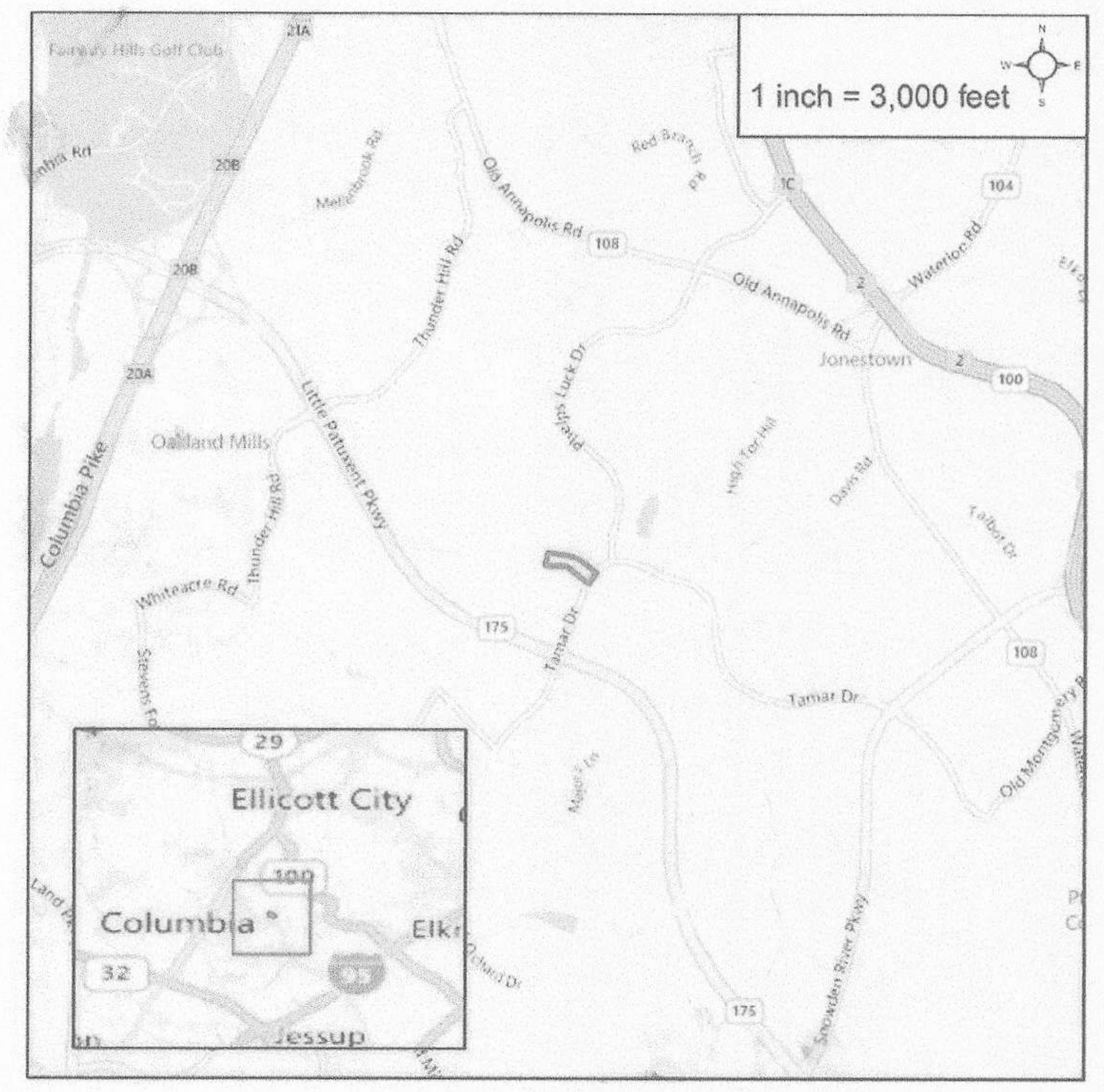
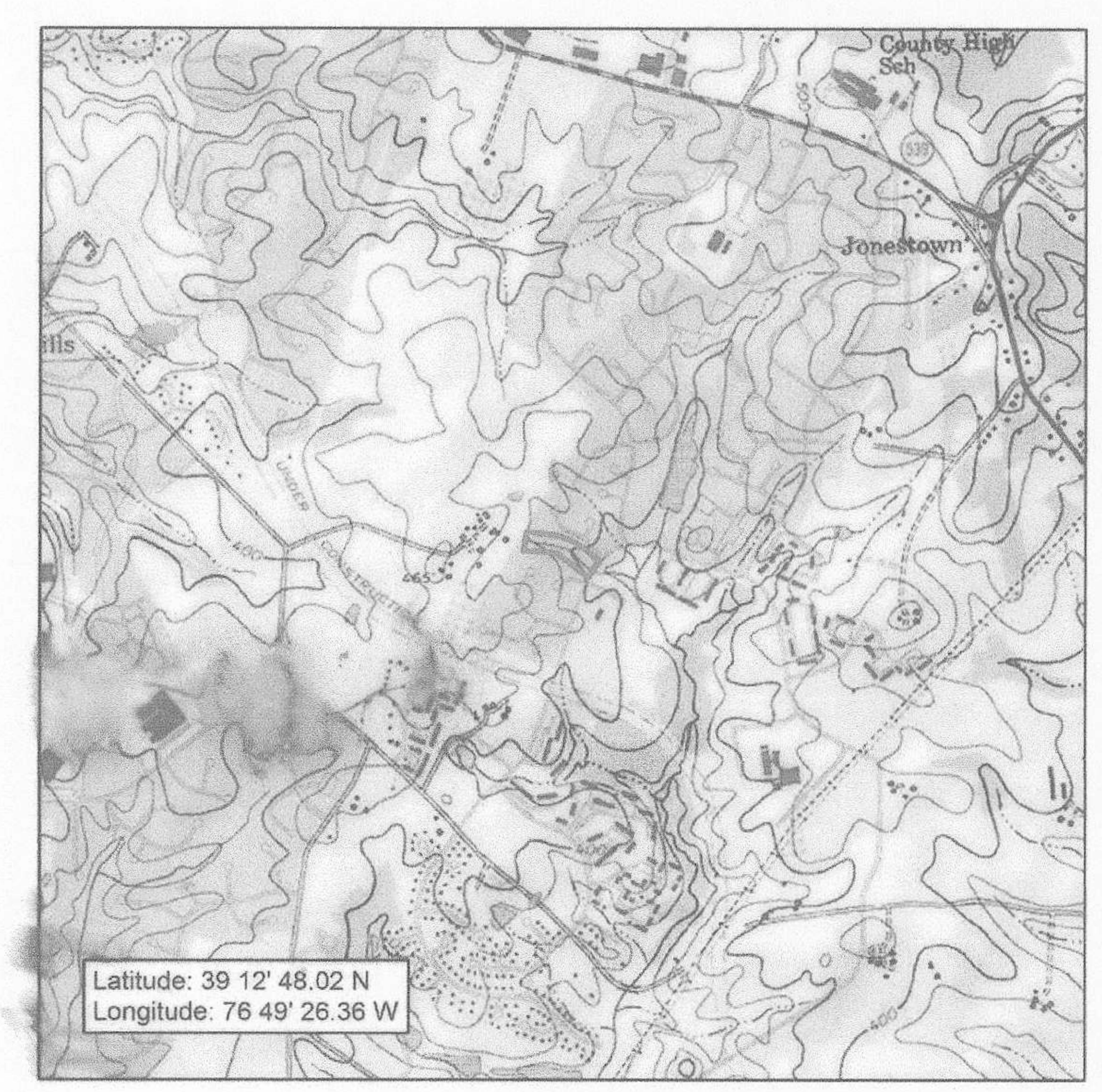
SPRING HOUSE CREEK STREAM RESTORATION
BLANDAIR REGIONAL PARK
HOWARD COUNTY, MARYLAND



SOURCE: WORLD STREET MAP

1"=4000'

VICINITY MAP



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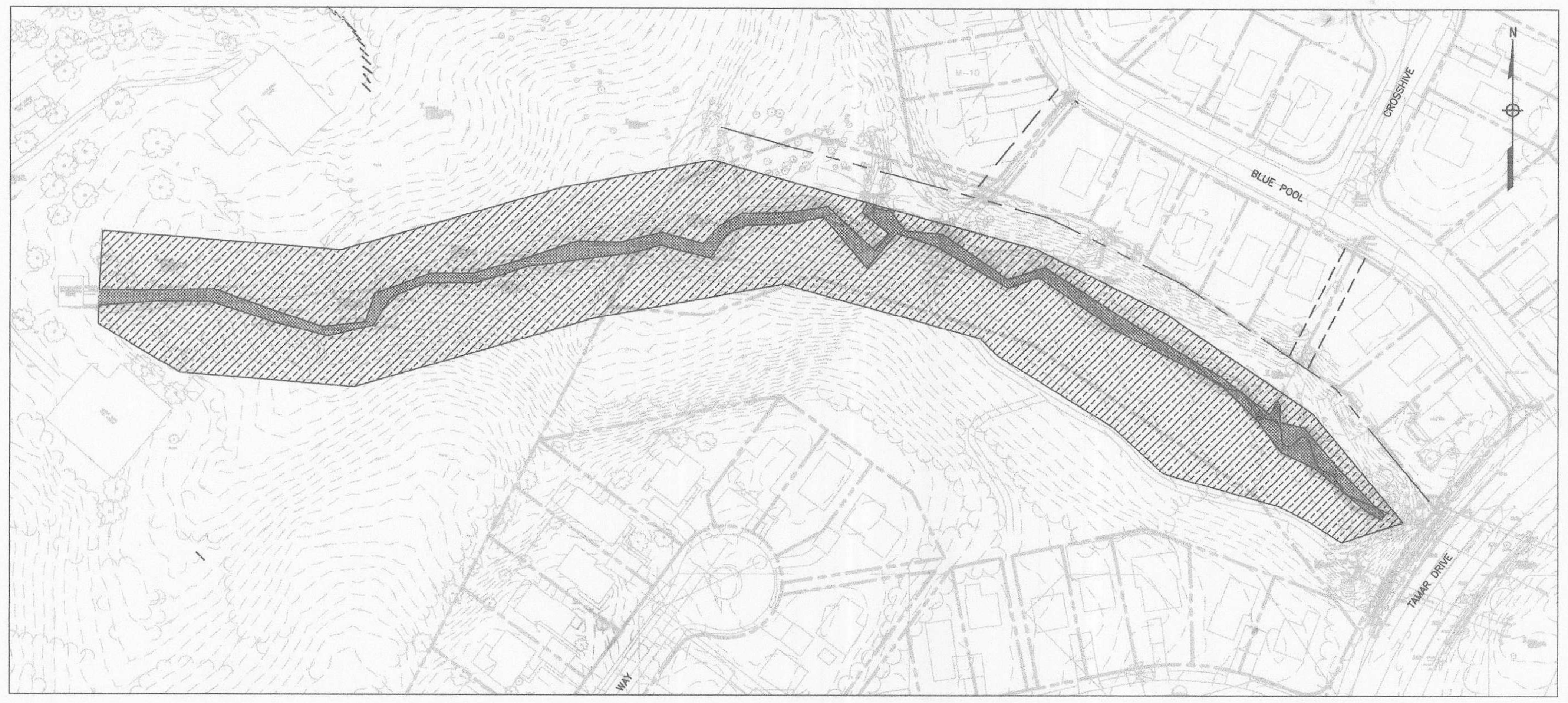
LOCATION MAP



SHEET INDEX

1 TITLE SHEET WITH LOCATION MAP
2 EXISTING CONDITIONS
3 STREAM DESIGN
4 STREAM GEOMETRY
5 TYPICAL CHANNEL DETAILS
6 TYPICAL STREAM BANK DETAILS
7 PLANTING PLAN, NOTES, AND DETAILS
8 INVASIVE SPECIES CONTROL

REVISIONS

DEPARTMENT OF PUBLIC WORKS
9250 BENDIX ROAD
ELLICOTT CITY, MD 21043

KEY PLAN

GRAPHIC SCALES

SIGNATURE

10-2-14

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EXPIRATION DATE: 8/12/2015

WR&A
WHITMAN, REQUARDT & ASSOCIATES, LLP
9030 Stony Point Parkway, Suite 220, Richmond, VA 23235

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND.

10/30/14		10/24/14	
DIRECTOR OF PUBLIC WORKS	DATE	CHIEF, BUREAU OF ENGINEERING	DATE
10-30-2014		Steve Shaver 10/21/14	
CHIEF, BUREAU OF HIGHWAYS	DATE	CHIEF, TRANSPORTATION AND SPECIAL PROJECTS DIVISION	DATE

TITLE SHEET

Drawing No.

SR-1

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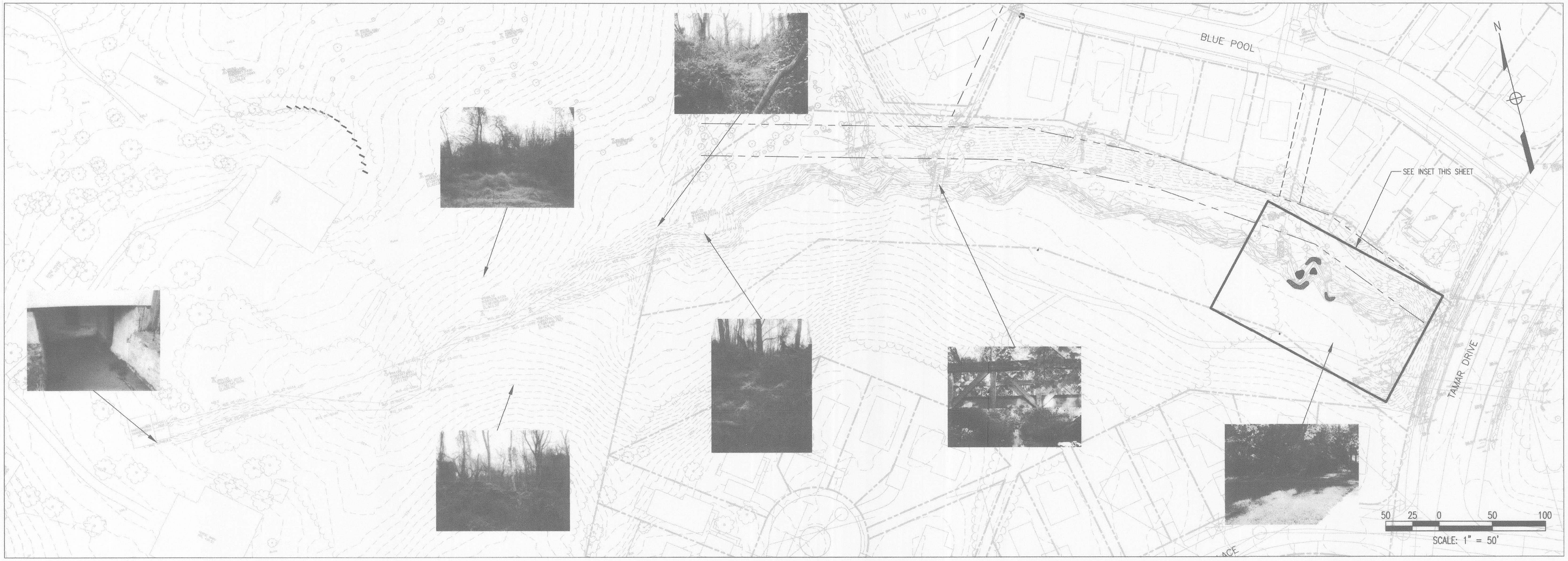

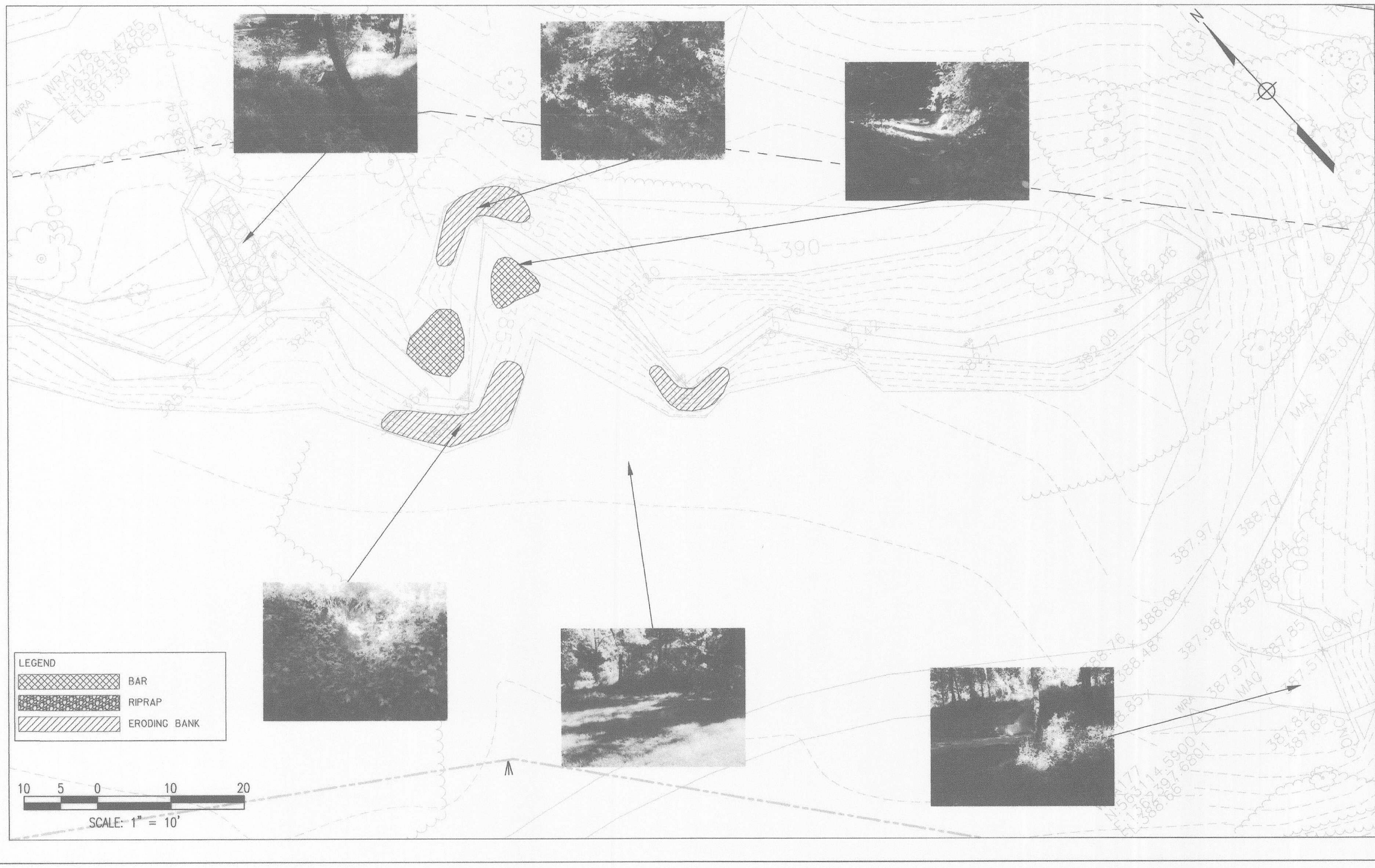

SPRING HOUSE CREEK - EXISTING CONDITIONS

SITE SUMMARY

Spring House Creek is a 1300 linear foot perennial spring-fed stream. The spring, discharging from a historical spring house provides consistent baseflows which are also augmented by the many sæps along the stream channel. The upper portion of the stream is impacted by invasive species and a lack of a healthy riparian buffer. The lower portion of the stream is impacted by a single stormwater outfall. The upper515 linear feet of the stream is located within the Blandair Regional Park boundaries, and the lower 788 feet is located on Columbia Association Property.

UPPER REACH

Upstream of the stormwater outfall, the channelappears to be relatively stable, often with groundwater seeps along its banks, and occasional wider areas where seep wetlands have developed in the floodplain.

The upper section within the park drains approximately 33 acres of the historical farmstead and adjacent residentia community. Future developmentin the park does not include stormwater facility discharges or active recreation (i.e. soccer and baseball fields) in this area of the park, thus there is no anticipated change in the spring flows feeding this stream.

The reach between the spring house and the stormwater culvert is approximately 1,150 linear feet long. It has a steep channel slope (3.1% average),with several steep drops over bedrock or large tree roots. However, the stream is vertically stable due to the limited spring flows and bedrock grade control. The stream banks are steep and the channel is well entrenched into its valley. Despite the stæpness of the banks, they are not eroding excessively. The stream has a cobble substrate along much of its length, with finer substrates in areas of lower slope. There are wetland seeps along the bank, and occasional small wet meadow areas where the chamel widens and has accumulated sediment. There is very little pool development due to the steep slope.

The primary deficiency along the upper reach of the stream is the lack of shade and canopy and the presence of invasive species.

LOWER REACH

WR&A staff conducted a geomorphic survey of the lower 190 linear feet of stream channel. An 18 inch stormwater outfall, draining approximately 3.5 acres of adjacent residential development,discharges into the stream at the upper end of the reach. Storm flows from this outfall appear to responsible for channel incision and bank erosion downstream of the outfall. The invert of the outfall is 3 feet above the stream bed, and flows through previously placed riprap and natural stone. The stones in thedischarge channel are not stable, and many have been displaced. A large willow has fallen across the outfall, creating a signficant void space in the bank.

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EXISTING CONDITIONS

Drawing No.

SR-2

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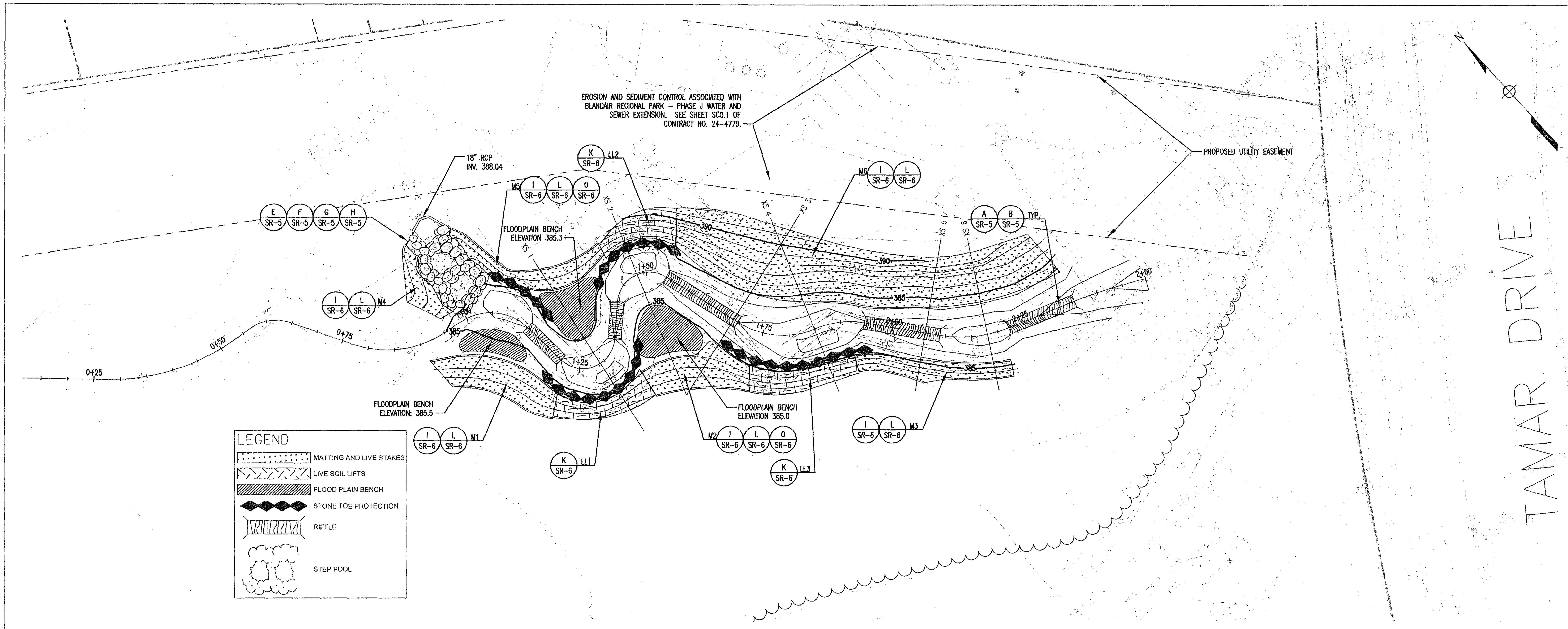
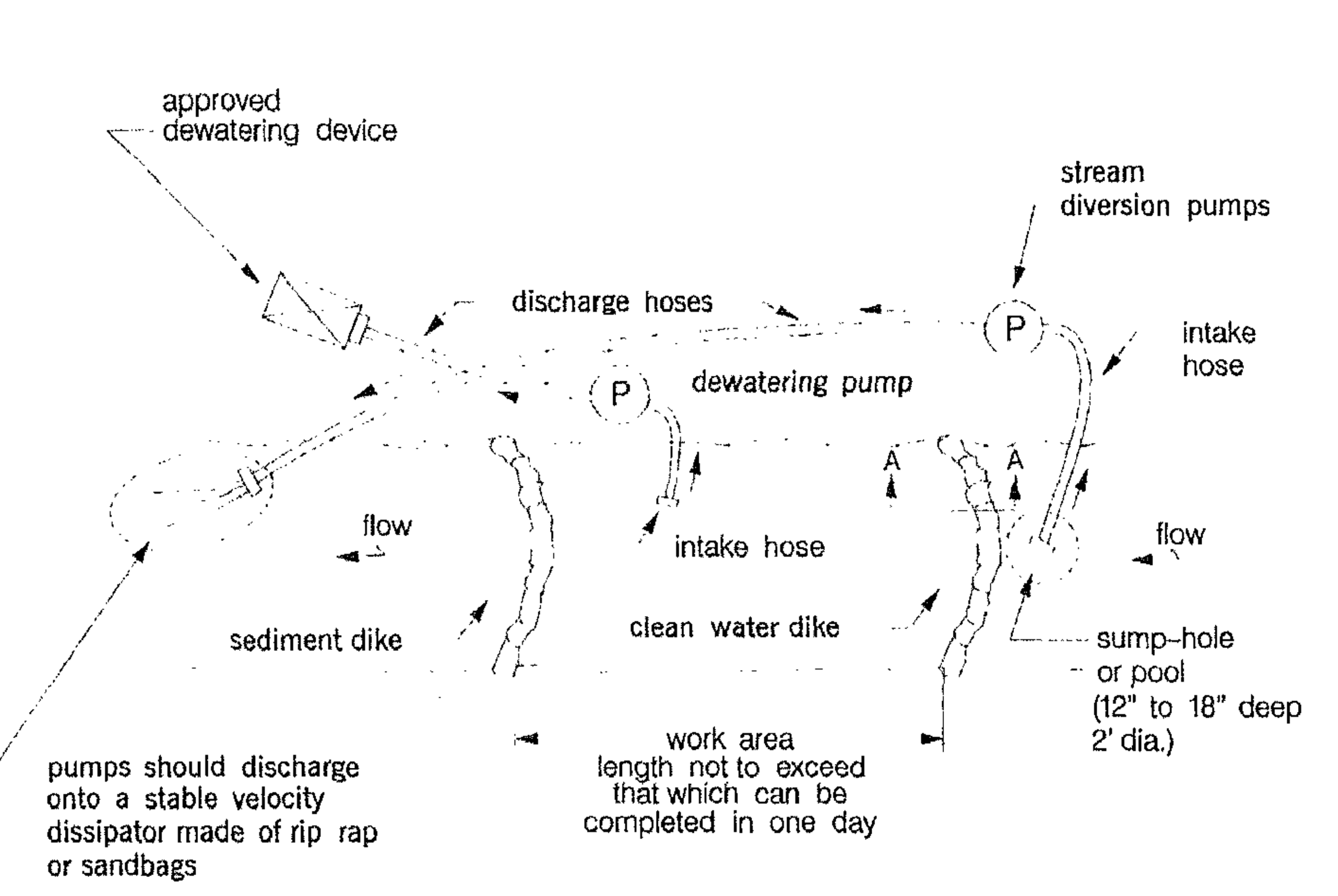


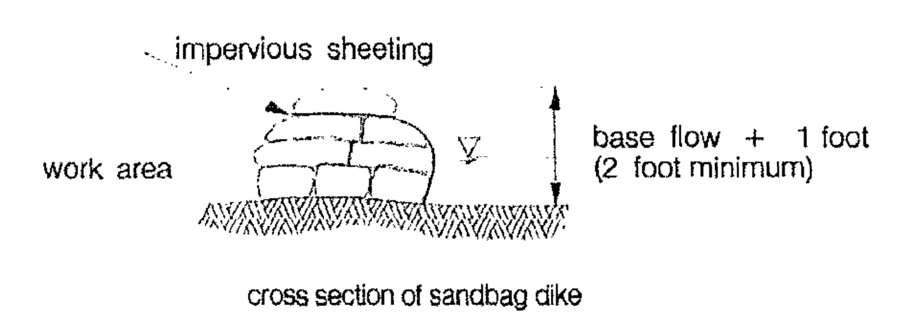
Maryland's Guidelines To Waterway Construction

DETAIL 1.2: PUMP-AROUND PRACTICE

PLAN VIEW



SECTION A-A



TEMPORARY INSTREAM CONSTRUCTION MEASURES	REVISED NOVEMBER 2000 PAGE 1.2 – 3	MARYLAND DEPARTMENT OF THE ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

STREAM FEATURES

RIFFLES:

	FROM	TO	LENGTH
R1	1+12	1+21	8.7 FT.
R2	1+35	1+42	7.0 FT.
R3	1+54	1+70	16.1 FT.
R4	1+95	2+09	14.5 FT.
R5	2+24	2+50	25.8 FT.

STONE TOE:

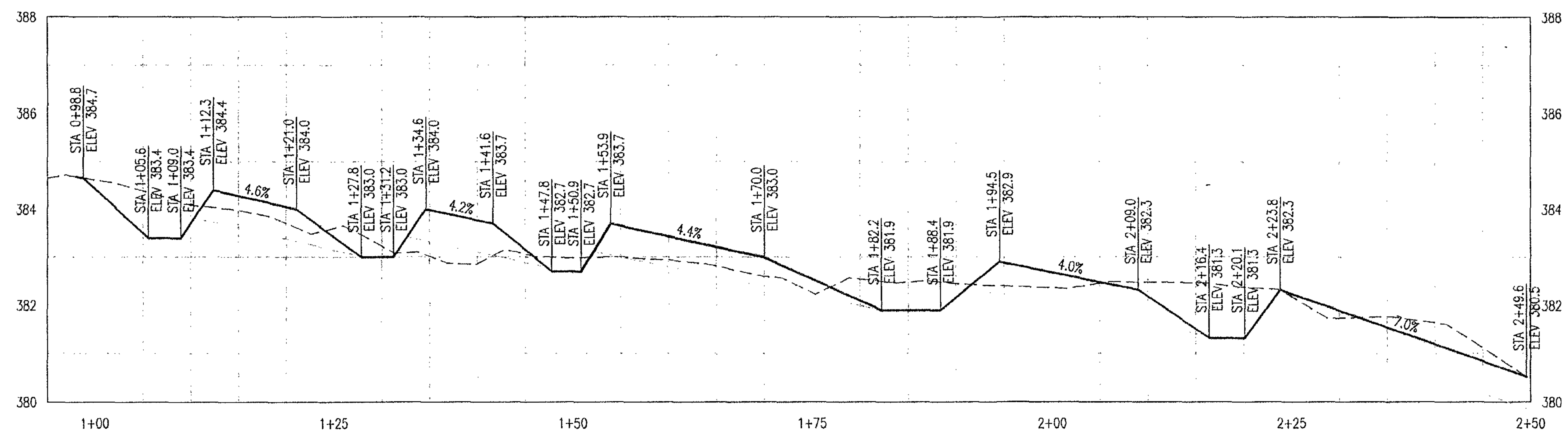
	BANK	FROM	TO	LENGTH
ST1	LEFT	1+05	1+15	15.3 FT.
ST2	RIGHT	1+21	1+34	25.9 FT.
ST3	LEFT	1+42	1+54	21.2 FT.
ST4	RIGHT	1+70	1+95	28.5 FT.

LIVE SOIL LIFTS:

	BANK	FROM	TO	LENGTH @ TOE	TOTAL LENGTH
LL1	RIGHT	1+23	1+32	19.0 FT.	57.0 FT.
LL2	LEFT	1+46	1+53	15.4 FT.	69.3 FT.
LL3	RIGHT	1+74	1+93	20.8 FT.	72.8 FT.

MATTING W/LIVE STAKES

	BANK	FROM	TO	LENGTH @ TOE	AREA
M1	RIGHT	0+92	1+23	25.5 FT.	17.7 SQ.YD.
M2	RIGHT	1+32	1+74	21.6 FT.	15.7 SQ.YD
M3	RIGHT	1+93	2+21	29.8 FT.	11.9 SQ.YD
M4	LEFT	0+90	0+98	15.0 FT.	5.8 SQ.YD
M5	LEFT	1+02	1+46	34.1 FT.	12.9 SQ.YD
M6	LEFT	1+53	2+34	76.4 FT.	95.0 SQ.YD



EROSION AND SEDIMENT CONTROL NOTES

1. ALL LONG-TERM STOCK PILES OF ROCK AND SOIL SHALL BE PROTECTED FROM EROSION BY INSTALLING A SILT FENCE AROUND THEIR PERIMETERS.
2. CLEARING AND GRADING OF BANKS SHALL BE LIMITED TO AN AREA THAT CAN BE COMPLETED AND STABILIZED IN THE SAME DAY. ALL DISTURBED AREAS SHALL BE STABILIZED AT THE END OF EACH WORK DAY.
3. WHEN WORK IN THE CHANNEL IS CONDUCTED IN THE DRY, A PUMP-AROUND SHALL BE USED TO BYPASS CLEAN WATER AROUND THE WORK AREA. IF A DEWATERING PUMP IS USED TO KEEP THE WORK AREA DRY, THE WATER SHALL BE DISCHARGED THROUGH A "DIRT BAG" OR OTHER APPROVED FILTERING DEVICE.
4. UPON COMPLETION OF GRADING AND INSTALLATION OF BANK PROTECTION AND BED STRUCTURES, ALL STREAM BANKS SHALL BE MATTED WITH COIR FIBER MATTING AND ALL FLOODPLAIN AREAS SHALL BE SEEDED AND MULCHED WITH STRAW.

LARGE WOODY MATERIAL PLACEMENT

1. PLACEMENT WILL BE RESTRICTED TO AREAS UPSTREAM OF RESTORATION REACH.
2. ENGINEER WILL SELECT THREE LOCATIONS FOR PLACEMENT IN FIELD.
3. ALL WOODY MATERIAL WILL BE SALVAGED ON SITE.
4. ALL WORK PLACING WOODY MATERIAL IN AND AROUND THE STREAM WILL BE CONDUCTED WITHOUT MECHANICAL EQUIPMENT IN THE STREAM.
5. SEE DETAIL, SHEET 5.
6. AFTER INSTALLATION, SITE TO BE SEEDED WITH CHEWINGS FESCUE, SEE SHEET 6.

STORMWATER OUTFALL/STEP-POOL DATA

	INV. WEIR	INV. POOL
OUTFALL	388.04	---
STEP 1	387.0	385.5
STEP 2	386.0	384.5
STEP 3	385.0	383.4

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND.

10/30/14 DIRECTOR OF PUBLIC WORKS — DATE	10/29/14 CHIEF, BUREAU OF ENGINEERING — DATE
10-30-2014 CHIEF, BUREAU OF HIGHWAYS — DATE	10/21/14 CHIEF, TRANSPORTATION AND SPECIAL PROJECTS DIVISION — DATE

REVISIONS

DEPARTMENT OF PUBLIC WORKS
9250 BENDIX ROAD
ELLICOTT CITY, MD 21043

KEY PLAN

GRAPHIC SCALES

10 5 0 10 20
SCALE: 1" = 10'

SIGNATURE

10-2-14

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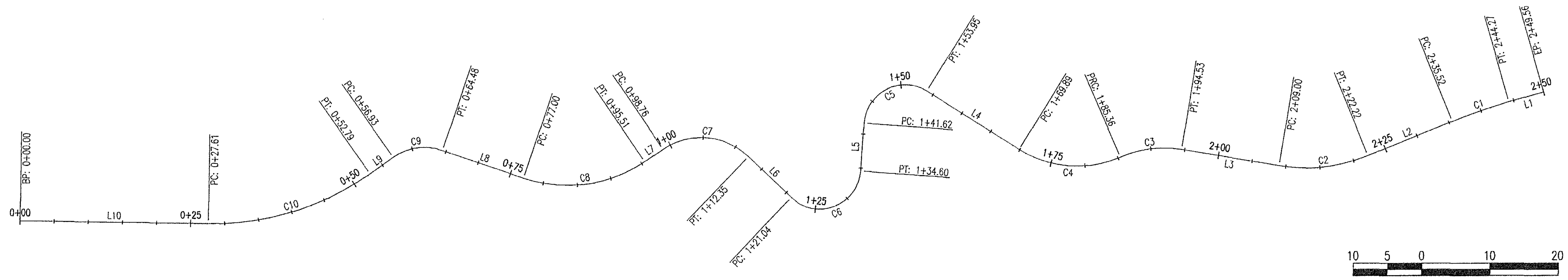
STREAM DESIGN

Drawing No.

SR-3

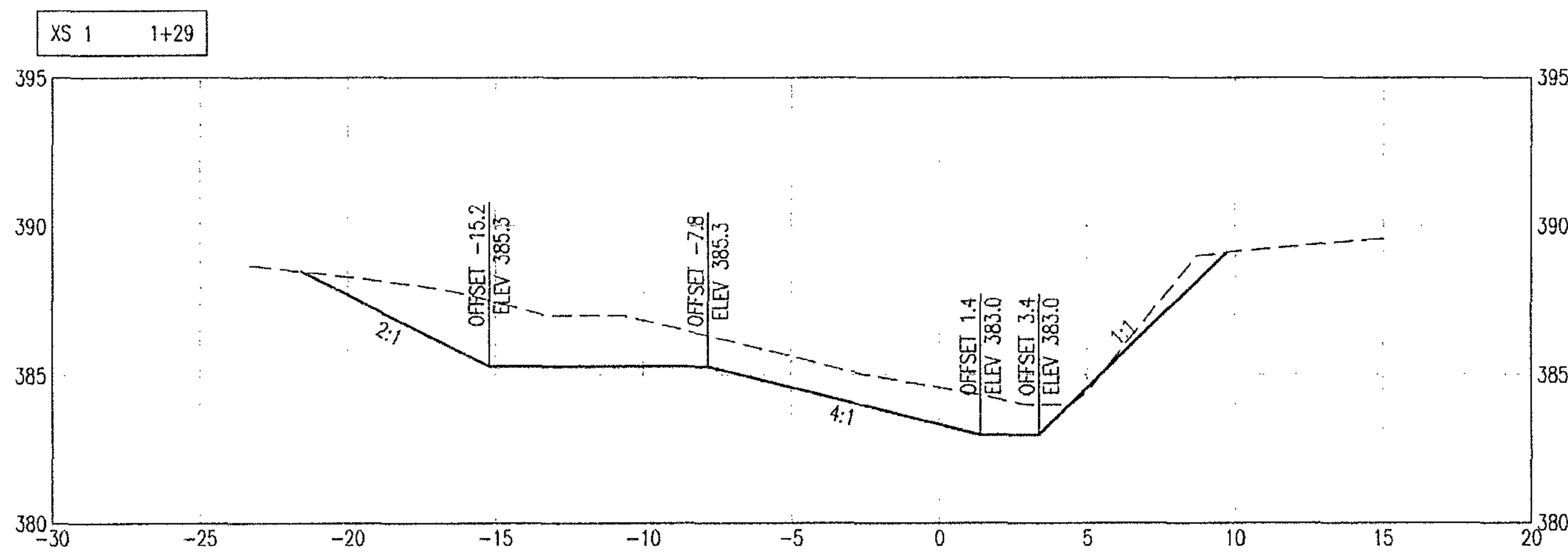
Scale: 1"=10'	
Date: 3/13/14	Sheet 3 of 8
Des: RCS	Drawn: ASH / Check: RCS

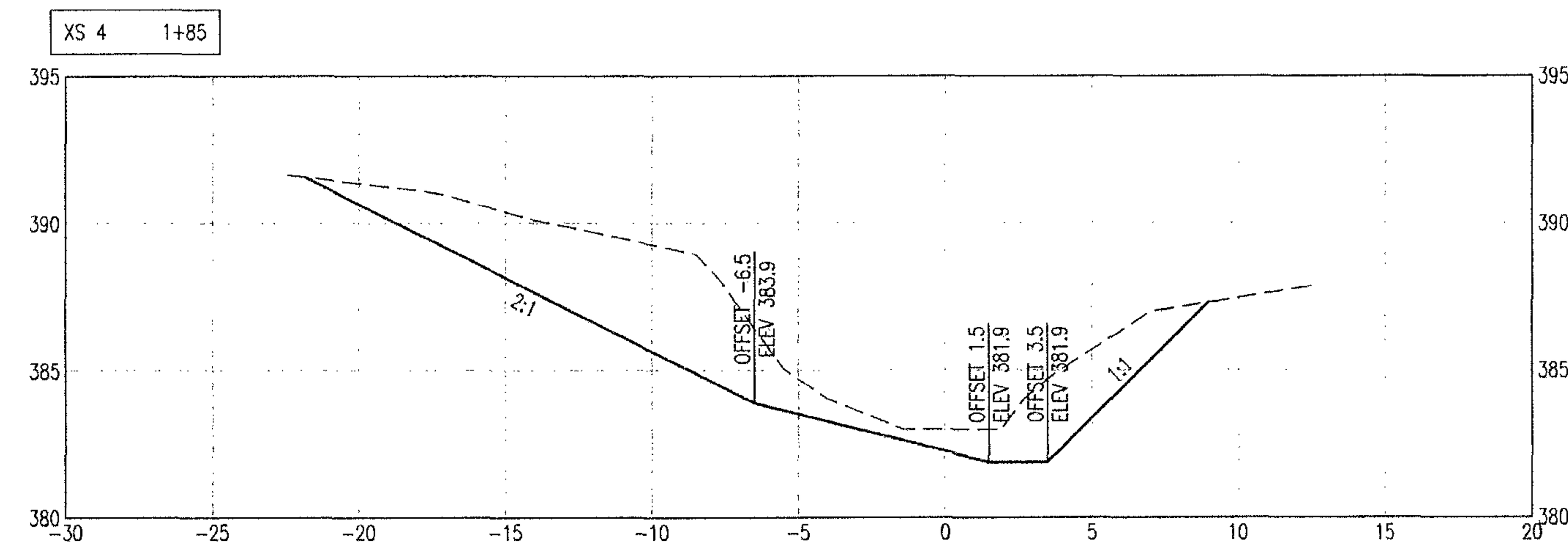


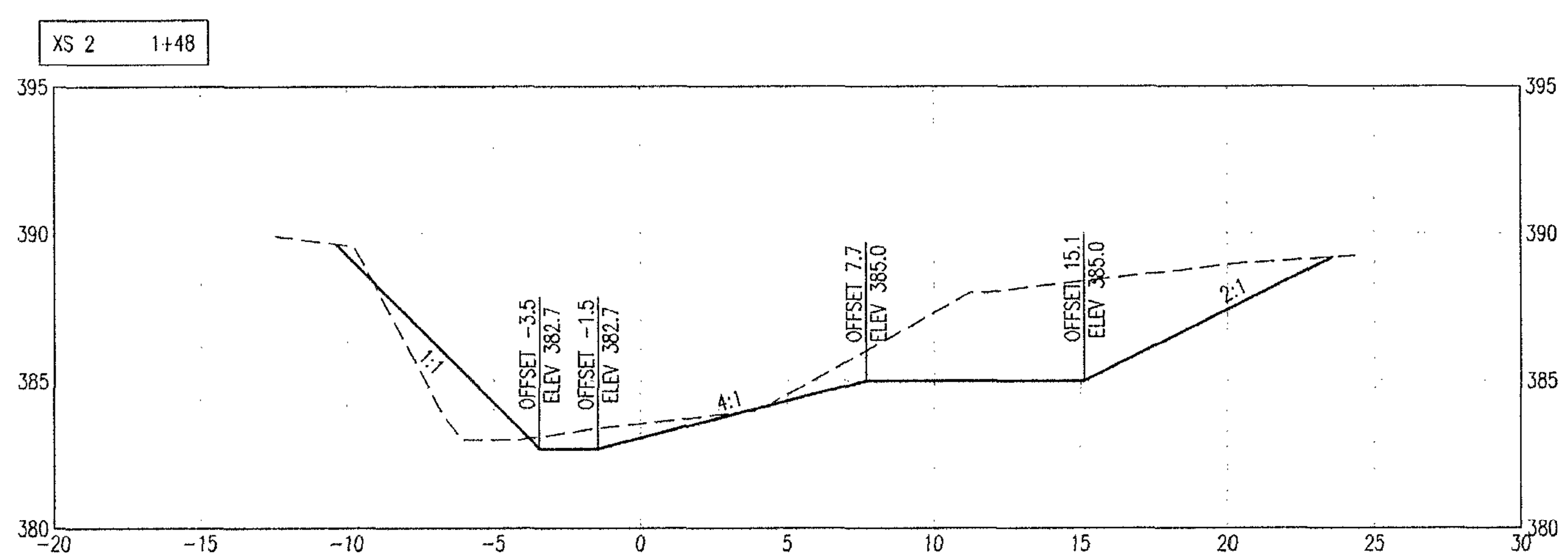
10 5 0 10 20

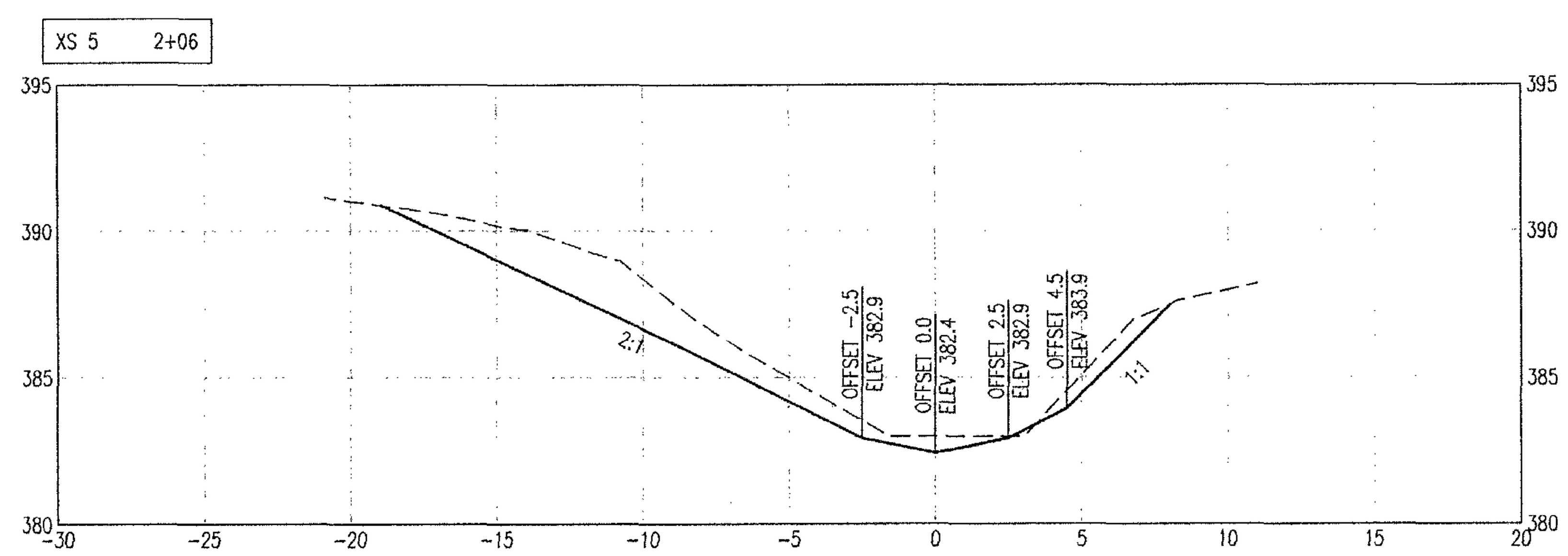
SCALE: 1" = 10'

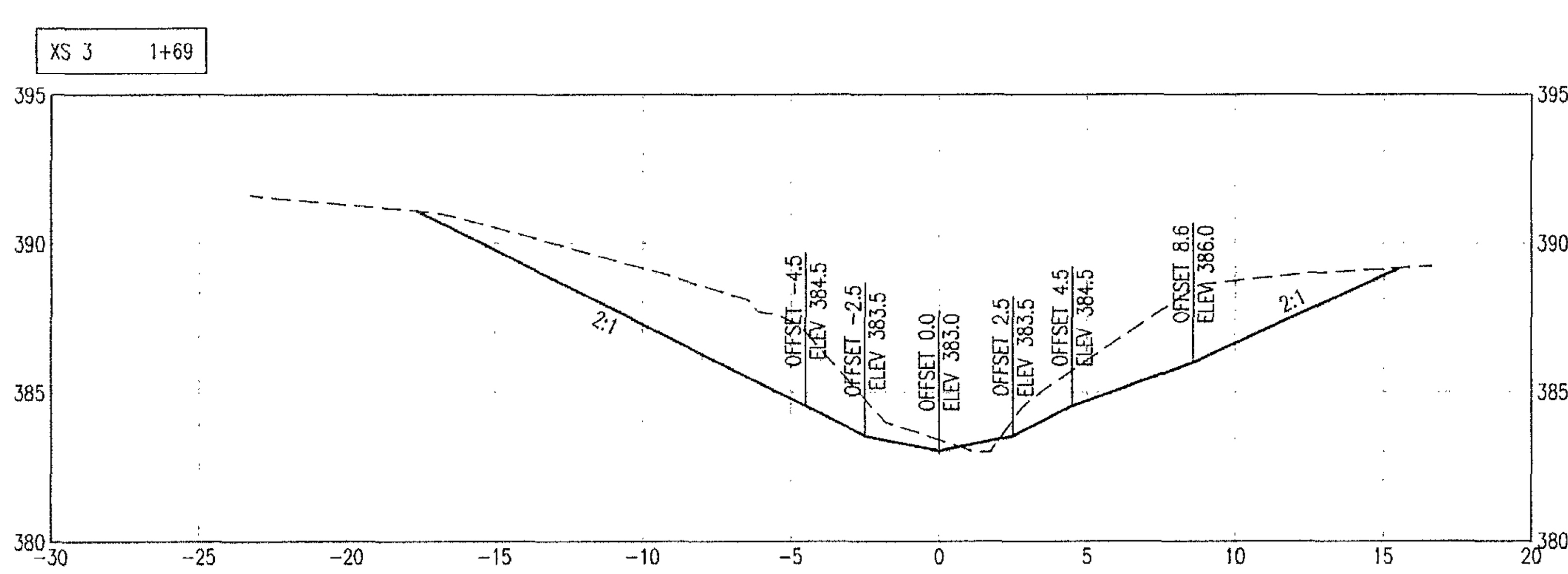
Number	Length	Radius	Line/Chord Direction	Start Northing	Start Easting
L10	27.607		S46° 18' 44.93"E	563297.39	1362264.30
C10	25.181	40.000	S64° 20' 50.46"E	563278.32	1362284.26
L9	4.146		S82° 22' 55.99"E	563267.60	1362306.59
C9	7.549	8.000	S55° 20' 55.95"E	563267.05	1362310.70
L8	12.518		S28° 18' 55.91"E	563262.92	1362316.68
C8	18.506	20.000	S54° 49' 26.72"E	563251.90	1362322.62
L7	3.257		S81° 19' 57.52"E	563241.61	1362337.21
C7	13.585	10.000	S42° 24' 54.18"E	563241.12	1362340.43
L6	8.696		S03° 29' 50.83"E	563231.85	1362348.91
C6	13.552	6.000	S68° 12' 12.08"E	563223.17	1362349.44
L5	7.019		N47° 05' 26.67"E	563219.14	1362359.51
C5	12.333	6.000	S74° 01' 24.85"E	563223.92	1362364.65
L4	15.942		S15° 08' 16.38"E	563221.09	1362374.53
C4	15.470	16.000	S42° 50' 10.50"E	563205.70	1362378.69
C3	9.175	16.000	S54° 06' 21.64"E	563194.79	1362388.80
L3	14.468		S37° 40' 38.65"E	563189.49	1362396.13
C2	13.214	24.000	S53° 27' 00.39"E	563178.04	1362404.98
L2	13.299		S69° 13' 22.13"E	563170.27	1362415.46
C1	8.751	80.000	S66° 05' 20.67"E	563165.55	1362427.89
L1	5.293		S62° 57' 19.21"E	563162.00	1362435.89

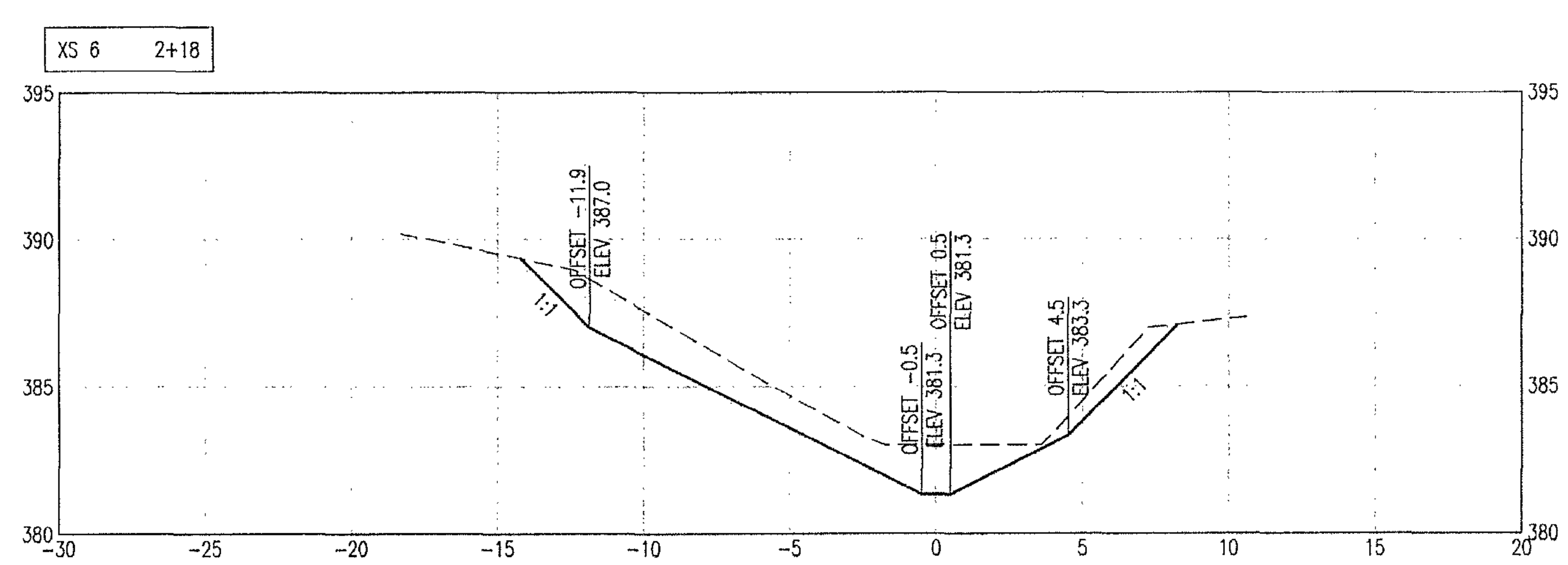












5 0 5 10

SCALE: 1" = 5'

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HOWARD COUNTY, MARYLAND.

[signature] 10/30/14
DIRECTOR OF PUBLIC WORKS DATE

[signature] 10/24/14
CHIEF, BUREAU OF ENGINEERING DATE

[signature] 10-30-2014
CHIEF, BUREAU OF HIGHWAYS DATE

Steve Shaver 10/21/14
CHIEF, TRANSPORTATION AND SPECIAL PROJECTS DIVISION DATE

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9250 BENDIX ROAD
ELLICOTT CITY, MD 21043

KEY PLAN

GRAPHIC SCALES

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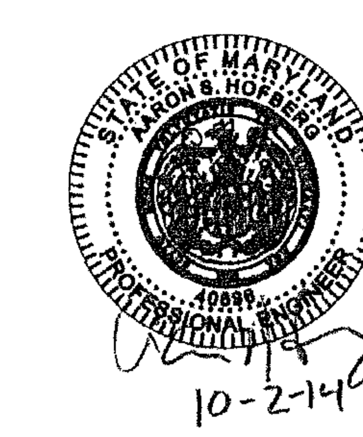

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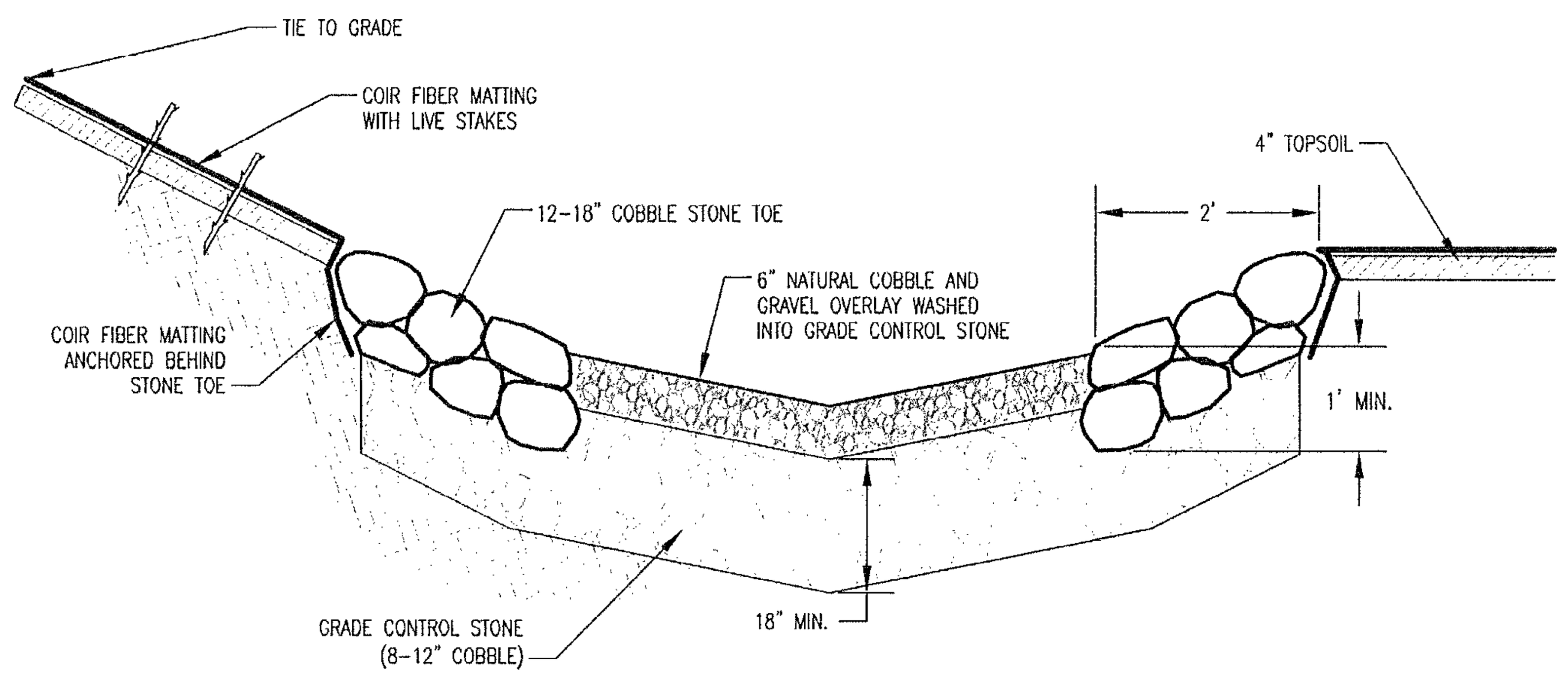
STREAM GEOMETRY

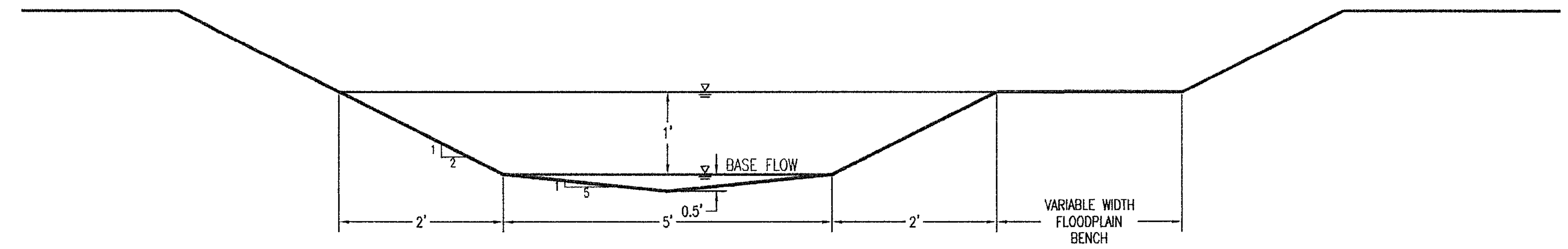
Drawing No.

SR-4

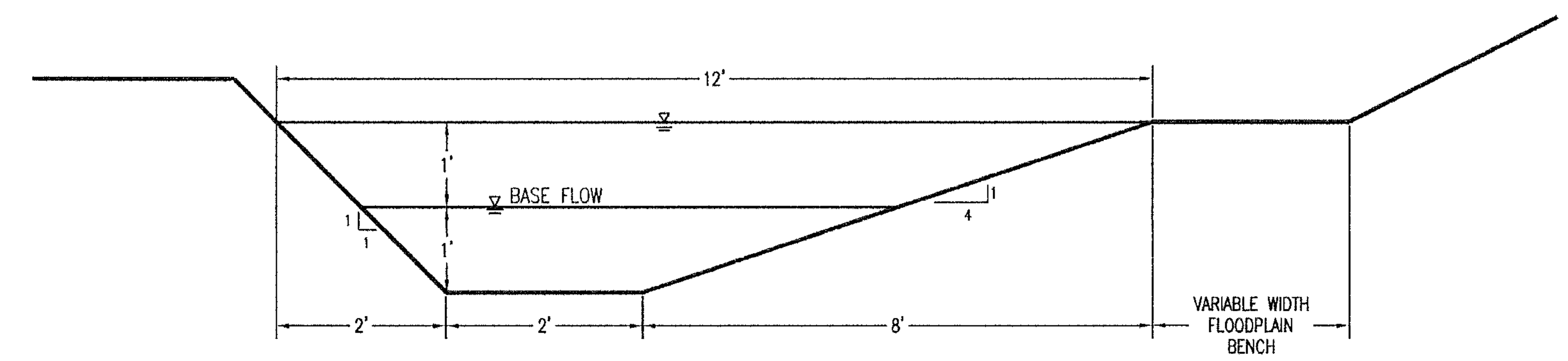
Scale: 1"=10'	
Date: 3/13/14	Sheet 4 of 8
Des: RCS	Drawn: ASH	Check: RCS



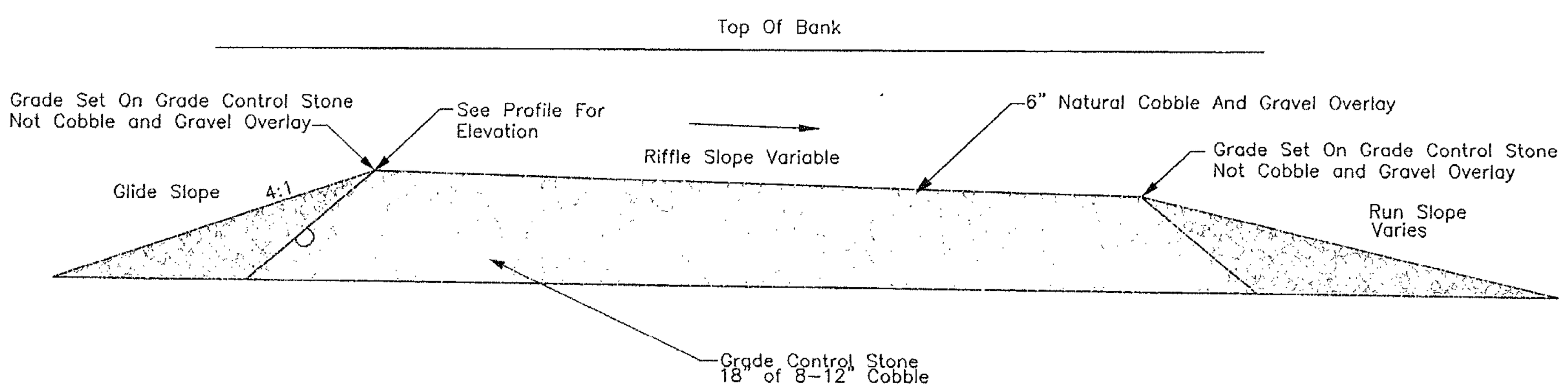
A / SR-3 CROSS SECTION DETAIL RIFFLE GRADE CONTROL NTS



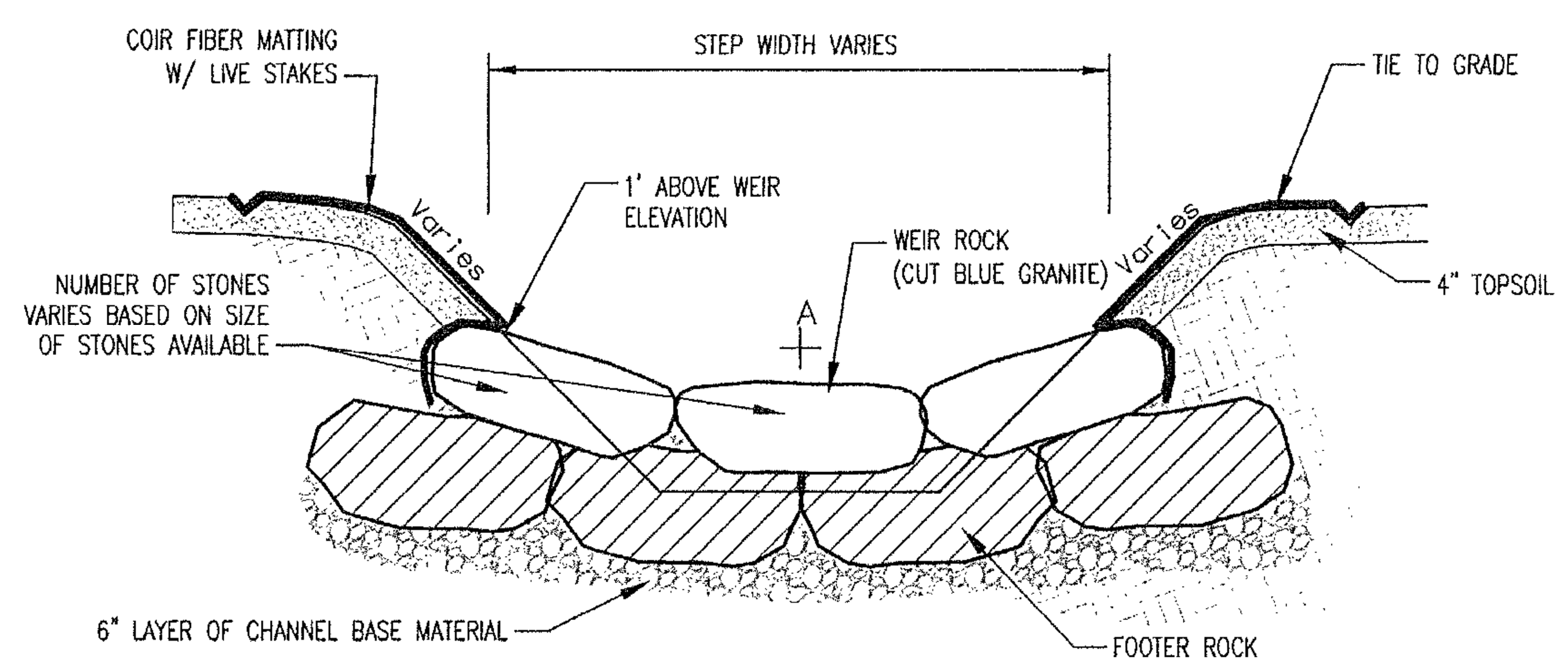
C / SR-4 CROSS SECTION TYPICAL RIFFLE NTS



D / SR-4 CROSS SECTION TYPICAL POOL NTS



B / SR-3 PROFILE RIFFLE GRADE CONTROL NTS



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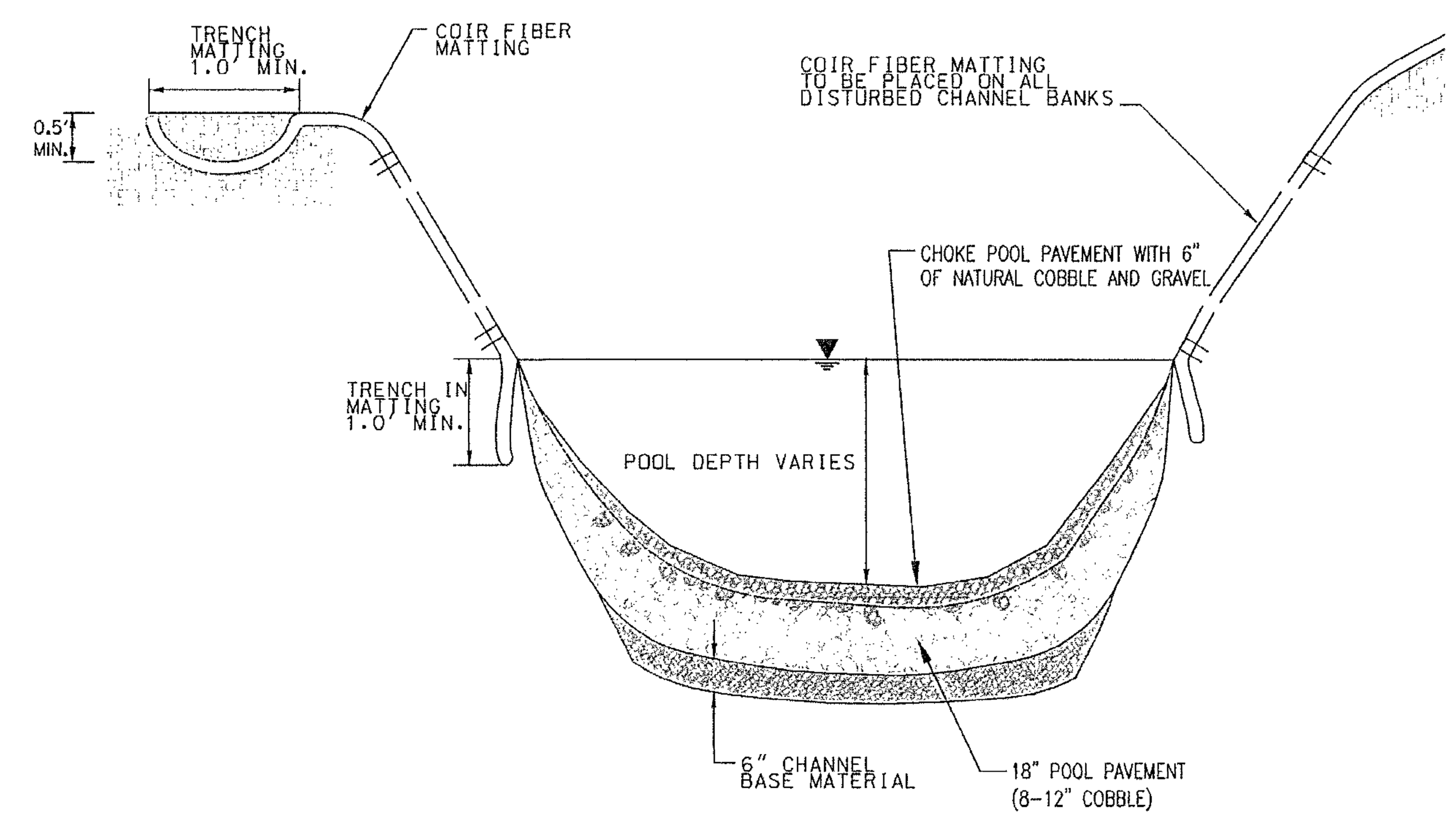

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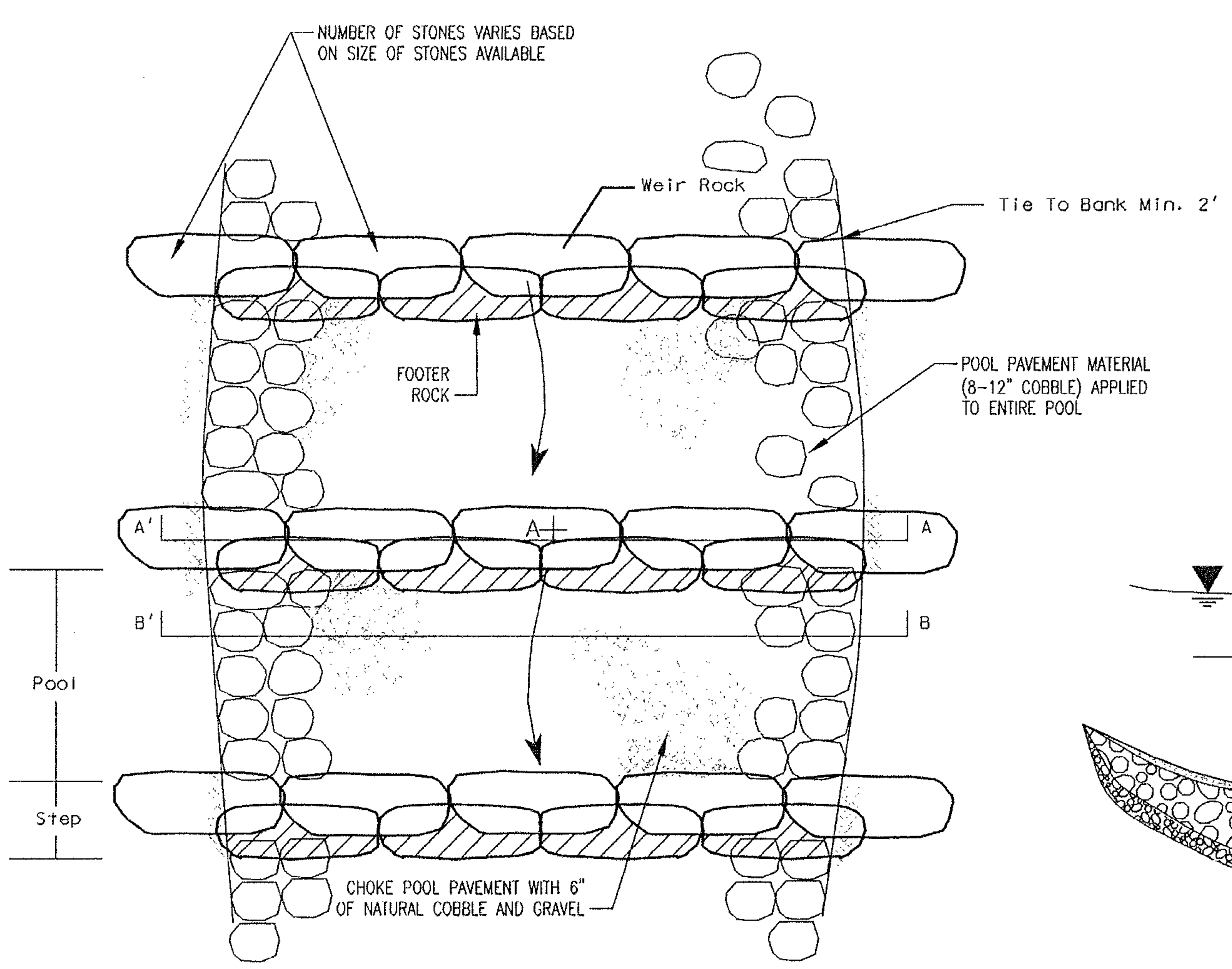

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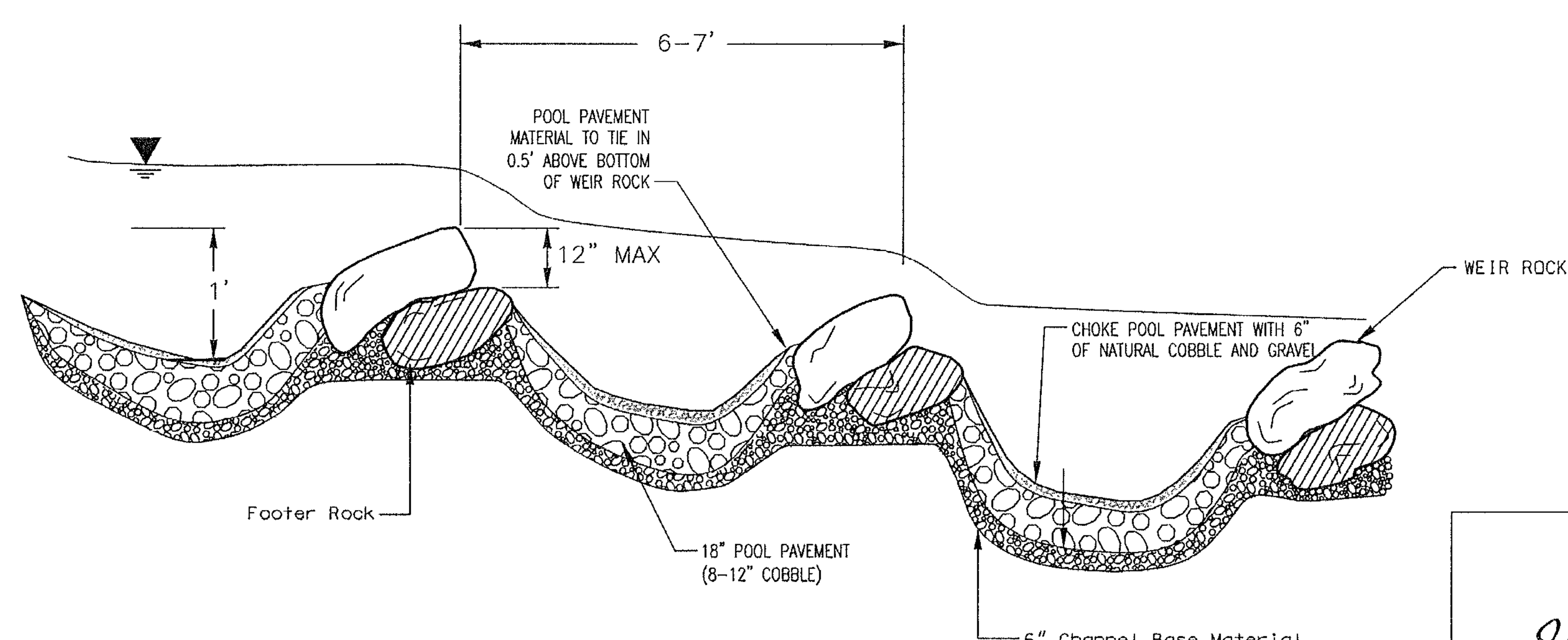
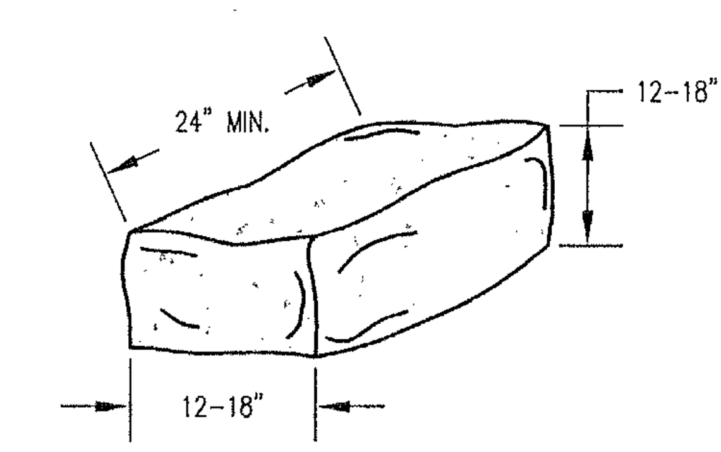


G / SR-3 TYPICAL PROFILE STEP POOL NTS



I / SR-3 TYPICAL FOOTER/WEIR ROCK STEP POOL NTS

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10/30/14		10/24/14	
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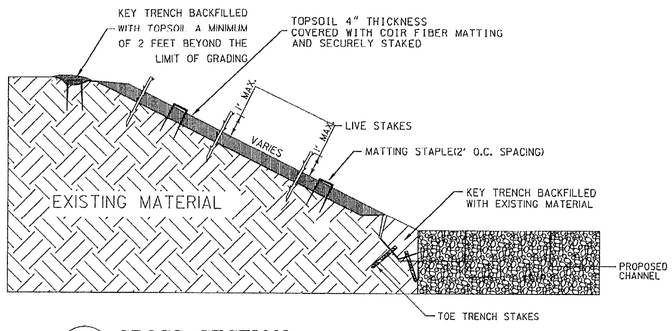
TYPICAL CHANNEL DETAILS

Drawing No.

SR-5

Scale: NTS	
Date: 3/13/14	Sheet 5 of 8
Des: RCS	Drawn: ASH / Check: RCS



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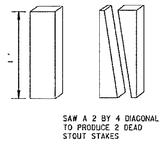
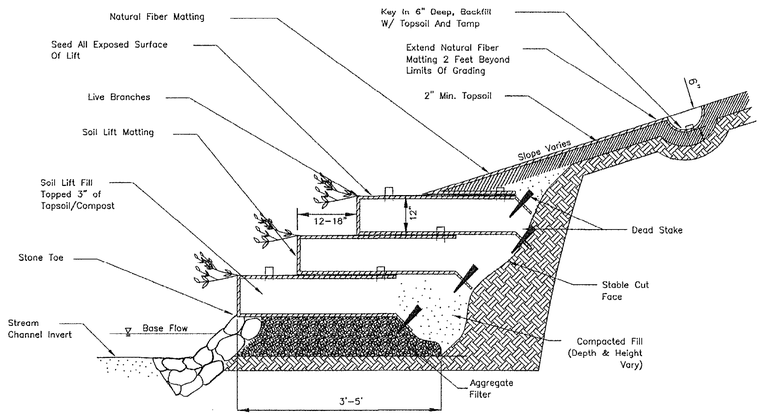
COIR FIBER MATTING W/LIVE STAKES NTS



J / SR-6 TYPICAL
DEAD STAKE DETAIL NTS



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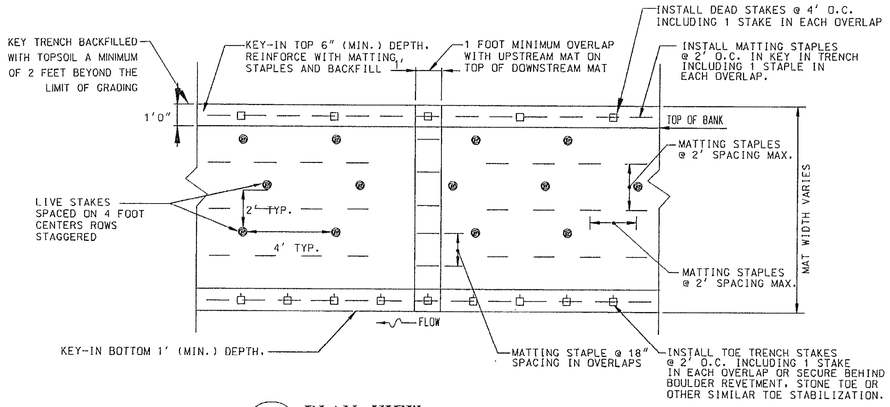
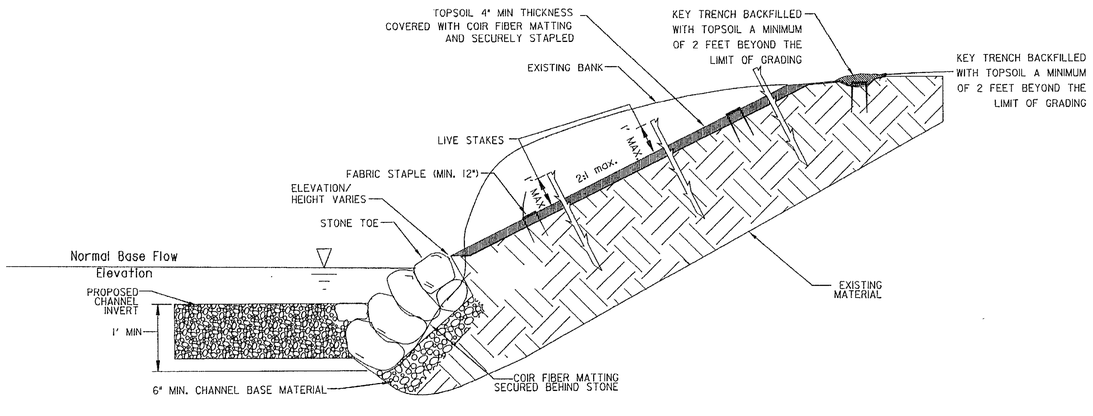
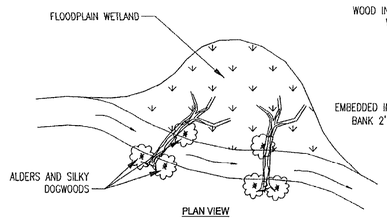
STONE TOE WITH LIVE SOIL LIFTS NTS



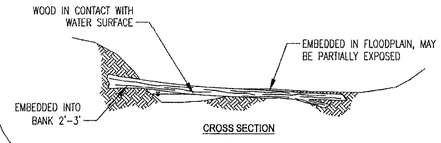
L / SR-3 PLAN VIEW
COIR FIBER MATTING DETAIL NTS



0 / SR-3 CROSS SECTION - STONE TOE WITH
COIR FIBER MATTING AND LIVE STAKES NTS



PLAN VIEW



CROSS SECTION

NOTES:
1. LARGE WOODY MATERIAL TO BE SALVAGED FROM ON SITE
2. INSTALL AS DIRECTED BY ENGINEER
3. WOODY MATERIAL TO BE LESS THAN 10" DIAMETER
4. WOODY MATERIAL SHALL NOT BLOCK ENTIRE CHANNEL
5. PLANT ALDERS AND SILKY DOGWOODS ADJACENT TO WOODY MATERIAL IN BANKS DISTURBED BY INSTALLATION OF WOODY MATERIAL.

M / SR-3 LARGE WOODY MATERIAL DETAIL
NTS

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND.

DIRECTOR OF PUBLIC WORKS	10/30/14 DATE	CHIEF, BUREAU OF ENGINEERING	10/24/14 DATE
CHIEF, BUREAU OF HIGHWAYS	10-30-2014 DATE	CHIEF, TRANSPORTATION AND SPECIAL PROJECTS DIVISION	10/21/14 DATE

REVISIONS

DEPARTMENT OF PUBLIC WORKS
9250 BENDIX ROAD
ELLICOTT CITY, MD 21043

KEY PLAN

GRAPHIC SCALES

SIGNATURE

STATE OF MARYLAND · RAGHU B. HOSKERE · 40896 · PROFESSIONAL ENGINEER
10-2-14

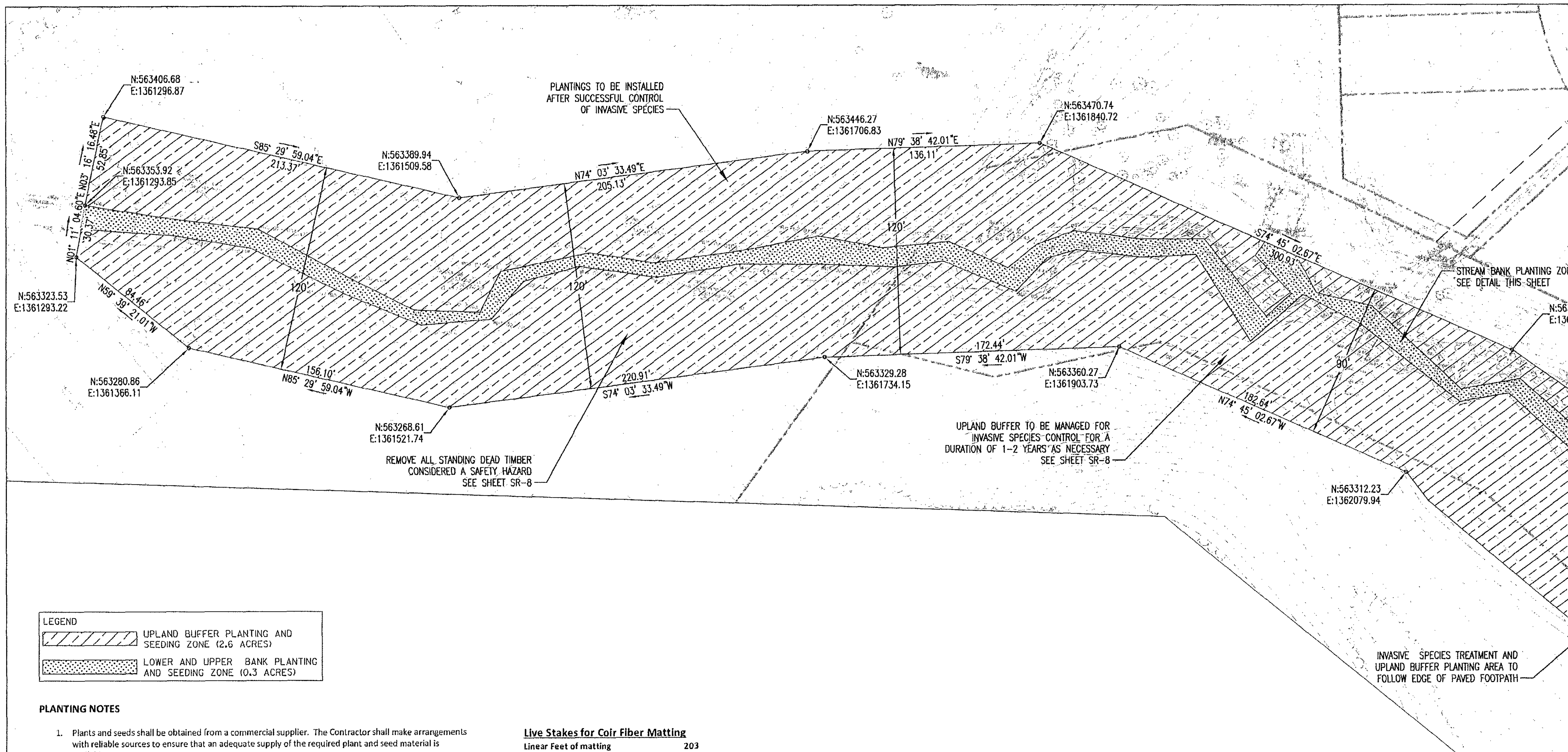
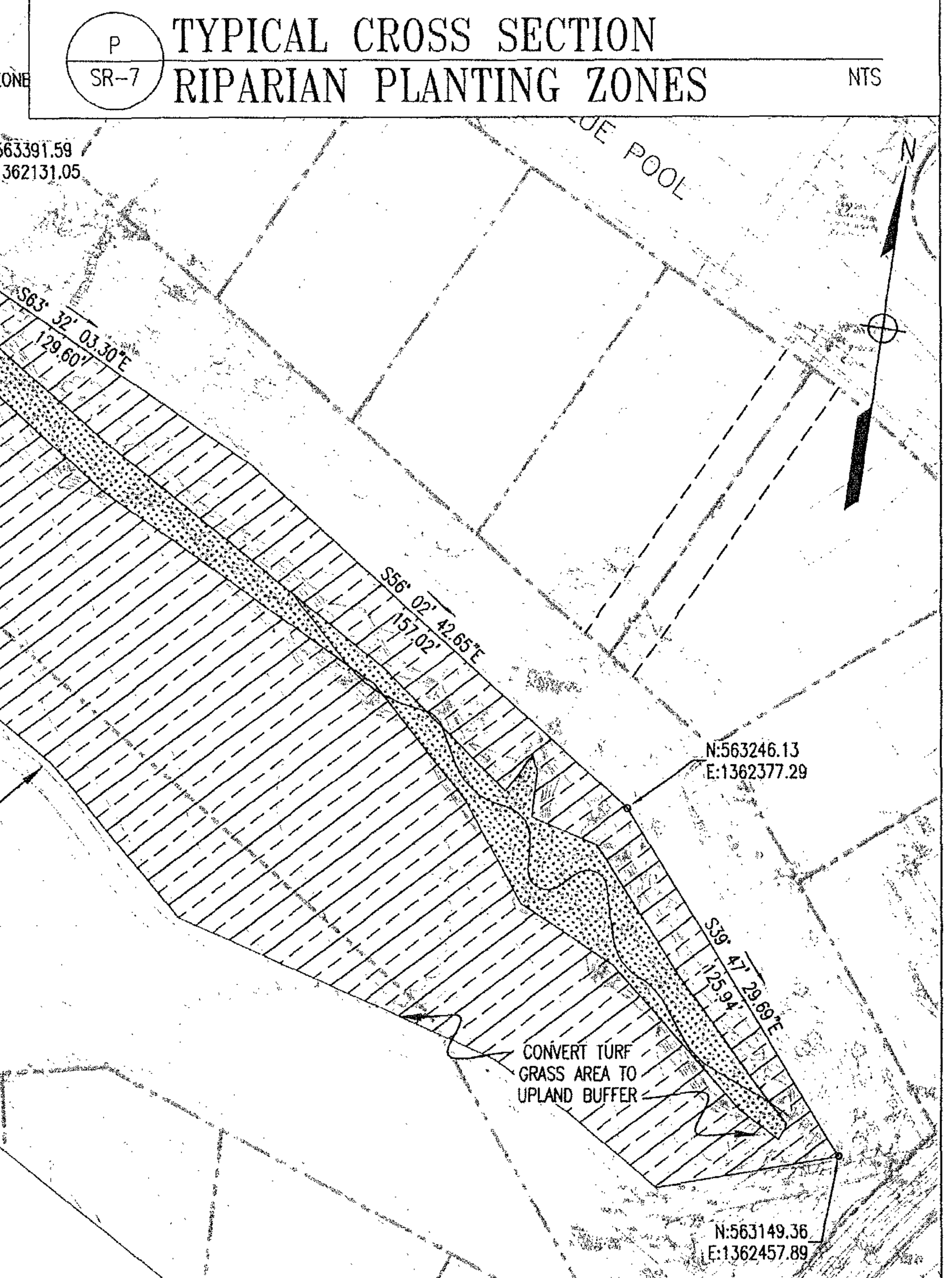
PROFESSIONAL CERTIFICATION.
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 40896
EXPIRATION DATE: 8/12/2015

WHITMAN, REQUARDT & ASSOCIATES, LLP
9030 Stony Point Parkway, Suite 220, Richmond, VA 23235

TYPICAL STREAM BANK DETAILS

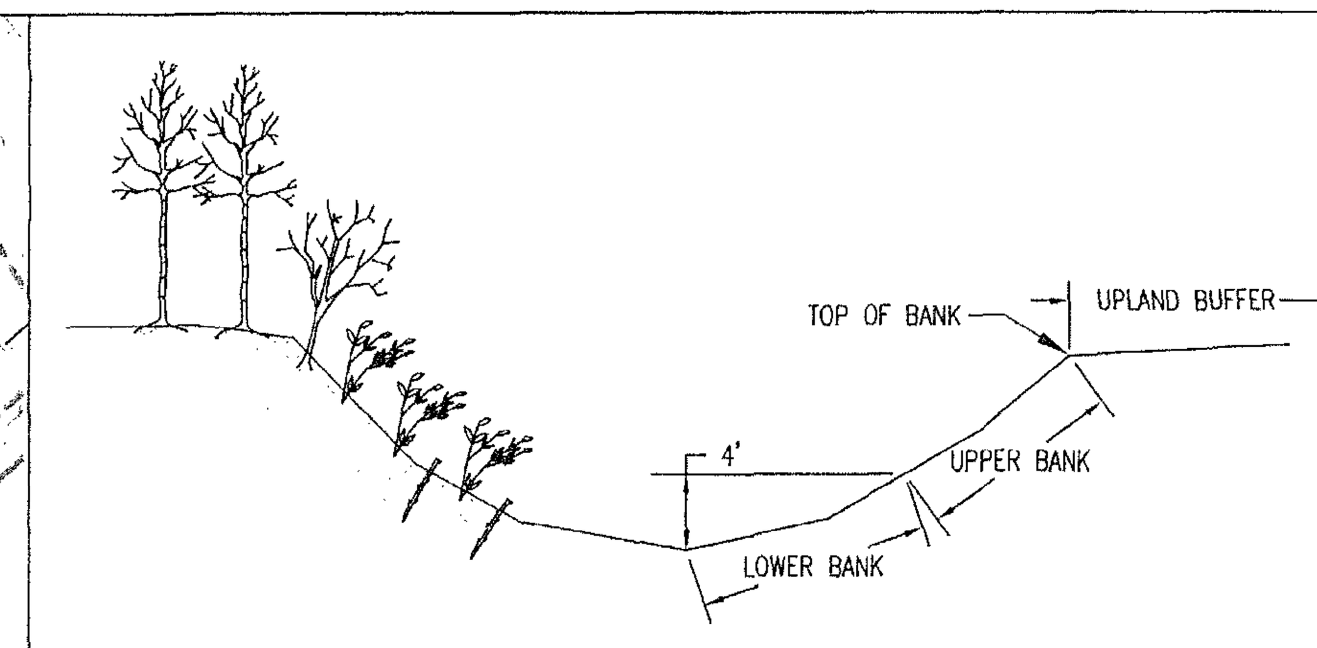
Drawing No.
SR-6

Scale: NTS		
Date: 3/13/14	Sheet 6 of 8	
Des: RCS	Drawn: ASH	Check: RCS

LEGEND

(hatched)	UPLAND BUFFER PLANTING AND SEEDING ZONE (2.6 ACRES)
(stippled)	LOWER AND UPPER BANK PLANTING AND SEEDING ZONE (0.3 ACRES)



P SR-7 TYPICAL CROSS SECTION RIPARIAN PLANTING ZONES NTS

PLANTING NOTES

1. Plants and seeds shall be obtained from a commercial supplier. The Contractor shall make arrangements with reliable sources to ensure that an adequate supply of the required plant and seed material is available.
2. In the event that a seed specified is not commercially available, the Contractor may request a substitution in writing. All requests for substitutions shall be made at least 2 months prior to seeding and be approved by the Engineer.
3. All plant material received from commercial suppliers shall conform to the current issue of the American Standard for Nursery Stock, published by the American Association of Nurserymen.
4. Requests for plant material substitution must be submitted in writing at least two months prior to planting, and the substitution must be approved by the Engineer.
5. The Contractor is responsible for installing all plant material in the appropriate season for each plant type. The planting season for container trees and shrubs shall be from October 28 through December 30 and February 1 through March 30. For all bioengineering materials (i.e. live stakes, whips) installation shall be in the dormant season, October 28 through March 30.
6. All plant material shall be uniformly shaped and have a vigorous root system. The plant material shall be healthy, vigorous, and free from defects, decay, abrasions of the bark, plant diseases, insect pest eggs, and all forms of infestations. The plant material must be fresh and free from transplant shock or visible wilt. Unhealthy plant stock and plants from cold storage are unacceptable and will be rejected.
7. All container grown stock shall have been propagated in a container long enough for the roots to have developed sufficiently to hold its soil when removed from the container. Container stock with poorly developed roots is unacceptable and will be rejected.
8. No seeding shall occur when the soil is frozen or flooded. No fescue shall be used on site.
9. The Contractor shall notify the Environmental Engineer a minimum of 48 hours prior to commencing planting or seeding operations.
10. The final location and orientation of all plant material, as well as the location of all planting zones, will be subject to the approval of the Engineer. The Contractor will be responsible for replanting or reseeding any plant material installed without the approval of the Engineer.
11. Each containerized plant shall be fertilized with 20-10-5 controlled-release tablets. Formulations vary considerably by manufacturer, and other formulations are acceptable, provided the tablets are not readily water-soluble. The tablets shall be buried within the planting pit near the plant's root system. Plant stock shall be fertilized at the following rates:

Stock	No. of Tablets
< 24"	1
2-3'	3
4-6'	4

12. During planting the Contractor shall water each plant with the following minimum quantities of water, unless otherwise directed by the Engineer:

Trees	1 gallon per plant
Shrubs	1 gallon per plant
Tubling	1 quart per plant

SEEDING NOTES:

1. **Bank Stabilization Seeding**: All bank stabilization, such as stone toe and live soil lifts, shall be seeded with Ernst Conservation Seed Mix – Native Right-of-Way Woods Mix with Annual Ryegrass (ERNMX-132-1), or approved equal. Seed mix shall be installed under coir fiber matting at a rate of 2 pound per 1,000 sf.
2. **Upland Buffer and Bank Planting Zone Seeding**: After all invasive species control efforts have been completed, the area impacted by herbicide spraying shall be seeded with Ernst Conservation Seed Mix – Maryland Lower Midland Riparian Mix (ERNMX-772), or approved equal. Seed mix shall be installed at a rate of 15 pounds per acre.
3. **Woody Material Installation**: Any soils disturbed during the installation of woody material in upper reaches of the stream channel shall be seeded with Chewings Fescue (*Festuca rubra ssp commutate*), at a rate of 2 pounds per 1,000 sf. Chewings Fescue is a native grass common to Maryland riparian zones.

Live Stakes for Coir Fiber Matting

Linear Feet of matting 203
No. per Linear Foot 1
Total Live Branches 203

Scientific Name	Common Name	Indicator Status	Size	Stock	%	Quantity
Cornus amomum	Silky Dogwood	FACW	24"-36"	Live Stakes	100%	203
					100%	**203**

Live Branches for Live Soil Lifts

Linear Foot of Lifts 199
No. per Linear Foot 3
Total Live Branches 597

Scientific Name	Common Name	Indicator Status	Size	Stock	%	Quantity
Cornus amomum	Silky Dogwood	FACW	36-48"	Live Whips	100%	597
					100%	**597**

Lower Bank Planting Zone (Approximately 1 every foot of bank)

Linear Feet 2660
Plants per linear foot 1
Total Plants 2,660

Scientific Name	Common Name	Indicator Status	Size	Stock	%	Quantity
Alnus serrlata	Smooth alder	FACW	8-16"	Tublings	15%	399
Betula nigra	River birch	FACW	8-16"	Tublings	15%	399
C. occidentalis	Button Bush	OBL	2-3'	Live stakes	10%	266
Cornus amonum	Silky Dogwood	FAC	2-3'	Live stakes	20%	532
Lindera benzoin	Spicebush	FACW-	8-16"	Tublings	20%	532
Sambrucus canadensis	Elderberry	FACW	8-16"	Tublings	10%	266
Viburnum dentatum	Arrowwood	FAC	8-16"	Tubling	10%	266
TOTAL					**100%**	**2,660**

Upper Bank Planting Zone (Approximately 1 every 5 feet of bank)

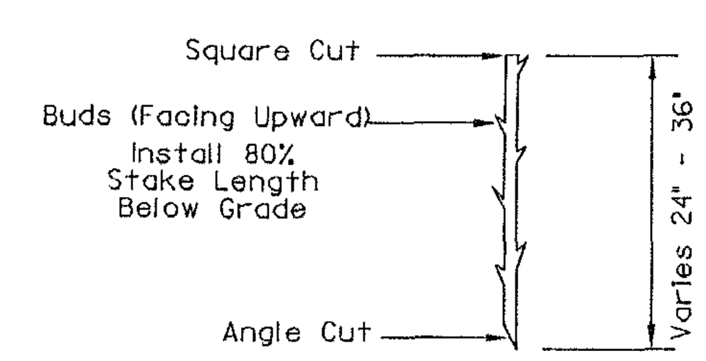
Linear Feet 2660
Plants per linear foot 0.2
Total Plants 536

Scientific Name	Common Name	Indicator Status	Size	Stock	%	Quantity
Acer rubrum	Red Maple	FAC	4-6'	Container	35%	187
Carpinus caroliniana	American Hornbeam	FAC	4-6'	Container	10%	54
Cercis canadensis	Redbud	FACU	3-4'	Container	10%	54
Platanus occidentalis	Sycamore	FACW	4-6'	Container	25%	133
Sassafras albidum	Sassafras	FAC	4-6'	Container	10%	54
Viburnum dentatum	Arrowwood	FAC	3-4'	Container	10%	54
TOTAL					**100%**	**536**

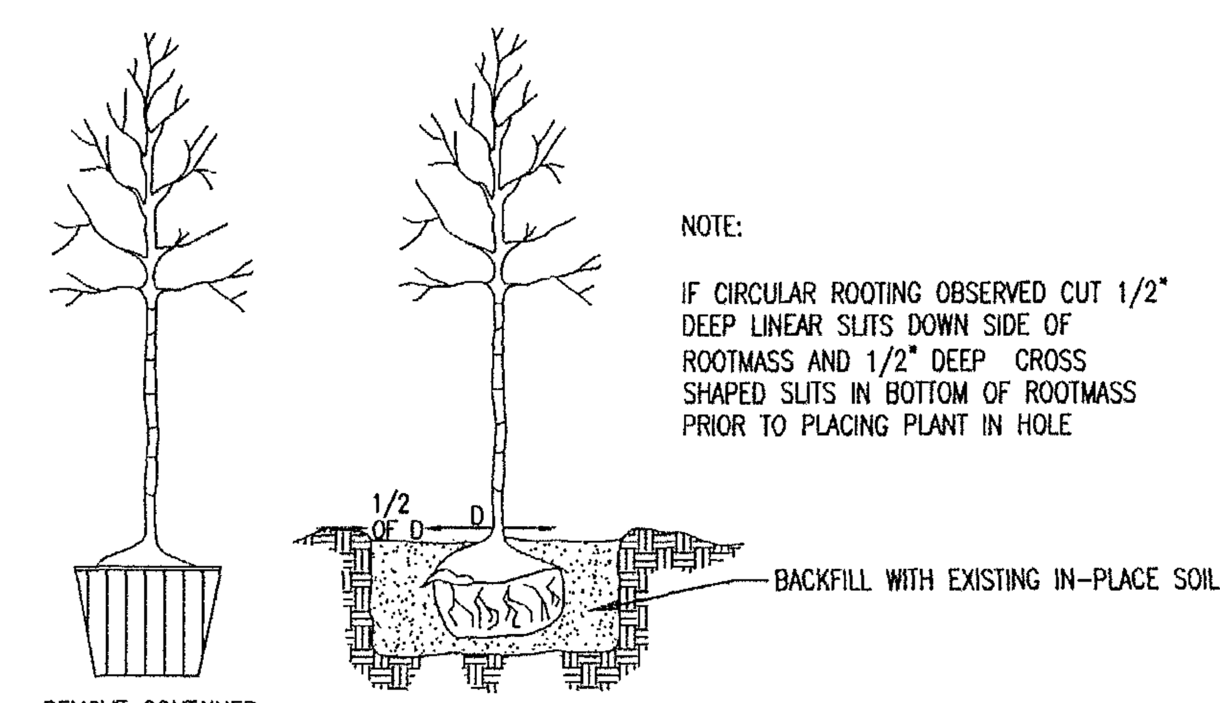
Upland Buffer Planting Zone (approx. 12' On Center)

Acres 2.63
Plants per Acre 350
Total Plants 927

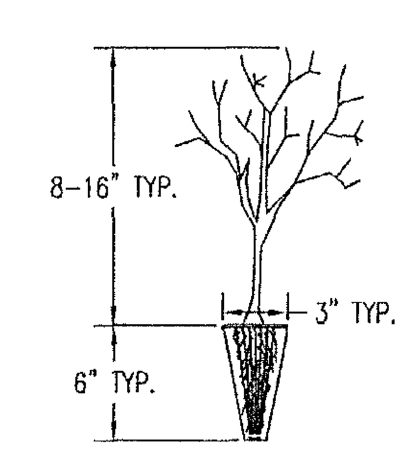
Scientific Name	Common Name	Indicator Status	Size	Stock	%	Quantity
Carya sp	Hickory sp.	FACU	4-6'	Container	25%	231
Fagus grandifolia	American Beech	FACU	4-6'	Container	5%	47
Liriodendron tulipifera	Tulip Popular	FACU	4-6'	Container	35%	323
Nyssa sylvatica	Blackgum	FAC	4-6'	Container	10%	93
Quercus alba	White Oak	FACU	4-6'	Container	10%	93
Quercus rubra	Northern Red Oak	FACU	4-6'	Container	5%	47
Viburnum prunifolium	Blackhaw Viburum	FACU	4-6'	Container	10%	93
					100%	**927**



Q SR-7 TYPICAL LIVE STAKE DETAIL NTS



R SR-7 TREE AND SHRUB PLANTING CONTAINER DETAIL NTS



NOTES:

1. PLANT AT THE SAME DEPTH AS WHEN PREVIOUSLY GROWN.
2. BACKFILL WITH EXISTING IN-PLACE SOIL.

S SR-7 SHRUB TUBELING/SEEDLING DETAIL NTS

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND.

[signature] DIRECTOR OF PUBLIC WORKS	10/30/14 DATE	[signature] CHIEF, BUREAU OF ENGINEERING	10/24/14 DATE
[signature] CHIEF, BUREAU OF HIGHWAYS	10-30-2014 DATE	Steve Shaver CHIEF, TRANSPORTATION AND SPECIAL PROJECTS DIVISION	10/21/14 DATE

REVISIONS

DEPARTMENT OF PUBLIC WORKS
9250 BENDIX ROAD
ELLICOTT CITY, MD 21043

KEY PLAN

GRAPHIC SCALES

40 20 0 40 80

SCALE: 1" = 40'

SIGNATURE

[seal] [signature] 10-2-14

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. 40896 EXPIRATION DATE: 8/12/2015

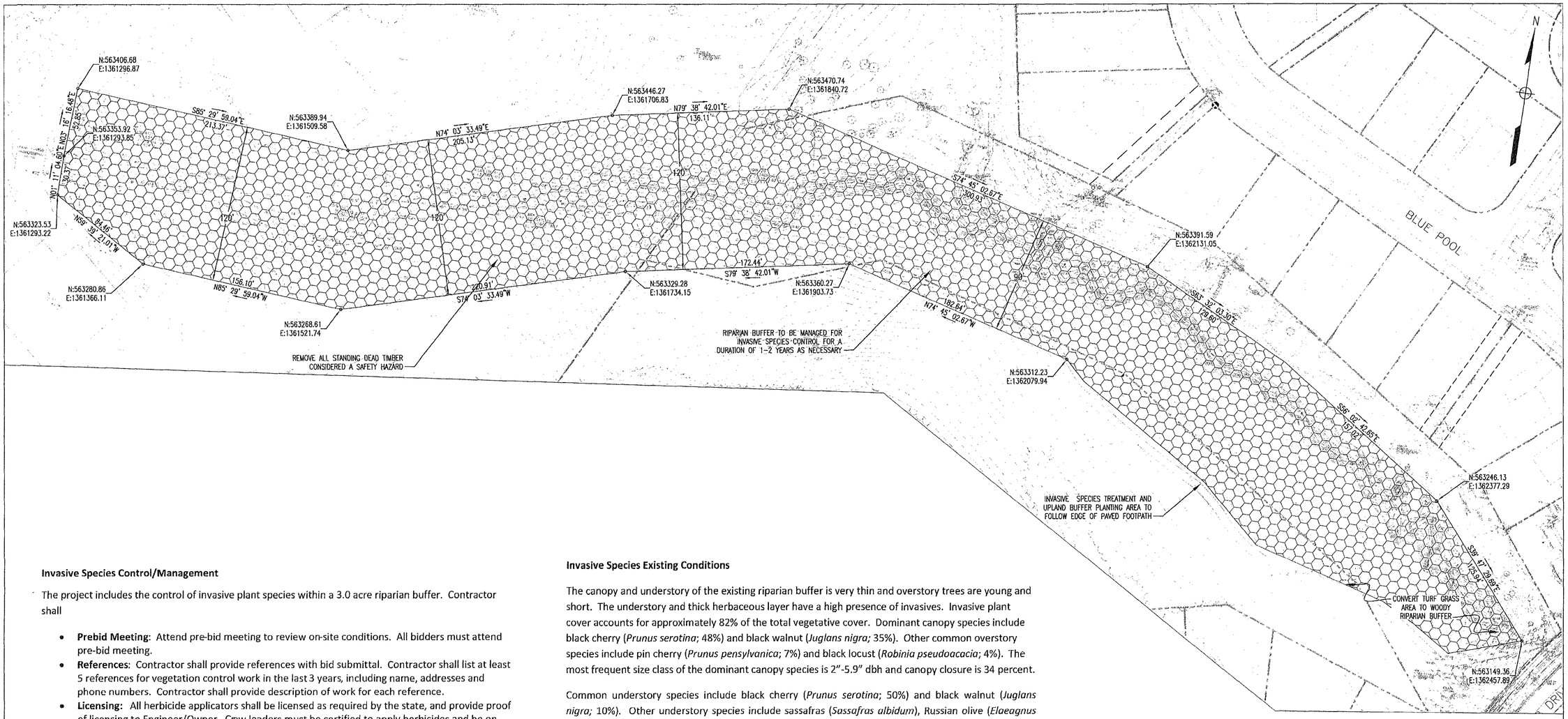
WR&A
WHITMAN, REQUARDT & ASSOCIATES, LLP
9030 Stony Point Parkway, Suite 220, Richmond, VA 23235

PLANTING PLAN, NOTES, AND DETAILS

Drawing No.

SR-7

Scale: 1"=40'		
Date: 3/13/14	Sheet 7 of 8	
Des: RCS	Drawn: ASH	Check: RCS



Invasive Species Control/Management

The project includes the control of invasive plant species within a 3.0 acre riparian buffer. Contractor shall

- **Prebid Meeting**: Attend pre-bid meeting to review on-site conditions. All bidders must attend pre-bid meeting.
- **References**: Contractor shall provide references with bid submittal. Contractor shall list at least 5 references for vegetation control work in the last 3 years, including name, addresses and phone numbers. Contractor shall provide description of work for each reference.
- **Licensing:** All herbicide applicators shall be licensed as required by the state, and provide proof of licensing to Engineer/Owner. Crew leaders must be certified to apply herbicides and be on-site at all times. Documentation of licenses and certifications must be provide with bid.
- **Invasive Species Control Plan**: Contractor shall prepare an Invasive Species Management Plan and submit with Contract Bid. This plan must contain the following information:
  - The species of invasive plants that are addressed in the plan
  - The proposed method of control – mechanical and/or chemical for each species.
  - Method of control must include time of year requirements, name of herbicides to be used, all dyes, or surfactants to be used. If mechanical removal, Contractor must specify the equipment required, and how plant material will be disposed.
  - Potential impacts on non-target plant and animals.
  - Anticipated % control of target species
- **Herbicide Use**: All use of herbicides shall be in accordance with EPA regulations and all applicable state requirements. Any herbicide used along the stream banks must be labeled and approved by EPA for use along water and wetlands.
- **Local Permits**: Contractor is required to obtain any required permits from the County / Park Authority prior to the use of herbicides. Contractor is responsible for coordinating methods of control, safety requirements, time of day limits, and other requirements that the Park Authority may deem necessary.
- **Contract Duration**: The duration of this contract shall be two years, including two full growing season.
- **Performance Guarantee**: The Contractor shall achieve a minimum of 85% control of the taget species at the end of the contract duration.
- **Target Species**:
  - Russian olive (*Elaeagnus angustifolia*)
  - multiflora rose (*Rosa multiflora*)
  - Japanese honeysuckle (*Lonicera japonica*)
  - garlic mustard (*Alliaria petiolata*),
  - mile-a-minute (*Persicaria perfoliata*)
  - Japanese stiltgrass (*Eulalia viminea*),
- **Non-Target Damage**: Limited damage to native herbaceous vegetation within the buffer zone is acceptable.
- **Application Log**: Contractor must maintain a log of all activities, including types of herbicides and amounts applied. Contractor must provide copies of logs to Engineer on a monthly basis.

Invasive Species Existing Conditions

The canopy and understory of the existing riparian buffer is very thin and overstory trees are young and short. The understory and thick herbaceous layer have a high presence of invasives. Invasive plant cover accounts for approximately 82% of the total vegetative cover. Dominant canopy species include black cherry (*Prunus serotina;* 48%) and black walnut (*Juglans nigra;* 35%). Other common overstory species include pin cherry (*Prunus pensylvanica*; 7%) and black locust (*Robinia pseudoacacia*; 4%). The most frequent size class of the dominant canopy species is 2"-5.9" dbh and canopy closure is 34 percent.

Common understory species include black cherry (*Prunus serotina*; 50%) and black walnut (*Juglans nigra;* 10%). Other understory species include sassafras (*Sassafras albidum*), Russian olive (*Elaeagnus angustifolia*), persimmon (*Diospyros virginiana*), dogwood (*Cornus sp.*), multiflora rose (*Rosa multiflora*), and grapevine (*Vitis sp.*). Common herbaceous species include Japanese honeysuckle (*Lonicera japonica*), garlic mustard (*Alliaria petiolata*), field garlic (*Allium vineale*), northern red oak (*Quercus rubra*), mile-a-minute (*Persicaria perfoliata*), ladysthumb (*Polygonum cespitosum*), multiflora rose (*Rosa multiflora*), cowcress (*Lepidium campestre*), poison ivy (*Toxicodendron radicans*), Japanese stiltgrass (*Eulalia viminea*), and raspberry (*Rubus sp.*). Herbaceous cover is 97 percent.

The riparian buffer, particularly in the upper portion of this reach, lacks tree canopy and there is a large number of standing dead trees. The stream bank is mostly covered with multi-floral rose and herbaceous vegetation, with very little woody vegetation. Wetland seeps along the channel do support sedges and ferns typical of headwater seep wetlands.

Removal of Dead Standing Trees

The buffer along this stream has a significant number of standing dead trees. Any tree deemed a safety hazard to the public or to the crews responsible for planting and managing the riparian buffer shall be taken down. All removals shall be coordinated with the Park.

- Contractor shall mark /flag each tree to be removed, and have them reviewed and approved by Engineer or Park Authority.
- Contractor is responsible for coordinating method of removal, safety requirements, time of day limits, and other requirements that the Park Authority may deem necessary.
- Woody material that is not used in the restoration of the site can be chipped and distributed in a natural manor throughout the buffer.

DEPARTMENT OF PUBLIC WORKS
HOWARD COUNTY, MARYLAND.

DIRECTOR OF PUBLIC WORKS	10/30/14 DATE	CHIEF, BUREAU OF ENGINEERING	10/24/14 DATE
CHIEF, BUREAU OF HIGHWAYS	10/30/2014 DATE	CHIEF, TRANSPORTATION AND SPECIAL PROJECTS DIVISION	10/21/14 DATE

REVISIONS

DEPARTMENT OF PUBLIC WORKS
9250 BENDIX ROAD
ELLICOTT CITY, MD 21043

KEY PLAN

GRAPHIC SCALES

40 20 0 40 80
SCALE: 1" = 40'

SIGNATURE

STATE OF MARYLAND · STEVEN E. HOPKINS · 40896 · PROFESSIONAL ENGINEER
10-2-14

PROFESSIONAL CERTIFICATION.
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EXPIRATION DATE: 8/12/2015

WHITMAN, REQUARDT & ASSOCIATES, LLP
9030 Stony Point Parkway, Suite 220, Richmond, VA 23235

INVASIVE SPECIES CONTROL

Drawing No.

SR-8

Scale: 1"=40'		
Date: 3/13/14	Sheet 8 of 8	
Des: RCS	Drawn: ASH	Check: RCS