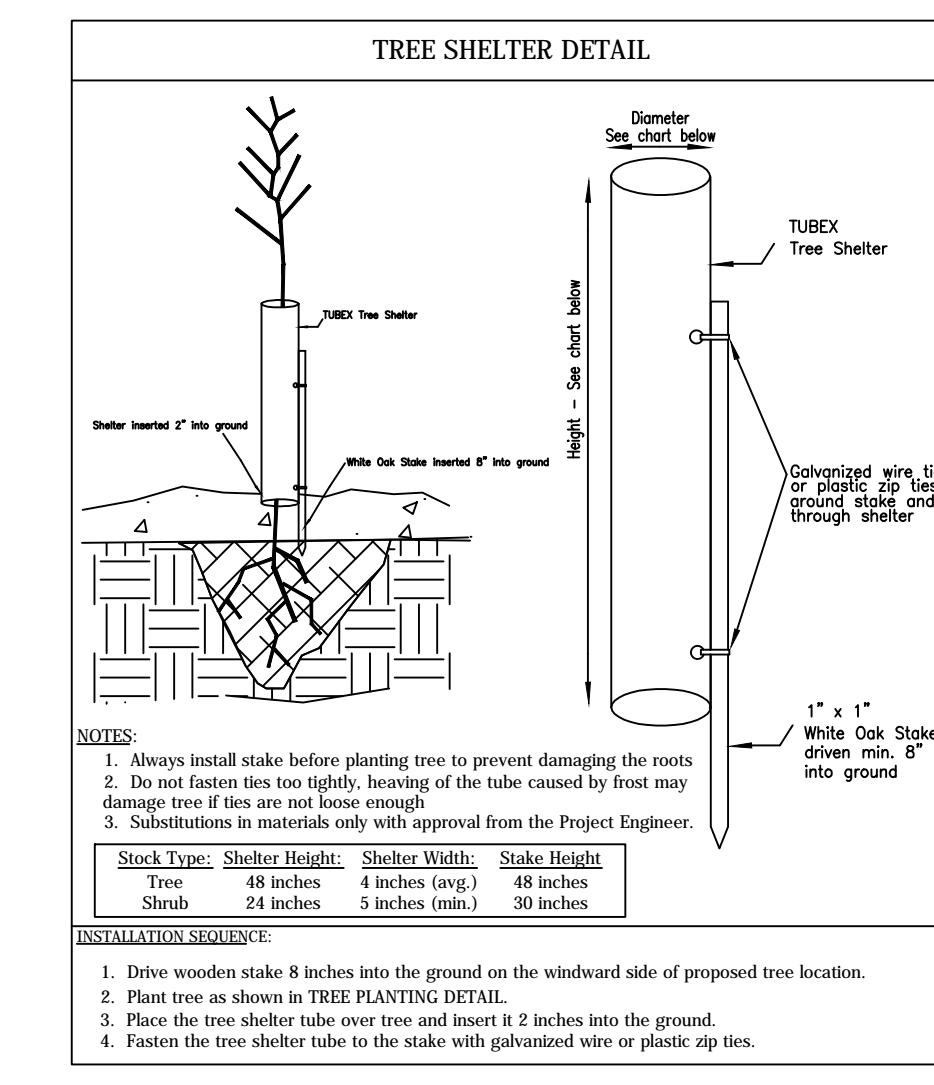
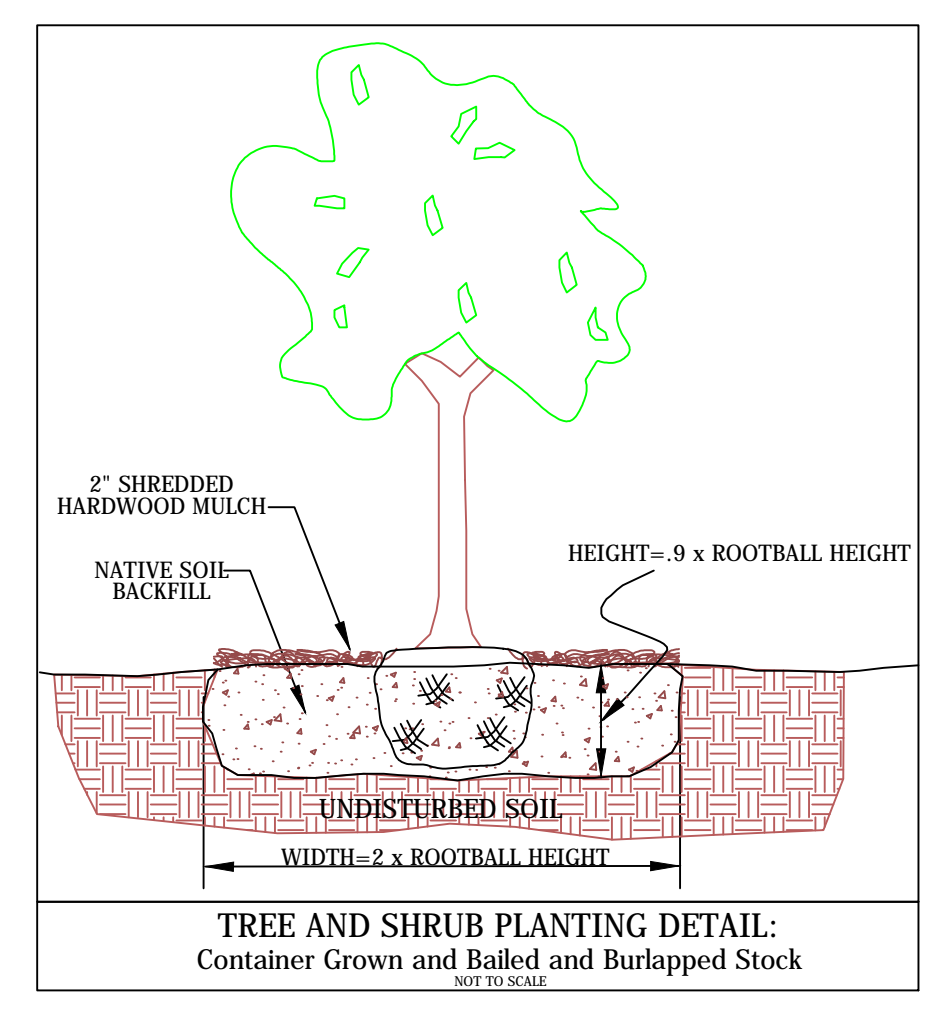
NOTE:
1. Attachment of signs to trees is prohibited.
2. Signs should be properly maintained.
3. Avoid injury to roots when placing posts for the signs.
4. Signs posted should be visible to all construction personnel from all directions.

PERMANENT WETLAND SEED MIX

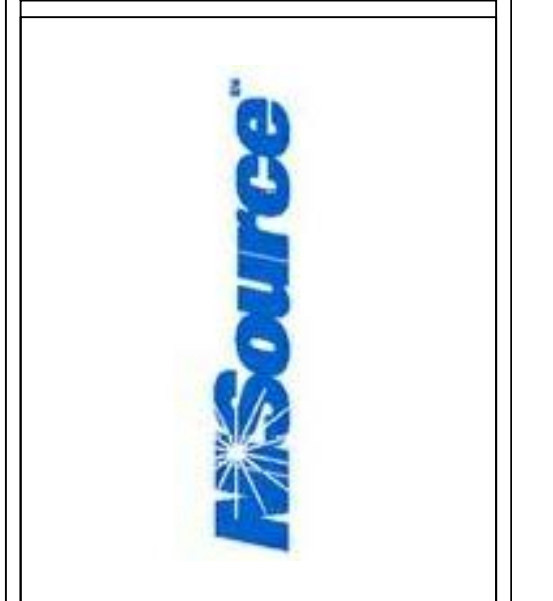
Common Name	Botanical Name	Indicator	Min. %		Seeding Rate (lbs/ac)
			Purity	Germ.	
Soft Rush	<i>Juncus effusus</i>	FACW	90	85	1
Wool Grass	<i>Scirpus cyperinus</i>	FACW	90	85	1
Bluejoint	<i>Calamagrostis canadensis</i>	FACW	90	85	1
Switchgrass	<i>Panicum virgatum</i>	FAC	90	85	4
Rice cut grass	<i>Leersia orizoides</i>	OBL	90	85	1.5
Fowl Bluegrass	<i>Poa palustris</i>	FACW	90	85	1.5
Total			10 lbs/ac		

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."



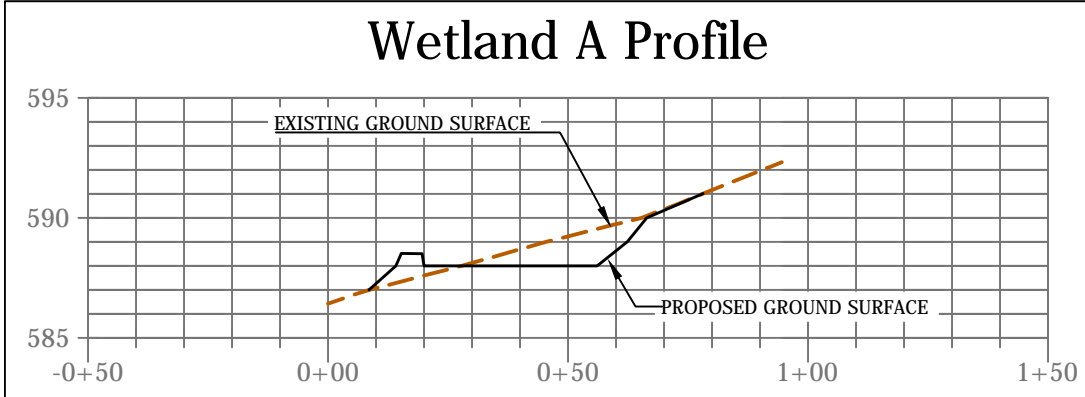
NISOURCE GAS LINE MB OFF-SITE
WETLAND MITIGATION @ 1ST MINE RUN
PHASE II WETLAND MITIGATION PLAN
BALTIMORE COUNTY, MD
MDE/COE PERMIT TRACKING NO. 12-NT-0433/201261660



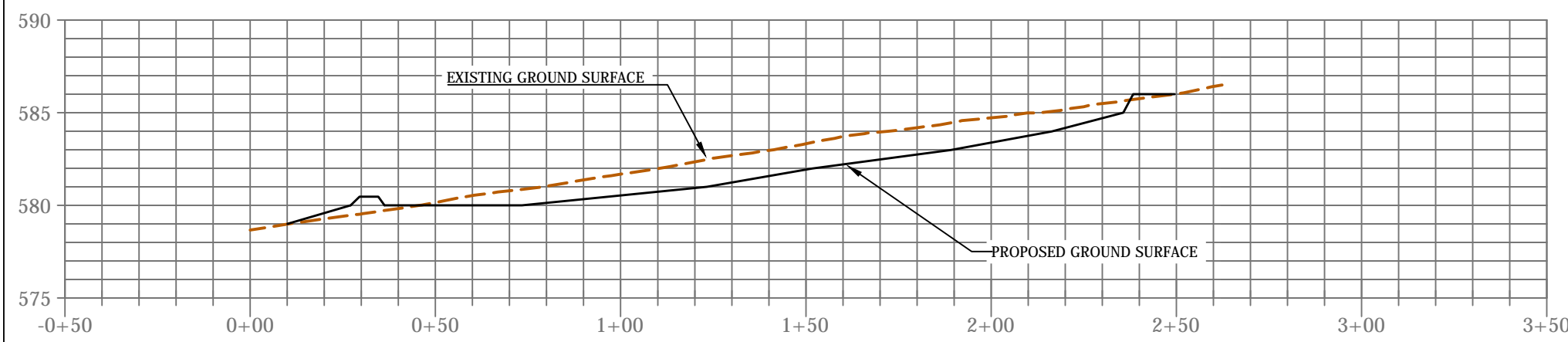
REVISIONS

NO.	DATE	DESCRIPTION	REV. BY	APP. BY
7/13		PER MDE COMMENTS	WJV	

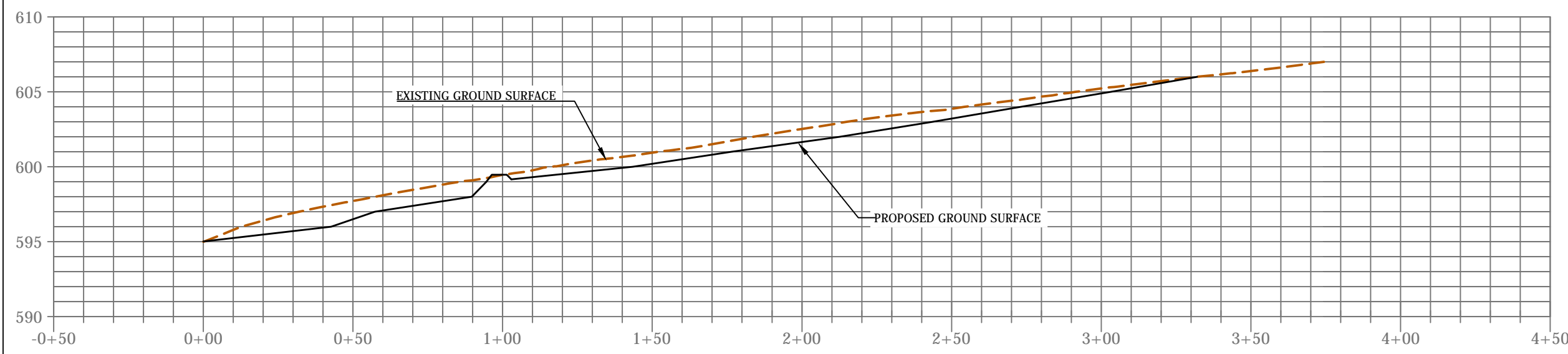
PROJECT MANAGER: JBM
DESIGNED: CKA
DRAWN: CKA
PROJECT NO. 1303
DATE: 6/19/13
SHEET:



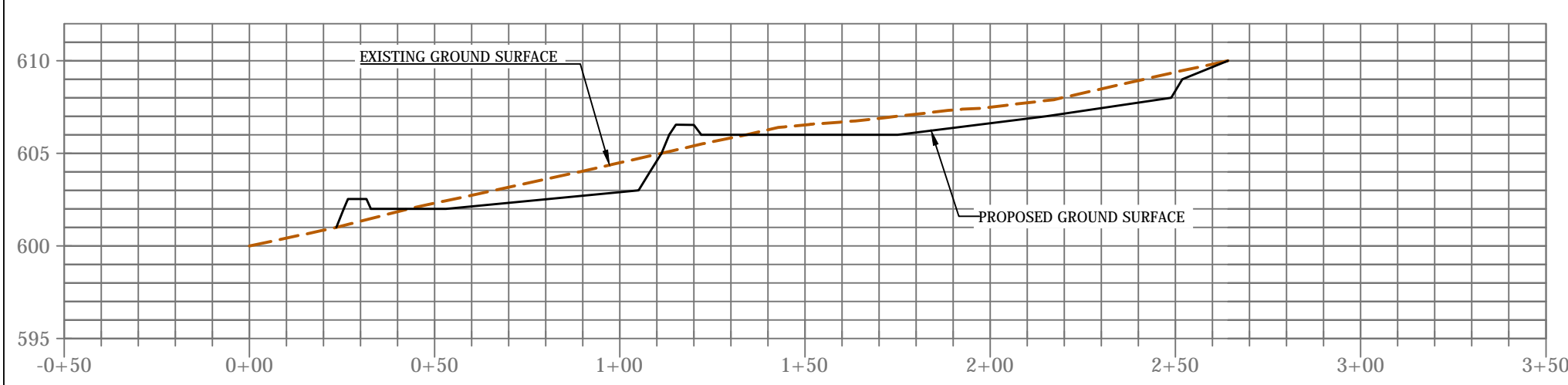
Wetland A Profile



Wetland B Profile

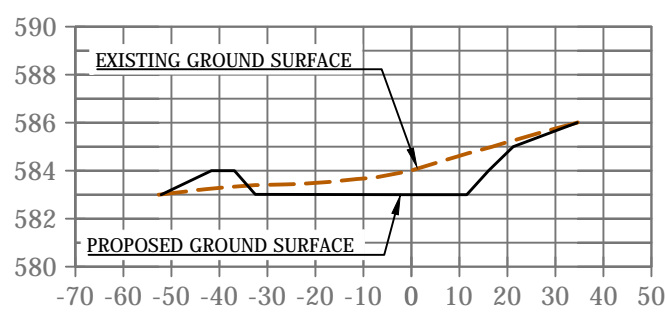


Wetland C Profile

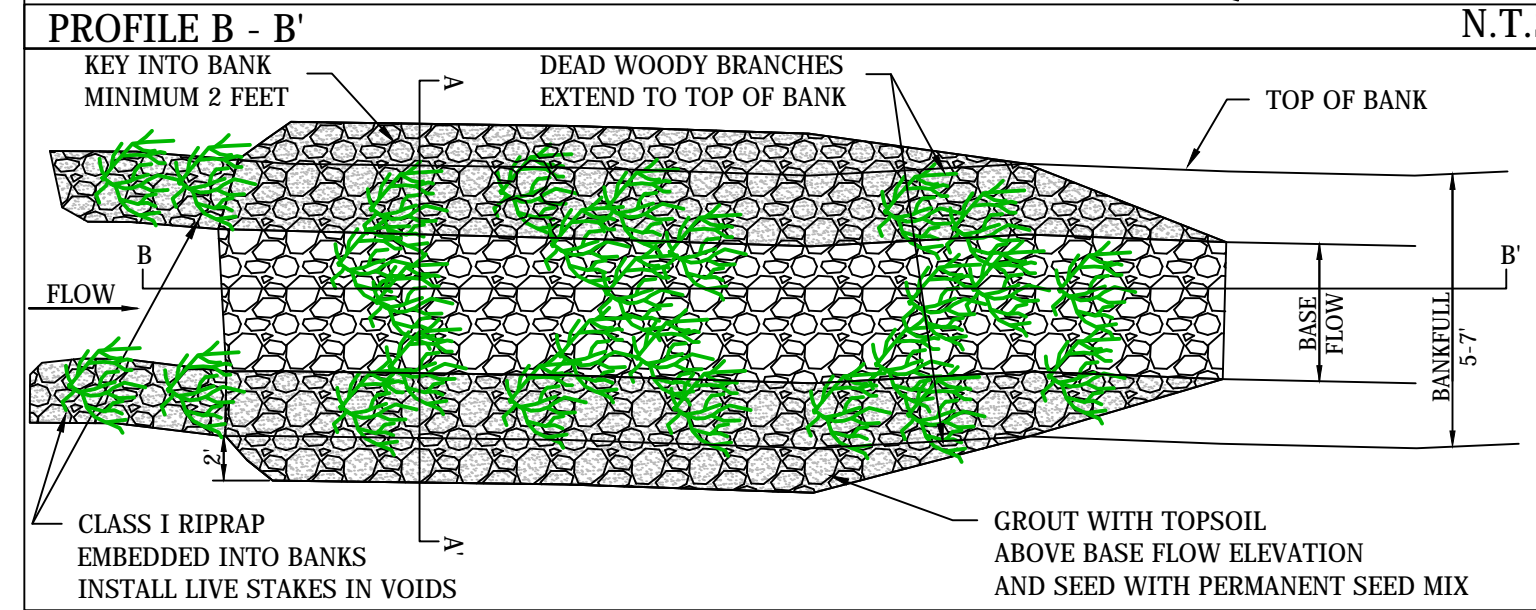
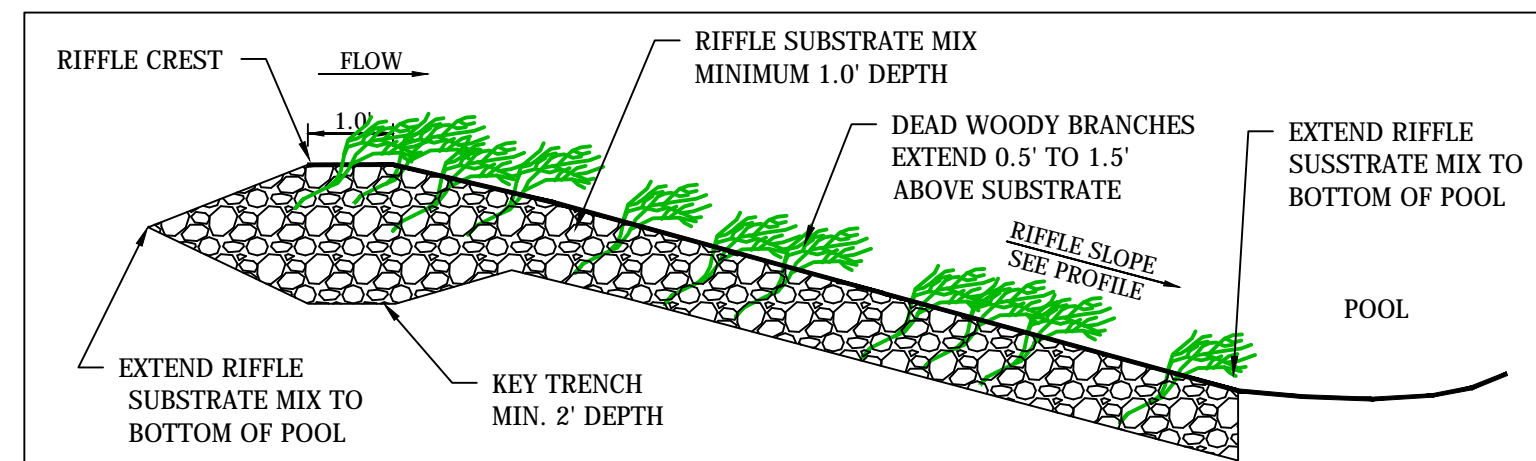
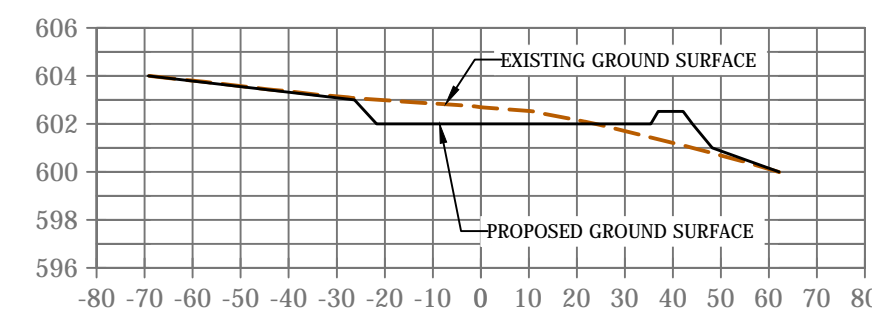


Wetland D Profile

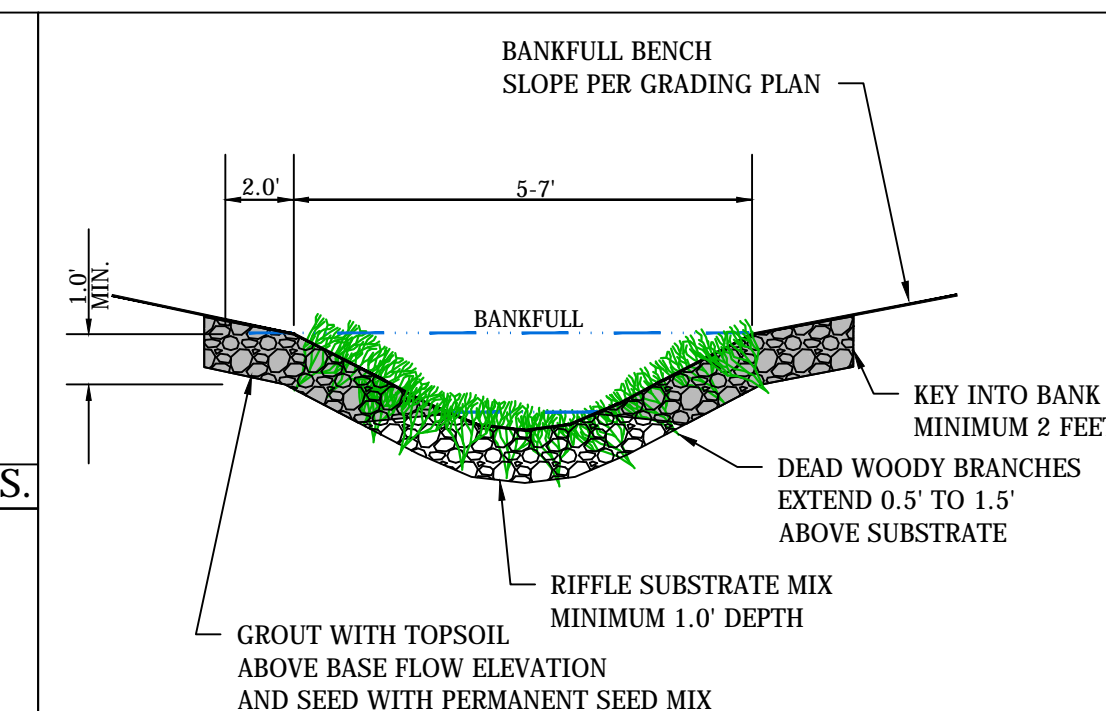
WETLAND B-B' CROSS SECTION



Wetland C-C' CROSS SECTION



PROFILE B - B' N.T.S. PLAN VIEW N.T.S. RIFFLE GRADE CONTROL STRUCTURE WITH EMBEDDED WOODY BRANCHES DETAIL



CROSS SECTION A - A' N.T.S. NOTES: 1. DEAD WOODY BRANCHES SHOULD BE PLACED IN LINES OR GROUPINGS SO THEY ARE CONTINUOUS ACROSS THE ACTIVE CHANNEL. STRAIGHT LINES ARE NOT REQUIRED. 2. BRANCHES ARE TO BE PLACED WITH THE LARGER END EMBEDDED IN THE SUBSTRATE AND TIPS AT A DOWNSTREAM ANGLE. 3. LIVE OR DORMANT BRANCHES ARE NOT TO BE USED. 4. TIPS OF BRANCHES SHOULD EXTEND A MINIMUM OF 0.5' AND MAXIMUM OF 1.5' BEYOND TOP OF RIFFLE SUBSTRATE.

RIFFLE GRADE CONTROL STRUCTURE WITH EMBEDDED WOODY BRANCHES INSTALLATION

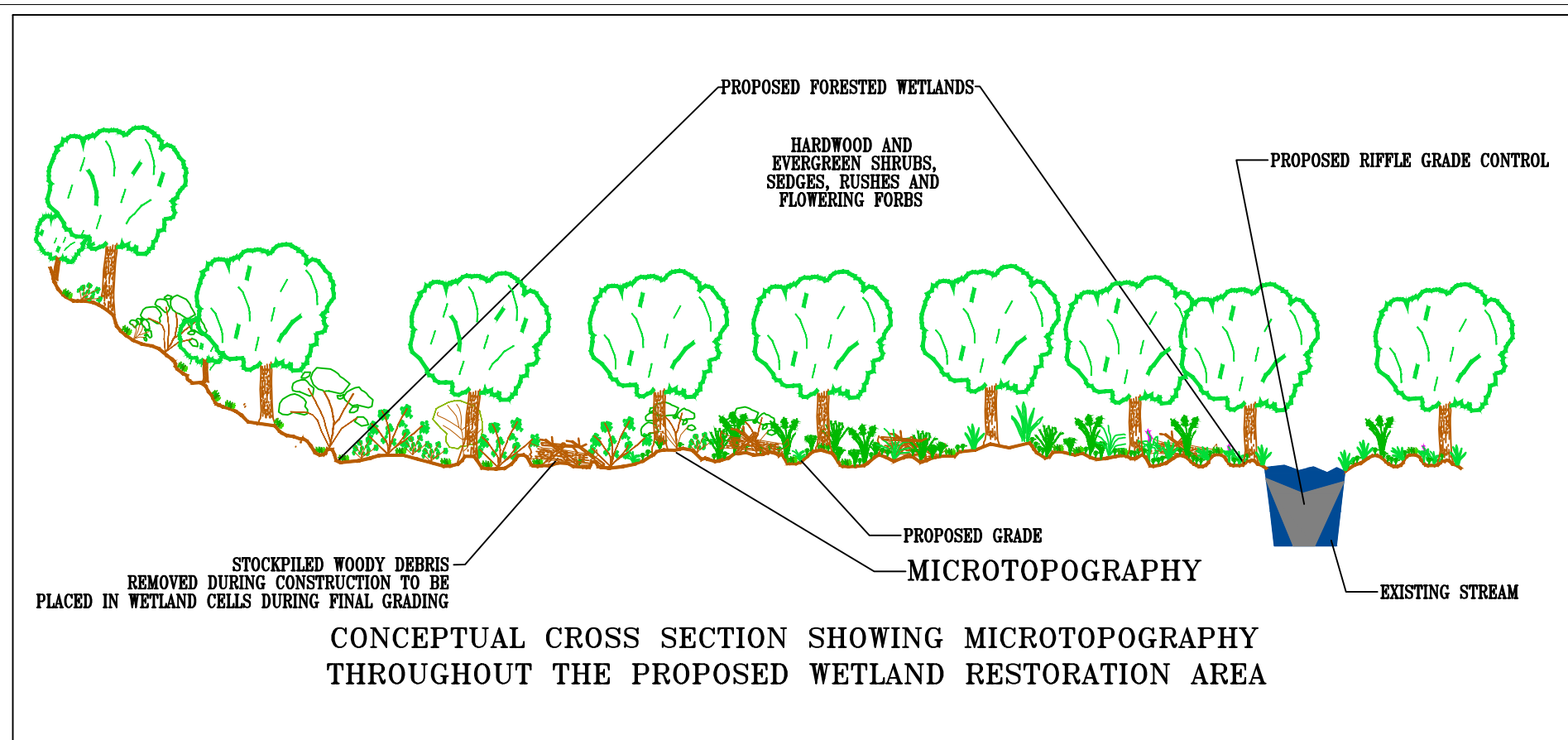
- DESCRIPTION
 - Work shall consist of furnishing and installing stone and woody materials for the creation of riffle grade control structures within the proposed stream bed.
- MATERIALS

Riffle Substrate Mix

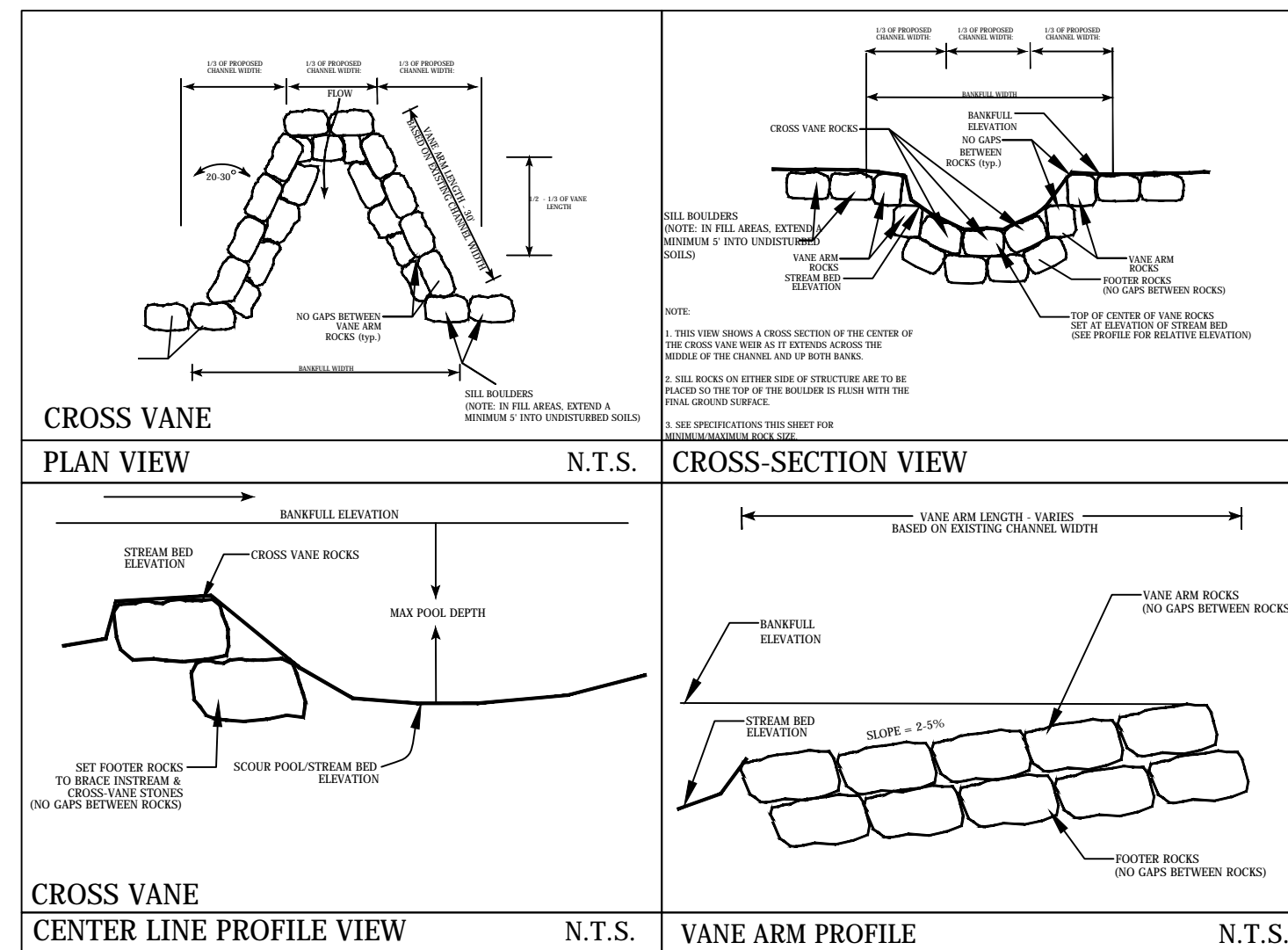
 - Riffle substrate mix material shall consist of natural field rock or crushed rock from a quarry and shall be sound, tough, dense, resistant to the action of air and water, and suitable in all respects for the purpose intended. Material may contain small amounts of fine aggregate but shall contain no amounts of soil material.
 - Source and supply of material shall be from an approved mining operation with up-to-date regulatory permits, and shall be submitted to the Construction Manager for review and approval prior to beginning construction. Gravel tailings shall NOT be indiscriminately mined from active streams and rivers.
 - Riffle substrate mix shall be a mixture containing approximately the following size distribution:
 - 60 % Gravel - 0.12 to 5 inch (0.3 - 7.6 cm) diameter
 - 40 % Cobble - 5 to 18 inch (7.6 - 45.7 cm) diameter
 - Cobble and gravel material shall be angular stone. Rounded, weathered, or "River Run" material shall not be used.
 - Gravel shall be rounded or "River Run" gravel.
 - 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.

Dead Woody Branches

 - Dead woody branch material shall be 1 inch in diameter (maximum) and 18-30 inches in length.
 - Dead woody branches shall be from native trees and shrubs. No exotic or invasive species are to be used.
 - All branches must be dead for more than three months and less than 12 months.
 - No willow (*Salix*) or shrub dogwood (*Cornus sericea*, *Cornus mas* or *Cornus racemosa*) species are to be used.
- CONSTRUCTION
 - Work shall proceed from downstream to upstream.
 - Excavate existing channel to form subgrade of proposed riffle sequence.
 - Fill with cobble portion of riffle substrate mix.
 - Install dead branches in voids of cobble such that base of branches will be buried at least one foot in substrate mix and tips extend at least 0.5 foot to 1.5 feet above top of proposed grade.
 - Install gravel portion of riffle substrate mix, ensuring that branch tips are not buried. Create low flow channel at stream centerline by grading riffle substrate mix at 15:1 slope from banks toward center of channel.
 - Dead woody branches that extend more than 18" above the riffle substrate shall be trimmed.
 - Bottom of upstream riffle and top of downstream riffle are to be set at the same elevation.
 - Grade banks to bankfull elevation and grade floodplain as shown on grading plan. Grout channel bank areas of riffle structure (above base flow) with topsoil.

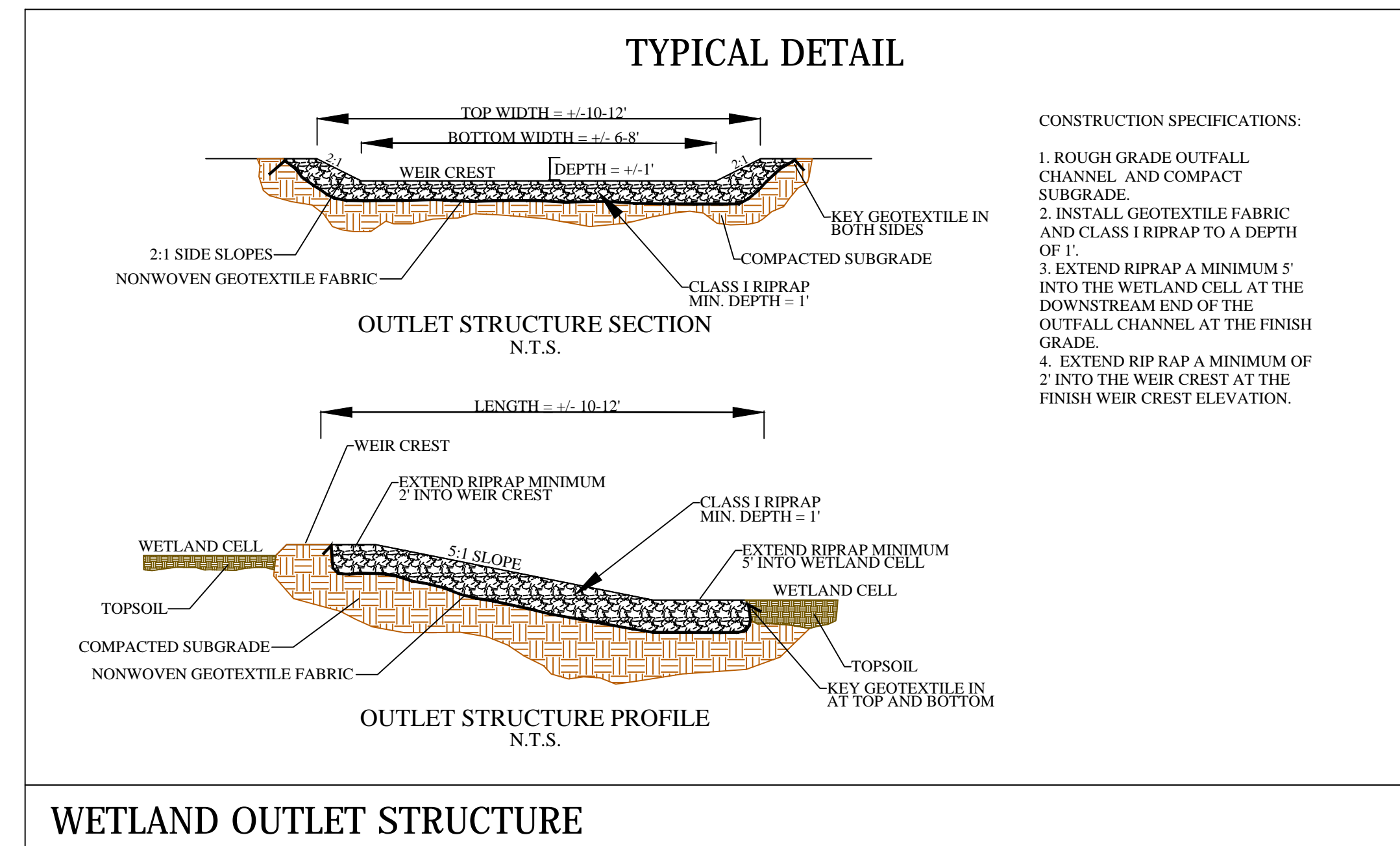


CONCEPTUAL CROSS SECTION SHOWING MICROTOPOGRAPHY THROUGHOUT THE PROPOSED WETLAND RESTORATION AREA



CROSS VANE Installation Sequence

- Construct the weir portion of the cross vane first. A trench perpendicular to the stream channel shall be excavated in the center of the channel extending approximately one third (1/3) of the proposed channel width (refer to detail), the exact length to be determined by the Designated Specialist in the field. The trench shall be excavated to a depth which will accommodate two (2) rows of footer boulders. Continue excavation of the trench progressively streamward, in conjunction with the placement of the footer and the weir boulders (boulders which are placed on top of the footers in the weir portion of the Cross Vane).
- The lower footer boulders shall be placed in the excavated trench such that they are touching one another.
- The upper footer boulders shall be placed on top of the lower footer boulders such that they are skewed upstream of the footer boulders.
- Weir boulders shall be placed on top of the footer boulders such that they are contiguous, staggered over the two (2) adjacent footer boulders, placed skewed upstream of the footer boulders, and placed so the top of boulder is 6 inches above the proposed stream invert.
- Excavate a scour pool downstream of the Cross Vane. The grading plans show general pool locations: grade scour pool as directed by the Designated Specialist.
- Cut a trench for one of the vanes of the Cross Vane, starting from the edge of the weir portion of the cross vane. The dimensions of the trench (width and depth) shall accommodate the dimensions of the boulders. The angle of the trench shall be twenty to thirty degrees off of the angle of the proposed streambank. The vane of the cross vane shall extend into the stream channel approximately one third (1/3) of the channel width, with exact length to be determined by the length shown on the plans.
- Footer boulders shall be placed in the excavated trench such that they are touching one another. Additional footer boulders may be required for placement of the vane boulders at the required elevation.
- A vane boulder will be placed at an elevation indicated on the plans. The subsequent vane boulders shall be positioned toward the stream channel at a three (3) to seven (7) percent slope, until the vane extends to approximately one third (1/3) of the channel width, with exact length to be determined by the Designated Specialist in the field (refer to detail).
- Vane boulders shall be placed on top of the footer boulders such that they are contiguous, staggered over the footer boulders, and placed skewed upstream of the footer boulders.



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NISOURCE GAS LINE MB OFF-SITE
 WETLAND MITIGATION @ 1ST MINE RUN
 PHASE II WETLAND MITIGATION PLAN
 BALTIMORE COUNTY, MD
 MDE/COE PERMIT TRACKING NO. 12-NT-0433/201261660

Source

REVISIONS				
NO.	DATE	DESCRIPTION	REV. BY	APP. BY

PROJECT MANAGER: JBM
 DESIGNED: CKA
 DRAWN: CKA
 PROJECT NO. 1303
 DATE: 6/19/13
 SHEET: 3 of 3
 Profile/Cross Section & Details