



January 7, 2018

Mr. Edmond Miller
New River Light and Power
146 Faculty Street Ext
Boone, NC 28607

RE: Payne Branch Dam – Middle Fork of the New River Restoration Project Update

Mr. Miller,

We have the 60% stream restoration design plans ready for permit submittal (attached). With 2 of the 3 applicable land owners having signed Agent Authorization forms, we are now working with the private landowner downstream of the dam to get his AA signed, we are then ready to submit to the regulatory agencies (USACE, NCDEQ). Furthermore, BFEC is working on the Floodplain Modeling portion of the project (LOMAR/CLOMAR) and adjustment to the hydraulic model in preparation of submittal to NC Emergency Management.

As you know we have submitted a request for an additional \$500,000 from CWMTF and per their Board meeting - have been placed on the provisional list for funding. Meaning, the project was not selected for funding in the near term but is likely to receive funding when State dollars come available prior to June 1, 2019. Once funding is secured, a conservation easement will be required. Therefore, we are proposing a meeting for 9:00 a.m. on January 29th with project stakeholders (ASU, Watauga County, and Blue Ridge Conservancy) in your office. We have been in touch through Adam Williams with Matt Makdad to schedule this meeting.

Sincerely,

Charles Anderson
Project Manager
Resource Institute, Inc.

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Jan 11 2019

PAYNE BRANCH DAM REMOVAL

BLOWING ROCK, WATAUGA COUNTY, NORTH CAROLINA

GENERAL NOTES:

- 1. STREAM ASSESSMENT DATA (LONGITUDINAL PROFILE, CROSS-SECTIONS, ETC.) PRESENTED HEREIN COLLECTED BY BFEC/BFED.
- 2. CONTOUR DATA PRESENTED IN THIS DOCUMENT IS TAKEN FROM NCDOT LIDAR DATA (2' and 10' CONTOURS).
- 3. HORIZONTAL AND VERTICAL GRID CONTROL TIED TO PROJECT BY RICK SNYDER PLS# L-4418.

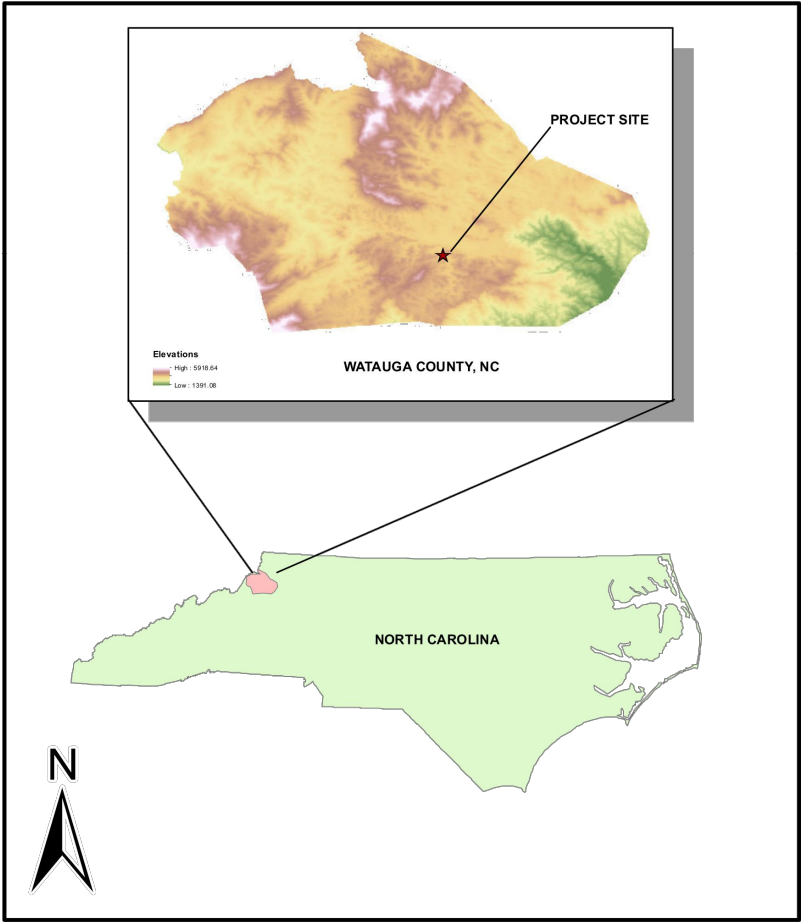
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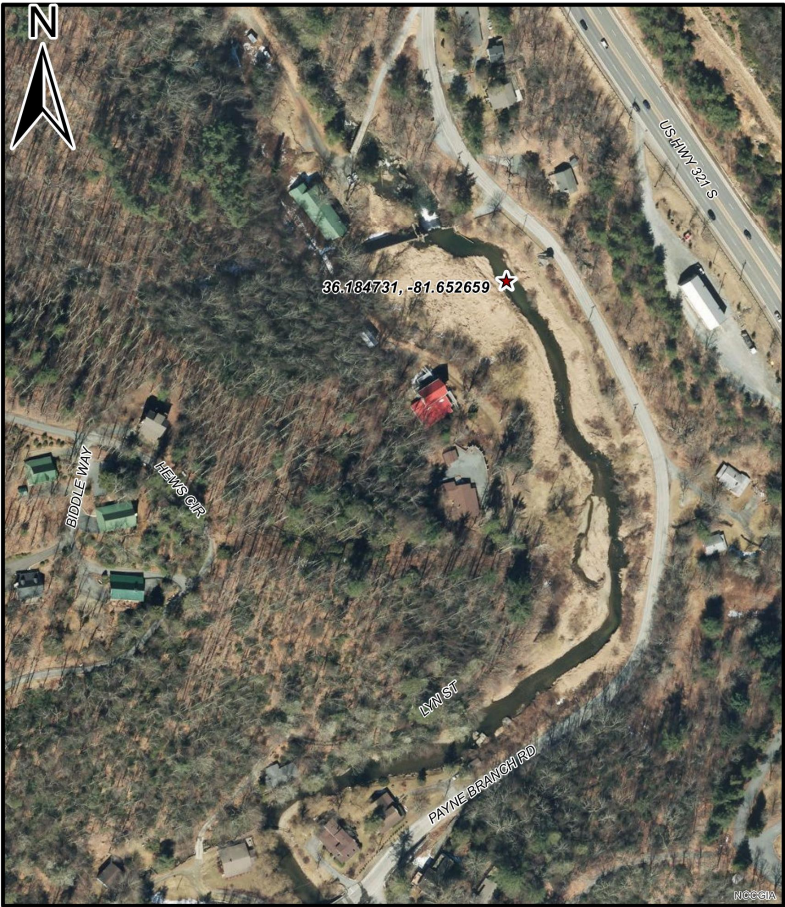
Construction Sequence

- 1. Install erosion and sediment control structures, including construction entrance, staging area, and stream crossing.
- 2. Excavate diversion channel in floodplain west, starting upstream of Impoundment (Project) Reach.
- 3. Remove dam on western side of valley, connect diversion channel to Downstream Reach.
- 4. Turn river into diversion channel, ensure downstream flow.
- 5. Remove dam and upstream retaining wall on eastern side of valley.
- 6. Excavate existing gravel substrate in Impoundment Reach to be used as cascade/riffle substrate in design channel.
- 7. Grade design river channel, bankfull bench, and floodplain west, moving upstream to downstream. Leave dam portion within channel and scour pool just upstream during grading activities to reduce sedimentation.
- 8. Install cascade/riffles and rock vane structures from upstream to downstream. For cascade/riffles, use excavated substrate from original channel combined with larger rock material from off-site to achieve the design median (D50).
- 9. Install stormwater outlet channels (3), moving upstream to downstream.
- 10. Remove dam portion within channel to design elevation after river restoration complete. Add rock along the upstream and downstream dam face for scour protection and to establish a natural step appearance.
- 11. Ensure final dam elevation on western and eastern side of valley are min. 2 ft below design floodplain elevation to ensure vegetation establishment.
- 12. Remove in-stream piers, install wall toe protection within downstream reach.
- 13. Seed/mat riverbanks, seed/straw bankfull bench and floodplain east.
- 14. Turn river flow back into new channel, modify channel and structures as needed to ensure effective flow and function.
- 15. Backfill diversion channel, install vernal pools, seed/straw floodplain west.
- 16. Remove construction entrance, seed/straw all disturbed upland areas.
- 17. Install livestakes and riparian buffer trees and shrubs.

Project Location Map



Project Aerial Map



60% PROGRESS DRAWINGS
DO NOT USE FOR CONSTRUCTION

Cover
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

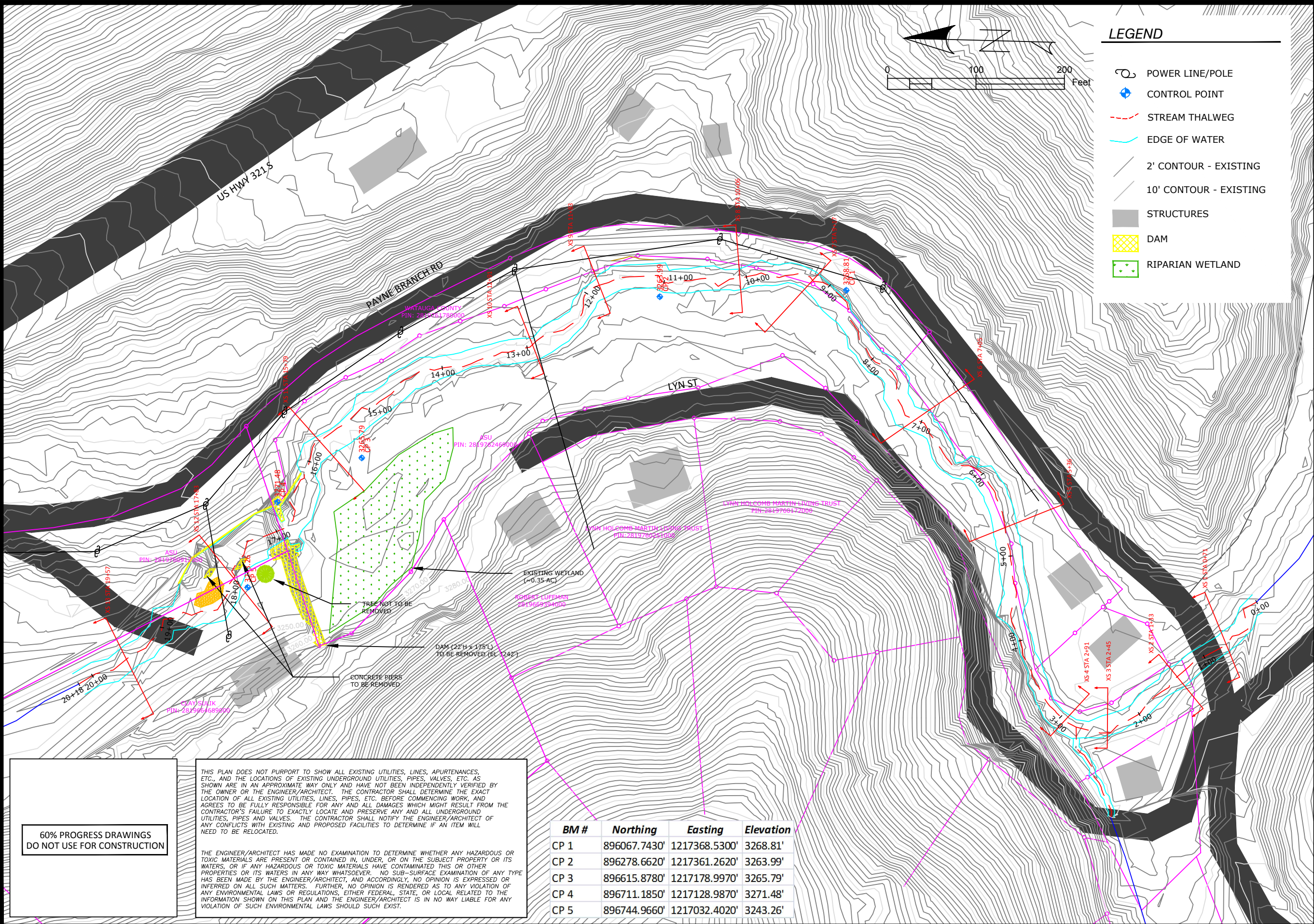
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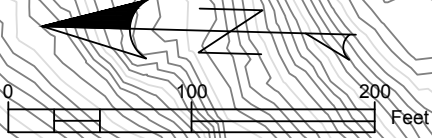
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- LEGEND**
- POWER LINE/POLE
 - CONTROL POINT
 - STREAM THALWEG
 - EDGE OF WATER
 - 2' CONTOUR - EXISTING
 - 10' CONTOUR - EXISTING
 - STRUCTURES
 - DAM
 - RIPARIAN WETLAND



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THIS PLAN DOES NOT PURPORT TO SHOW ALL EXISTING UTILITIES, LINES, APPURTENANCES, ETC., AND THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES, PIPES, VALVES, ETC. AS SHOWN ARE IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR THE ENGINEER/ARCHITECT. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES, LINES, PIPES, ETC. BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT RESULT FROM THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES, PIPES AND VALVES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER/ARCHITECT OF ANY CONFLICTS WITH EXISTING AND PROPOSED FACILITIES TO DETERMINE IF AN ITEM WILL NEED TO BE RELOCATED.

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BM #	Northing	Easting	Elevation
CP 1	896067.7430'	1217368.5300'	3268.81'
CP 2	896278.6620'	1217361.2620'	3263.99'
CP 3	896615.8780'	1217178.9970'	3265.79'
CP 4	896711.1850'	1217128.9870'	3271.48'
CP 5	896744.9660'	1217032.4020'	3243.26'

Overall Site Plan
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

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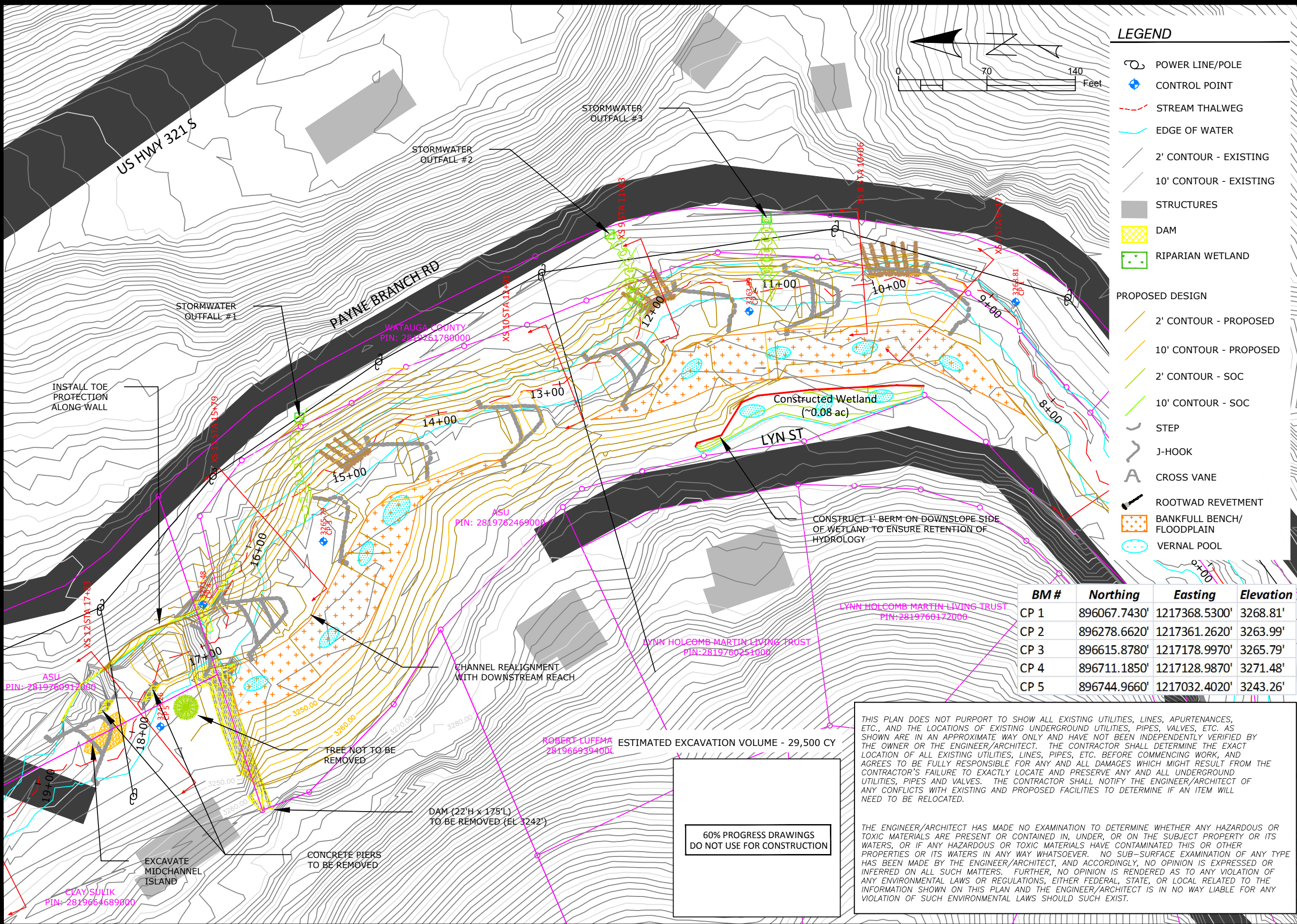


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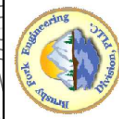
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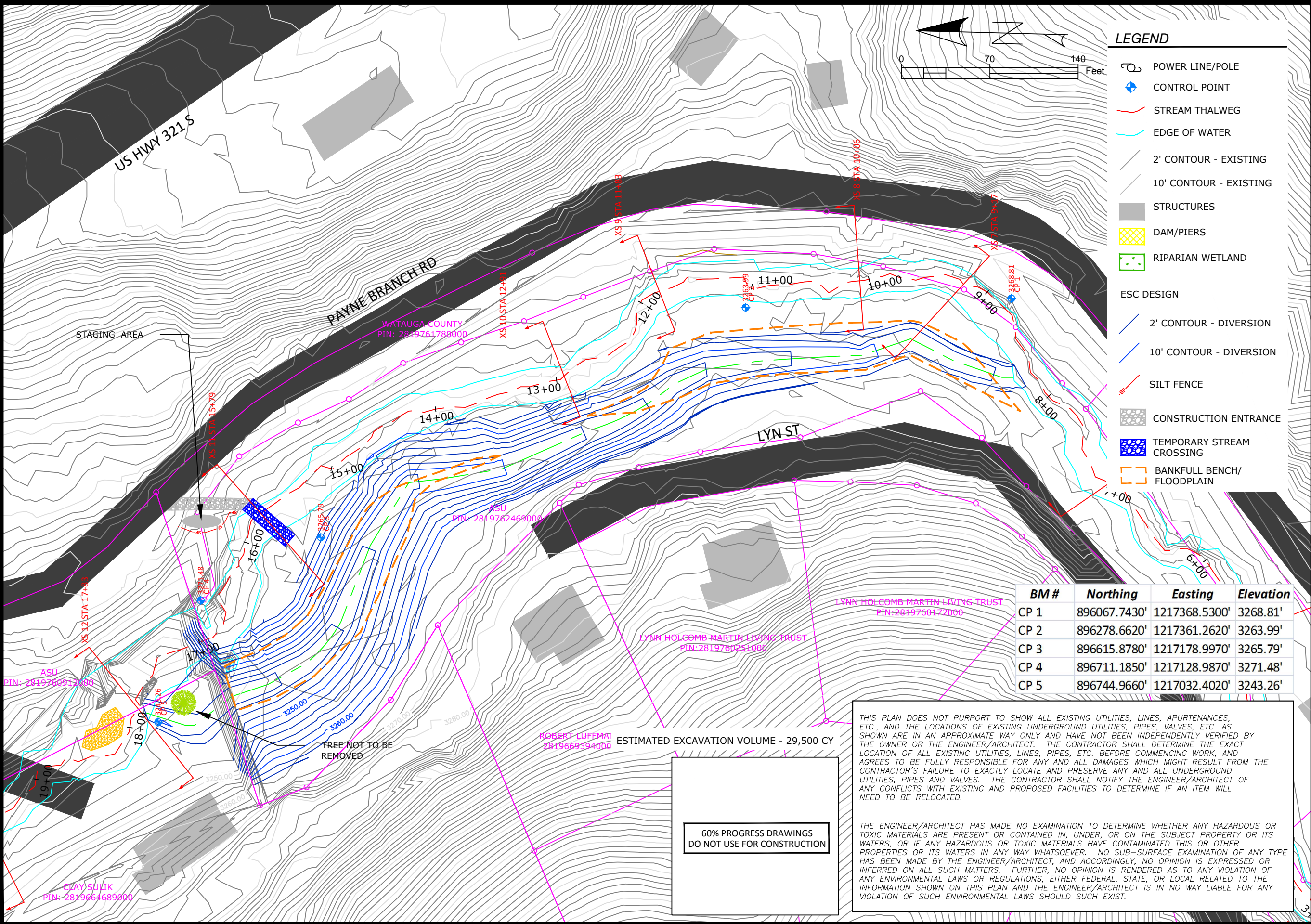


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Grading Site Plan
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina



LEGEND

- POWER LINE/POLE
- CONTROL POINT
- STREAM THALWEG
- EDGE OF WATER
- 2' CONTOUR - EXISTING
- 10' CONTOUR - EXISTING
- STRUCTURES
- DAM/PIERS
- RIPARIAN WETLAND
- ESC DESIGN
 - 2' CONTOUR - DIVERSION
 - 10' CONTOUR - DIVERSION
 - SILT FENCE
 - CONSTRUCTION ENTRANCE
 - TEMPORARY STREAM CROSSING
 - BANKFULL BENCH/ FLOODPLAIN

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ESTIMATED EXCAVATION VOLUME - 29,500 CY

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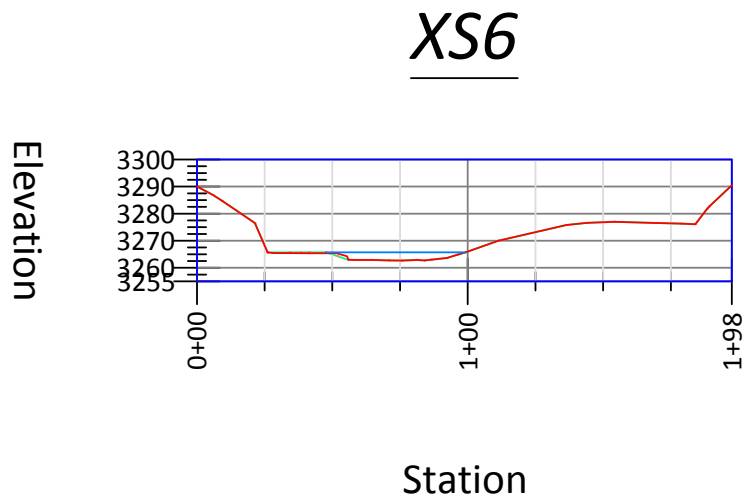
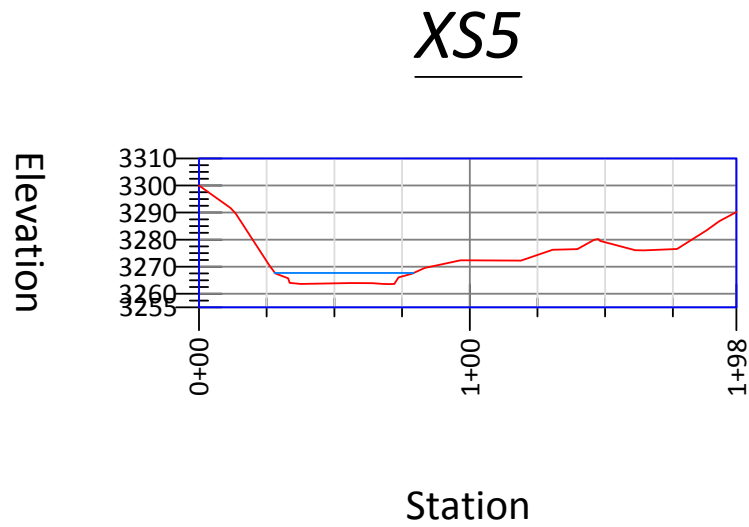
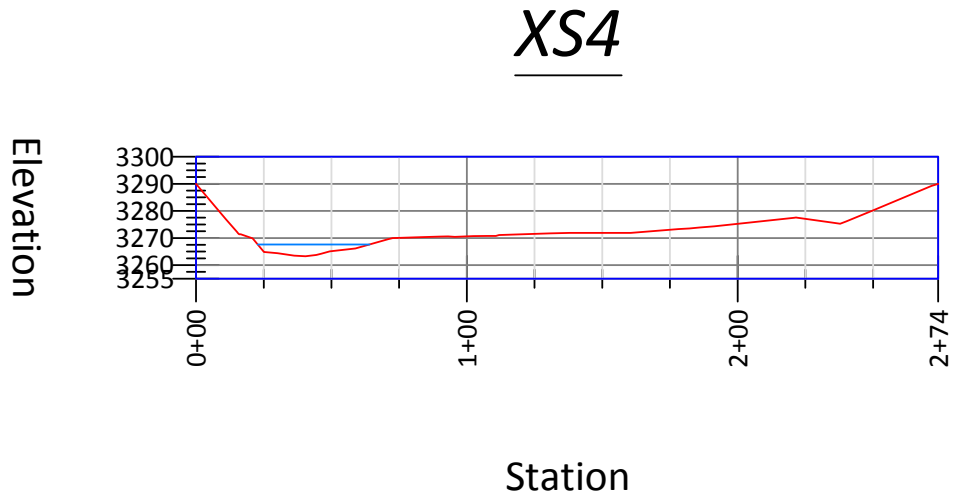
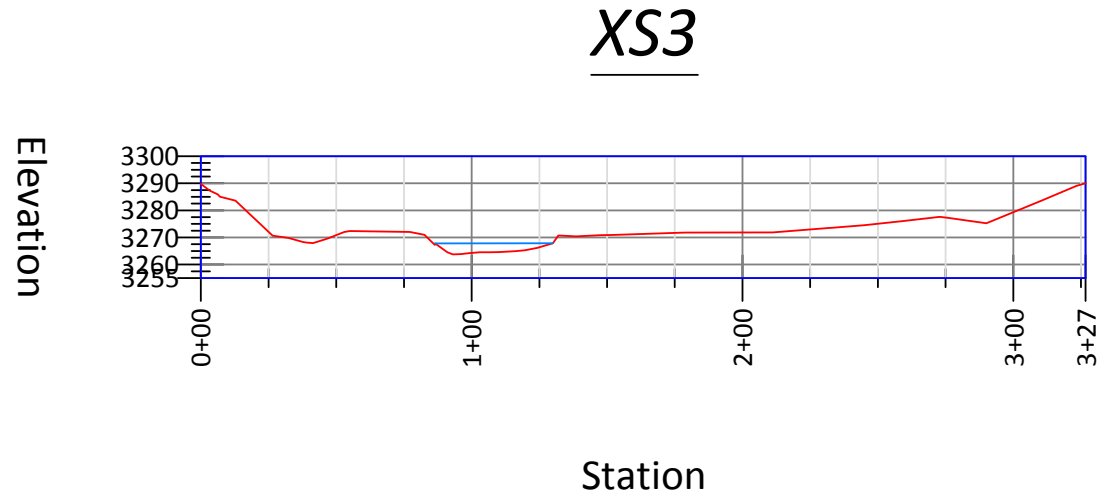
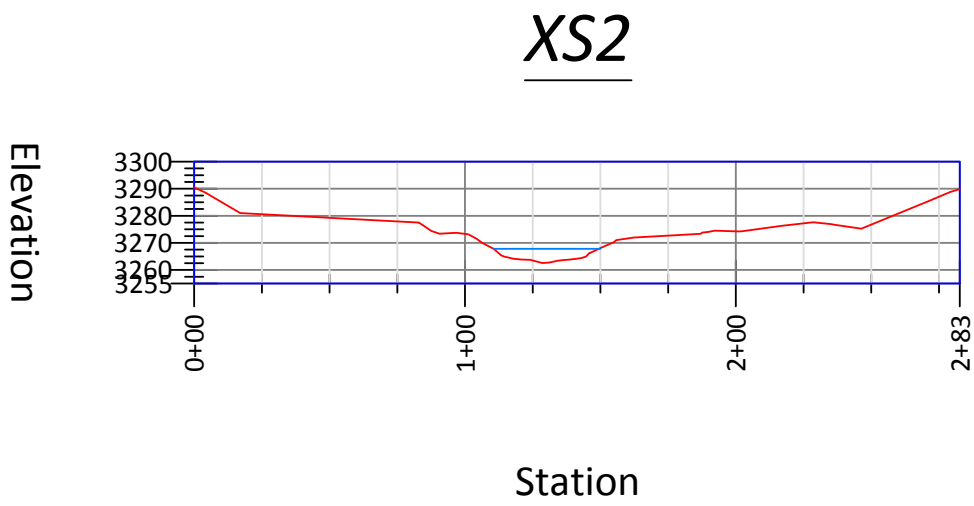
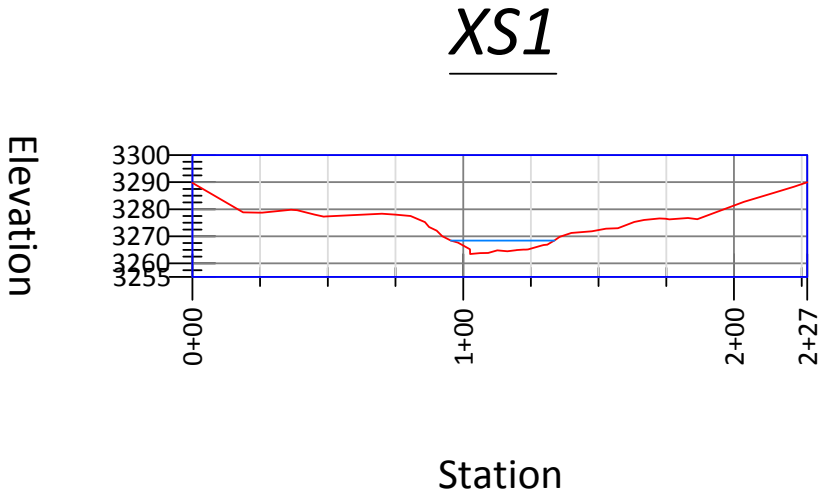
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Erosion and Sediment Control Plan
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

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LEGEND

- EXISTING CONDITION
- PROPOSED CONDITION
- EXISTING/PROPOSED BANKFULL

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Upstream Cross-Sections
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

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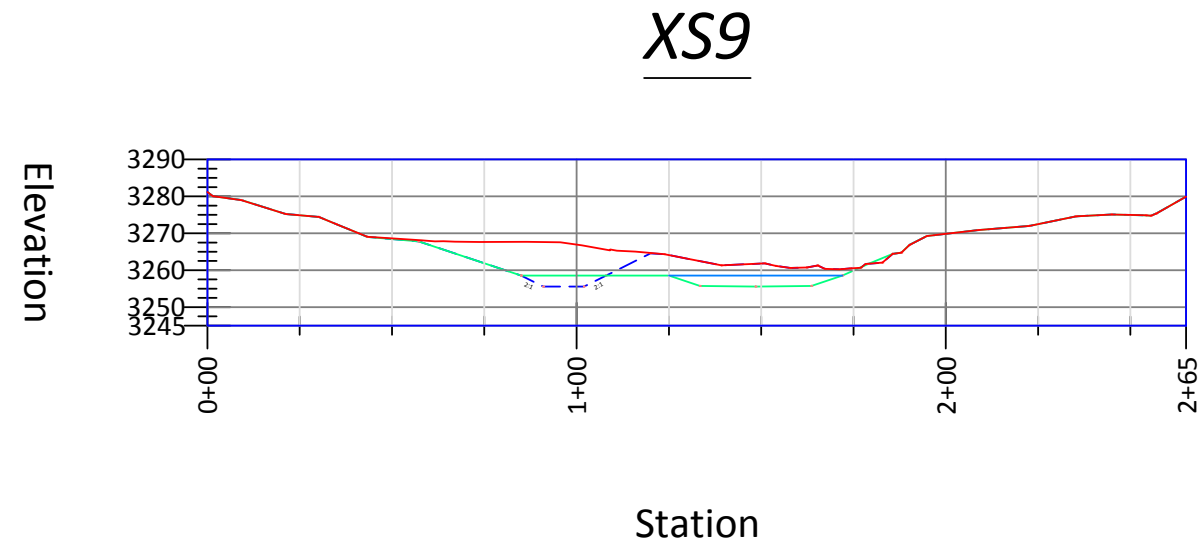
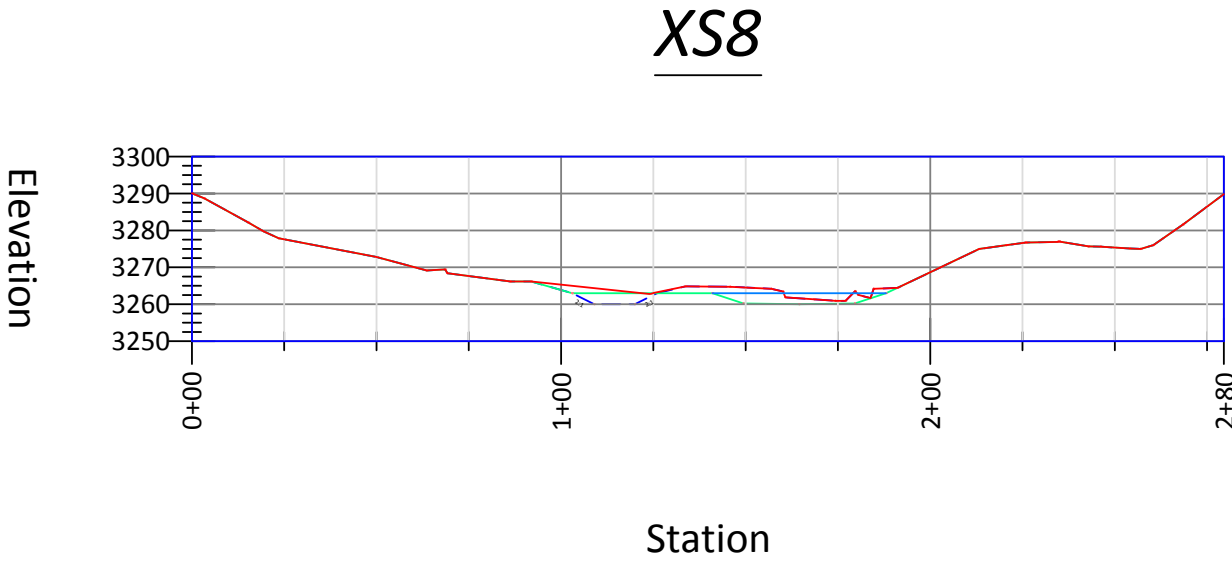
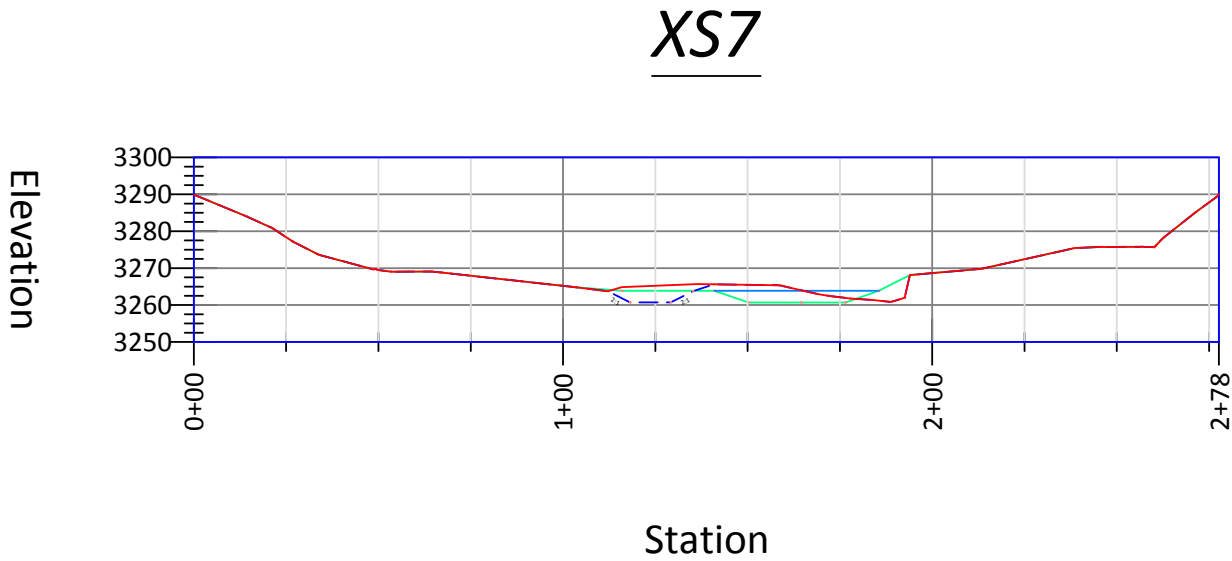


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LEGEND

- EXISTING CONDITION
- PROPOSED CONDITION
- PROPOSED BANKFULL
- PROPOSED DIVERSION CHANNEL

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Impoundment Cross-Sections
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

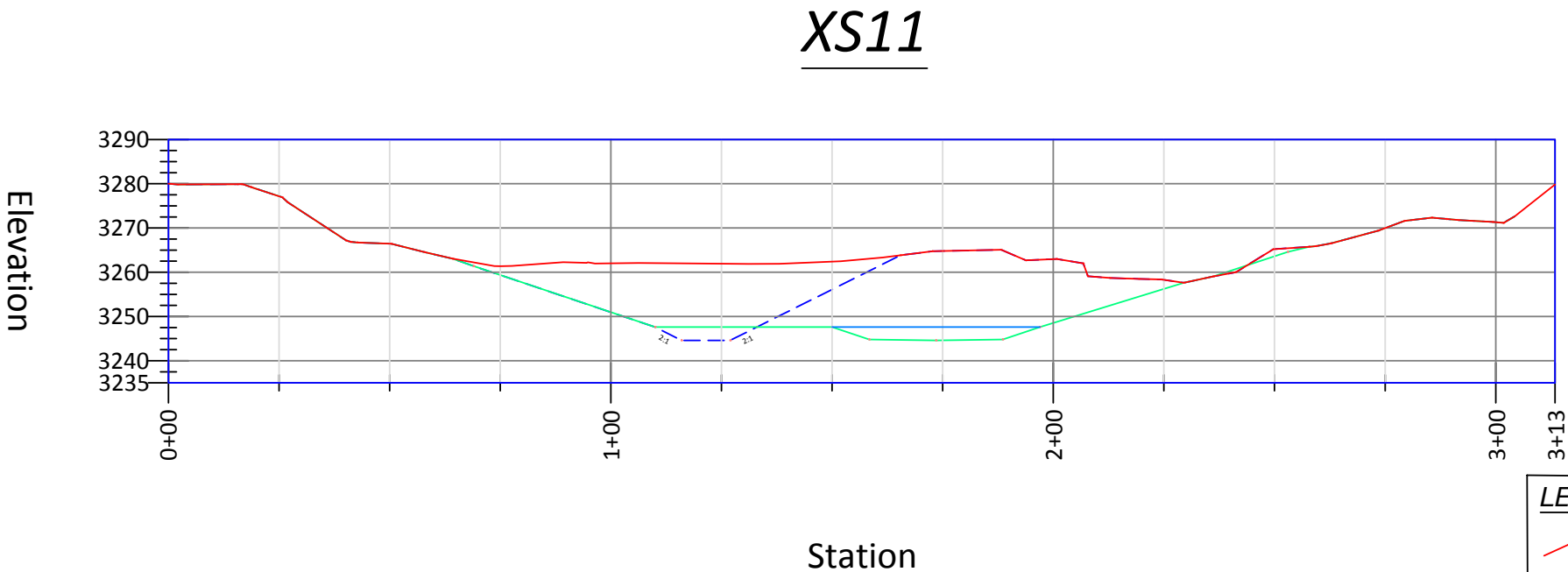
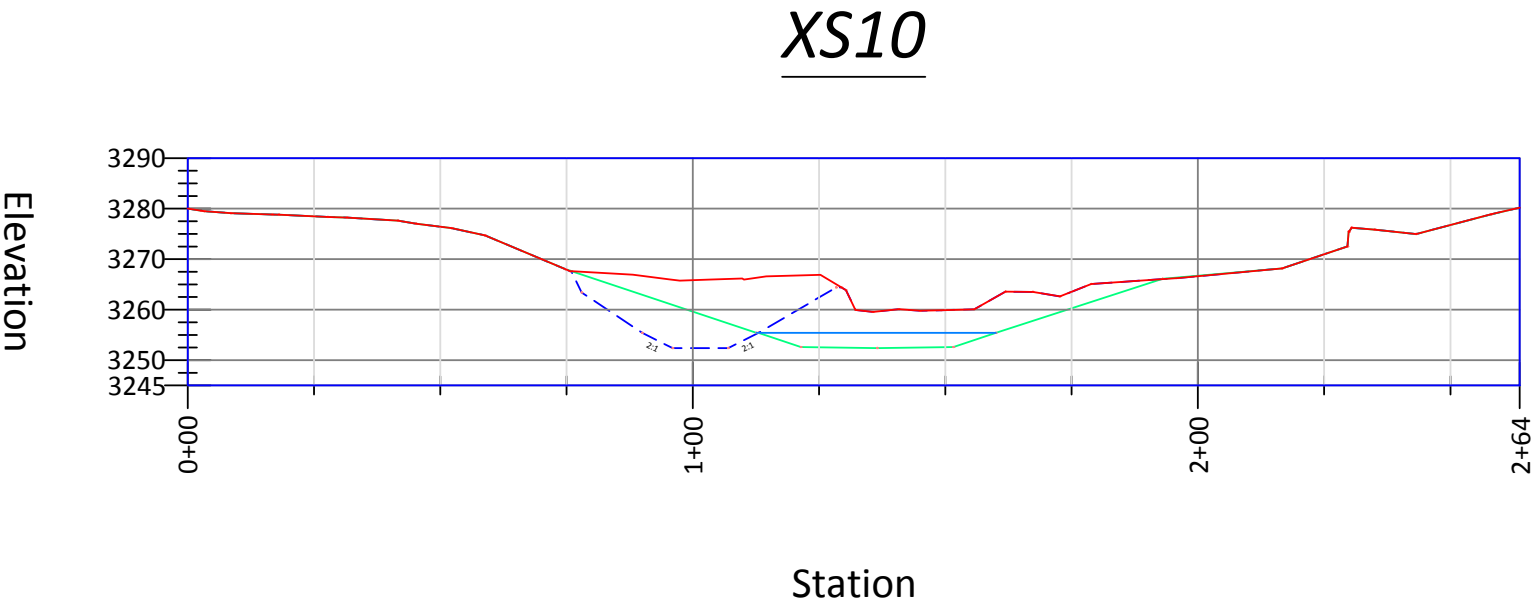
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LEGEND

- EXISTING CONDITION
- PROPOSED CONDITION
- PROPOSED BANKFULL
- PROPOSED DIVERSION CHANNEL

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Impoundment Cross-Sections

[Payne Branch Dam Removal](#)
Watauga County, Blowing Rock, North Carolina

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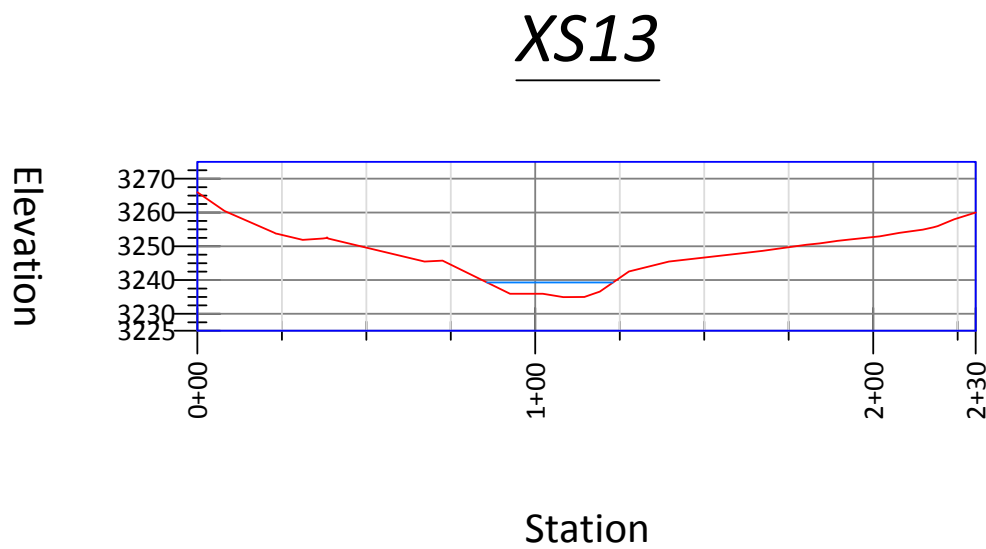
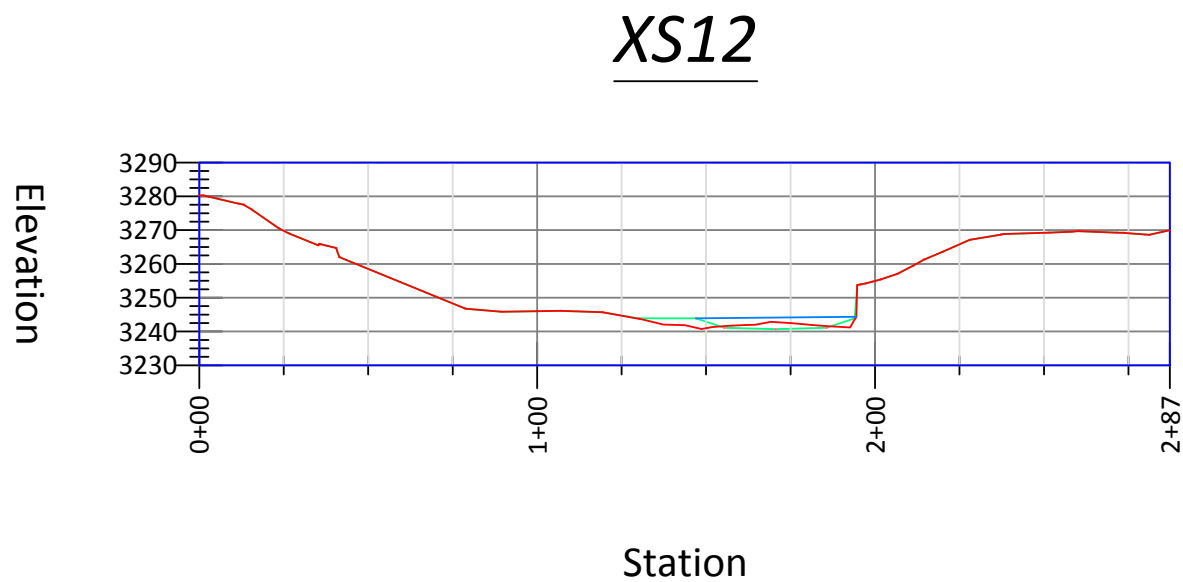
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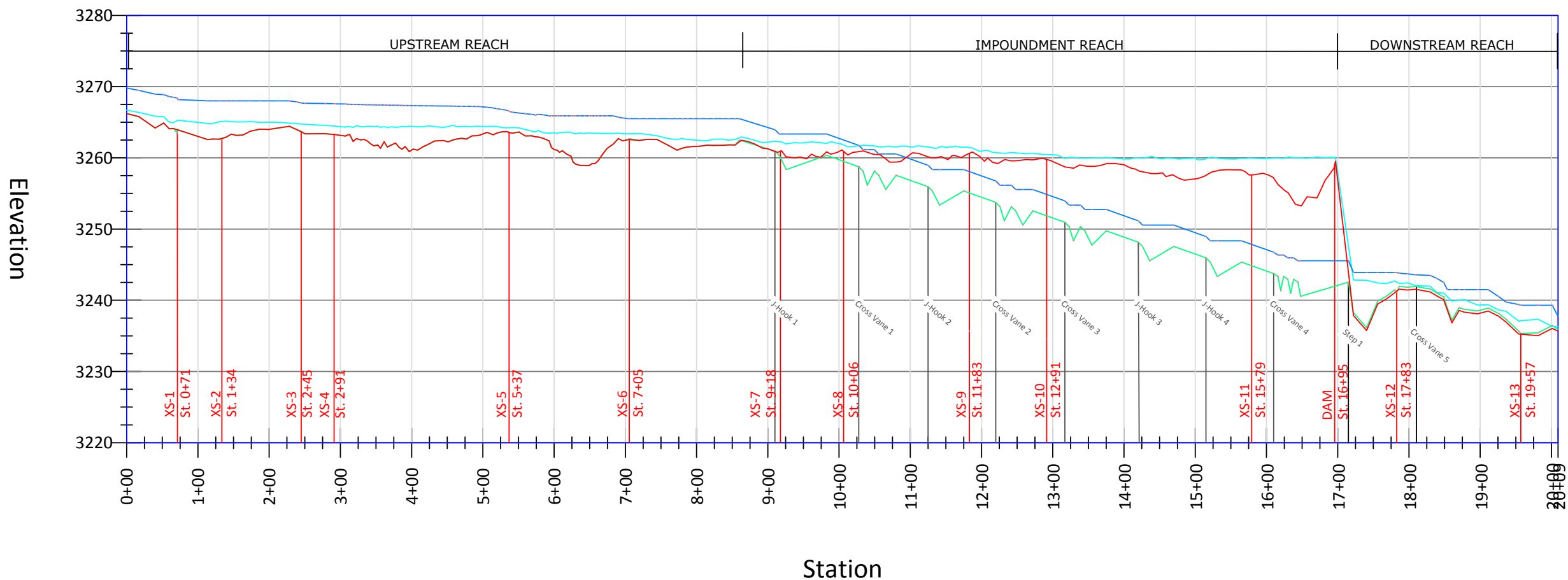


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LEGEND

- EXISTING CONDITION
- PROPOSED CONDITION
- PROPOSED BANKFULL
- LOW WATER SURFACE

LONGITUDINAL PROFILE (H:V = 1:10)



Downstream Cross-Sections & Longitudinal Profile

Payne Branch Dam Removal

Watauga County, Blowing Rock, North Carolina

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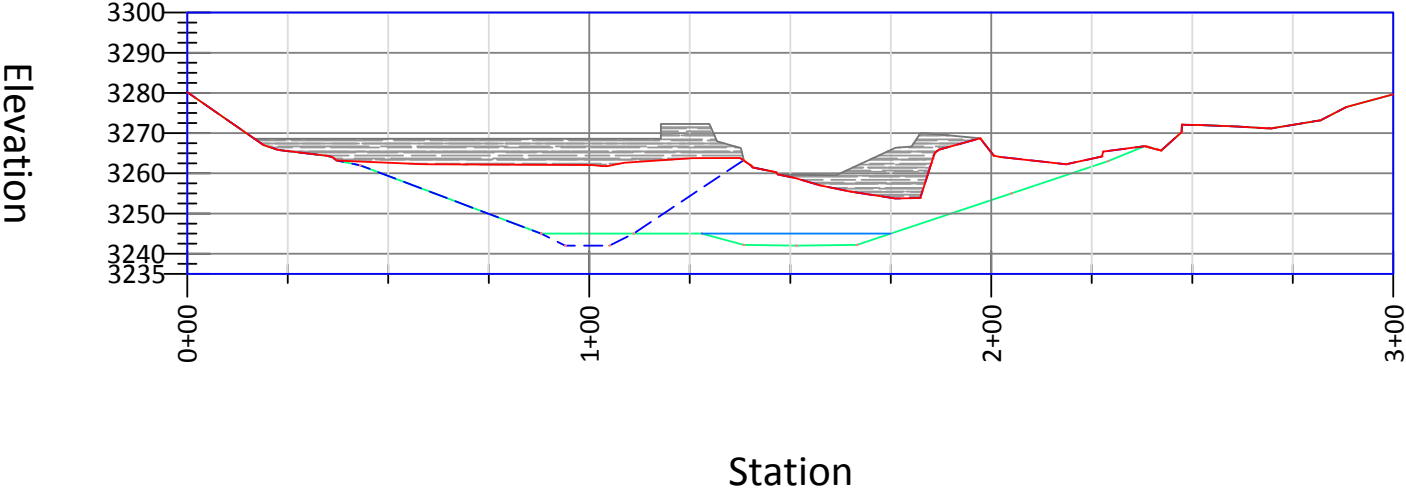
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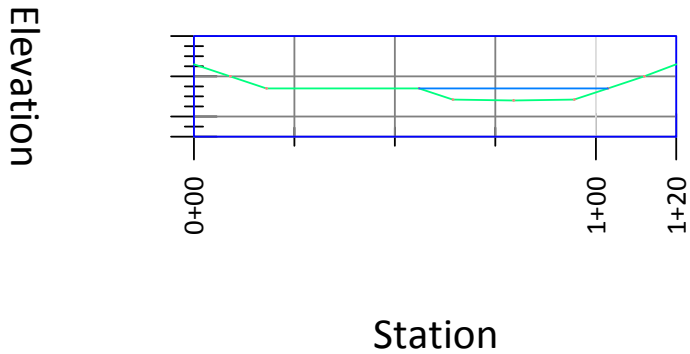
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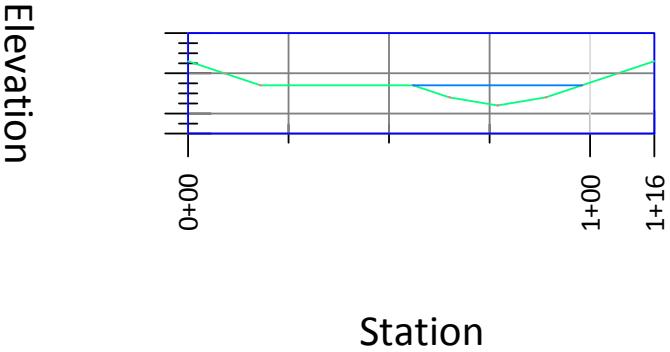
Dam Location XS - Upstream View



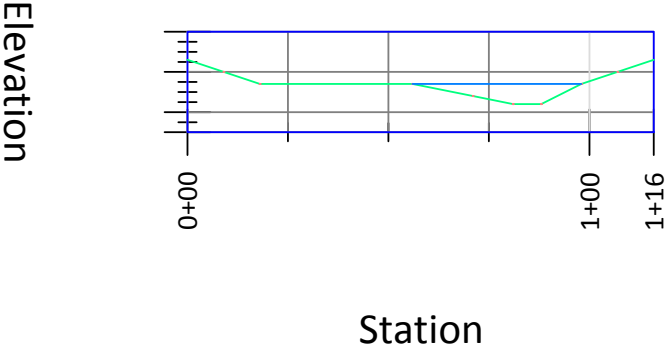
Typical Riffle XS



Typical Scour Pool XS



Typical Meander Pool XS



LEGEND

- EXISTING CONDITION
- PROPOSED CONDITION
- PROPOSED DIVERSION CHANNEL
- PROPOSED BANKFULL
- EXISTING DAM

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Payne Branch Dam & Typical Cross-Sections
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

PROJECT REACH SUMMARY TABLE

	Middle Fork New River Existing Conditions				Middle Fork New River Proposed Conditions			
Stream Assessment Parameters (Average)	Overall Payne Branch Dam Reach (Avg)	Upstream Reach (Avg)	Impoundment Reach* (Avg)	Downstream Reach (Avg)	Overall Payne Branch Dam Reach (Avg)	Upstream Reach (Avg)	Impoundment Reach* (Avg/Range)	Downstream Reach (Avg)
Stream Type	C4/B4c	B4c	C4	B4a	C4b/B4	B4c	C4b / B4	C4b
Drainage Area (sq mi)	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
Reach Slope (ft/ft)	0.0150	0.0043	0.0035	0.0772	0.0150	0.0043	0.0240	0.0208
Bankfull Area (sq ft)	122.6	113.2	119.9	156	112.4	113.2	111.1	114.1
Bankfull Width (ft)	46.1	42.2	41	67.9	44.9	42.2	47.0	47
Bankfull Depth (ft)	2.7	2.68	2.92	2.3	2.5	2.68	2.4	2.4
Bankfull Max Depth	4.1	4.00	4.40	3.70	3.5	4.0	3.0	3.2
Bankfull Width / Depth Ratio	17.3	15.7	14	29.5	18.0	15.7	19.9	19.4
Bankfull Max Depth Ratio	1.5	1.5	1.5	1.6	1.4	1.5	1.3	1.3
Bank Height Ratio	1.3	1.6	1.1	1.3	1.3	1.6	1.0	1.0
Entrenchment Ratio	2.4	2.0	3.5	1.8	2.1	2.0	2.0 (1.4-2.2)	2.5
Riffle/Cascade** Length (ft)	45.4	56.9	30.4	52.5	51.4	56.9	45.6 (45.0-50.0)	52.4
Riffle/Cascade Length Ratio	1.0	1.3	0.7	0.8	1.2	1.3	1.0 (1.0-1.1)	1.1
Riffle/Cascade Slope (ft/ft)	0.032	0.021	0.033	0.053	0.031	0.021	0.035 (0.031-0.036)	0.0527
Riffle/Cascade Slope Ratio	2.1	4.9	9.3	0.7	3.0	4.8	1.4 (1.3-1.5)	2.5
Step Height (ft)	7.7	0.92	N/A	11.1	1.0	0.92	0.55 (0.4-0.6)	2.3
Step Height Ratio	0.17	0.02	N/A	0.16	0.02	0.02	0.015 (0.012-0.02)	0.05
Step Length (ft)	12.8	7.6	N/A	15.3	6.5	7.6	6.0	4.7
Pool Area	131.1	122.9	145.7	112.3	123.0	125.2	123.0	116
Pool Bkf Width	43.8	42.8	47.2	37.0	42.3	44.1	42.0	37.4
Pool Bkf Depth	3.0	2.9	3.1	3.0	2.9	2.9	2.9	3.1
Pool Max Depth	4.5	4	4.8	4.3	4.6	4.3	5.0	4.4
Pool Length (ft)	125.7	125.6	178.0	56.2	76.7	125.0	34.8 (16.0-77.0)	57.2
Pool Length Ratio	2.7	3.0	4.3	0.8	1.8	3.0	0.74 (0.34-1.6)	1.2
Pool to Pool Spacing (ft)	153.2	180.4	141.8	115.9	122.0	180.4	65.6 (22.0-117.6)	115.9
P-P Spacing Ratio	3.3	4.3	3.5	1.7	2.8	4.3	1.4 (0.5-2.5)	2.5
D50 (mm)	19	19	19	110	67 ^a	19	102 ^a	110
D84 (mm)	82	82	82	280	205 ^a	82	305 ^a	280
% Cascade/Riffle	23	26	15	55	35	26	43	36.7
% Step	2	1	0	10	4	1	8	3.3
% Pool	75	73	85	35	61	73	49	60.0

**Cascade = Steep Riffle, >2% slope

^a Particle size distributions estimated based on proportion of reach (for Overall Reach) and project design (Impoundment Reach)

****Cascade = Steep Riffle, >2% slope**

² Clinton, D.R., 2001. *Stream Morphology Relationships from Reference Streams in North Carolina*. Thesis, NCSU

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³ USFWS Virginia Field Office, 2015. Beecher Branch Stream Restoration Project data, personal communication.

⁴ Reference Reach survey, 2018, just downstream of project reach

⁴ Reference Reach survey, 2018, just downstream of project reach

60% PROGRESS DRAWINGS
DO NOT USE FOR CONSTRUCTION

Summary Tables

[Payne Branch Dam Removal](#)

Watauga County, Blowing Rock, North Carolina

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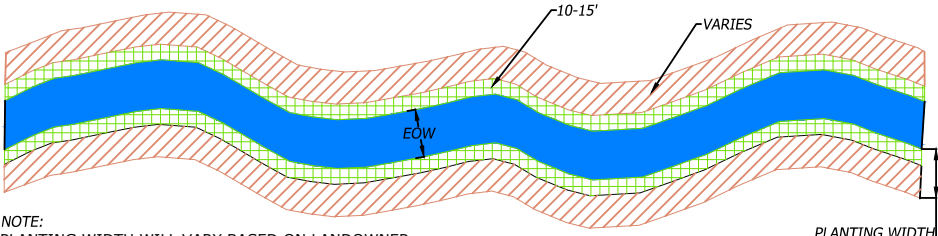
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

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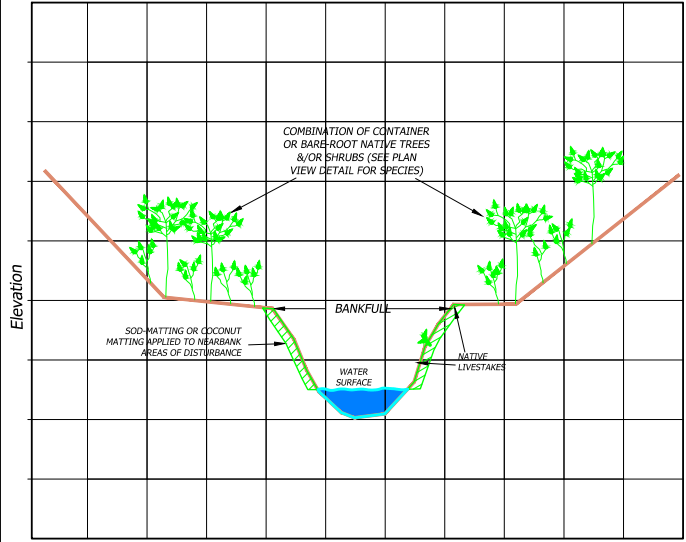
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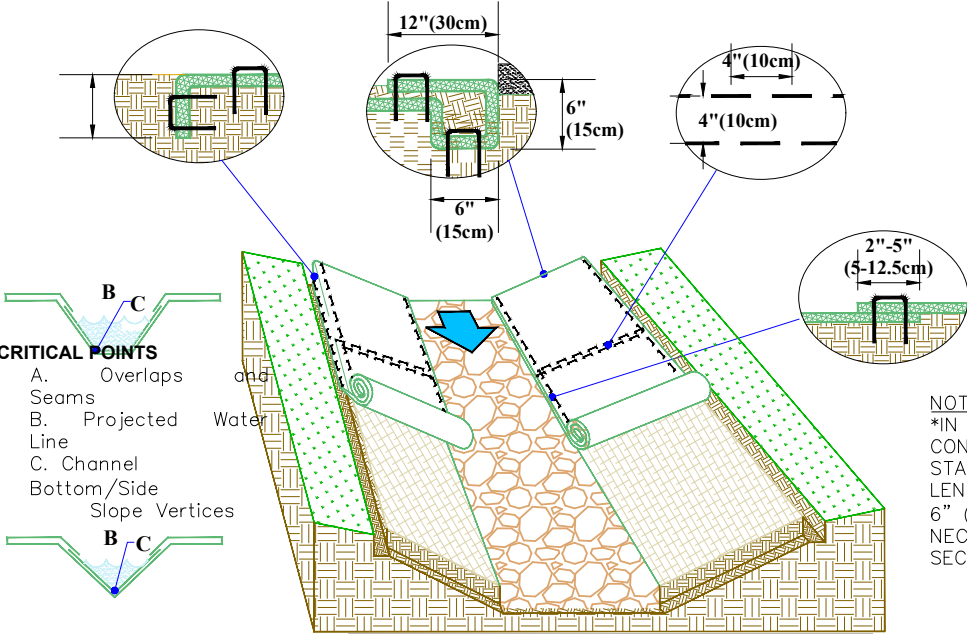
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	NATIVE SOD MATTING AND/OR EROSION CONTROL FABRIC (NAG C700BN) ARE TO BE PLACED ON NEAR BANK AND DISTURBED AREAS WHEN AVAILABLE. 1. SEED IMMEDIATELY WITH TEMPORARY RYEGRASS. 2. FOLLOWING CONSTRUCTION, AREA TO BE SEEDED WITH A PERMANENT GRASS/HERB MIXTURE. MATTING AND FABRIC ARE TO BE STAKED DOWN WITH LARGE STAPLES AND/OR NATIVE/WOODY STAKES. 3. LIVESTAKE SPECIES INCLUDE BUT ARE NOT LIMITED TO: <i>Cornus amomum</i> , <i>Physocarpus opulifolius</i> , <i>Salix sericea</i> , <i>Sambucus canadensis</i> .		NATIVE TREE AND SHRUB (1-3 GALLON CONTAINERS) SPECIES TO BE PLANTED AT A DENSITY SUFFICIENT TO PROVIDE 300 TREES/ACRE AT MATURITY -FLOODPLAIN SPECIES INCLUDE BUT ARE NOT LIMITED TO: <i>Acer rubrum</i> , <i>Amelanchier arborea</i> , <i>Betula nigra</i> , <i>Ilex spp.</i> , <i>Juglans nigra</i> , <i>Liriodendron tulipifera</i> , <i>Malus coronaria</i> , <i>Physocarpus opulifolius</i> , <i>Quercus rubra</i> , etc.

TYPICAL CHANNEL RE-VEGETATION PLAN VIEW DETAIL



- NOTE:
- ALL DISTURBED AREAS ARE TO BE IMMEDIATELY SOWED WITH A TEMPORARY GRASS MIXTURE.
 - FOLLOWING SITE CONSTRUCTION A NATIVE/PERMANENT GRASS MIXTURE WILL BE APPLIED WHEN AVAILABLE.

TYPICAL CHANNEL RE-VEGETATION CROSS-SECTION DETAIL



NOTE:
*IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 CM) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.

SLOPE INSTALLATION INSTRUCTIONS:

- PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
- BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH WITH APPROXIMATELY 12" (30CM) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30 CM) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30 CM) APART ACROSS THE WIDTH OF THE BLANKET.
- ROLL THE BLANKETS IN DIRECTION OF WATER FLOW. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
- THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" – 5" (5 CM – 12.5 CM) OVERLAP DEPENDING ON BLANKET TYPE. 5. CONSECUTIVE BLANKETS SPICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5 CM) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30 CM) APART ACROSS ENTIRE BLANKET WIDTH.
- PLACE CONSECUTIVE BLANKETS END-OVER-END (SHINGLE STYLE) WITH A 4"-6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE BLANKETS .
- FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12"(30CM) APART IN A 6"(15CM) DEEP X 6"(15CM) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
- ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5-12.5CM) (DEPENDING ON BLANKETS TYPE) AND STAPLED.

INSPECTION AND MAINTENANCE:

This consists primarily of two components, stream stabilization structures (J-Hooks, Cross vanes, etc.) and planting of the stream banks and riparian areas. In the event that the stream structures shift, wash away, settle, or otherwise physically cannot function as designed, contact the responsible party. If the new plantings experience a mortality rate of greater than 25%, the dead/dying plants will need to be replaced.

PERMANENT SEED MIX:

APPLY AT 15 LBS PER ACRE OF DISTURBANCE (per specifications of seed supplier):

ERNST CONSERVATION SEED MIX ERNMX-178 (FLOODPLAIN MIX) WHICH INCLUDES THE FOLLOWING SPECIES:

Fox Sedge, Partridge Pea, Dear Tongue, Little Bluestem, Virginia Wild Rye, Riverbank Wild Rye, Swamp Sunflower, Ox Eye Sunflower, Arrow Wood, Big Bluestem, Silky Dogwood, Switchgrass, Indiangrass, Staghorn Sumac, Showy Tick Trefoil, Purple Bergamot, Black Eyed Susan, Joe Pye Weed , Soft Rush, Giant Ironweed, Tall White Beard Tongue, Spotted Joe Pye Weed, Bone Set, and Blue False Indigo.

Seedbed Preparation:

Disturbed soils within riparian areas will be amended to provide an optimum environment for seed germination and seedling growth. Surface soils will be loose enough for water infiltration and root penetration. Lime will be added to the soil to ensure a pH level between 5.5 - 7. Fertilizer (18-46-0) will be added to nutrient deficient areas. All riparian areas will be raked to loosen compacted soil prior to seeding.

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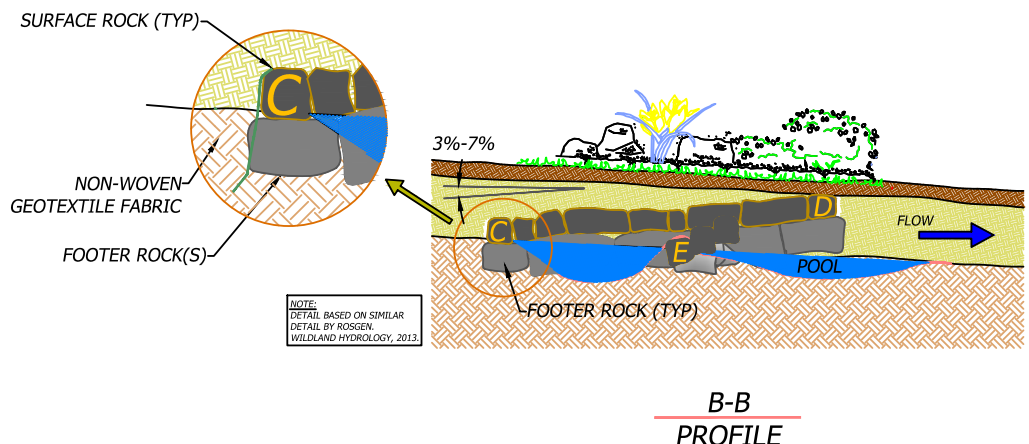
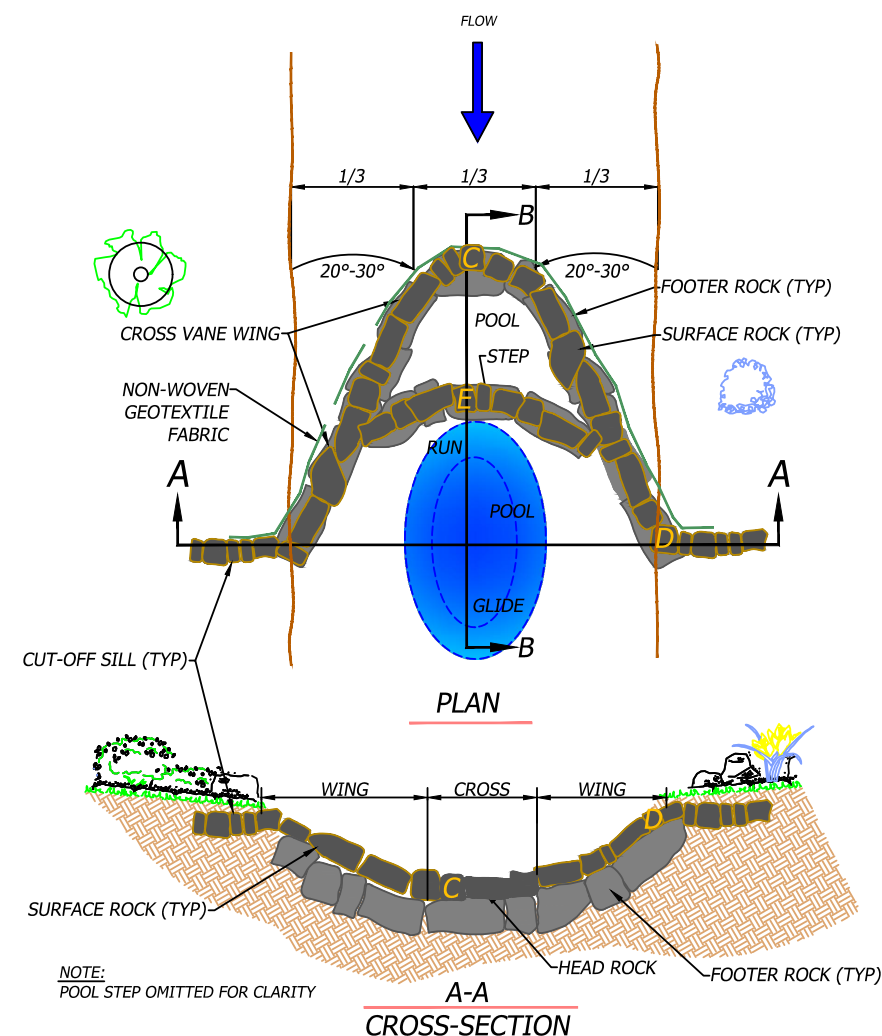


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Construction Details
Payne Branch Dam Removal
Watauga County, Blowing Rock, North Carolina

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ROCK CROSS-VANE STEP STRUCTURE

- MATERIAL NOTES:**
1. ROCK DIMENSIONS SHALL BE 1'-2' THICK, 2'-3' WIDE, AND 3'-5' LONG.
 2. ROCK SHALL BE NATIVE STONE HARVESTED LOCALLY OR FROM EXISTING STREAM.
 3. THE ROCKS SHOULD BE RECTANGULAR OR NEARLY SO AT THE ROCK TO ROCK CONTACT. THE ROCK TO ROCK CONTACT SHOULD BE SOLID. IF ROCKS ARE NOT PERFECTLY FLAT, THE THICKER END SHOULD BE PLACED DOWNSTREAM.
- CONSTRUCTION NOTES:**
1. A TRENCH SHALL BE DUG IN A MANNER THAT THE FOOTER ROCKS, CROSS HEADER ROCKS AND A MIN OF 1/3 OF THE WING HEADER ROCKS ARE BURIED BENEATH THE BED SURFACE ELEVATION.
 2. ROCKS ARE PRECISELY PLACED WITH A HYDRAULIC THUMB.
 3. FOOTER ROCKS SHALL BE PLACED FIRST WITH HEADER ROCKS PLACED ON TOP PRIOR TO BACKFILLING THE TRENCH.
 4. IN THE CENTER (CROSS) PORTION THE HEADER ROCKS SHALL BE PLACED SO THAT THE TOP OF THE HEAD ROCK IS AT AN ELEVATION EQUAL TO THE PROPOSED BED ELEVATION.
 5. GEOTEXTILE FABRIC SHALL BE PLACED IN THE TRENCH WITH APPROX. 2 FT. OF OVERLAP.
 6. ROCK FILL MATERIAL SHALL BE BACK FILLED AROUND THE FABRIC.
 7. THE HEADER ROCKS ON THE WING PORTION SHALL BE PLACED SO THAT THEY SLOPE UP FROM THE BED ELEVATION AT THE CROSS PORTION, TO A BANKFULL ELEVATION AND MEET THE BANK AT A 20°-30° ANGLE.
 8. SURFACE AND FOOTER ROCKS AT BOTH ENDS SHALL BE TIED IN SECURELY TO THE BANK TO ELIMINATE THE POSSIBILITY OF WATER DIVERSION.

Structure Dimension Table	
Parameter	Cross Vane
1/3 Bankfull Width	15.5
Vane Arm Angle (deg)	20.0
Vane Arm Angle (rad)	0.35
Stream Length (ft)	42.5
Vane Arm Length (ft)	45.2
Vane Slope (%)	5.5
Vane Arm Height (ft)	2.5
Bankfull Max Depth (ft)	3.0
Step Height (ft)	0.4-0.6

Structure Elevation Table (ft)				
Cross Vane	Station	Bankfull	Apex	Thalweg
1	10+27.6	3262.25	3260.25	3259.25
2	12+20	3257.25	3255.25	3254.25
3	13+17	3254.45	3252.45	3251.45
4	16+10	3246.45	3244.45	3243.45
5	18+30	3244.2	3242.2	3241.2

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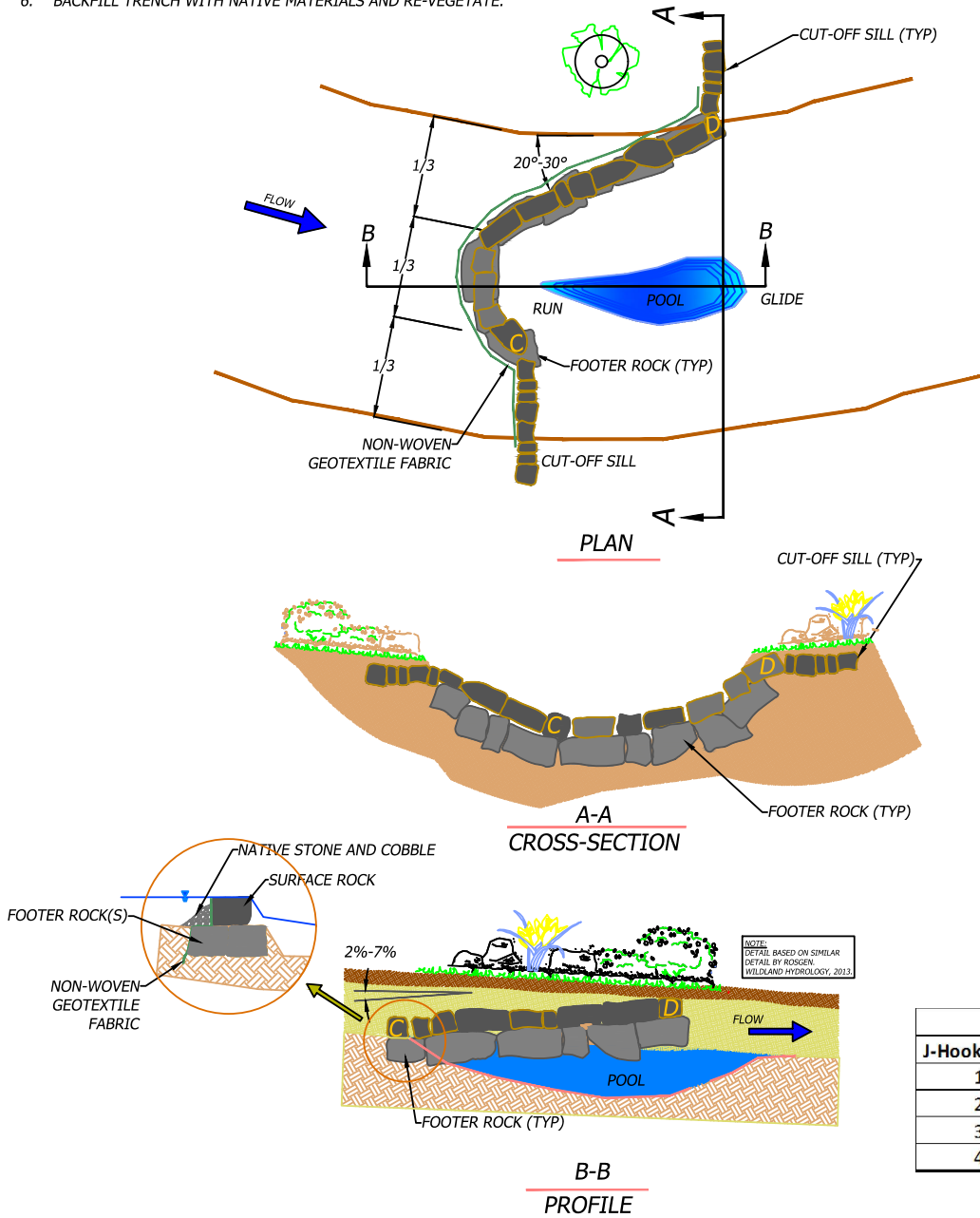
MATERIAL NOTES:

1. ROCK DIMENSIONS SHALL BE APPROXIMATELY 1'-2' THICK, 2'-3' WIDE, AND 3'-5' LONG.
2. ROCK SHALL BE NATIVE STONE HARVESTED LOCALLY OR FROM EXISTING STREAM.
3. THE ROCKS SHOULD BE RECTANGULAR OR NEARLY SO AT THE ROCK TO ROCK CONTACT. THE ROCK TO ROCK CONTACT SHOULD BE SOLID. IF ROCKS ARE NOT PERFECTLY FLAT, THE THICKER END SHOULD BE PLACED DOWNSTREAM.

CONSTRUCTION NOTES:

1. THE LOWER ROCK (HEAD ROCK) FOOTER WILL FIRST BE PLACED FOLLOWED BY THE HEAD ROCK TO SET THE INITIAL STRUCTURE ELEVATION.
2. THE SUBSEQUENT ROCK (MOVING UPSTREAM) AND ASSOCIATED FOOTERS WILL THEN BE SET SIGHTING THE PROPOSED 20-30° BANK DEFLECTION LINE.
3. ROCK PLACEMENT FOLLOWS MOVING UPSTREAM AT A 2-7% SLOPE UNTIL A BANKFULL ELEVATION IS REACHED AT THE END OF THE STRUCTURE WING.
4. A ROCK SILL WILL THEN BE CONSTRUCTED PERPENDICULAR TO THE STRUCTURE ANGLE TO PREVENT THE FORMATION OF A CUTOFF CHANNEL.
5. A TRENCH SHALL BE DUG UPSTREAM ON THE BANKSIDE OF THE WING WHERE NON-WOVEN GEOTEXTILE FABRIC WILL BE PLACED WITH APPROX. 2' OF OVERLAP
6. BACKFILL TRENCH WITH NATIVE MATERIALS AND RE-VEGETATE.

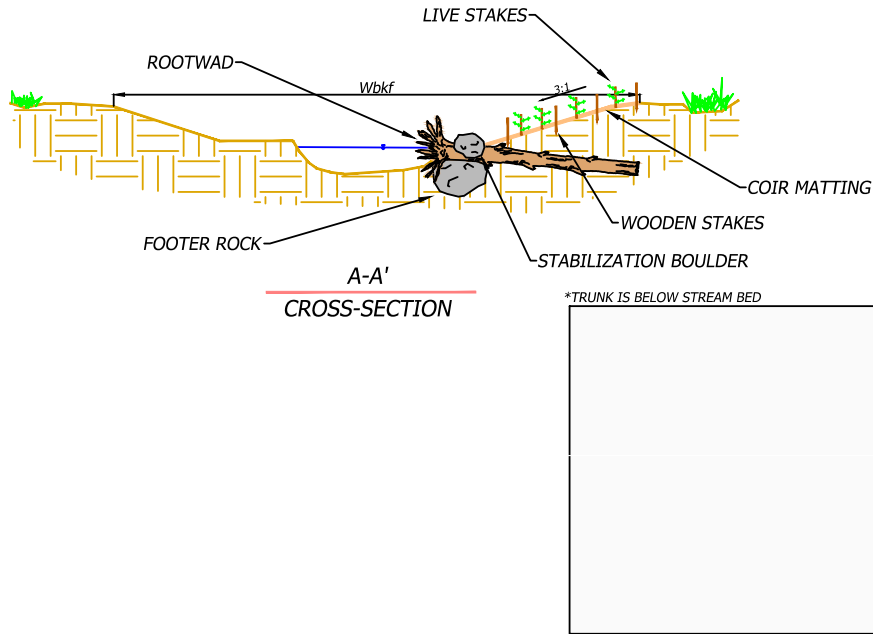
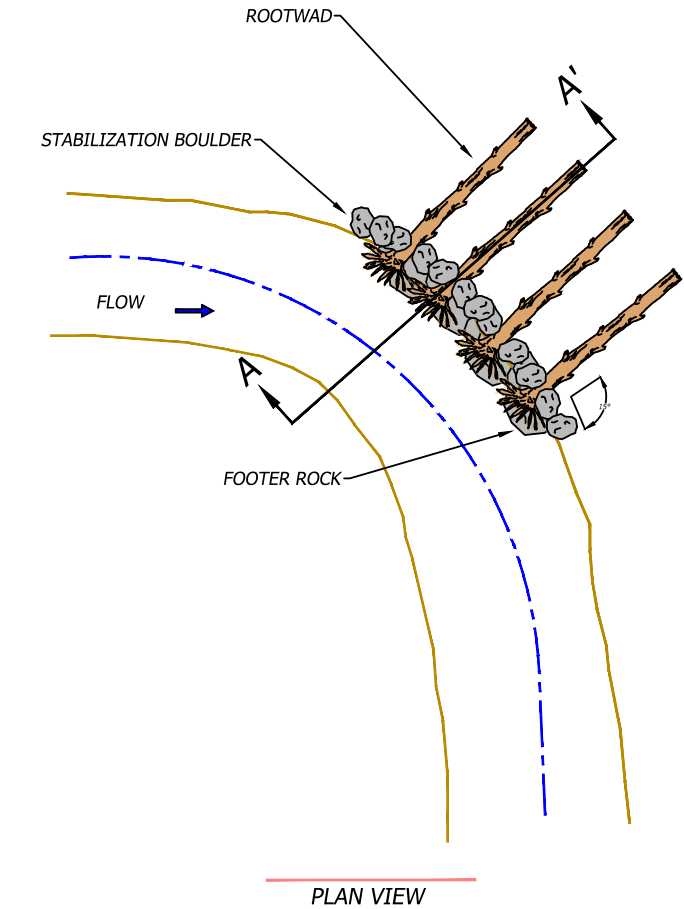
ROCK J-HOOK VANE STEP STRUCTURE



NOTES:

1. A TRENCH SHALL BE DUG ALONG THE TOE OF THE BANK TO A DEPTH OF THE DIAMETER OF THE FOOTER ROCK.
2. FOOTER ROCKS SHALL BE PLACED AT THE TOE OF THE CHANNEL AND THE ROOT WAD SHALL BE PLACED DIRECTLY ABOVE IT. THE TRUNK SHALL BE SUBMERGED AT BASEFLOW.
3. THE VELOCITY VECTORS OF THE STREAM IN THE CHANNEL ARE ALIGNED WITH THE TRUNKS LONGITUDINAL AXIS AND WILL INTERSECT THE ROOT MASS AT A 90 DEGREE ANGLE.
4. A BOULDER MAY BE PLACED ON THE DOWNSTREAM SIDE, ON TOP OF, AND ON THE UPSTREAM SIDE BETWEEN THE ROOTMASS AND THE BANK TO PROVIDE EROSION CONTROL.
5. THERE SHOULD NOT BE A GAP BETWEEN THE ROOT FANS.
6. ROOTWAD LOGS SHALL BE AT LEAST 20' LENGTH AND HAVE A MINIMUM DIAMETER AT BREAST HEIGHT (DBH) OF 12" IN MAINSTEM.
7. SHALLOW-ROOTED RATHER THAN DEEP-ROOTED TREE SPECIES WITH RATIOS OF ROOT FAN DIAMETERS TO BOLE DIAMETERS OF 4.0 OR GREATER ARE PREFERRED; AVOID NARROW BASED, FAN DIAMETER RATIOS LESS THAN 3.0.

ROOTWAD REVETMENT



Structure Dimension Table	
Parameter	J-Hook Vane
1/3 Bankfull Width	15.5
Vane Arm Angle (deg)	20.0
Vane Arm Angle (rad)	0.35
Stream Length (ft)	42.5
Vane Arm Length (ft)	45.2
Vane Slope (%)	5.5
Vane Arm Height (ft)	2.5
Bankfull Max Depth (ft)	3.0
Step Height (ft)	0.60

Structure Elevation Table (ft)				
J-Hook Vane	Station	Bankfull	Apex	Thalweg
1	9+10	3264.5	3262	3261.5
2	11+25	3259.45	3256.95	3256.45
3	14+20	3251.65	3249.15	3248.65
4	15+15	3249.05	3246.55	3246.05

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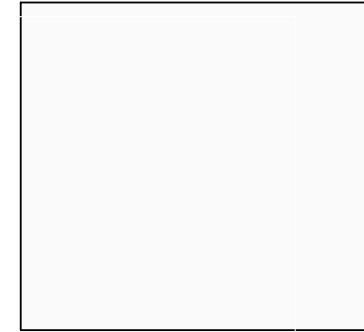
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VERNAL POOL



FACU: Facultative Upland--Usually occurs in non-wetlands (Probability 67%-99%)
Occasionally found in wetlands (Probability 1%-33%)

Arrowhead	<i>Sagittaria arifolia</i>	ANY	W SW	FS PS	
Lizards Tail	<i>Saururus cernuus</i>	ANY	W SW	FS PS	
Narrow-leaf cattail	<i>Typha angustifolia</i>	ANY	W SW	FS	
Broad-leaf Cattail	<i>Typha latifolia</i>	ANY	W SW	FS	

VERNAL POOL EXCAVATED TO DEPTH OF WATER TABLE

WATER TABLE

Wbktf

FACU

FACW

OBL

FAC

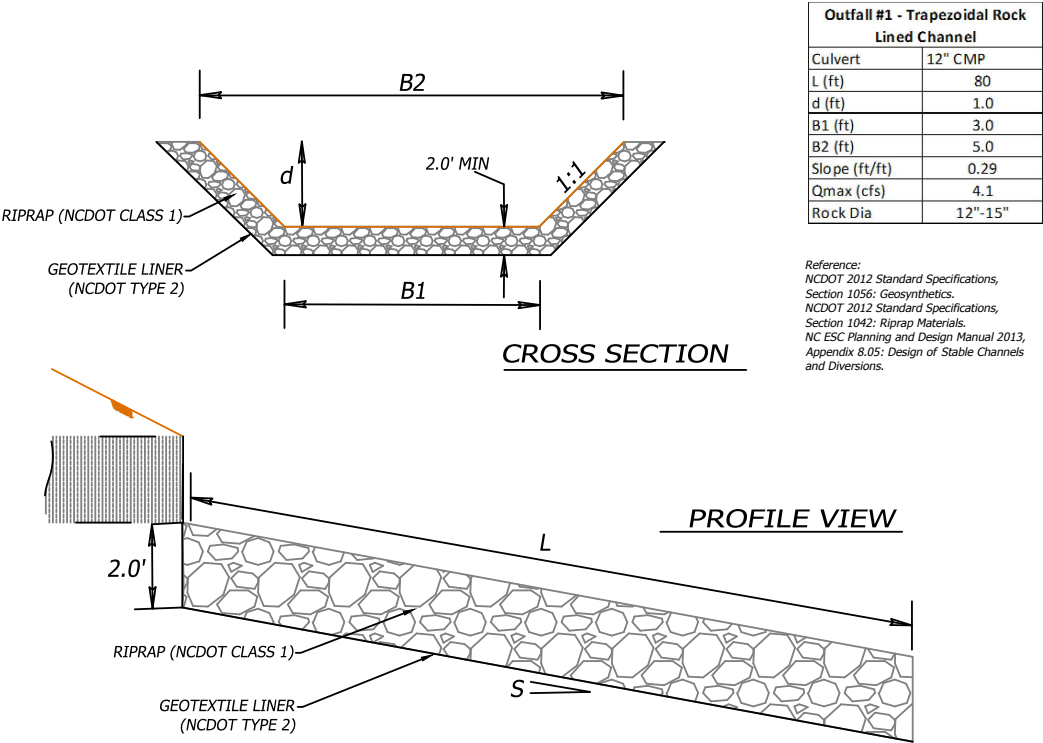
NATIVE SPECIES PLANTED AT PERIMETER OF VERNAL POOL

CROSS-SECTION

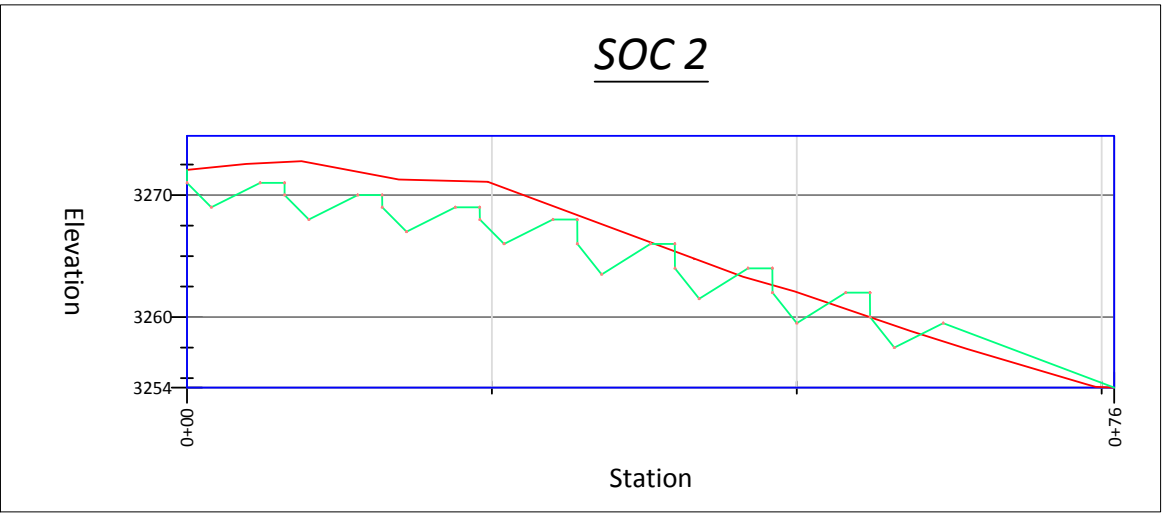
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STORMWATER OUTFALL CHANNELS

STORMWATER OUTFALL #1

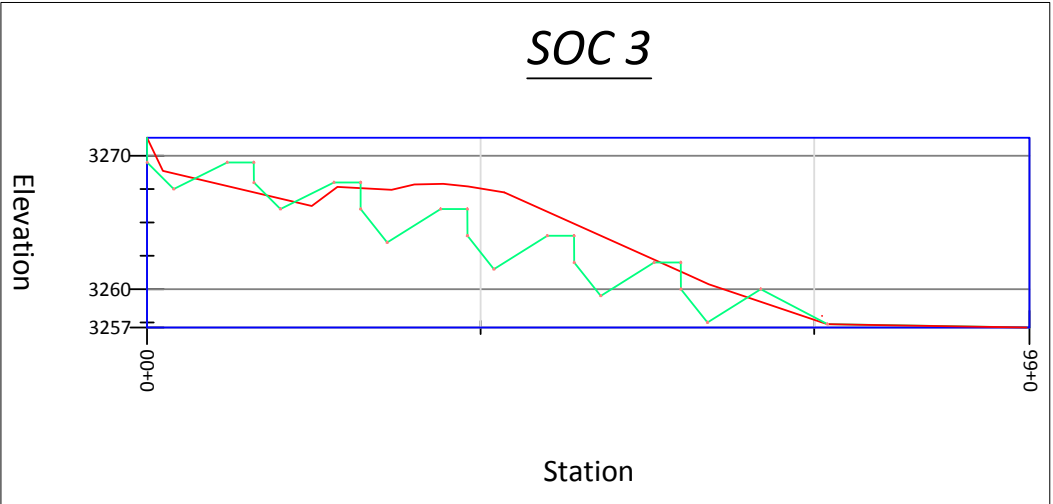


STORMWATER OUTFALL #2 - STEP POOL CHANNEL



Outfall #2 - Step Pool Channel	
Culvert	24" CMP
L (ft)	72
Slope (ft/ft)	0.23
Qmax (cfs)	18.0
Bankfull Area (sq ft)	8.3
Bankfull Width (ft)	8.5
Bankfull Mean Depth (ft)	1.0
Bankfull Max Depth (ft)	1.5
Step Height (ft)	1.0-2.0
Step Length (ft)	2.0
Pool Length (ft)	6.0
Max Pool Depth (ft)	2.0-2.5
Step Rock Dia	2.0-3.0

STORMWATER OUTFALL #3 -STEP POOL CHANNEL



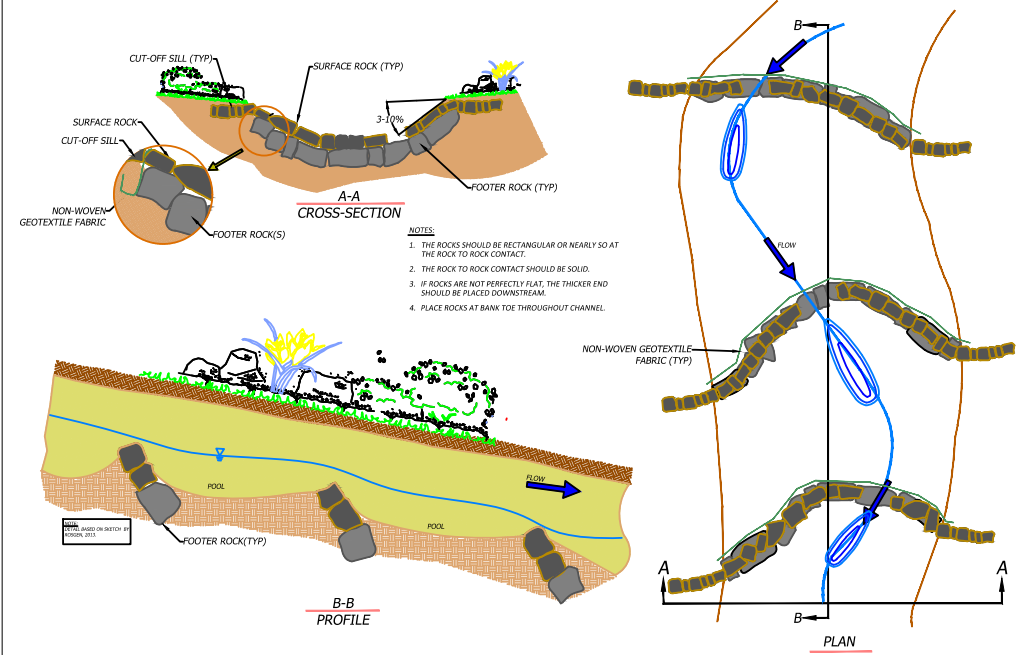
Outfall #3 - Step Pool Channel	
Culvert	24" CMP
L (ft)	52
Slope (ft/ft)	0.27
Qmax (cfs)	14.0
Bankfull Area (sq ft)	7.3
Bankfull Width (ft)	8.2
Bankfull Mean Depth (ft)	0.9
Bankfull Max Depth (ft)	1.3
Step Height (ft)	1.5-2.0
Step Length (ft)	2.0
Pool Length (ft)	6.0
Max Pool Depth (ft)	2.0-2.5
Step Rock Dia (ft)	2.0-3.0

LEGEND

EXISTING CONDITION

PROPOSED CONDITION

STEP-POOL WITH ALTERNATING THALWEG STRUCTURE



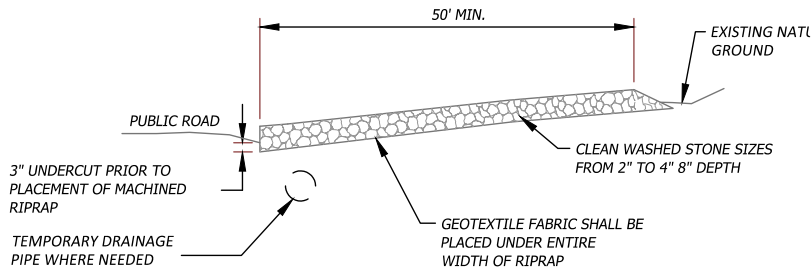
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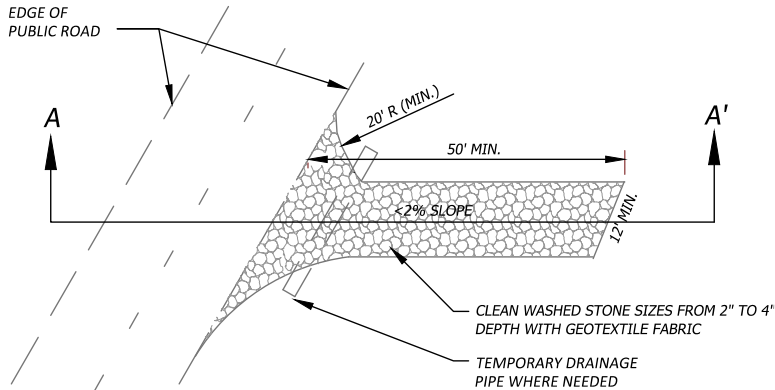


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TEMPORARY CONSTRUCTION ENTRANCE DETAIL

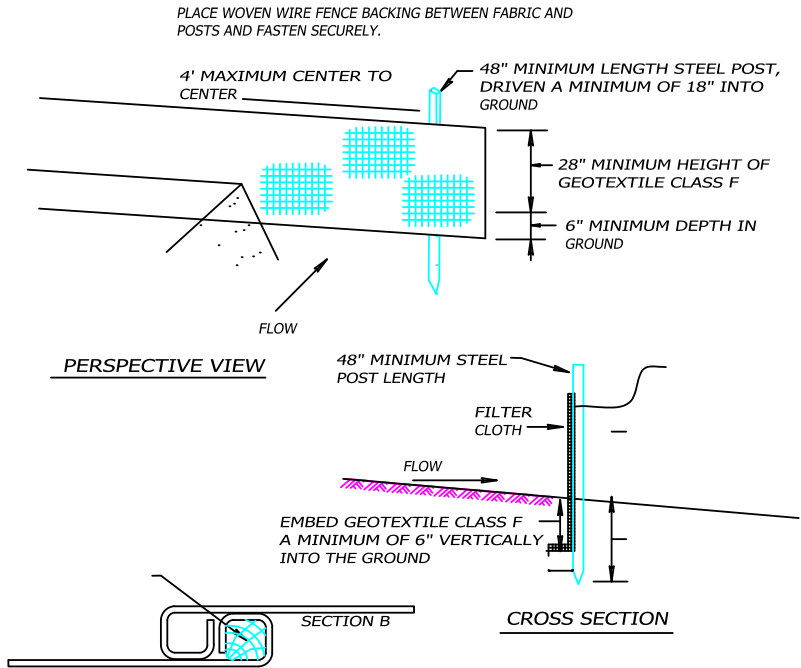


SECTION A-A'



Reference: NC Erosion and Sediment Control Manual 2015, Section 4.2 - Gravel Construction Entrance

SILT FENCE WITH WIRE BACKING



JOINING TWO ADJACENT SILT FENCE SECTIONS

- Steel posts shall be a minimum of 48" long driven a minimum of 18" into the ground. The steel posts may be standard T or U section weighing not less than 1.3 lbs/ft.
- Geotextile and woven wire fence backing shall be fastened securely to each post from top to ground level and the geotextile shall meet the following requirements:
tensile strength warp 260 lbs/in. (min), fill 180 lbs/in.
bursting strength 175 lbs/in (min)
flow rate 70 gpm/sq. ft
- Where ends of geotextile fabric come together they shall be overlapped, folded, and secured to prevent sediment bypass.
- Silt fence shall be inspected before and after each rainfall event and maintained when bulges occur or when sediment accumulation reaches 50% of the fabric height.

GENERAL EROSION AND SEDIMENT CONTROL NOTES

- All areas of disturbance not yet at final grade after a period of 14 days shall be stabilized with temporary seeding and mulch cover. Temporarily stabilization measures will be applied only to areas left undisturbed for less than 1 year. For seeding mix and method, see attached Temporary Seeding detail.
- Permanent seeding/planting will be performed within 14 days of achieving final grade at any disturbed area. Monitoring will be conducted in order to assure the establishment of permanent vegetative cover that is uniform and mature enough to survive and inhibit erosion. For seeding mix and method, see attached Permanent Seeding detail.
- All denuded critical areas (slopes, streambanks, etc.) will be temporarily stabilized at the end of each working week. When final grade is achieved on critical areas, the areas will be stabilized with a combination of permanent seeding, coir matting, and live stake installation. See Slope Stabilization and Channel Revegetation details.
- During Priority 1 Restoration, construction of the new channel will be done in dry conditions. If upland construction is unfeasible, the streams will be diverted around the construction activities, through pumping or diversion channel.
- Stockpile areas for excavated soil material, rock, and large woody debris are designated on the Site Plan. Silt fence shall be installed on the downslope of each stockpile area, as shown on the Site Plan.

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Erosion and Sediment Control Details
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