



IN REPLY REFER TO

DEPARTMENT OF THE ARMY  
WILMINGTON DISTRICT, CORPS OF ENGINEERS

Washington Regulatory Field Office  
2407 W 5<sup>th</sup> Street  
Washington, North Carolina 27889

January 29, 2013

Regulatory Division

Action ID No. 2008-00252

Mr. Gregory J. Thorpe, Ph.D.  
Environmental Management Director, PDEA  
1548 Mail Service Center  
Raleigh, North Carolina 27699-1548

Dear Dr. Thorpe:

Reference the Department of the Army (DA) individual permit (IP) issued to you on July 21, 2008, for the U.S. Highway 70 Goldsboro Bypass project (R-2554), from Aulander Road (SR 1381) west of Goldsboro, in Wayne County and ending east of Promise Land Road (SR 1323) southwest of LaGrange, in Lenoir County. This office received a permit modification request dated November 6, 2012, addressing the proposed construction of Sections BB and C, from east of Wayne Memorial Drive (SR 1556) to east of Promise Land Road (SR 1323) in Wayne County, North Carolina.

The modification also requests a permit expiration date extension until December 31, 2018. The R-2554 permit expires on December 31, 2013. The anticipated construction completion date for Sections BB and C is July 3, 2015.

The proposed modification for R-2554 Sections BB and C will result in 18.99 acres of permanent wetland impacts, 0.01 acres of temporary wetland impacts, 1.26 acres of hand clearing in wetlands, 8042 linear feet of permanent stream impacts, and 734 linear feet of temporary stream impacts. Sections BB and C are the final two of four phases of construction. The following table reflects the total impacts for the R-2554 Goldsboro Bypass project:

R-2554 Section	Permanent Wetland Impacts (ac.)*	Temporary Wetland Impacts (ac.)	Hand Clearing (ac.)	Wetlands Requiring Mitigation (ac.)	Permanent Stream Impacts (lf)	Temporary Stream Impacts (lf)	Streams Requiring Mitigation (lf)
A	3.99	0.31	0.31	3.99	2,202	165	2,202
BA	5.78	0	2.18	5.78	3,722	254	3,772
BB -C	18.99	<0.01	1.26	18.99	8,042	734	6,918
Totals	28.76	0.31	3.75	28.76	14,016	1,153	12,892

\*Includes permanent fill, excavation and mechanized clearing.

There will be no jurisdictional impacts due to utility relocations on this project. The power lines, telephone lines and cable TV will be relocated jointly to the left side of US 70 on proposed poles and existing poles in wetlands. Most of the existing water lines will be relocated along the length of the project with installation in wetland areas being performed by trenchless methods.

This modification request was discussed and coordinated with the appropriate State and Federal agencies at previous Merger 01 concurrence meetings and the coordination revealed no objections to this modification request. Therefore, the permit is hereby modified in accordance with the specific work activities described above and in enclosed with the permit modification package.

It is understood that all conditions of the original permit and applicable modifications remain valid. In addition, the permittee will comply with the additional special permit conditions as follows:

a.) All work authorized by this permit modification must be performed in strict compliance with the submitted work plans, which are part of this permit. Any modification to the permit plans must be approved by US Army Corps of Engineers (Corps) prior to implementation.

b.) The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit, and any authorized modifications. A copy of this permit, and any authorized modifications, including all conditions, shall be available at the project site during construction and maintenance of this project.

c.) Under the previous permit, compensatory mitigation was provided for the following impacts on the entire R-2554 project: 16.32 acres of riparian wetlands, 11.3 acres of non-riparian wetlands, and 13,153 feet of stream impacts. Increased stream and wetland impacts will be mitigated through the use of assets in the NCDOT Debit Ledger and onsite mitigation via natural stream design (NSD). The permittee shall comply with the on-site wetland and stream mitigation plans submitted with the original application R-2554-BA dated March 28, 2008, the modification request for R-2554-A on January 10, 2012, and the on-site wetland and stream mitigation plans submitted with this modification request for R-2554-BB and C. The following tables represent the mitigation proposed by NCDOT:

**Table 1. Wetland Mitigation (acres)**

Section	Restoration	Preservation (5:1)	Total Credits Proposed
R-2554BA Tommy's Rd. (site 8)	0.11	2.37	0.58
R-2554C Bear Creek (site 12)*	26.84		26.84
Jeffrey's Warehouse	0.21	8.61	1.9
Totals	27.16	10.98	29.32

\*Bear Creek is the Mill Branch Mitigation Bank

**Table 2. Stream Mitigation (linear feet)**

Section	Restoration	Preservation (5:1)	Total Credits Proposed
R-2554A Claridge Nursery	10,397		10,397
R-2554A NSD Site VII	544		544
R-2554BA NSD Site 4	1,083		1,083
R-2554BA NSD Site 5	561		561
R-2554BA Tommys Rd. (site 8)	61	691	199.2
R-2554BB NSD Site 9	1,322		1,322
R-2554C UT West Bear Creek	1,038		1,038
Totals	15,006	691	15,144.2

d.) The permit expiration date is extended from December 31, 2013 to December 31, 2018.

e.) Prior to commencing construction within jurisdictional waters of the United States for any portion of the proposed project, the permittee shall forward the latest version of project construction drawings to the Corps of Engineers, Washington Regulatory Field Office NCDOT Regulatory Project Manager. Half-size drawings will be acceptable.

Questions regarding this correspondence may be directed to Tom Steffens, NCDOT Coordinator/Regulatory Project Manager at the Washington Regulatory Field Office, telephone (910) 251-4615.

Sincerely,

FILENAM:LETTERHD R-2554-BB-IP Mod Final  
CESAW-RG-W/Steffens/rab/s

Mail/BB 29 Jan 15 File

Tom Steffens  
Supervisory Regulatory Project Manager  
Washington Regulatory Field Office

Copies furnished w/o attachments:

Mr. Travis Wilson  
NC Wildlife Resources Commission  
Eastern Region Highway Project Coordinator  
Habitat Conservation Program  
1142 I-85 Service Road  
Creedmoor, North Carolina 27522

Mr. Gary Jordan  
U.S. Fish and Wildlife Service  
Fish and Wildlife Enhancement  
Post Office Box 33726  
Raleigh, North Carolina 27636-3726

Mr. Chris Militscher  
C/O FHWA  
U.S. Environmental Protection Agency  
Raleigh Office  
310 New Bern Avenue, Room 206  
Raleigh, North Carolina 27601

Mr. Rob Ridings  
NC Division of Water Quality  
Transportation Permitting Unit  
1650 Mail Service Center  
Raleigh, North Carolina 27699

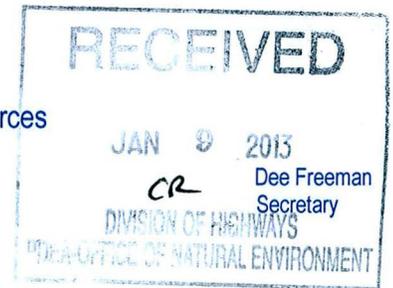


North Carolina Department of Environment and Natural Resources

Division of Water Quality  
Charles Wakild, P.E.  
Director

Beverly Eaves Perdue  
Governor

December 27, 2012



Dr. Greg Thorpe, PhD., Manager  
Project Development and Environmental Analysis  
North Carolina Department of Transportation  
1548 Mail Service Center  
Raleigh, North Carolina, 27699-1548

Subject: Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act and NEUSE BUFFER RULES with ADDITIONAL CONDITIONS for Construction of US 70 Goldsboro Bypass in Wayne County, Federal Aid Project No. F-56-2(28), State Project No. 8.T330801, TIP No. R-2554BB &C, DWQ Project No. 20080570 ver. 4.

Dear Dr. Thorpe:

Attached hereto is a modification of Certification No. 3740 issued to The North Carolina Department of Transportation (NCDOT) dated May 16, 2008.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

for

Charles Wakild  
Director

Attachments

cc: Tom Steffens, US Army Corps of Engineers, Washington Field Office  
Chris Manley, NCDOT NEU  
Chad Coggins, Division 4 Environmental Officer  
Travis Wilson, NC Wildlife Resources Commission  
Jason Elliott, NCDOT, Roadside Environmental Unit  
File Copy

Transportation and Permitting Unit  
1650 Mail Service Center, Raleigh, North Carolina 27699-1617  
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604  
Phone: 919-807-6300 \ FAX: 919-807-6492  
Internet: [www.ncwaterquality.org](http://www.ncwaterquality.org)

One  
North Carolina  
*Naturally*

**Modification to the 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act  
and NEUSE BUFFER RULES, with ADDITIONAL CONDITIONS**

**THIS CERTIFICATION MODIFICATION** is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Quality (DWQ) Regulations in 15 NCAC 2H .0500 and 15A NCAC 2B.0233. This certification modification for R-2554 Section A authorizes the NCDOT to impact acres of jurisdictional wetlands, linear feet of jurisdictional streams and square feet of protected riparian buffers in Wayne County. The project shall be constructed pursuant to the application dated received November 1, 2012 and additional information received December 21, 2012. The modified authorized impacts are as described below, and **replace** the Section BB & C approved impacts in the original authorization:

**Revised Section BB & C Stream Impacts in the Neuse River Basin**

Site	Permanent Impact to Stream (linear ft)	Bank Stabilization to Stream (linear ft)	Temporary Impact to Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
3BB	1197	0	176	1373	1197
4BB	965	0	45	1010	965
9BB	1763	0	10	1773	1763
10BB	14	26	16	56	0
12BB	94	41	0	135	0
13BB	75	13	9	97	0
1C	956	0	100	1056	956
3C	712	12	30	754	724
4C	489	0	151	640	489
5C	273	0	29	302	273
10C	288	0	37	325	288
11C	346	0	40	386	346
12C	394	19	10	423	413
14C	365	0	81	446	365
<b>Total</b>	<b>7931</b>	<b>111</b>	<b>734</b>	<b>8776</b>	<b>7779</b>

**Total Revised Stream Impact for R-2554 Section BB&C: 8776 linear feet**

**Section BB&C Onsite Stream Restoration**

Site	Onsite Stream Restoration (linear feet)
9BB	1322
4C	1038
<b>Total</b>	<b>2360</b>

\*7770 ft stream mitigation required minus 2360 ft onsite = 5410 linear feet required.

**Revised Section BB&C Wetland Impacts in the Neuse River Basin**

Site	Permanent Fill (ac)	Temporary Fill (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Wetland Impacts Requiring Mitigation (ac)
1BB	0.07	0.01	0	0	1.26	1.34	0.07
6BB	0.14	0	0	0.02	0	0.16	0.16
7BB	0.23	0	0	0.07	0	0.30	0.30
10BB	0.02	0	0	0.03	0	0.05	0.05
4C	0.39	0	0	0	0	0.39	0.39
6C	1.72	0	0	0.12	0	1.84	1.84
7C	2.80	0	0	0.24	0	3.04	3.04
8C	0.16	0	0	0.06	0	0.22	0.22
9C	2.01	0	0	0.25	0	2.26	2.26
10C	1.03	0	0.03	0.19	0	1.25	1.25
11C	1.48	0	0.02	0.22	0	1.72	1.72

12C	3.99	0	0	0.51	0	4.50	4.50
13C	0.73	0	0	0.14	0	0.87	0.87
14C	2.05	0	0.07	0.20	0	2.32	2.32
<b>Total</b>	<b>16.82</b>	<b>0.01</b>	<b>0.12</b>	<b>2.05</b>	<b>1.26</b>	<b>20.26</b>	<b>18.99</b>

**Total Revised Wetland Impact for R-2554 Section BB&C: 20.26 acres.**

**Revised Section BB&C Neuse Riparian Buffer Impacts**

Site	Zone 1 Impact (sq ft)	<i>minus</i> Wetlands in Zone 1 (sq ft)	= Zone 1 Buffers (not wetlands) (sq ft)	Zone 1 Buffer Impacts Requiring Mitigation (sq ft)	Zone 2 Impact (sq ft)	<i>minus</i> Wetlands in Zone 2 (sq ft)	= Zone 2 Buffers (not wetlands) (sq ft)	Zone 2 Buffer Impacts Requiring Mitigation (sq ft)
1BB (Bridge)	12673	0	12673	N/A	6632	1282	5350	N/A
1BB (Road)	0	0	0	0	2662	0	2662	2662
2BB	14557	0	14557	14557	9274	0	9274	9274
3BB	84682	0	84682	84682	54810	0	54810	54810
4BB	56693	0	56693	56693	33216	0	33216	33216
5BB	5837	0	5837	N/A	3767	0	3767	N/A
8BB	27383	0	27383	27383	17829	0	17829	17829
9BB	75556	0	75556	75556	51193	0	51193	51193
10BB	19949	2146	17803	17803	13834	0	13834	13834
11BB	150	0	150	N/A	0	0	0	N/A
12BB	8763	0	8763	8763	5855	0	5855	5855
13BB	5482	0	5482	N/A	3605	0	3605	N/A
1C	81439	0	81439	81439	55355	0	55355	55355
3C	38586	0	38586	38586	25761	0	25761	25761
4C (Bridge)	42577	0	42577	N/A	24848	0	24848	N/A
4C (Road)	29122	6074	23048	23048	19521	0	19521	19521
5C	16066	0	16066	16066	8839	0	8839	8839
10C	17771	17771	0	0	9597	9597	0	0
11C	21574	13098	8476	8476	11233	5705	5528	5528
12C	26669	2018	24651	24651	19063	2377	16686	16686
13C Perpendicular	508	0	508	N/A	2190	0	2190	N/A
13C (Parallel)	4568	0	4568	4568	5504	0	5504	5504
14C	23583	21511	2072	2072	14238	12540	1698	1698
<b>Totals</b>	<b>614188</b>	<b>62618</b>	<b>551570</b>	<b>484343</b>	<b>398826</b>	<b>31501</b>	<b>367325</b>	<b>327565</b>

**Total Revised R-2554 Section BB&C Buffer Impacts: 1013014 square feet.**

**Note:** Wetland, Stream and Riparian Buffer Impacts for R-2554 Sections A and BA are unchanged from the previous versions of this application. This modification addresses impact changes for Sections BB and C only.

**Section BB&C Neuse Buffer Onsite Restoration**

Site	Zone 1 Restoration (sq ft)	Zone 2 Restoration (sq ft)	Total Buffer Restoration (sq ft)
9BB	76057	55759	131816
4C	78065	51956	130021
<b>Totals</b>	<b>154122</b>	<b>107715</b>	<b>261837</b>

The application provides adequate assurance that the discharge of fill material into the waters of the Neuse River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your modified application dated received November 2, 2012 and addition information received December 21, 2012. All the authorized activities and conditions of certification associated with the original Water Quality Certification dated May 16, 2008 and modifications dated August 24, 2009 and March 19, 2012 still apply except where superceded by this certification. Should your project change, you are required to notify NCDWQ and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). Additional buffer impacts may require compensatory mitigation as described in 15A NCAC 2B.0242(9). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

**Conditions of Certification:**

1. Compensatory mitigation for impacts to 13,655 linear feet of streams is required for all of R-2554. As stated in your application, compensatory mitigation for impacts to jurisdictional streams shall be provided by onsite stream restorations plus onsite stream preservation. The stream mitigations will occur as follows:

Section	Site	Restoration (1:1) (linear feet)	Preservation (5:1) (linear feet)	Total Credits Proposed (linear ft)
A	Claridge Nursery	10397	0	10397
A	NSD Site VII	544	0	544
BA	NSD Site 4	1083	0	1083
BA	NSD Site 5	561	0	561
BA	Tommy's Road Site 8	61	691	199.2
BB	NSD Site 9	1322	0	1322
C	UT West Bear Creek	1038	0	1038
<b>Totals</b>	-	<b>15,006</b>	<b>691</b>	<b>15144.2</b>

The onsite stream relocations shall be constructed in accordance with the design submitted in your March 28, 2008 application and January 10, 2012 and November 2, 2012 modification applications. Please be reminded that as-builts for the completed streams shall be submitted to the North Carolina Division of Water Quality 401 Wetlands Unit with the as-builts for the rest of the project. If the parameters of this condition are not met, then the permittee shall supply additional stream mitigation for these impacts. All channel relocations will be constructed in a dry work area, will be completed and stabilized, and must be approved on site by DWQ staff, prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. All stream relocations and restorations shall have a 50-foot wide native wooded buffer planted on both sides of the stream unless otherwise authorized by this Certification. A transitional phase incorporating rolled erosion control product (RECP) and appropriate temporary ground cover is allowable.

2. The stream mitigation sites shall be monitored annually for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003. Success of the mitigation site shall be determined by NCDWQ during an on-site visit at or near the end of the monitoring period.

3. Compensatory mitigation for impacts to 28.76 acres of wetlands for all of R-2554 is required. As stated in your application, compensatory mitigation for these wetlands shall occur as follows:

Section	Site	Restoration (1:1) (acres)	Preservation (5:1) (acres)	Total Credits Proposed (acres)
BA	Tommy's Road Site 8	0.11	2.37	0.58
C	Bear Creek (Site 12)	26.84	0	26.84
Jeffrey's Warehouse	Jeffrey's Warehouse Mitigation Bank	0.21	8.61	1.9
<b>Totals</b>	-	<b>27.16</b>	<b>10.98</b>	<b>29.32</b>

The permittee shall comply with the on-site wetland mitigation plan submitted with the application on March 28, 2008 and modification applications on January 10, 2012 and November 1, 2012.

4. For the onsite wetland mitigation sites, the permittee shall plant 680 stems/acre. Vegetation success shall be measured by survivability over a 5-year monitoring period. Survivability will be based on 320 stems/acre after three (3) years and 260 stems after five (5) years. A survey of vegetation during the growing season shall be conducted annually over the five-year monitoring period and submitted to the NC Division of Water Quality. If the surviving vegetation densities are below the required thresholds after the five-year monitoring period, the site may still be declared successful at the discretion of and with written approval from the NC Division of Water Quality.

5. For the onsite wetland mitigation sites, hydrologic success of the sites will be attained by restoration of a hydrologic regime that results in inundation or saturation of the soils within 12 inches of the ground surface for at least 12.5 percent of the growing season. The hydrologic monitoring shall persist for a total of five (5) years. After the five-year monitoring period, if the monitoring requirements are not met, the site may still be declared successful at the discretion of and with written approval from the NC Division of Water Quality.

6. Compensatory mitigation for impacts to 833,336 square feet of protected riparian buffers in Zone 1 and 582,742 square feet of protected riparian buffers in Zone 2 shall be required for all of R-2554 for a total of 1,416,078 square feet. As stated in your applications compensatory mitigation for these riparian buffers shall be provided partially by onsite buffer restorations as follows:

Section	Site	Zone 1 Restoration (sq ft)	Zone 2 Restoration (sq ft)	Total (sq ft)
A	NSD Site VII	34380	22733	57113
A	Claridge Nursery	617605	377052	994657
BA	NSD Site 4	59609	35530	95139
BA	NSD Site 5	34199	21760	55959
BA	Tommy's Road Site 8	4459	3333	7792
BB	NSD Site 9	76057	55759	131816
C	UT West Bear Creek	78065	51956	130021
<b>Totals</b>	-	<b>904,374</b>	<b>568,123</b>	<b>1,472,497</b>

7. In accordance with 15A NCAC 02B.0242(9) riparian vegetation reestablishment for buffer mitigation sites shall include a minimum of at least 2 native hardwood tree species planted at a density sufficient to provide 320 trees per acre at maturity. The mitigation area shall be placed under a perpetual conservation easement that will provide for protection of the property's nutrient removal efficiencies.

8. For the buffer mitigation sites, the permittee shall monitor the sites. An annual report shall be submitted to the DWQ for a period of 5 years showing monitoring results, survival rate/ success of tree and vegetation establishment, and that diffuse flow through the riparian buffer has been maintained. The first annual report shall be submitted within one year of final planting. Failure to achieve a buffer density of 320 trees per acre after 5 years will require the annual report to provide appropriate remedial actions to be implemented and a schedule for implementation. Approval of the final annual report, and a formal "close out" of the mitigation site by the DWQ is required.

9. All on-site mitigation sites shall be protected in perpetuity by a conservation easement or through NCDOT fee simple acquisition and recorded in the NCDOT Natural Environment Unit mitigation geodatabase.

10. A copy of the final construction drawings shall be furnished to NCDWQ Central Office prior to the pre-construction meeting. The permittee shall provide written verification that the final construction drawings comply with the permit drawings contained in the application dated received November 1, 2012 and additional information received December 7, 2012 and December 21, 2012. Any deviations from the approved drawings are not authorized unless approved by the NC Division of Water Quality.
11. No waste, spoil, solids, or fill of any kind shall occur in wetlands, waters, or riparian areas beyond the footprint of the impacts depicted in the 404/401 Permit Application, including at any borrow sites. All construction activities, including the design, installation, operation, and maintenance of sediment and erosion control Best Management Practices, shall be performed so that no violations of state water quality standards, statutes, or rules occur;
12. The post-construction removal of any temporary bridge structures must return the project site to its preconstruction contours and elevations. The impacted areas shall be revegetated with appropriate native species.
13. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means (grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Please refer to the most current version of *Stormwater Best Management Practices*.
14. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams, shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWQ. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWQ for guidance on how to proceed and to determine whether or not a permit modification will be required.
15. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.
16. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.
17. For all streams being impacted due to site dewatering activities, the site shall be graded to its preconstruction contours and revegetated with appropriate native species.
18. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species.
19. All riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated. Maintained buffers shall be permanently revegetated with non-woody species by the end of the growing season following completion of construction. For the purpose of this condition, maintained buffer areas are defined as areas within the transportation corridor that will be subject to regular NCDOT maintenance activities including mowing. The area with non-maintained buffers shall be permanently revegetated with native woody species before the next growing season following completion of construction.
20. All stormwater runoff shall be directed as sheetflow through stream buffers at nonerosive velocities, unless otherwise approved by this certification.
21. Pursuant to NCAC15A 2B.0233(6), sediment and erosion control devices shall not be placed in Zone 1 of any Neuse Buffer without prior approval by the NCDWQ. At this time, the NCDWQ has approved no sediment and erosion control devices in Zone 1, outside of the approved project impacts, anywhere on this project. Moreover, sediment and erosion control devices shall be allowed in Zone 2 of the buffers provided that Zone 1 is not compromised and that discharge is released as diffuse flow.

22. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

23. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.

24. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.

25. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.

26. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.

27. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.

28. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.

29. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.

30. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

31. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.

32. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If NCDWQ determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, NCDWQ may reevaluate and modify this certification.

33. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification..

34. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.

35. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.

36. The Permittee shall report any violations of this certification to the Division of Water Quality within 24 hours of discovery.

37. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.

38. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify NCDWQ when all work included in the 401 Certification has been completed.

39. Native riparian vegetation (i.e. trees and shrubs native to your geographic region) must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction.

40. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.

41. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:

- a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
- b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
- c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
- d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

42. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

43. No drill slurry or water that has been in contact with uncured concrete shall be allowed to enter surface waters. This water shall be captured, treated, and disposed of properly.

44. This certification authorizes riparian buffer impacts for the Gray Pit borrow site. As stated in your application, 17,892 square feet of Zone 1 buffers and 11,803 square feet of Zone 2 buffers will be impacted however reforested. The replacement buffer will be 82,328 square feet of Zone 1 buffers and 57,935 square feet of Zone 2 buffers. Riparian vegetation reestablishment shall include a minimum of at least 2 native hardwood tree species planted at a density sufficient to provide 320 trees per acre at maturity.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of Administrative Hearings.

The petition may be faxed-provided the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.  
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings  
6714 Mail Service Center  
Raleigh, NC 27699-6714  
Telephone: (919)-733-2698, Facsimile: (919)-733-3478

A copy of the petition must also be served on DENR as follows:

Ms. Mary Penny Thompson, General Counsel  
Department of Environment and Natural Resources  
1601 Mail Service Center  
Raleigh, NC 27699-1601

This the 27th day of December 2012

DIVISION OF WATER QUALITY



Charles Wakild  
Director

WQC No. 3740

NCDWQ Project No.: \_\_\_\_\_

County: \_\_\_\_\_

Applicant: \_\_\_\_\_

Project Name: \_\_\_\_\_

Date of Issuance of 401 Water Quality Certification: \_\_\_\_\_

**Certificate of Completion**

Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant is required to return this certificate to the 401 Transportation Permitting Unit, North Carolina Division of Water Quality, 1650 Mail Service Center, Raleigh, NC, 27699-1650. This form may be returned to NCDWQ by the applicant, the applicant's authorized agent, or the project engineer. It is not necessary to send certificates from all of these.

***Applicant's Certification***

I, \_\_\_\_\_, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

***Agent's Certification***

I, \_\_\_\_\_, hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

***Engineer's Certification***

\_\_\_\_\_ Partial \_\_\_\_\_ Final

I, \_\_\_\_\_, as a duly registered Professional Engineer in the State of North Carolina, having been authorized to observe (periodically, weekly, full time) the construction of the project, for the Permittee hereby state that, to the best of my abilities, due care and diligence was used in the observation of the construction such that the construction was observed to be built within substantial compliance and intent of the 401 Water Quality Certification and Buffer Rules, the approved plans and specifications, and other supporting materials.

Signature \_\_\_\_\_ Registration No. \_\_\_\_\_

Date \_\_\_\_\_

# REFORESTATION DETAIL

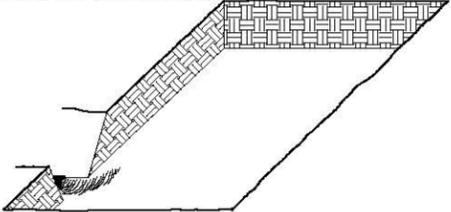
PROJECT REFERENCE NO.	SHEET NO.
R-2554BB&C	
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
<span style="font-size: 8px; vertical-align: middle;">HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116</span>	
<span style="font-size: 8px; vertical-align: middle;">BARNHILL CONTRACTING COMPANY</span>	

## PLANTING DETAILS SEEDLING / LINER BAREROOT PLANTING DETAIL

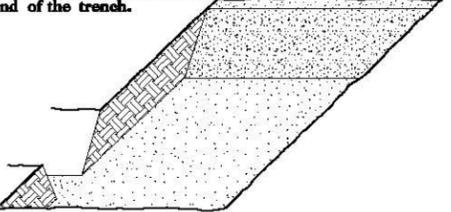
## REFORESTATION

### HEALING IN

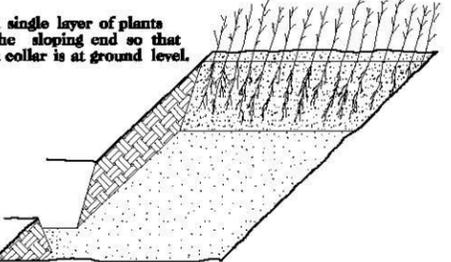
1. Locate a healing-in site in a shady, well protected area.
2. Excavate a flat bottom trench 12 inches deep and provide drainage.



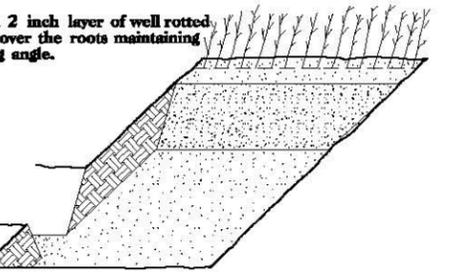
3. Backfill the trench with 2 inches well rotted sawdust. Place a 2 inch layer of well rotted sawdust at a sloping angle at one end of the trench.



4. Place a single layer of plants against the sloping end so that the root collar is at ground level.

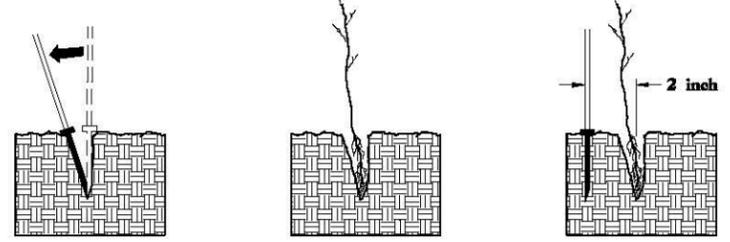


5. Place a 2 inch layer of well rotted sawdust over the roots maintaining a sloping angle.

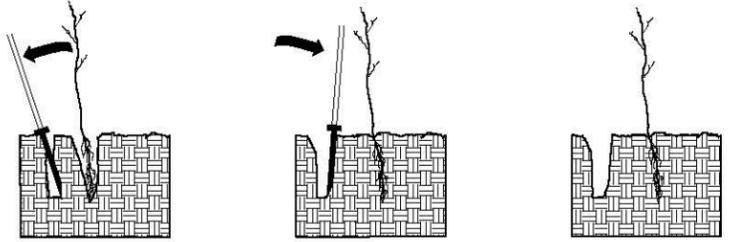


6. Repeat layers of plants and sawdust as necessary and water thoroughly.

### DIBBLE PLANTING METHOD USING THE KBC PLANTING BAR



1. Insert planting bar as shown and pull handle toward planter.
2. Remove planting bar and place seedling at correct depth.
3. Insert planting bar 2 inches toward planter from seedling.



4. Pull handle of bar toward planter, firming soil at bottom.
5. Push handle forward firming soil at top.
6. Leave compaction hole open. Water thoroughly.

TREE REFORESTATION SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.

### PLANTING NOTES:

**PLANTING BAG**  
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.



**KBC PLANTING BAR**  
Planting bar shall have a blade with a triangular cross section, and shall be 12 inches long, 4 inches wide and 1 inch thick at center.



**ROOT PRUNING**  
All seedlings shall be root pruned, if necessary, so that no roots extend more than 10 inches below the root collar.

### REFORESTATION

MIXTURE, TYPE, SIZE, AND FURNISH SHALL CONFORM TO THE FOLLOWING:

25% LIRIODENDRON TULIPIFERA	TULIP POPLAR	12 in - 18 in BR
25% PLATANUS OCCIDENTALIS	SYCAMORE	12 in - 18 in BR
25% FRAXINUS PENNSYLVANICA	GREEN ASH	12 in - 18 in BR
25% BETULA NIGRA	RIVER BIRCH	12 in - 18 in BR

PLOT DRIVER: NCDOT\_pdf\_color\_eng\_100.ppt  
 USER: cmyers  
 FILE: HDR-Engineering-Dept-Marketing\DOTs-Regional\Local-Agencies\IR-2554BB&C-Goldsboro\IR-2554BB&C-Environmental\On-Site-Mitigation\Site-Planting\IR-2554BB&C-HYD-MIT-PLANT-DETAILS.dgn  
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 TIME: 7:44:34 AM  
 DATE: 10/10/2012

REVISIONS

**North Carolina Department of Transportation  
Project Development and Environmental Analysis Unit  
Natural Environment Section (NES)  
Raleigh, North Carolina**

**NSD Site 9 (Mark Edwards Site)  
On-site Stream Mitigation Plan for  
US Highway 70 Goldsboro Bypass Construction  
Wayne County, North Carolina**

**T.I.P. Number R-2554BB&C  
WBS No. 34461.3.8  
ONE # 096-013**

**October 30, 2012**

**1.0 BASELINE INFORMATION**

The project is located within USGS Hydrologic Cataloging Unit 03020202, and NC Division of Water Quality (NCDWQ) sub-basin 03-04-05 of the Neuse River Basin, and is part of the of the South Atlantic-Gulf region. The mitigation site begins adjacent to Mark Edwards Road approximately 0.7 mile south of the intersection of Mark Edwards Road and Hood Swamp Road in Wayne County near Goldsboro, within the Right of Way for R-2554. The project is within the Inner Coastal Plain physiographic province, specifically the Rolling Coastal Plain Ecoregion. Land use within the watershed is primarily agriculture with limited forested areas and low density residential development. The existing stream length, drainage area, and jurisdictional status are summarized in Table 1.

**Table 1. Summary of Existing Stream Length and Drainage Area.**

<b>Stream Reach</b>	<b>Existing Length (LF)</b>	<b>Drainage Area (sq mi)</b>	<b>Intermittent/Perennial Status</b>
UT to West Bear Upper Reach (Sta. 13+08.94 -SR13REV- to 14+49.33 -SR13REV-) NSD Site 9 Mark Edwards Site	841	0.05	NCDWQ Form Score $\geq$ 30 Stream reach already considered perennial by agencies during impact assessments. Status = <u>Perennial</u>
UT to West Bear Lower Reach (Sta. 44+77.69 -SR12- to 53+98.90 -SR12-) NSD Site 9 Mark Edwards Site	736	0.24	NCDWQ Form Score $\geq$ 30 Stream reach already considered perennial by agencies during impact assessments. Status = <u>Perennial</u>

The project includes relocation and buffer restoration of an unnamed tributary (UT) to West Bear Creek. West Bear Creek has been assigned Stream Index Number 27-72-2 (NCDWQ 2012) and is designated a warm water stream with a classification of C; Sw, NSW. Class C waters are protected for secondary recreation, fishing, and aquatic life. The supplemental classifications for Bear Creek are Swamp Water (Sw) and Nutrient Sensitive Waters (NSW). Swamp Water is

intended to recognize those waters with low velocities and other natural characteristics different from adjacent streams; Nutrient Sensitive Waters are those needing additional nutrient management due to their potential for excessive growth of microscopic or macroscopic vegetation.

A large portion of the native plant communities have been removed from the site and its drainage area to facilitate agricultural land uses. Approximately 70% (2.2 acres) of the project boundary is composed of agricultural fields, 20% (0.6 acres) is made up of a mix of riparian species along a portion of the left stream bank, and the remaining 10% (0.3 acres) is low density residential.

NCDOT will perform on-site mitigation for jurisdictional stream impacts associated with Transportation Improvement Program (TIP) R-2554 as part of the construction of the US Highway 70 Goldsboro Bypass alignment. The project will serve as on-site mitigation through the restoration of 1,322 linear feet of stream and 76,057 square feet (sq. ft.) of Zone 1 and 55,759 sq. ft. of Zone 2 riparian buffer.

## **2.0 SITE SELECTION**

TIP R-2554BB&C involves construction of the US Highway 70 Bypass from Wayne Memorial Drive east to existing US 70 near La Grange. The majority of existing channel of the UT will be filled in during construction of the US 70 Bypass and relocated within the roadway Right of Way. Buffers will be reforested adjacent to the stream relocation with a total buffer width of approximately 100 feet. Two culverts (187 feet and 90 feet) will be constructed to carry the flow of the UT to West Bear Creek beneath the US 70 Bypass and service road as well as the replacement of a 29-foot long culvert to provide access to the adjacent landowners. Permanent stream impacts associated with the construction of the Goldsboro Bypass include 14,016 linear feet of jurisdictional stream channels.

The mitigation site will include approximately 3.1 acres within the NCDOT Right of Way. The area occurs northeast and southwest of the alignment from approximate roadway station SR13REV 12+68 RT to station LREV 357+94. Within this area, NCDOT will perform natural channel design of 1,322 linear feet of stream via floodplain excavation, site grading and planting. Approximately 131,816 square feet of buffer restoration adjacent to the UT to West Bear Creek will occur at this site. The vast majority of the restoration will occur downstream of the proposed culvert, to the southwest of the R-2554BB&C alignment.

### **Site Considerations**

The UT to West Bear Creek relocation will begin below an existing driveway culvert adjacent to Mark Edwards Road. The relocation will then turn west toward the US 70 Bypass alignment, cross the alignment through reinforced concrete pipe culverts, then take a southerly course, pass through a 29-foot driveway culvert, and eventually tie in to the existing channel. The design of the stream relocation has been broken into two segments, upper and lower reaches, due to the change in the drainage areas and proposed highway crossing.

A preliminary design was provided and approved by the agencies; however, several constraints have been noted during more detailed design. These constraints include an overhead utility pole which will not be moved during this project and two additional tie-ins that were not included in the previous design. In addition to these issues, the stream also has approximately 3 feet of fall over its length. The proposed culvert under the US 70 Bypass will be sloped in order to minimize the number of drops along the reach. Also, the existing driveway crossing, located 2/3 of the way down the lower reach will be replaced to provide increased capacity, promote connection with the restored floodplain, and set culvert inverts to the appropriate elevation.

### **3.0 SITE PROTECTION INSTRUMENT**

The mitigation area is located within the NCDOT Right of Way. The site will be managed to prohibit all uses inconsistent with its use as mitigation property, including any activity that would materially alter the biological integrity or functional and educational value of the site, consistent with the mitigation plan.

The site will be placed in the NES mitigation geodatabase. It will be monitored for five years with annual reports provided to the Interagency Review Team. After closeout, the site will be placed in the NCDOT Stewardship Program for long term management and protection.

### **4.0 OBJECTIVES**

The goal of the project is to restore 1,322 linear feet of stream and 76,057 sq. ft. of Zone 1 and 55,759 sq. ft. of Zone 2 riparian buffer to mitigate for impacts associated with TIP R-2554. The functional restoration of the site will be accomplished using natural channel design approaches for a single-thread channel for the UT to West Bear Creek and buffer restoration. The proposed restoration and mitigation amounts are summarized in Table 2 below:

**Table 2. Restoration Approaches and Proposed Mitigation Amounts.**

<b>Mitigation Area</b>	<b>Size</b>	<b>Potential Credits (1:1 ratio)</b>	<b>Restoration Approach</b>
UT to West Bear Creek Upper Reach (Sta. 13+08.94 - SR13REV- to 14+49.33 -SR13REV-)	632 LF	632	Restoration will consist of a Rosgen Priority Level II approach. A new floodplain will be excavated at a lower elevation, and a stable meandering channel restored through the new floodplain. (C/E5 streamtype)
UT to West Bear Creek Lower Reach (Sta. 44+77.69 -SR12- to 53+98.90 -SR12-)	690 LF	690	Restoration will consist of a Rosgen Priority Level II approach. A new floodplain will be excavated at a lower elevation, and a stable meandering channel restored through the new floodplain. (C/E5 streamtype)
Riparian Buffer Restoration	Zone 1 76,057 SQ.FT.	Zone 1 76,057 SQ.FT.	Restoration will include the planting of a approximately 100 foot total riparian buffer corridor along the restored stream.
	Zone 2 55,759 SQ.FT.	Zone 2 55,759 SQ.FT.	

## **5.0 MITIGATION WORK PLAN**

The mitigation area will be constructed following residential relocations and culvert installation during the construction of TIP R-2554BB&C. Construction activities related to the mitigation site involve floodplain excavation, stream channel grading, structure installation, and native vegetation planting. Once these have been established, the new stream channels will be stabilized and prepared for normal flow conditions.

Reference reach data and past project experience support the design of a single-thread channel due to the watershed size, slope, and sediment transport competency (unit stream power). The design involves a Rosgen Priority Level II approach in which a new, meandering single-thread channel (C/E5 streamtype) will be constructed through a newly-established floodplain excavated at a lower elevation. In-stream structures will consist of logs and wooden structures to provide stability. The streambanks and adjacent floodplain areas will be planted with native vegetation that are moderately to highly tolerant of flooded conditions.

### **Riparian Buffer Planting**

Following the successful completion of site grading and stabilization, the vegetation plan for the site will include the planting of bare-root trees in riparian buffer areas adjacent to the UT to West Bear Creek. An approximately 100-foot wide buffer corridor will be maintained along the restored stream reach. Tree species commonly found in Coastal Plain Bottomland Hardwood forests will be planted across the site that include a mixture of no less than four native species adapted to site conditions, such as river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), swamp tupelo (*Nyssa sylvatica var. biflora*), sycamore (*Platanus occidentalis*), overcup oak (*Quercus lyrata*), and swamp chestnut oak (*Quercus michauxii*). Final species selection will be based on availability.

Native grass seeding and mulching will be applied on all disturbed areas within the stream restoration area for stabilization purposes according to guidance and standard procedures of NCDOT's Roadside Environmental Unit. An as-built report will be submitted within 60 days of completion of the project. Construction is anticipated to start in the summer of 2013.

## **6.0 PERFORMANCE STANDARDS**

NCDOT shall monitor stream channel stability and buffer vegetation survival on the site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success. Monitoring approaches follow those recommended by the Stream Mitigation Guidelines (USACE and NCDWQ 2003) for the UT to West Bear stream reach. These approaches are described below in Section 7.0.

## **7.0 MONITORING REQUIREMENTS**

The stream mitigation site will be monitored for five years or until success criteria is satisfied. Monitoring protocols shall follow the Monitoring Level 1 outlined in the Stream Mitigation Guidelines, April 2003. NCDOT will evaluate the success of the stream restoration project based on guidance provided by the Stream Mitigation Guidelines disseminated by the United States Army Corps of Engineers-Wilmington District. The survey of the channel dimension will consist of permanent cross sections placed at an equal number of pools and riffles. Annual photographs showing both banks and upstream and downstream views will be taken from permanent, mapped photo points. The entire restored length of stream will be investigated for channel stability and in-stream structure functionality as well as survey of the longitudinal profile. Any evidence of channel instability will be identified, mapped and photographed.

## **8.0 OTHER INFORMATION**

During refinement of the design of the stream relocation, two 0.5ft drops were proposed. Both of these drops are proposed downstream of the outlet of the culvert that passes under -SR12-. The locations of the proposed drops were determined based on the upstream grade control provided by the culverts under the roadway alignments. There will be a drop halfway between the culvert outlet and the first meander bend, then another drop in the first meander. The long culverts under the roadway alignments along with the two drop structures helped mitigate the 3 ft elevation change in this short reach.

## **9.0 DETERMINATION OF CREDITS**

Per the NCDOT plans and 401/404 permit application for R-2554, NCDOT proposes to restore 1,322 linear feet of stream and 76,057 sq. ft. of Zone 1 and 55,759 sq. ft. of Zone 2 riparian buffer via floodplain excavation and channel grading and subsequent native buffer reforestation to mitigate for permanent impacts associated with the TIP at a 1:1 ratio. An as-built report will be submitted within 60 days of completion of the project to verify actual linear feet constructed and buffer acreage planted. The success of the mitigation area and determination of total credits will be based upon successful completion and closeout of the monitoring period.

## **9.1 CREDIT RELEASE SCHEDULE**

NCDOT proposes immediate, full release of the proposed 1,322 linear feet of restored streams and 76,057 sq. ft. of Zone 1 and 55,759 sq. ft. of Zone 2 riparian buffer as on-site mitigation for the associated stream impacts of 14,016 linear feet for all sections of R-2554 at a 1:1 ratio.

**Table 3. Restoration Credit Schedule.**

<b>Section / Site</b>	<b>Stream Restoration (LF)</b>	<b>Buffer Restoration Zone 1 (Sq. Ft.)</b>	<b>Buffer Restoration Zone 2 (Sq. Ft.)</b>	<b>Total Buffer Credit (Sq. Ft.)</b>
R-2554BB NSD Site 9 Mark Edwards Site	1,322	76,057	55,759	131,816

In the event that mitigation credits remain after permitting, they will be placed on the NCDOT on-site debit ledger for use on future TIP projects.

### **10.0 GEOGRAPHIC SERVICE AREA**

The proposed Geographic Service Area (GSA) for the mitigation area is composed of the 8-digit Hydrologic Cataloging Unit (HUC) 03020202. It is anticipated that the entire 1,322 linear feet will be used on-site at a 1:1 ratio to offset stream impacts associated with R-2554. Any remaining mitigation credit will be available for use within HUC 03020202 as well as adjacent HUC's 03020201 and 03020203 within the Neuse River Basin.

### **11.0 MAINTENANCE PLAN**

The site will be held by NCDOT and placed in the NES mitigation geodatabase. Once monitoring is completed and the site is closed out, it will be placed in the NCDOT Stewardship Program for long term maintenance and protection.

If an appropriate third party recipient is identified in the future, then the transfer of the property will include a conservation easement or other measure to protect the natural features and mitigation value of the site in perpetuity.

### **12.0 LONG TERM ADAPTIVE MANAGEMENT PLAN**

The site will be managed by NCDOT according to the mitigation plan. In the event that unforeseen issues arise that affect the management of the site, any remediation will be addressed by NCDOT in coordination with the Interagency Review Team.

### **13.0 FINANCIAL ASSURANCES**

The site will be managed by NCDOT with its own distinct cost center number within the NCDOT budgeting and financial tracking system. Therefore, all accounting for revenues, contract encumbrances, fund transfers, and expenses will be performed and reported independent from other capital budget or operating budget accounting.

**North Carolina Department of Transportation  
Project Development and Environmental Analysis Unit  
Natural Environment Section (NES)  
Raleigh, North Carolina**

**UT to West Bear Creek (Benton)  
On-site Stream Mitigation Plan for  
US Highway 70 Goldsboro Bypass Construction  
Wayne County, North Carolina**

**T.I.P. Number R-2554BB&C  
WBS No. 34461.3.8  
ONE ID # 096-008**

**October 30, 2012**

**1.0 BASELINE INFORMATION**

The project is located within USGS Hydrologic Cataloging Unit 03020202, and NC Division of Water Quality (NCDWQ) sub-basin 03-04-05 of the Neuse River Basin, and is part of the of the South Atlantic-Gulf region. The mitigation site is located approximately 0.6 mile west of the intersection of Guy Smith Road and N. Beston Road in Wayne County near Goldsboro within the Right of Way (ROW) for R-2554. The project is within the Inner Coastal Plain physiographic province, specifically the Rolling Coastal Plain Ecoregion. Land use within the watershed is primarily agriculture with limited forested areas and low density residential development. The existing stream length, drainage area, and jurisdictional status are summarized in Table 1.

**Table 1. Summary of Existing Stream Length and Drainage Area.**

<b>Stream Reach</b>	<b>Existing Length (LF)</b>	<b>Drainage Area (sq mi)</b>	<b>Intermittent/Perennial Status</b>
UT to West Bear Creek (Benton)	498	1.16	NCDWQ Form Score $\geq 30$ Stream reach already considered perennial by agencies during impact assessments. Status = <u>Perennial</u>

The project includes relocation of an unnamed tributary (UT) to West Bear Creek and buffer restoration along the UT as well as the left (north) bank of West Bear Creek. West Bear Creek has been assigned Stream Index Number 27-72-2 (NCDWQ 2012) and is designated a warm water stream with a classification of C; Sw, NSW. Class C waters are protected for secondary recreation, fishing, and aquatic life. The supplemental classifications for Bear Creek are Swamp Water (Sw) and Nutrient Sensitive Waters (NSW). Swamp Water is intended to recognize those waters with low velocities and other natural characteristics different from adjacent streams; Nutrient Sensitive Waters are those needing additional nutrient management due to their potential for excessive growth of microscopic or macroscopic vegetation.

Most of the native plant communities have been removed from the site and its drainage area to facilitate agricultural land uses. Approximately 95% (19 acres) of the project boundary is composed of open fields, currently planted in corn, while the remaining 5% (1 acres) is made up of a mix of riparian species associated with the existing stream banks and fallow land along the edge of the field.

NCDOT will perform on-site mitigation for jurisdictional stream impacts associated with Transportation Improvement Program (TIP) R-2554 as part of the construction of the US Highway 70 Goldsboro Bypass alignment. The project will serve as on-site mitigation through the restoration of 1,038 linear feet of streams and 78,065 square feet (sq. ft.) of Zone 1 and 51,956 sq. ft. of Zone 2 riparian buffer.

## **2.0 SITE SELECTION**

TIP R-2554BB&C involves construction of the US Highway 70 Bypass from Wayne Memorial Drive east to existing US 70 near La Grange. The existing channel of the UT will be filled in during construction of the US 70 Bypass and relocated within the floodplain of West Bear Creek. A 600-foot long bridge will be built to carry the US 70 Bypass over West Bear Creek, with buffers restored adjacent to the left bank of West Bear Creek as well as the relocated UT to West Bear Creek. Permanent stream impacts associated with the project include 14,016 linear feet of jurisdictional stream channels.

The mitigation site includes approximately 19.96 acres within Right of Way held by NCDOT. The area occurs north of the alignment from approximate roadway station 473+53LT to station 481+39 LT. Within this area, the NCDOT will restore 1038 linear feet of stream via floodplain excavation, site grading and planting. Approximately 130,021 square feet of buffer restoration adjacent to the UT to West Bear Creek and the left bank of West Bear Creek will occur at this site.

### **Site Considerations**

The UT to West Bear Creek relocation will begin below the existing scour hole at the pipe outlet from the existing pond upstream. The stream relocation should have no impacts to the existing dam and the NCDOT does not have any maintenance responsibilities related to the dam.

The area within the Right of Way will also be used for a borrow site for the proposed roadway and may provide additional wetland restoration credit. It is anticipated that approximately 50 thousand cubic yards of material will be removed from the site.

The existing berm adjacent to West Bear Creek will be removed to provide access to the floodplain and the FEMA analysis of the West Bear bridge crossing as well as to provide a riparian buffer along West Bear Creek within the Right of Way. The berm currently acts as a trail for off road vehicles. This will need to be monitored to ensure that the mitigation site is not vandalized by such activities in the future.

### **3.0 SITE PROTECTION INSTRUMENT**

The mitigation area is located within the NCDOT Right of Way and NCDOT Right of Way acquired for the project. The site will be managed to prohibit all uses inconsistent with its use as mitigation property, including any activity that would materially alter the biological integrity or functional and educational value of the site, consistent with the mitigation plan.

The site will be placed in the NES mitigation geodatabase. It will be monitored for five years with annual reports provided to the Interagency Review Team. After closeout, the site will be placed in the NCDOT Stewardship Program for long term management and protection.

### **4.0 OBJECTIVES**

The goal of the project is to restore 1,038 linear feet of stream and 78,065 sq. ft. of Zone 1 and 51,956 sq. ft. of Zone 2 riparian buffer to mitigate for impacts associated with TIP R-2554. The functional restoration of the site will be accomplished using natural channel design approaches for a single-thread channel for the UT to West Bear Creek and buffer restoration for the UT as well as the left bank of West Bear Creek. The proposed restoration and mitigation amounts are summarized in Table 2 below:

**Table 2. Restoration Approaches and Proposed Mitigation Amounts.**

<b>Mitigation Area</b>	<b>Size</b>	<b>Potential Credits</b>	<b>Restoration Approach</b>
UT to West Bear Creek (Benton)	1,038 LF	1,038 (1:1 ratio)	Restoration will consist of a Rosgen Priority Level II approach. A new floodplain will be excavated at a lower elevation, and a stable meandering channel restored through the new floodplain. (C/E5 streamtype)
Riparian Buffer Restoration Zone 1	78,065 SQ.FT.	78,065 SQ. FT. (1:1 ratio)	Restoration will include the planting of 50 foot riparian buffers on both sides of the restored stream as well as on the left bank of West Bear Creek.
Riparian Buffer Restoration Zone 2	51,956 SQ. FT.	51,956 SQ. FT. (1:1 ratio)	

### **5.0 MITIGATION WORK PLAN**

The mitigation area will be constructed following prior to excavation of the borrow material for TIP R-2554BB&C at this site. Construction activities related to the mitigation site involve floodplain excavation, stream channel grading, structure installation, and native vegetation planting. Once these have been established, the new stream channels will be stabilized and prepared for normal flow conditions.

Reference reach data and past project experience support the design of a single-thread channel due to its watershed size, slope, and sediment transport competency (unit stream power). The

design involves a Rosgen Priority Level II approach in which a new, meandering single-thread channel (C/E5 streamtype) will be constructed through a newly-established floodplain excavated at a lower elevation. In-stream structures will consist of logs and wooden structures to provide stability. The stream banks and adjacent floodplain areas will be planted with native vegetation that are moderately to highly tolerant of flooded conditions.

### **Riparian Buffer Planting**

Following the successful completion of site grading and stabilization, the vegetation plan for the site will include the planting of bare-root trees in riparian buffer areas adjacent to the UT to West Bear Creek and the left bank of West Bear Creek. A minimum buffer width of 50 feet will be maintained on all restored streams with wider buffers in most areas. Tree species commonly found in Coastal Plain Bottomland Hardwood forests will be planted across the site that include a mixture of no less than four native species adapted to site conditions, such as river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), swamp tupelo (*Nyssa sylvatica var. biflora*), sycamore (*Platanus occidentalis*), overcup oak (*Quercus lyrata*), and swamp chestnut oak (*Quercus michauxii*). Final species selection will be based on availability.

Native grass seeding and mulching will be applied on all disturbed areas within the stream restoration area for stabilization purposes according to guidance and standard procedures of NCDOT's Roadside Environmental Unit. An as-built report will be submitted within 60 days of completion of the project. Construction is anticipated to start in the summer of 2013.

## **6.0 PERFORMANCE STANDARDS**

NCDOT shall monitor stream channel stability and buffer vegetation survival on the site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success. Monitoring approaches follow those recommended by the Stream Mitigation Guidelines (USACE and NCDWQ 2003) for the UT to West Bear stream reach. These approaches are described below in Section 7.0.

## **7.0 MONITORING REQUIREMENTS**

The stream mitigation site will be monitored for five years or until success criteria is satisfied. Monitoring protocols shall follow the Monitoring Level 1 outlined in the Stream Mitigation Guidelines, April 2003. NCDOT will evaluate the success of the stream restoration project based on guidance provided by the Stream Mitigation Guidelines disseminated by the United States Army Corps of Engineers-Wilmington District. The survey of the channel dimension will consist of permanent cross sections placed at an equal number of pools and riffles. Annual photographs showing both banks and upstream and downstream views will be taken from permanent, mapped photo points. The entire restored length of stream will be investigated for channel stability and in-stream structure functionality as well as survey of the longitudinal profile. Any evidence of channel instability will be identified, mapped and photographed.

## **8.0 OTHER INFORMATION**

A couple of issues related to the dam upstream of the proposed stream relocation were noted during preliminary design. The first issue is sediment transport. The water coming out of the riser structure from the pond will be sediment starved and careful attention must be paid to the profile to ensure that a steep stream gradient does not further promote erosion. A range of unit stream power was calculated based on the stable reference reach and applied to the proposed design. Due to the elevation difference of the stream at the ROW limits and the tie in location at West Bear Creek, a total of ten 0.5ft drops have been added to meet the parameters of a stable stream.

The second issue is the flood attenuation the pond provides. Due to the attenuation, the channel cannot be designed based on the drainage area. However, a small section (20-30 ft) of the existing reach was found to be relatively stable and was therefore used as a reference reach. The profile and a cross section of this reach were surveyed to determine a bankfull discharge. The bankfull discharge for 1.16 sq mile drainage area was also routed through the pond and riser structure. The bankfull width based on the routed discharge was approximately 8 ft. The stable reach that was surveyed had a bankfull width of 8 ft as well, so the design moved forward with an 8 ft. bankfull width.

## **9.0 DETERMINATION OF CREDITS**

Per the NCDOT plans and 401/404 permit application for R-2554, NCDOT proposes to restore 1,038 linear feet of stream and 78,065 sq. ft. of Zone 1 and 51,956 sq. ft. of Zone 2 riparian buffer via floodplain excavation and channel grading and subsequent native buffer reforestation to mitigate for permanent impacts associated with the TIP at a 1:1 ratio. An as-built report will be submitted within 60 days of completion of the project to verify actual linear feet constructed and buffer acreage planted. The success of the mitigation area and determination of total credits will be based upon successful completion and closeout of the monitoring period.

## **9.1 CREDIT RELEASE SCHEDULE**

NCDOT proposes immediate, full release of the proposed 1,038 linear feet of restored streams and 78,065 sq. ft. of Zone 1 and 51,956 sq. ft. of Zone 2 restored riparian buffer as on-site mitigation for the associated stream impacts of 14,016 linear feet for R-2554 at a 1:1 ratio.

**Table 3. Restoration Credit Schedule.**

<b>Section / Site</b>	<b>Stream Restoration (LF)</b>	<b>Buffer Restoration Zone 1 (Sq. Ft.)</b>	<b>Buffer Restoration Zone 2 (Sq. Ft.)</b>	<b>Total Buffer Credit (Sq. Ft.)</b>
R-2554C UT to West Bear Creek (Benton)	1,038	78,065	51,956	130,021

In the event that mitigation credits remain after permitting, they will be placed on the NCDOT on-site debit ledger for use on future TIP projects.

## **10.0 GEOGRAPHIC SERVICE AREA**

The proposed Geographic Service Area (GSA) for the mitigation area is composed of the 8-digit Hydrologic Cataloging Unit (HUC) 03020202. It is anticipated that the entire 1,038 linear feet will be used on-site at a 1:1 ratio to offset stream impacts associated with R-2554. Any remaining mitigation credits will be available for use within HUC 03020202 as well as adjacent HUC's 03020201 and 03020203 within the Neuse River Basin.

## **11.0 MAINTENANCE PLAN**

The site will be held by NCDOT and placed in the NES mitigation geodatabase. Once monitoring is completed and the site is closed out, it will be placed in the NCDOT Stewardship Program for long term maintenance and protection.

If an appropriate third party recipient is identified in the future, then the transfer of the property will include a conservation easement or other measure to protect the natural features and mitigation value of the site in perpetuity.

## **12.0 LONG TERM ADAPTIVE MANAGEMENT PLAN**

The site will be managed by NCDOT according to the mitigation plan. In the event that unforeseen issues arise that affect the management of the site, any remediation will be addressed by NCDOT in coordination with the Interagency Review Team.

## **13.0 FINANCIAL ASSURANCES**

The site will be managed by NCDOT with its own distinct cost center number within the NCDOT budgeting and financial tracking system. Therefore, all accounting for revenues, contract encumbrances, fund transfers, and expenses will be performed and reported independent from other capital budget or operating budget accounting.

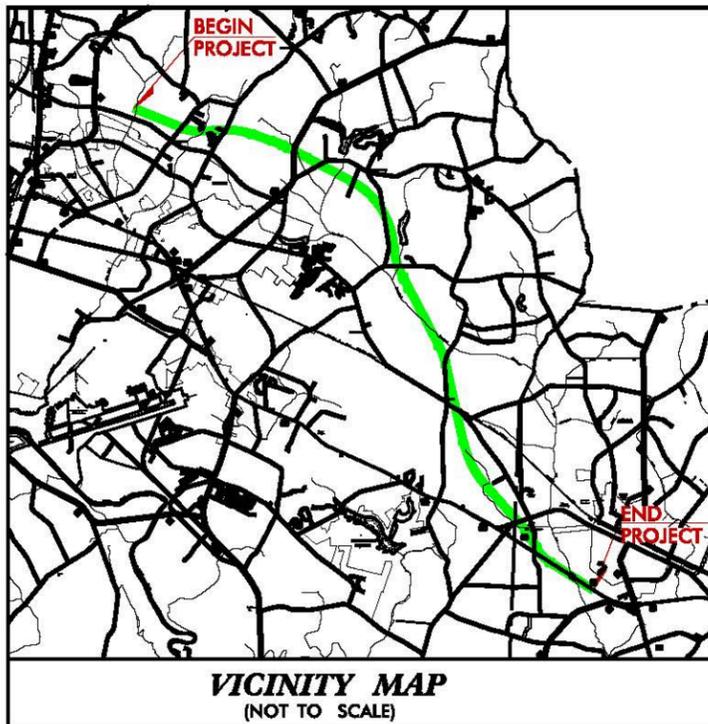
STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

**WAYNE-LENOIR COUNTIES**

**LOCATION: US 70 (GOLDSBORO BYPASS) FROM EAST OF SR 1556 (WAYNE MEMORIAL DRIVE) TO EAST OF SR 1323 (PROMISE LAND ROAD)**

**TYPE OF WORK: DESIGN-BUILD AS SPECIFIED IN THE SCOPE OF WORK CONTAINED IN THE REQUEST FOR PROPOSALS**

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2554BB&C	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34461.3.8	NHF-0070(147)	CONSTRUCTION	

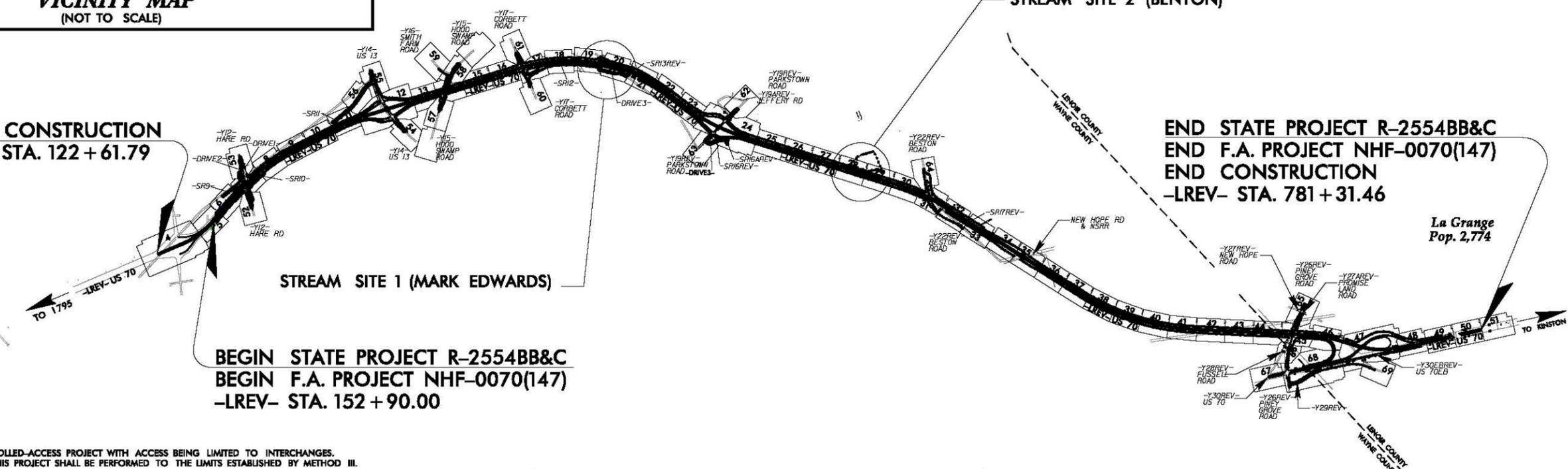


**R-2554BB&C  
ON-SITE MITIGATION**



**BEGIN CONSTRUCTION  
-LREV- STA. 122 + 61.79**

**END STATE PROJECT R-2554BB&C  
END F.A. PROJECT NHF-0070(147)  
END CONSTRUCTION  
-LREV- STA. 781 + 31.46**



**BEGIN STATE PROJECT R-2554BB&C  
BEGIN F.A. PROJECT NHF-0070(147)  
-LREV- STA. 152 + 90.00**

THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES. CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

**PROJECT PREPARED BY:**

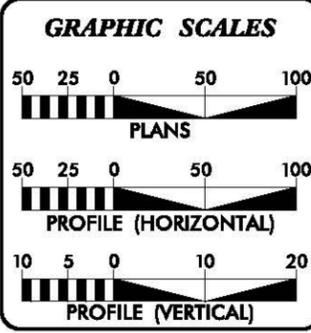
HDR Engineering, Inc. of the Carolinas  
3733 National Drive, Suite 207 Raleigh, N.C. 27612  
N.C.B.E.L.S. License Number: F-0116

**BARNHILL  
CONTRACTING  
COMPANY**

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION  
INCOMPLETE PLANS  
DO NOT USE FOR R/W ACQUISITION

**TIP PROJECT: R-2554BB&C**  
**CONTRACT: C202771**

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DATE: 9/4/2012  
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**DESIGN DATA**

ADT 2011	=	21400
ADT 2035	=	44500
DHV	=	8 %
D	=	55 %
T	=	11 % *
V	=	75 MPH
FUNCTIONAL CLASSIFICATION: INTERSTATE		
* TTST = 7%	DUAL = 4%	

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT R-2554BB&C	=	11.646 MILES
LENGTH STRUCTURE TIP PROJECT R-2554BB&C	=	0.256 MILES
TOTAL LENGTH TIP PROJECT R-2554BB&C	=	11.902 MILES
BRIDGE LENGTH BASED ON CENTERLINE PROJECTION STATION		

Prepared for the Office of:  
**DIVISION OF HIGHWAYS**  
1000 Birch Ridge Dr., Raleigh NC, 27610

2006 STANDARD SPECIFICATIONS

<b>RIGHT OF WAY DATE:</b> JANUARY 25, 2012 (R-2554BB) DECEMBER 23, 2002 (R-2554C)	<b>PAUL A. MEEHAN, P.E.</b> PROJECT ENGINEER
<b>LETTING DATE:</b> JANUARY 25, 2012	<b>CALVIN W. MOODY, III, P.E.</b> PROJECT DESIGN ENGINEER

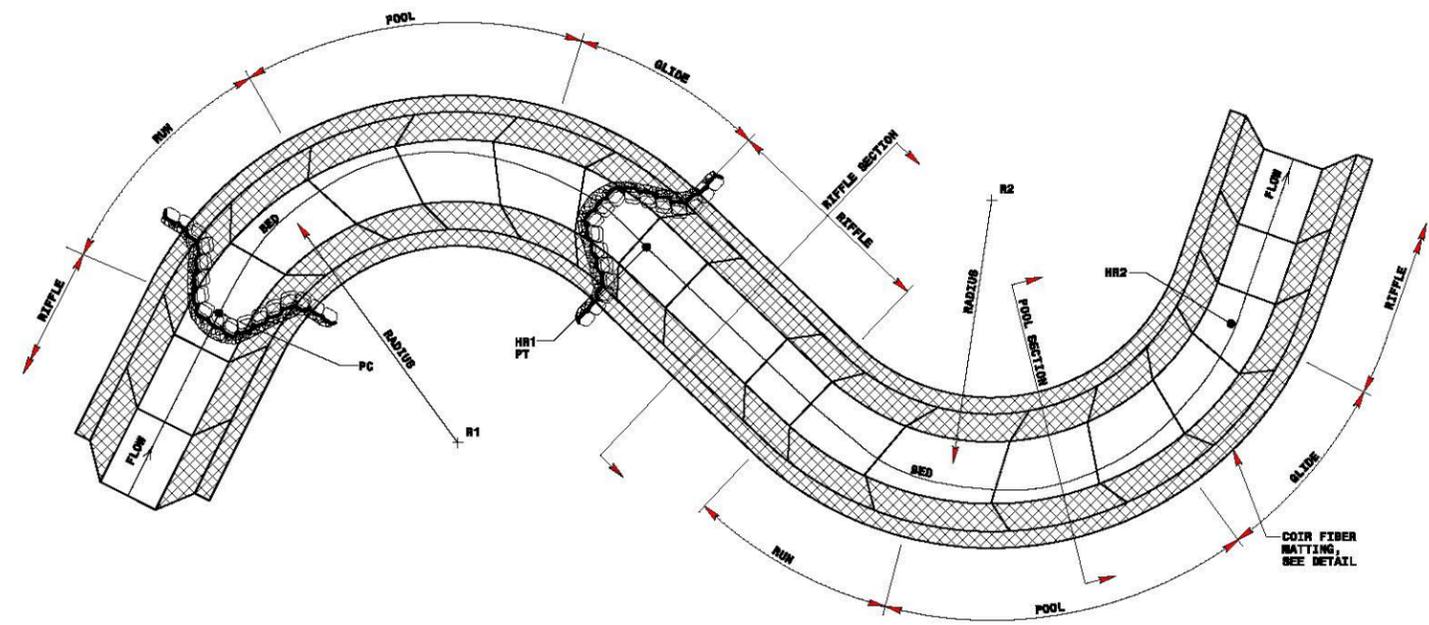
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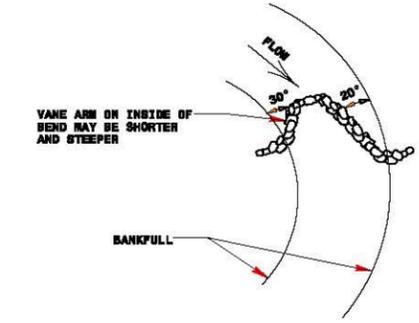
**ROADWAY DESIGN ENGINEER**

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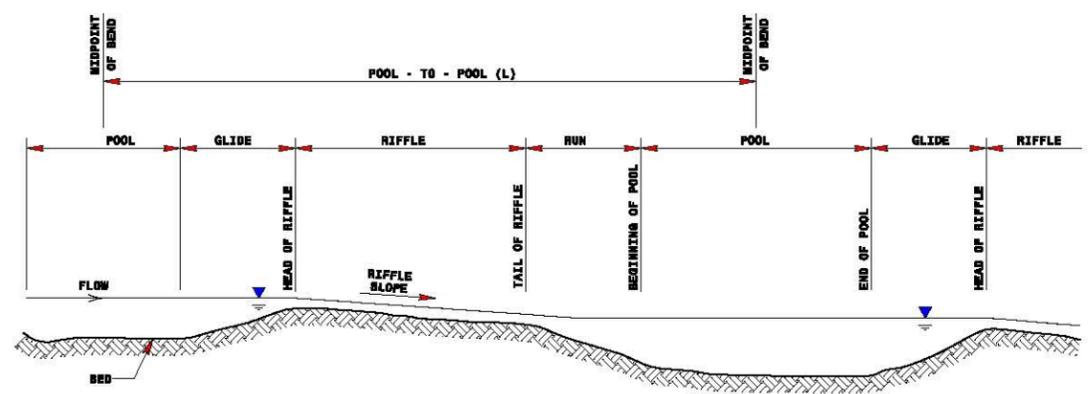




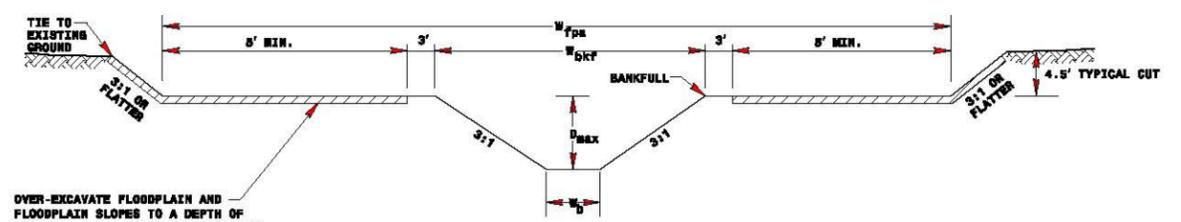
**TYPICAL PLAN**



**CROSS VANE CONSTRUCTION IN MEANDER-BEND PLAN VIEW**

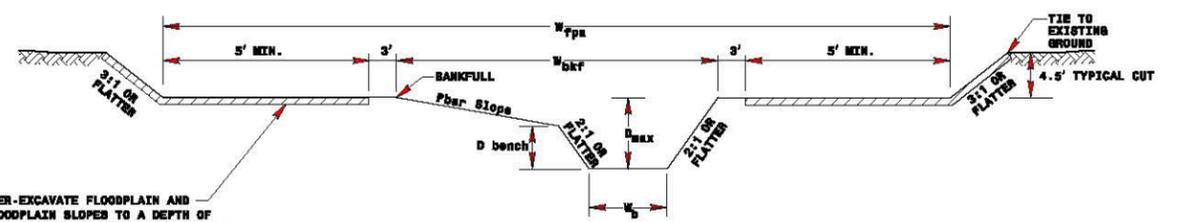


**TYPICAL PROFILE**



**TYPICAL RIFFLE WITH BANKFULL BENCH**

OVER-EXCAVATE FLOODPLAIN AND FLOODPLAIN SLOPES TO A DEPTH OF 6" BELOW FINAL GRADE AND PLACE 6" OF TOPSOIL TO FILL TO FINAL GRADE. OVER-EXCAVATION SHOULD BEGIN 3' FROM TOP OF BANK AND EXTEND TO EXCAVATION LIMITS.



**TYPICAL POOL WITH BANKFULL BENCH**

OVER-EXCAVATE FLOODPLAIN AND FLOODPLAIN SLOPES TO A DEPTH OF 6" BELOW FINAL GRADE AND PLACE 6" OF TOPSOIL TO FILL TO FINAL GRADE. OVER-EXCAVATION SHOULD BEGIN 3' FROM TOP OF BANK AND EXTEND TO EXCAVATION LIMITS.

STREAM	RIFFLE					POOL					
	W <sub>bkf</sub>	D <sub>max</sub>	W <sub>b</sub>	W <sub>fpa</sub>	W <sub>bkf</sub>	D <sub>max</sub>	W <sub>b</sub>	W <sub>fpa</sub>	Width/Depth Ratio	D <sub>bench</sub>	P <sub>bar</sub> Slope
STREAM 1 Sta. 10+00 - 26+39.1 (MARK EDWARDS)	7.0	0.9	1.6	75	10.5	1.75	0.7	75	12	1.0	5.75:1
STREAM 2 Sta. 10+00 - 20+37.91 (BENTON)	8.0	0.96	2.3	75	12	2	0.9	75	12	1.0	5.75:1

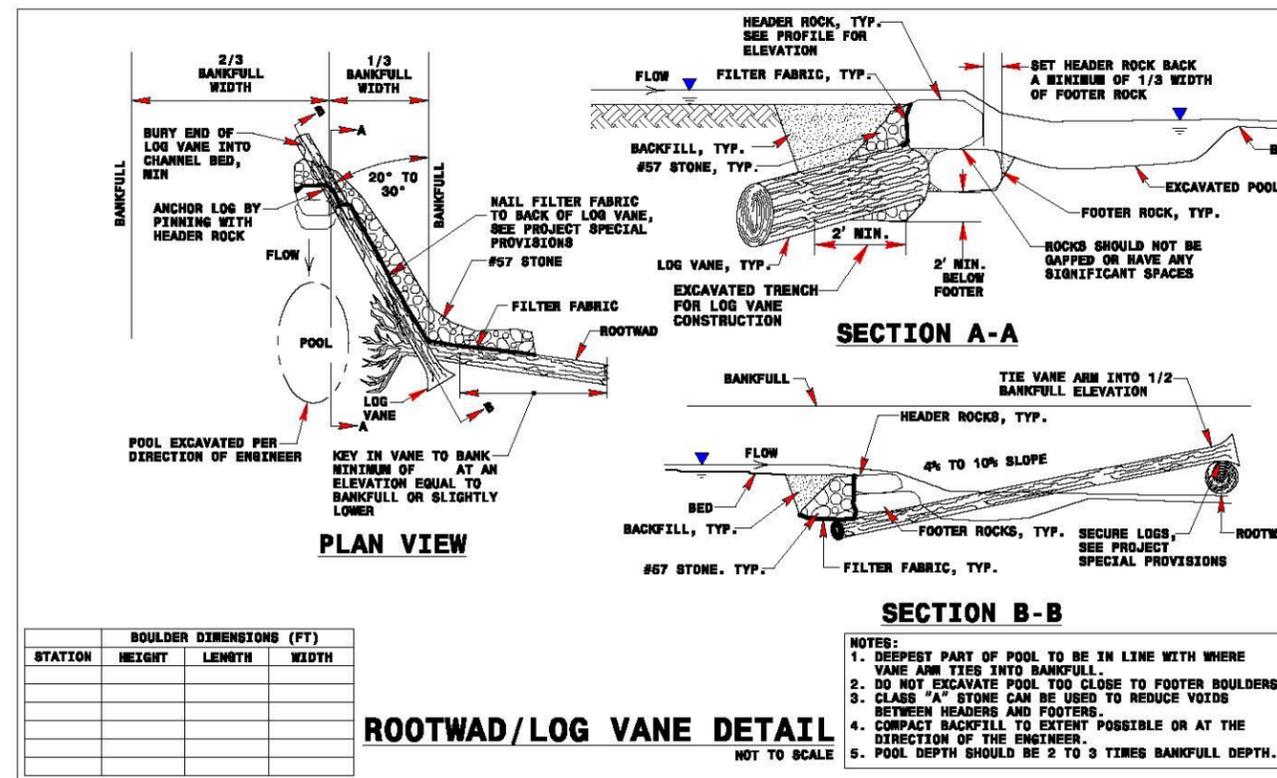
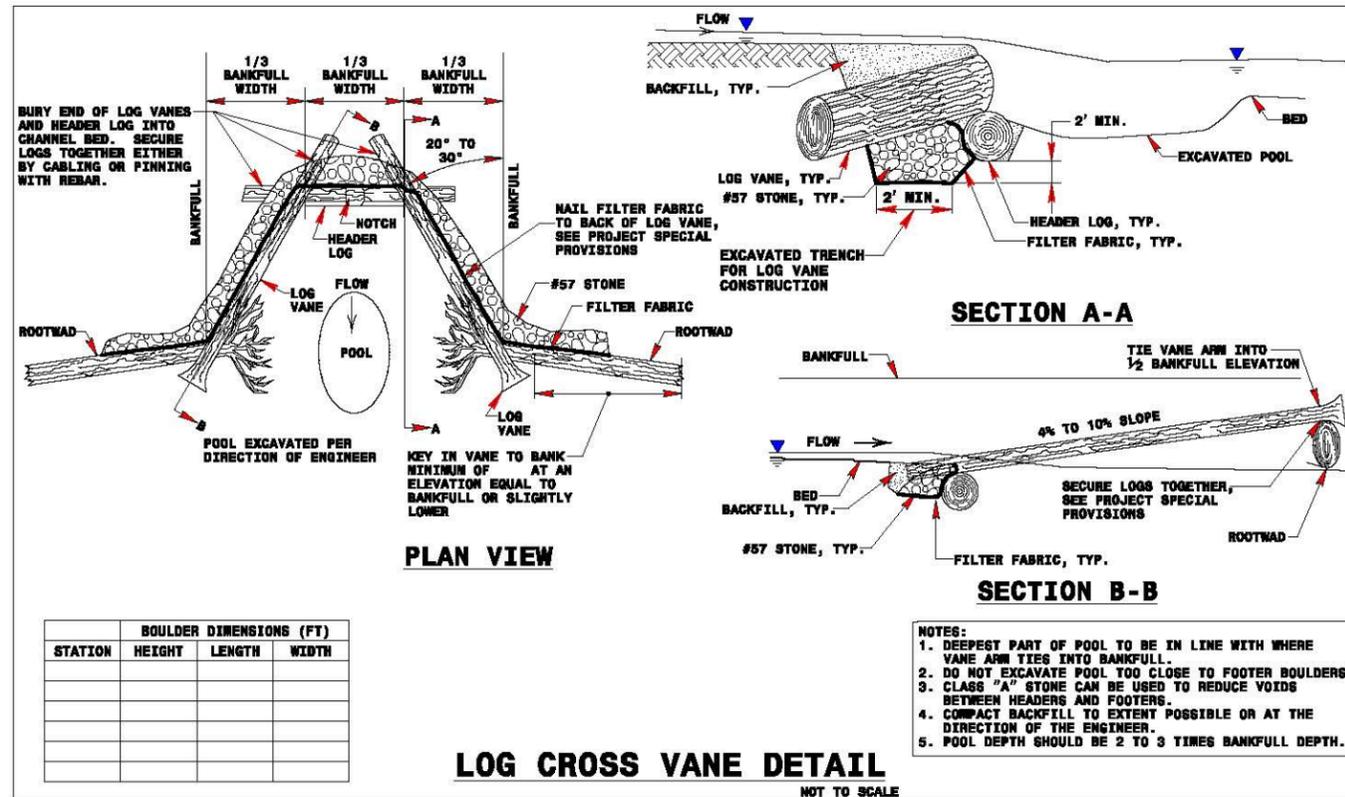
**NOTES:**  
 1. THE COORDINATES FOR EACH CENTER OF RADIUS (EX. "R1", "R2") AND EACH HEAD OF RIFFLE (EX. "HR1", "HR2") ARE INDICATED ON THE PLAN SHEETS.

**CHANNEL TYPICAL DETAIL**  
NOT TO SCALE

W<sub>bkf</sub> = BANKFULL WIDTH  
 D<sub>max</sub> = MAXIMUM DEPTH  
 W<sub>b</sub> = BOTTOM WIDTH  
 W<sub>fpa</sub> = FLOOD PRONE AREA WIDTH

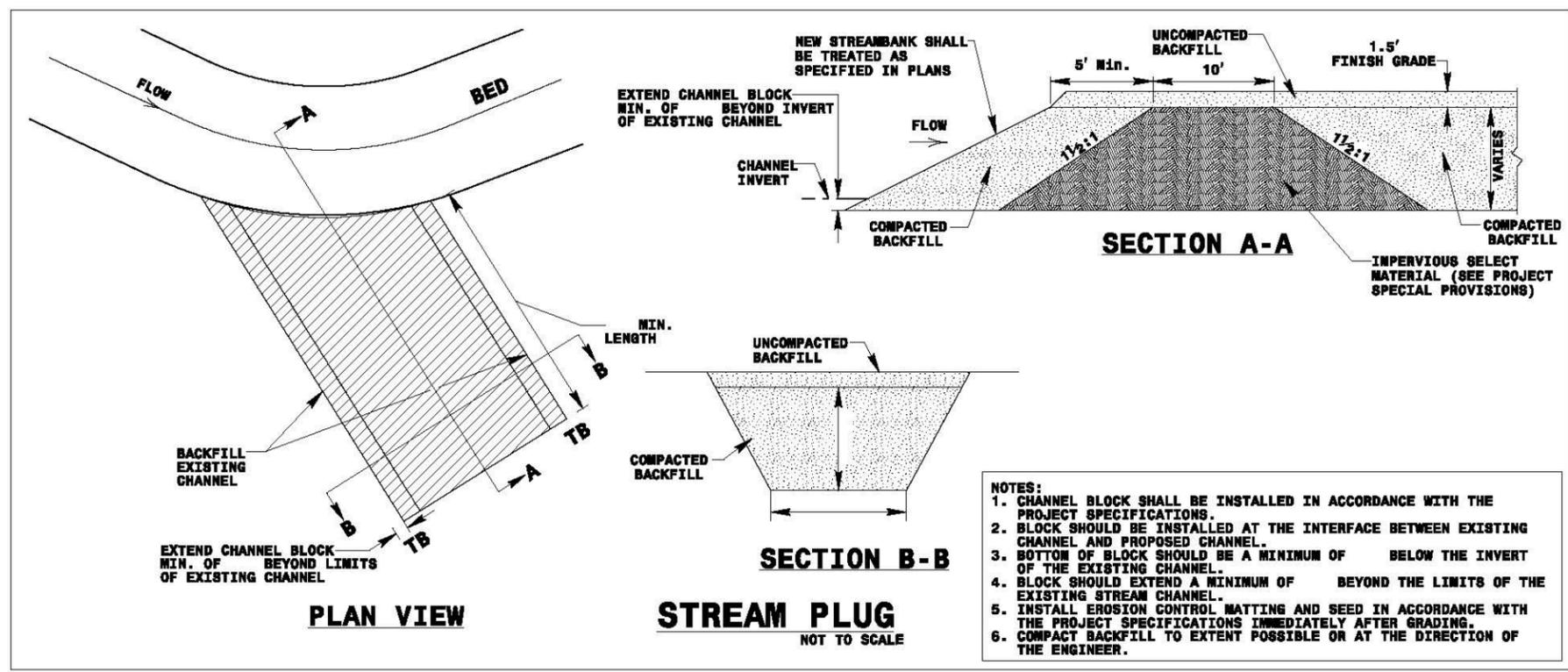
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REVISIONS



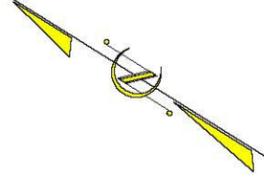
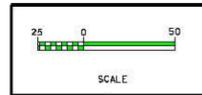
REVISIONS

REVISIONS



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	
<b>BARNHILL CONTRACTING COMPANY</b>	

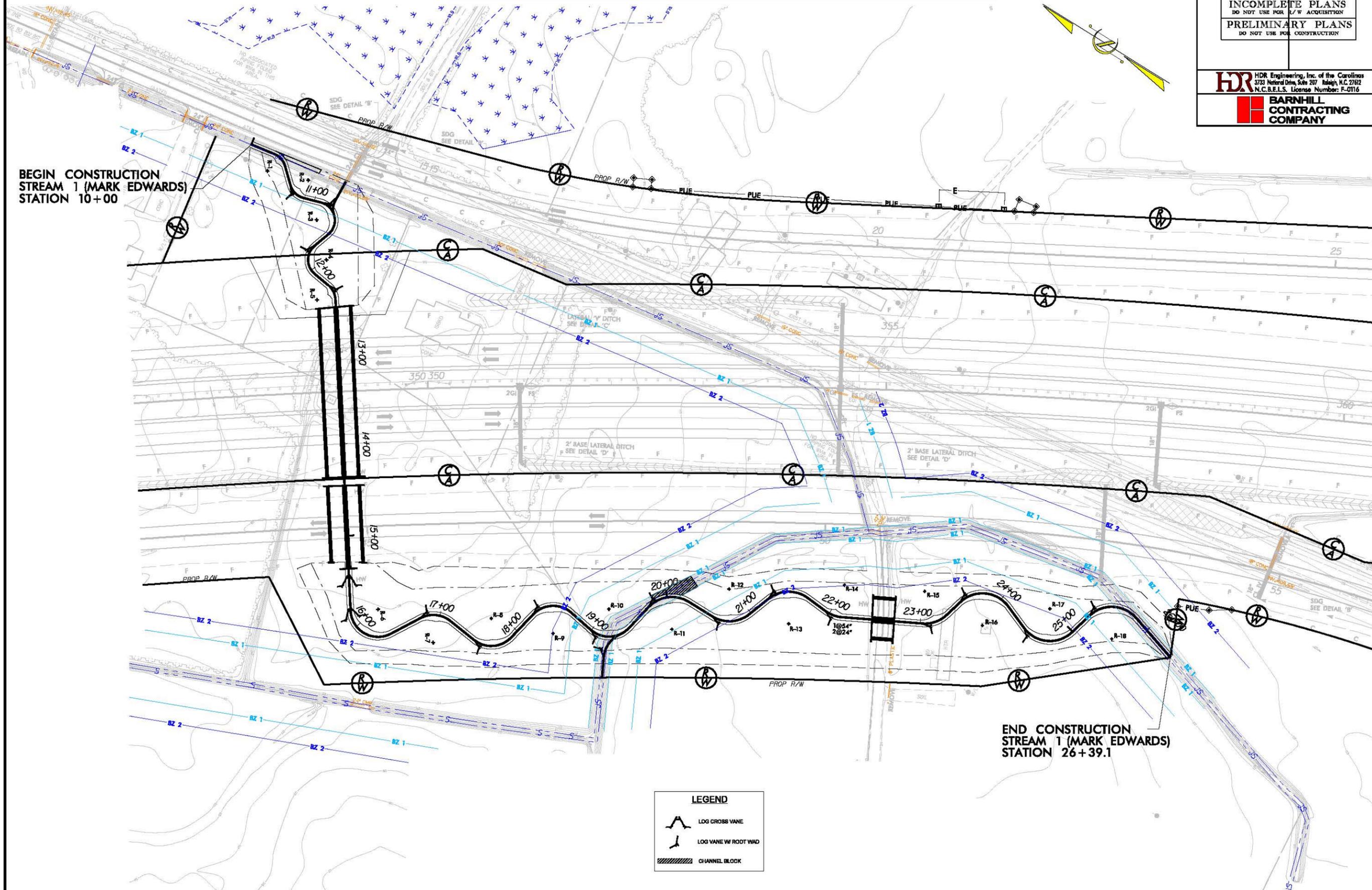
# STREAM 1 (MARK EDWARDS) SITE OVERVIEW



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
STREAM 1	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	

**BEGIN CONSTRUCTION  
STREAM 1 (MARK EDWARDS)  
STATION 10+00**

**END CONSTRUCTION  
STREAM 1 (MARK EDWARDS)  
STATION 26+39.1**



**LEGEND**

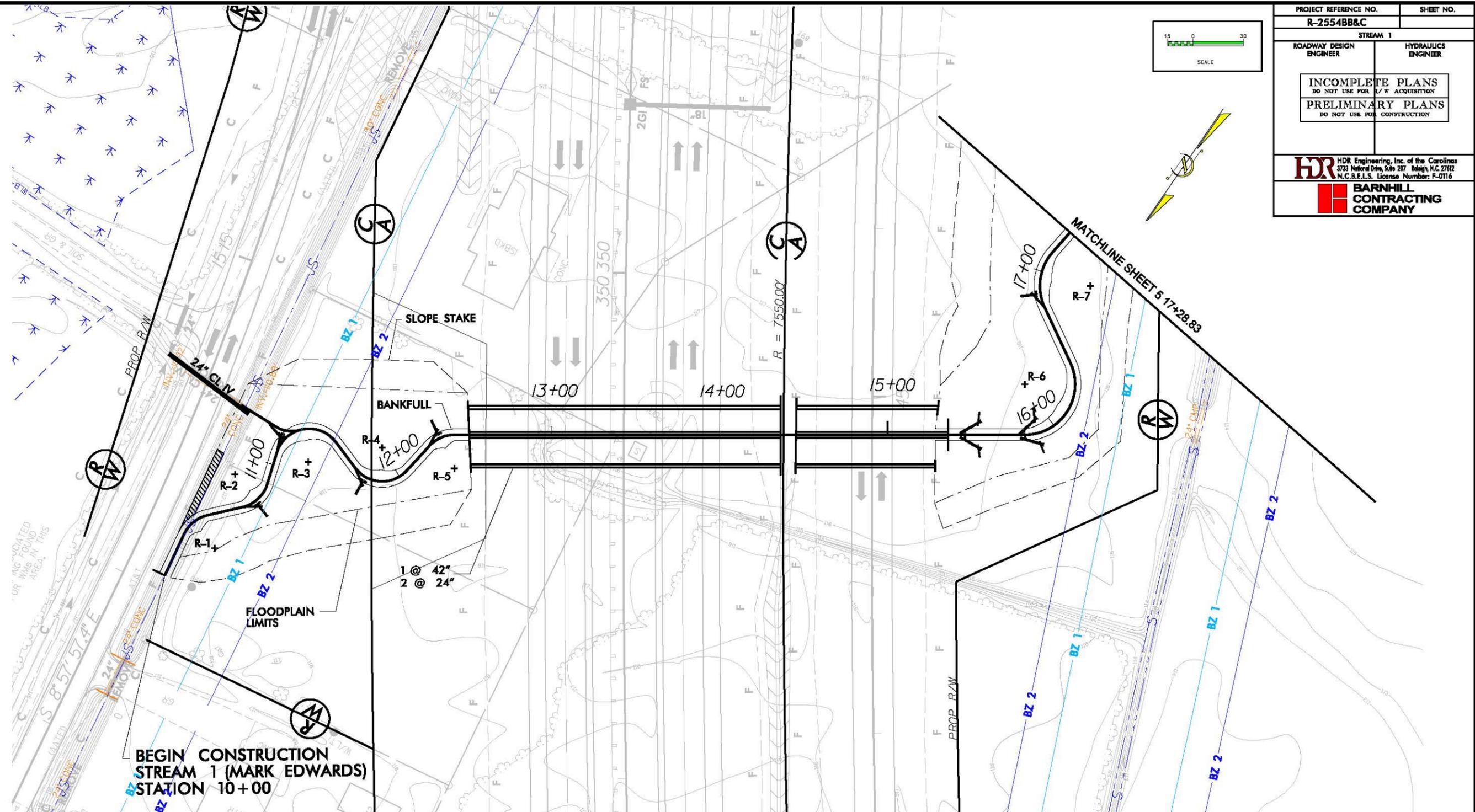
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- LOG VANE W/ ROOT WAD
- CHANNEL BLOCK

REVISIONS

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REVISIONS



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>		SHEET NO.	
STREAM 1			
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER		
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION			
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION			
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 287 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116			
<b>BARNHILL CONTRACTING COMPANY</b>			

**BEGIN CONSTRUCTION  
 STREAM 1 (MARK EDWARDS)  
 STATION 10+00**

**STREAM SITE 1 CURVE DATA**

PC STA.	NORTHING	EASTING	CURVE #	PT STA.	NORTHING	EASTING	RADIUS	POOL LOCATION	BKF. ELEV.
10+00.00	601,542.42	2,337,052.31	BEGIN	N/A	N/A	N/A	N/A	N/A	111.91
10+27.16	601,515.64	2,337,056.78	R-1	10+45.19	601,498.91	2,337,051.88	20.0'	LEFT	111.82
10+67.00	601,482.75	2,337,037.25	R-2	10+87.91	601,463.22	2,337,033.04	20.0'	RIGHT	111.74
11+07.40	601,444.87	2,337,038.97	R-3	11+51.43	601,419.59	2,337,013.61	20.0'	LEFT	111.87
11+70.64	601,425.65	2,336,995.38	R-4	12+05.71	601,409.42	2,336,969.27	20.0'	RIGHT	111.81
12+25.71	601,389.61	2,336,966.51	R-5	12+42.26	601,375.92	2,336,958.08	20.0'	LEFT	111.54
15+81.55	601,182.95	2,336,679.01	R-6	16+41.74	601,132.39	2,336,680.90	30.0'	RIGHT	109.82
16+78.21	601,113.95	2,336,712.37	R-7	17+12.93	601,084.58	2,336,726.98	30.0'	LEFT	109.24

**STREAM SITE 1 STRUCTURE LOCATIONS**

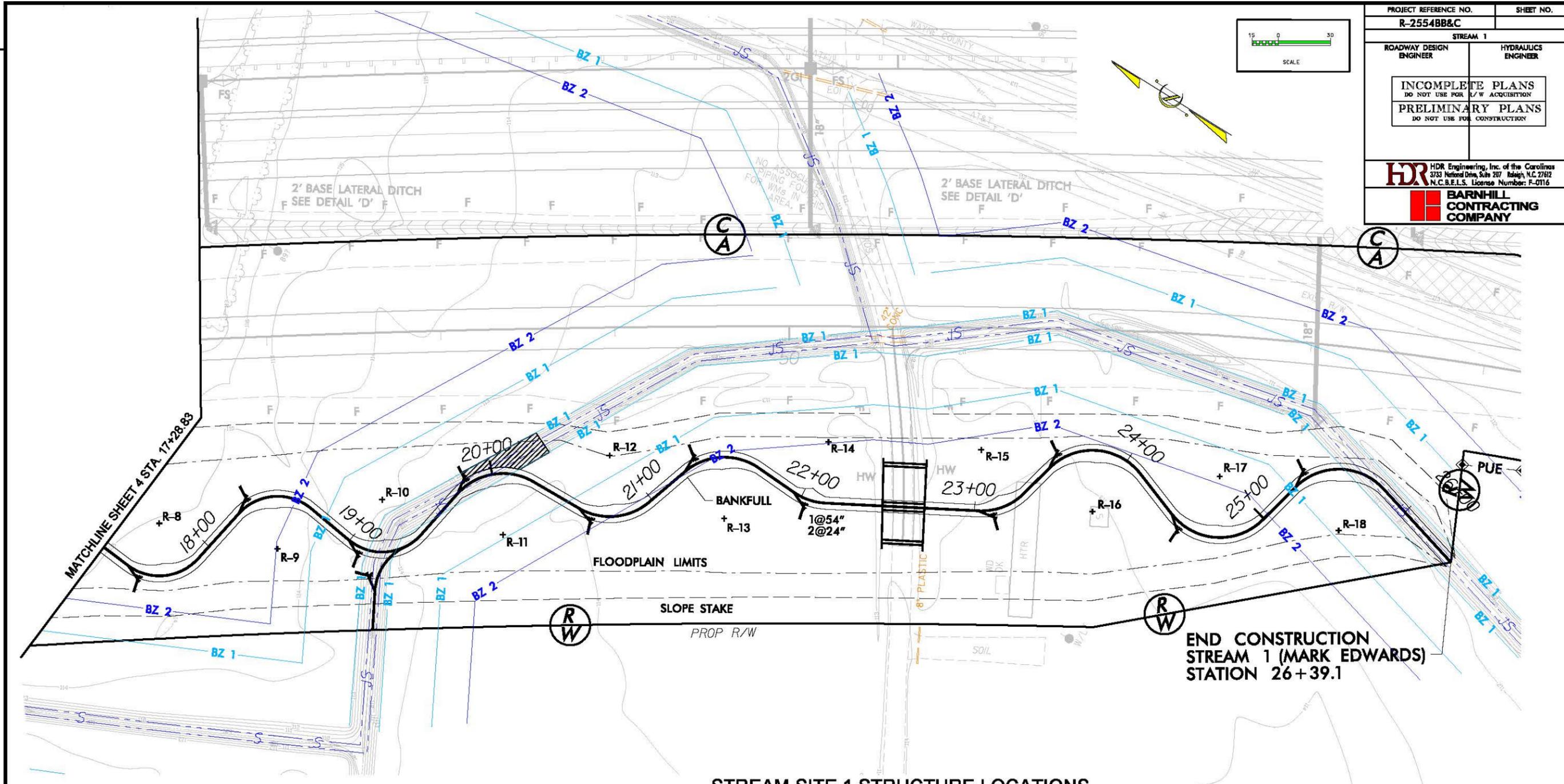
STRUCTURE TYPE	STATION	INV. ELEVATION	BKF. ELEVATION
LOG VANE W/ ROOTWAD	10+67.00	110.83	111.74
LOG VANE W/ ROOTWAD	11+07.40	110.77	111.87
LOG VANE W/ ROOTWAD	11+70.64	110.70	111.81
LOG VANE W/ ROOTWAD	12+25.15	110.63	111.54
LOG CROSS VANE	15+46.49	109.58	110.49
LOG CROSS VANE	15+81.55	108.92	108.82
LOG VANE W/ ROOTWAD	16+78.21	108.34	109.24

**LEGEND**

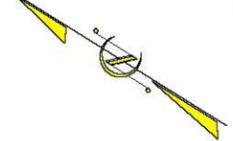
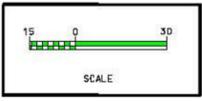
- LOG CROSS VANE
- LOG VANE W/ ROOT WAD
- CHANNEL BLOCK

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REVISIONS



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
STREAM 1	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	
<b>BARNHILL CONTRACTING COMPANY</b>	



**STREAM SITE 1 CURVE DATA**

PC STA.	NORTHING	EASTING	CURVE #	PT STA.	NORTHING	EASTING	RADIUS	POOL LOCATION	BKF. ELEV.
17+46.08	601,051.64	2,336,723.12	R-8	17+90.49	601,018.78	2,336,746.73	30.0'	RIGHT	109.13
18+25.37	601,011.59	2,336,780.86	R-9	18+71.20	600,977.33	2,336,804.28	30.0'	LEFT	109.01
18+99.46	600,949.45	2,336,799.65	R-10	19+45.53	600,915.14	2,336,823.30	30.0'	RIGHT	108.91
19+76.72	600,908.95	2,336,853.87	R-11	20+24.63	600,874.73	2,336,881.93	35.0'	LEFT	108.82
20+54.86	600,844.50	2,336,882.00	R-12	20+97.90	600,811.58	2,336,905.38	35.0'	RIGHT	108.73
21+24.77	600,802.65	2,336,930.73	R-13	21+70.59	600,766.95	2,336,954.00	35.0'	LEFT	108.64
21+94.87	600,742.74	2,336,952.14	R-14	22+14.30	600,723.94	2,336,955.96	35.0'	RIGHT	108.57
23+02.08	600,846.02	2,336,996.36	R-15	23+31.19	600,828.31	2,337,018.41	35.0'	RIGHT	108.31
23+51.62	600,823.04	2,337,038.15	R-16	24+10.71	600,576.30	2,337,061.88	35.0'	LEFT	108.25
24+39.93	600,549.14	2,337,050.87	R-17	24+99.07	600,502.39	2,337,074.43	35.0'	RIGHT	108.16
25+25.67	600,495.58	2,337,100.14	R-18	25+82.02	600,461.46	2,337,124.62	35.0'	LEFT	108.08
26+39.14	600,396.86	2,337,107.83	END	N/A	N/A	N/A	N/A	N/A	108.08

**STREAM SITE 1 STRUCTURE LOCATIONS**

STRUCTURE TYPE	STATION	INV. ELEVATION	BKF. ELEVATION
LOG VANE W/ ROOTWAD	17+46.08	108.22	109.13
LOG VANE W/ ROOTWAD	18+25.37	108.10	109.01
LOG VANE W/ ROOTWAD	18+99.46	108.00	108.91
LOG VANE W/ ROOTWAD	19+76.72	107.91	108.82
LOG VANE W/ ROOTWAD	20+54.86	107.82	108.73
LOG VANE W/ ROOTWAD	21+24.77	107.74	108.64
LOG VANE W/ ROOTWAD	21+94.87	107.67	108.57
LOG VANE W/ ROOTWAD	23+02.88	107.36	108.31
LOG VANE W/ ROOTWAD	23+51.62	107.34	108.25
LOG VANE W/ ROOTWAD	24+39.93	107.25	108.16
LOG VANE W/ ROOTWAD	25+25.67	107.17	108.08

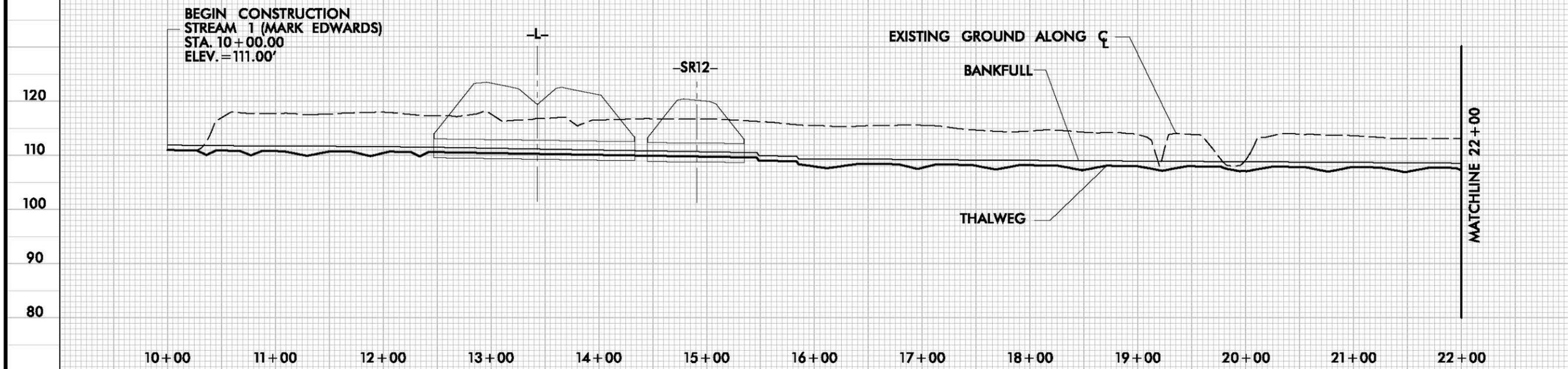
**LEGEND**

- LOG CROSS VANE
- LOG VANE W/ ROOT WAD
- CHANNEL BLOCK

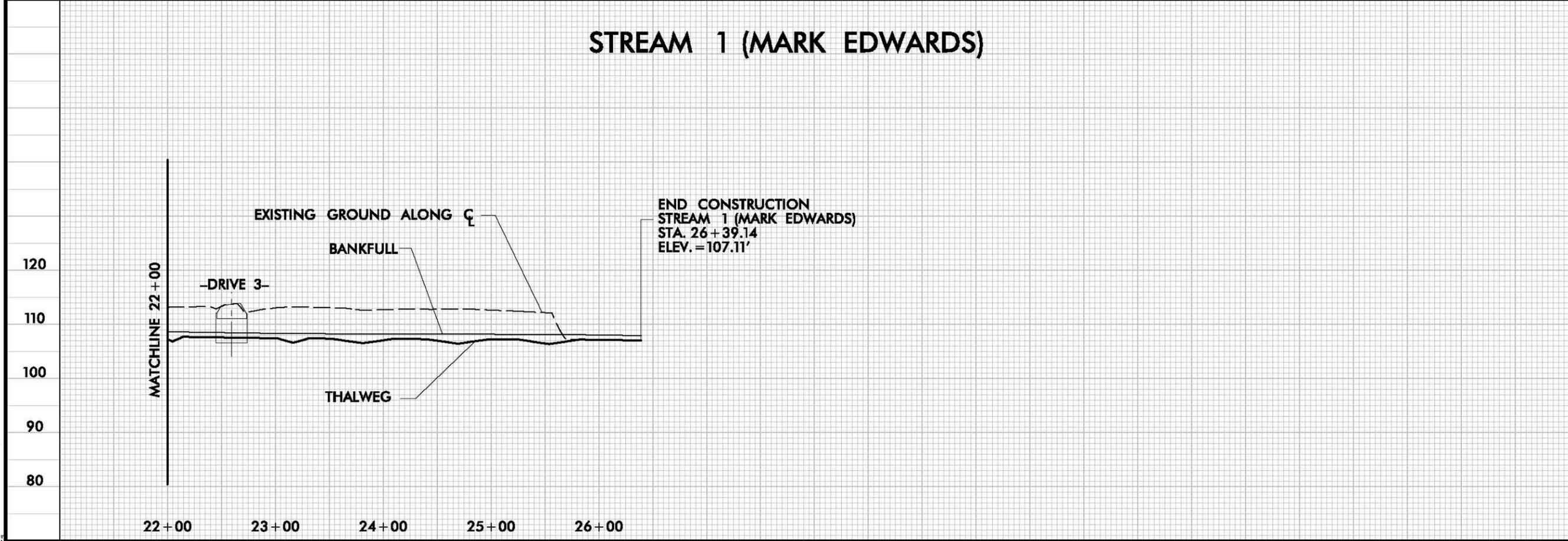
5/28/99

# STREAM 1 (MARK EDWARDS)

PROJECT REFERENCE NO. R-2554BB&C	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	

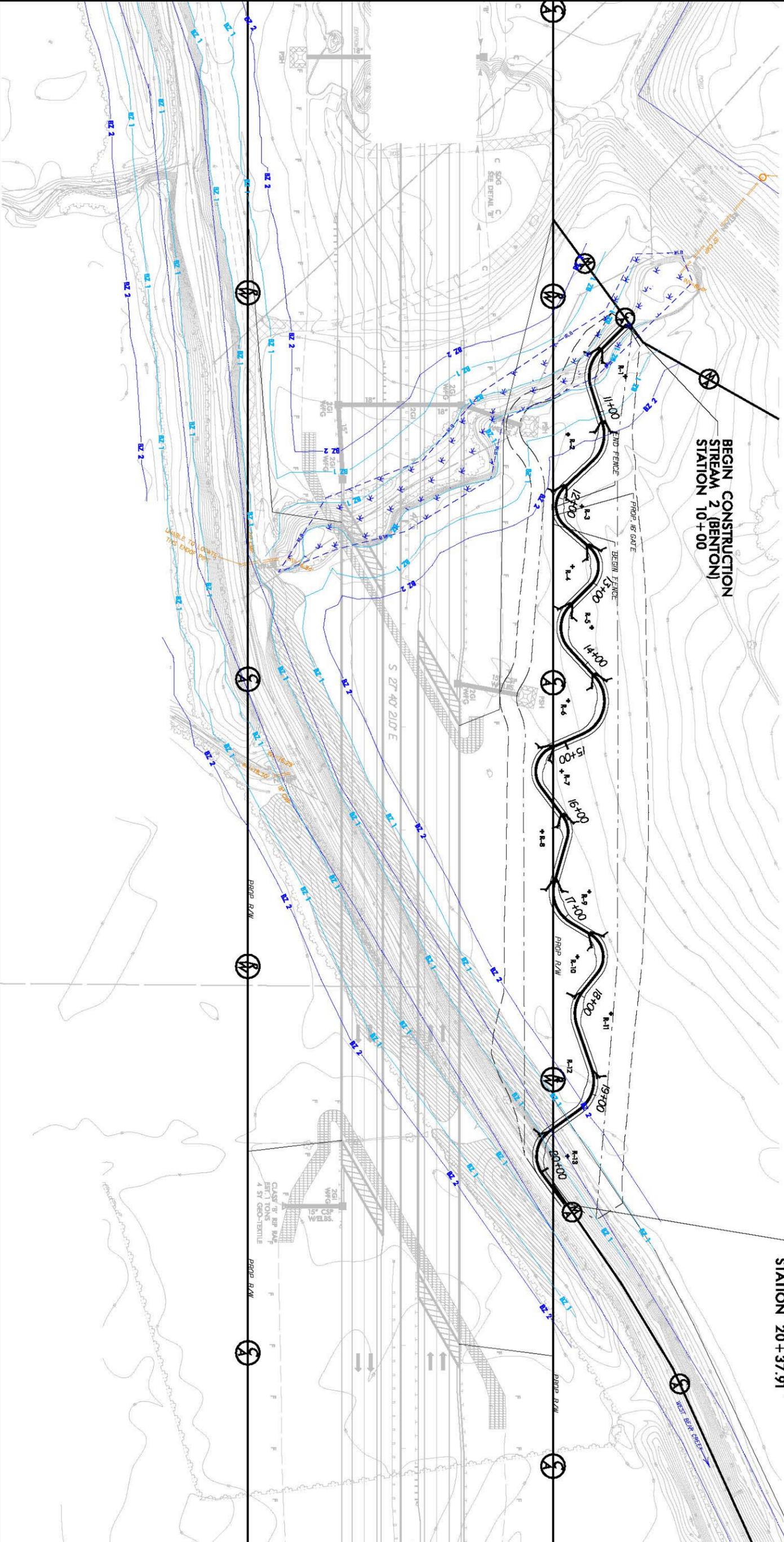


# STREAM 1 (MARK EDWARDS)

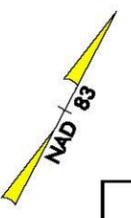
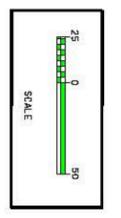


R-2554BB&C\_HYO\_MIT\_PFL.dgn

REVISIONS



**STREAM 2 (BENTON) SITE OVERVIEW**



**LEGEND**

	LOG CROSS VANE
	LOG VANES IN ROOT VARD
	CHANNEL BLOCK

**BEGIN CONSTRUCTION  
 STREAM 2 (BENTON)  
 STATION 10+00**

**END CONSTRUCTION  
 STREAM 2 (BENTON)  
 STATION 20+37.91**

PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS        DO NOT USE FOR E/R ACQUISITION        PRELIMINARY PLANS        DO NOT USE FOR CONSTRUCTION</b>	

**HDR** HDR Engineering, Inc. of the Carolina  
 3333 National Blvd, Suite 207 Raleigh, NC 27612  
 N.C. BELLS License Number: F-0716

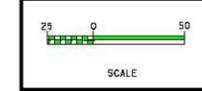
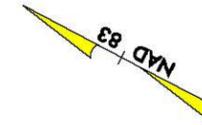
**BARNHILL CONTRACTING COMPANY**

# STREAM SITE 2 CURVE DATA

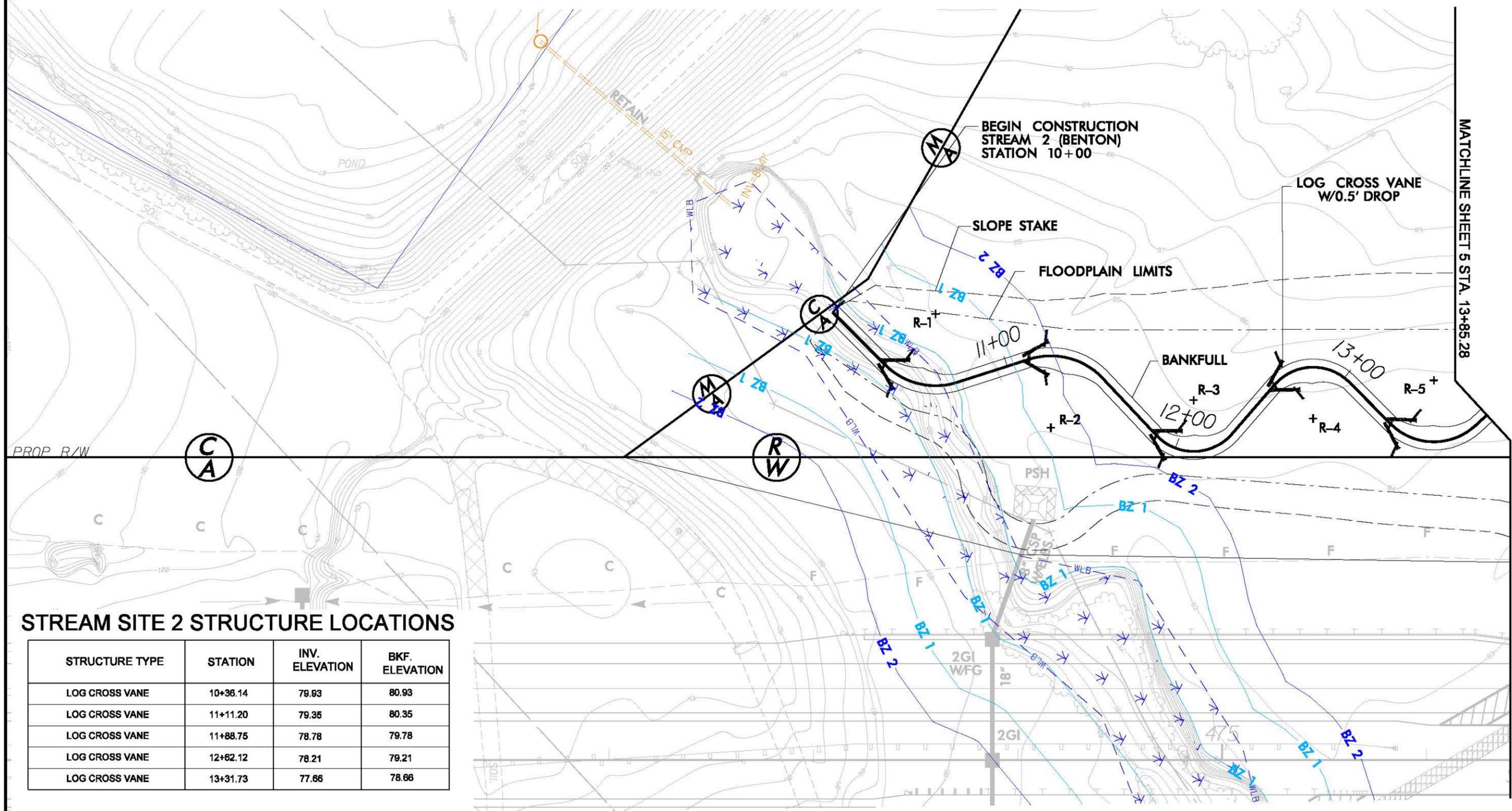
PC STA.	NORTHING	EASTING	CURVE #	PT STA.	NORTHING	EASTING	RADIUS	POOL LOCATION	BKF. ELEV.
10+00.00	580,023.59	2,341,688.62	BEGIN	N/A	N/A	N/A	N/A	N/A	
10+36.14	589,989.08	2,341,677.88	R-1	10+74.46	589,953.74	2,341,686.75	35.0'	RIGHT	80.93
11+11.20	589,927.97	2,341,712.93	R-2	11+50.59	589,891.61	2,341,721.47	35.0'	LEFT	80.35
11+88.75	588,855.54	2,341,709.03	R-3	12+30.52	589,823.08	2,341,726.92	25.0'	RIGHT	79.78
12+62.12	589,815.80	2,341,757.67	R-4	13+03.21	589,783.97	2,341,775.78	25.0'	LEFT	79.21
13+31.73	589,756.76	2,341,767.22	R-5	13+77.71	589,719.51	2,341,785.76	30.0'	RIGHT	78.66

## LEGEND

-  LOG CROSS VANE
-  LOG VANE W/ ROOT WAD
-  CHANNEL BLOCK



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
STREAM 2	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
 HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	
 <b>BARNHILL CONTRACTING COMPANY</b>	



## STREAM SITE 2 STRUCTURE LOCATIONS

STRUCTURE TYPE	STATION	INV. ELEVATION	BKF. ELEVATION
LOG CROSS VANE	10+36.14	79.93	80.93
LOG CROSS VANE	11+11.20	79.35	80.35
LOG CROSS VANE	11+88.75	78.78	79.78
LOG CROSS VANE	12+62.12	78.21	79.21
LOG CROSS VANE	13+31.73	77.66	78.66

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REVISIONS

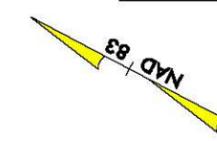
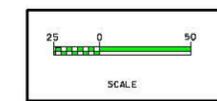
MATCHLINE SHEET 5 STA. 13+68.28

### STREAM SITE 2 CURVE DATA

PC STA.	NORTHING	EASTING	CURVE #	PT STA.	NORTHING	EASTING	RADIUS	POOL LOCATION	BKF. ELEV.
14+14.46	589,707.16	2,341,820.37	R-6	14+80.87	589,652.40	2,341,835.98	35.0'	LEFT	78.08
15+14.50	589,628.17	2,341,815.11	R-7	15+59.49	589,588.02	2,341,823.94	25.0'	RIGHT	77.52
15+84.92	589,572.81	2,341,855.95	R-8	16+18.07	589,555.23	2,341,869.71	25.0'	LEFT	76.95
16+61.48	589,512.70	2,341,878.40	R-9	17+07.40	589,484.76	2,341,910.69	35.0'	RIGHT	76.36
17+29.98	589,483.47	2,341,933.22	R-10	17+72.65	589,453.70	2,341,956.33	25.0'	LEFT	75.84
17+95.53	589,431.25	2,341,951.93	R-11	18+30.81	589,399.06	2,341,962.26	35.0'	RIGHT	75.27
18+75.46	589,368.43	2,341,994.75	R-12	19+20.13	589,327.38	2,342,002.08	35.0'	LEFT	75.18
19+55.29	589,295.90	2,341,986.42	R-13	20+02.84	589,255.49	2,342,000.30	30.0'	RIGHT	75.11
20+37.91	589,240.31	2,342,031.92	END	N/A	N/A	N/A	N/A	N/A	

### STREAM SITE 2 STRUCTURE LOCATIONS

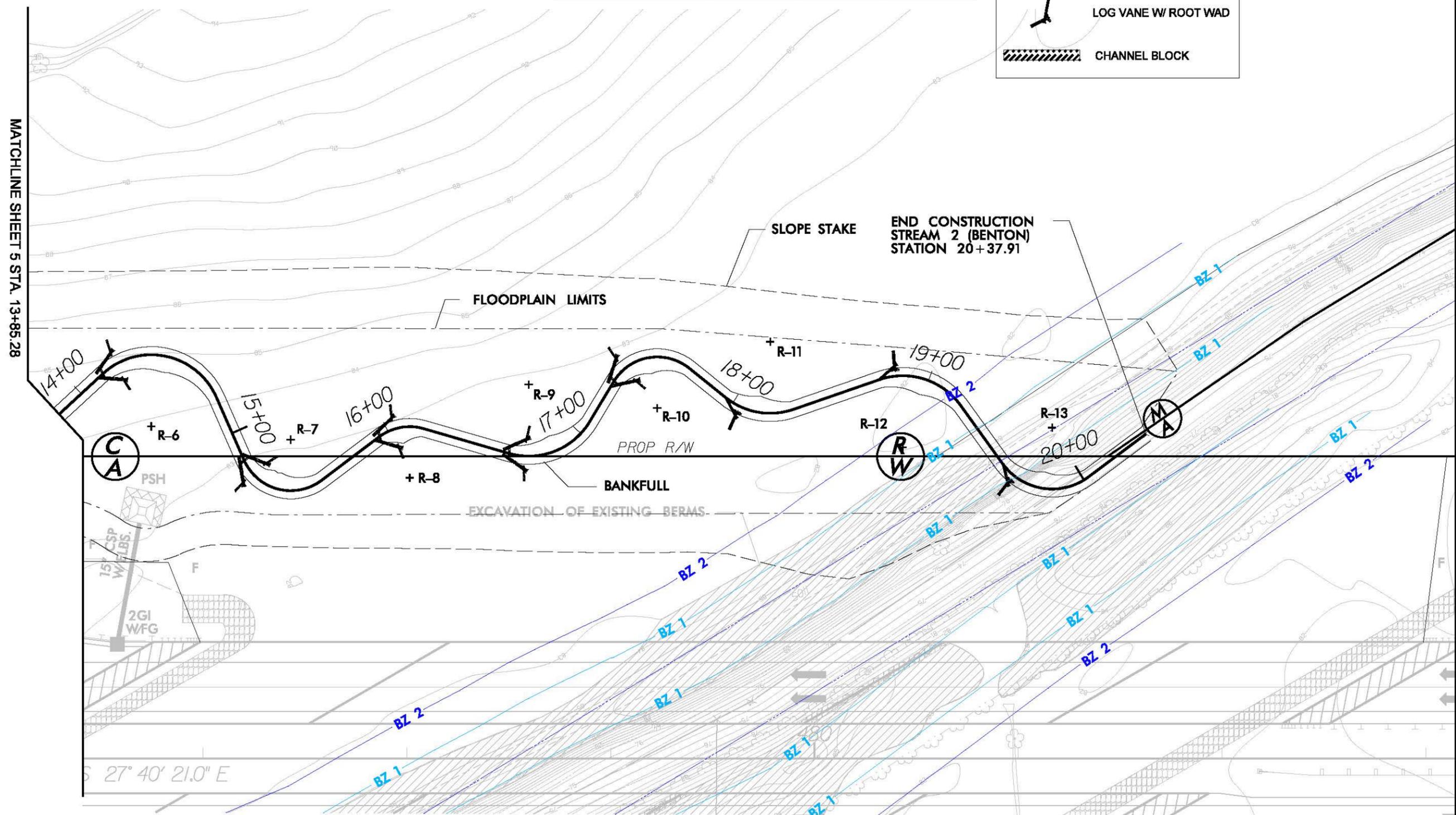
STRUCTURE TYPE	STATION	INV. ELEVATION	BKF. ELEVATION
LOG CROSS VANE	14+14.46	77.08	78.08
LOG CROSS VANE	15+14.50	78.52	77.52
LOG CROSS VANE	15+94.92	75.95	76.95
LOG CROSS VANE	16+61.48	75.36	76.36
LOG CROSS VANE	17+29.98	74.81	75.84
LOG VANE W/ ROOTWAD	17+95.54	74.27	75.27
LOG VANE W/ ROOTWAD	18+75.43	74.18	75.18
LOG VANE W/ ROOTWAD	19+55.29	74.11	75.11



#### LEGEND

- LOG CROSS VANE
- LOG VANE W/ ROOT WAD
- CHANNEL BLOCK

PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
STREAM 2	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 287 Raleigh, N.C. 27612 N.C.E.E.L.S. License Number: F-0116	
BARNHILL CONTRACTING COMPANY	



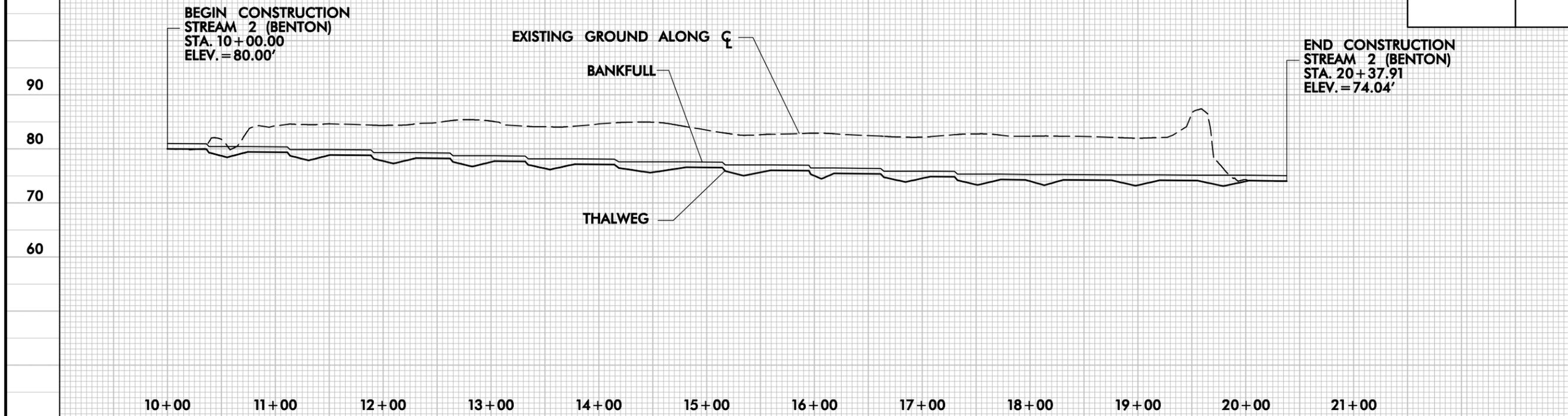
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REVISIONS

5/28/99

# STREAM 2 (BENTON)

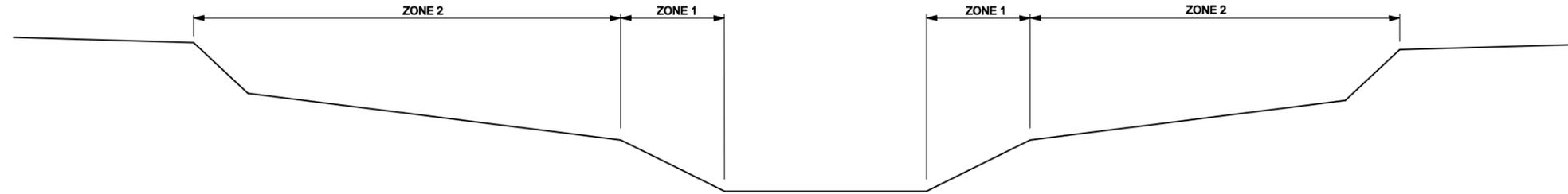
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ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	



R-2554BB&C.HYD.MIT.PFL.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2554BB&C	
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
 HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	
 BARNHILL CONTRACTING COMPANY	

## PLANTING DETAILS



### ZONE 1

#### LIVE STAKES

Species Name	Common Name
<i>Cornus amomum</i>	Silky dogwood
<i>Cephalanthus occidentalis</i>	Button bush

Zone 1 Streambank reforestation shall be planted 3' to 5' on center, random spacing, averaging 4' on center. Approx. 2722 plants per acre.

Native grass seeding and mulching will be applied on all disturbed areas within the stream restoration area for stabilization purposes according to guidance and standard procedures of NCDOT's Roadside Environmental Unit.

### ZONE 2

#### BARE ROOT

Species Name	Common Name
<i>Betula nigra</i>	River Birch
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Nyssa sylvatica var. biflora</i>	Swamp Tupelo
<i>Platanus occidentalis</i>	Sycamore
<i>Quercus lyrata</i>	Overcup Oak
<i>Quercus michauxii</i>	Swamp Chestnut Oak

Zone 2 Streambank reforestation shall be planted 6' to 10' on center, random spacing, averaging 8' on center. Approx. 680 plants per acre.

A minimum of 4 out of the 6 species to be installed approx. 10' on center (480 bare roots/acre) in equal proportions. Substitutions with other native species common to Coastal Plain Bottomland Hardwood may be accepted if the following species are not available. Prior approval is required for substitutions.

STREAM SITE 1 (MARK EDWARDS)	
TOTAL QUANTITY OF PLANTING	
Bare Roots	1,510
Live Stakes	544

STREAM SITE 2 (BENTON)	
TOTAL QUANTITY OF PLANTING	
Bare Roots	1,394
Live Stakes	436

#### PERMANENT SEED MIX/ TEMPORARY SEEDING

Native grass seeding and mulching will be applied on all disturbed areas within the stream restoration area according to guidance and standard procedures of NCDOT's Roadside Environmental Unit (Special Provision for Seeding and Mulching Native Grass-East).

REVISIONS

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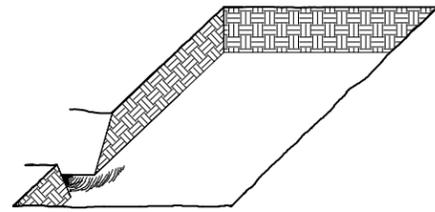
REVISIONS

# PLANTING DETAILS

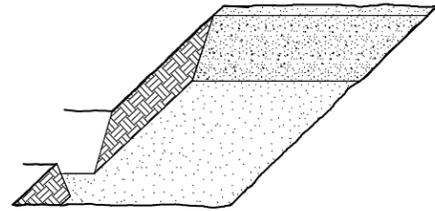
## PLANTING DETAILS SEEDLING / LINER BAREROOT PLANTING DETAIL

### HEALING IN

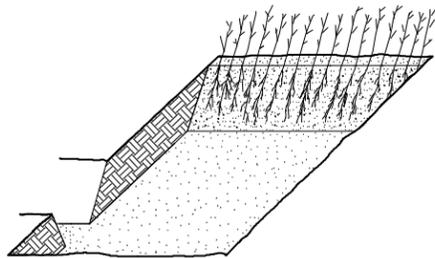
1. Locate a healing-in site in a shady, well protected area.
2. Excavate a flat bottom trench 12IN. deep and provide drainage.



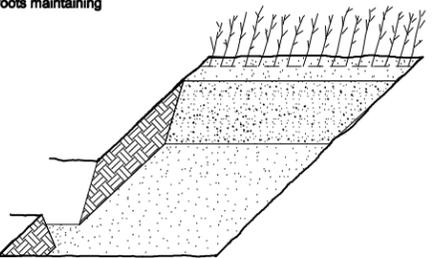
3. Backfill the trench with 2IN. well rotted sawdust. Place a 2IN. layer of well rotted sawdust at a sloping angle at one end of the trench.



4. Place a single layer of plants against the sloping end so that the root collar is at ground level.

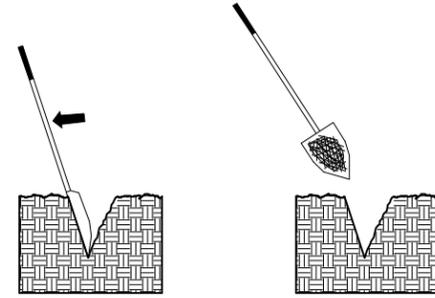


5. Place a 2IN. layer of well rotted sawdust over the roots maintaining a sloping angle.

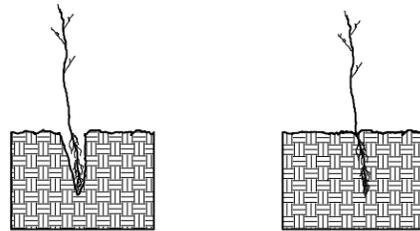


6. Repeat layers of plants and sawdust as necessary and water thoroughly.

### PLANTING METHOD USING A SHOVEL



1. Dig hole with shovel to appropriate depth and width for seedling.
2. Remove soil from hole with shovel. Hole shall not be made by compacting soil away from the hole.



3. Remove shovel and place seedling at correct depth.
4. Fill hole with soil. Tamp soil to remove air pockets. Water Thoroughly.

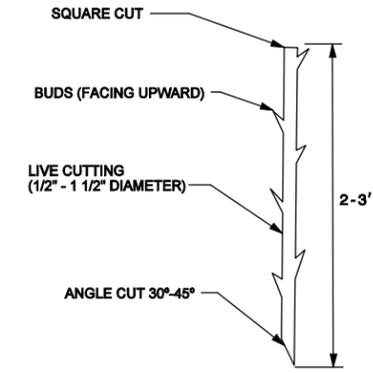
### PLANTING NOTES:

**PLANTING BAG**  
 During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.

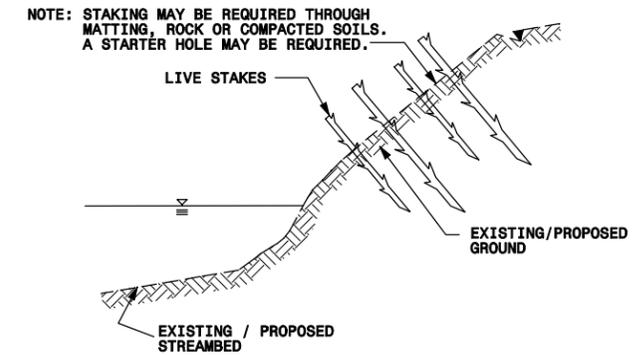


**ROOT PRUNING**  
 All seedlings shall be root pruned, if necessary, so that no roots extend more than 24inches (24IN.) below the root collar.

## LIVE STAKE DETAIL



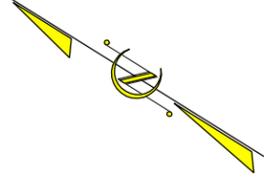
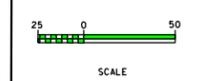
### LIVE STAKE



- NOTE:**
1. LIVE STAKES SHALL BE EVENLY SPACED 2' APART.
  2. LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY 3/4 OF LIVE STAKE IS WITHIN GROUND.
  3. IF STARTER HOLE IS NEEDED, MINIMIZE AIR POCKET.
  4. UTILIZE ALL ON SITE TRANSPLANT MATERIALS MADE AVAILABLE BY THE OWNER. ONCE SOURCE OF TRANSPLANT MATERIAL HAS BEEN HARVESTED, THEN UTILIZE LIVE STAKING.

PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION	
<b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION	
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	
<b>BARNHILL CONTRACTING COMPANY</b>	

# STREAM 1 (MARK EDWARDS) PLANTING OVERVIEW



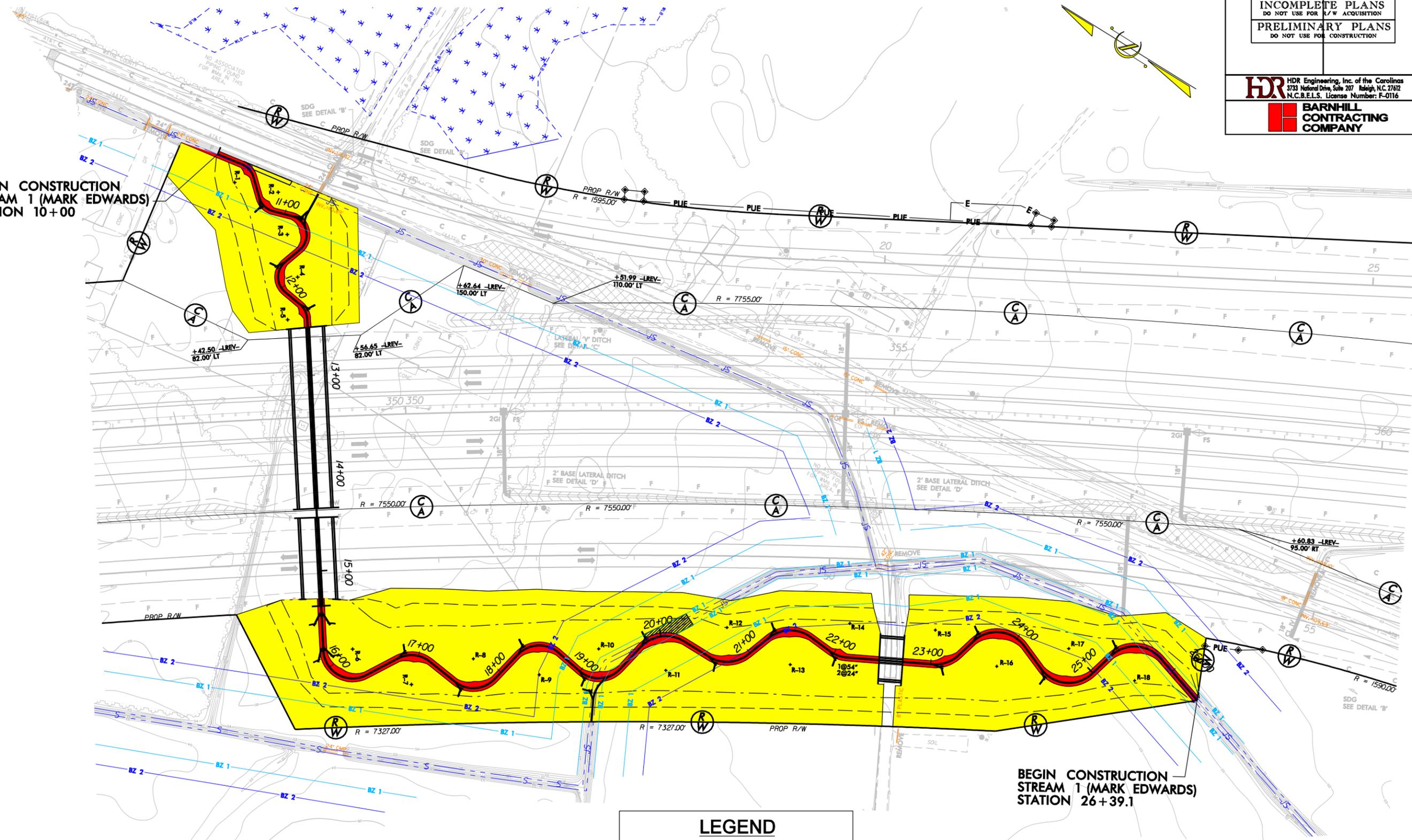
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STREAM 1		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION		
PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION		
<b>HDR</b> Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116		
<b>BARNHILL CONTRACTING COMPANY</b>		

**BEGIN CONSTRUCTION  
STREAM 1 (MARK EDWARDS)  
STATION 10+00**

**BEGIN CONSTRUCTION  
STREAM 1 (MARK EDWARDS)  
STATION 26+39.1**

**LEGEND**

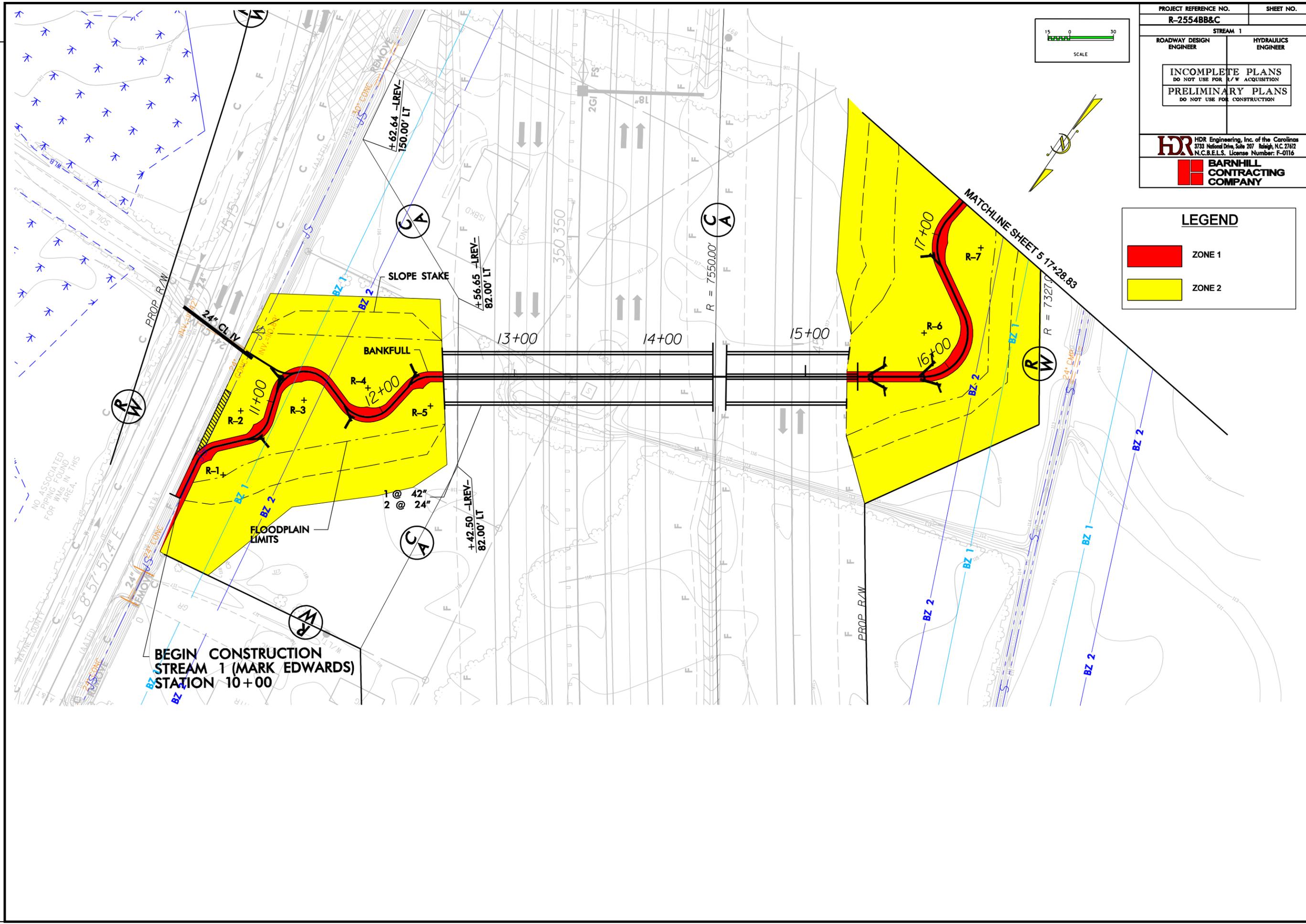
	<b>ZONE 1</b>
	<b>ZONE 2</b>



REVISIONS

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REVISIONS



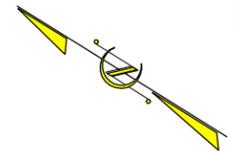
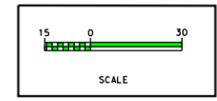
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STREAM 1		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION		
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116 <b>BARNHILL CONTRACTING COMPANY</b>		

**LEGEND**

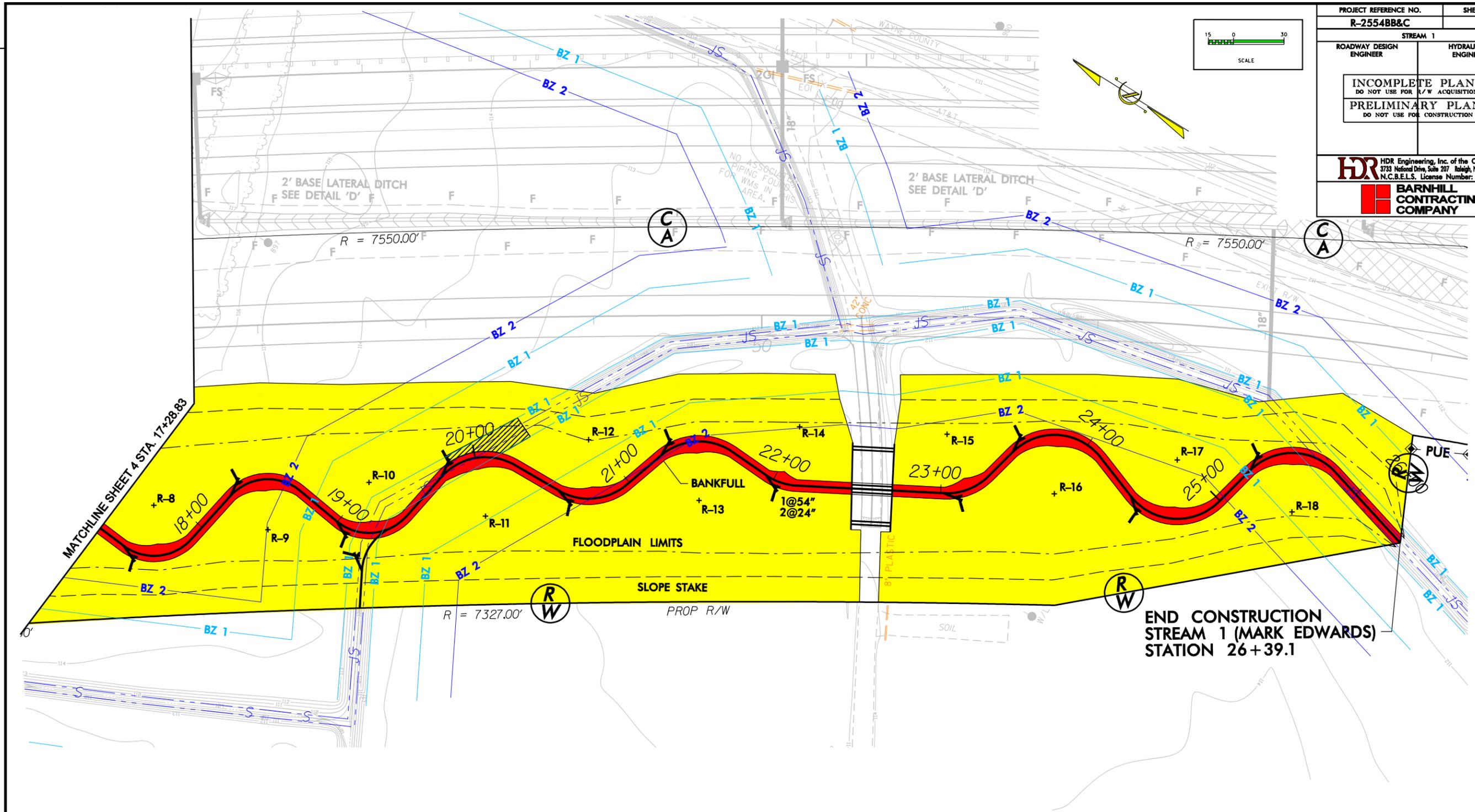
- ZONE 1
- ZONE 2

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REVISIONS



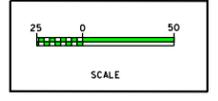
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STREAM 1		
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER	
<b>INCOMPLETE PLANS</b> DO NOT USE FOR R/W ACQUISITION <b>PRELIMINARY PLANS</b> DO NOT USE FOR CONSTRUCTION		
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116 <b>BARNHILL CONTRACTING COMPANY</b>		



**LEGEND**

	ZONE 1
	ZONE 2

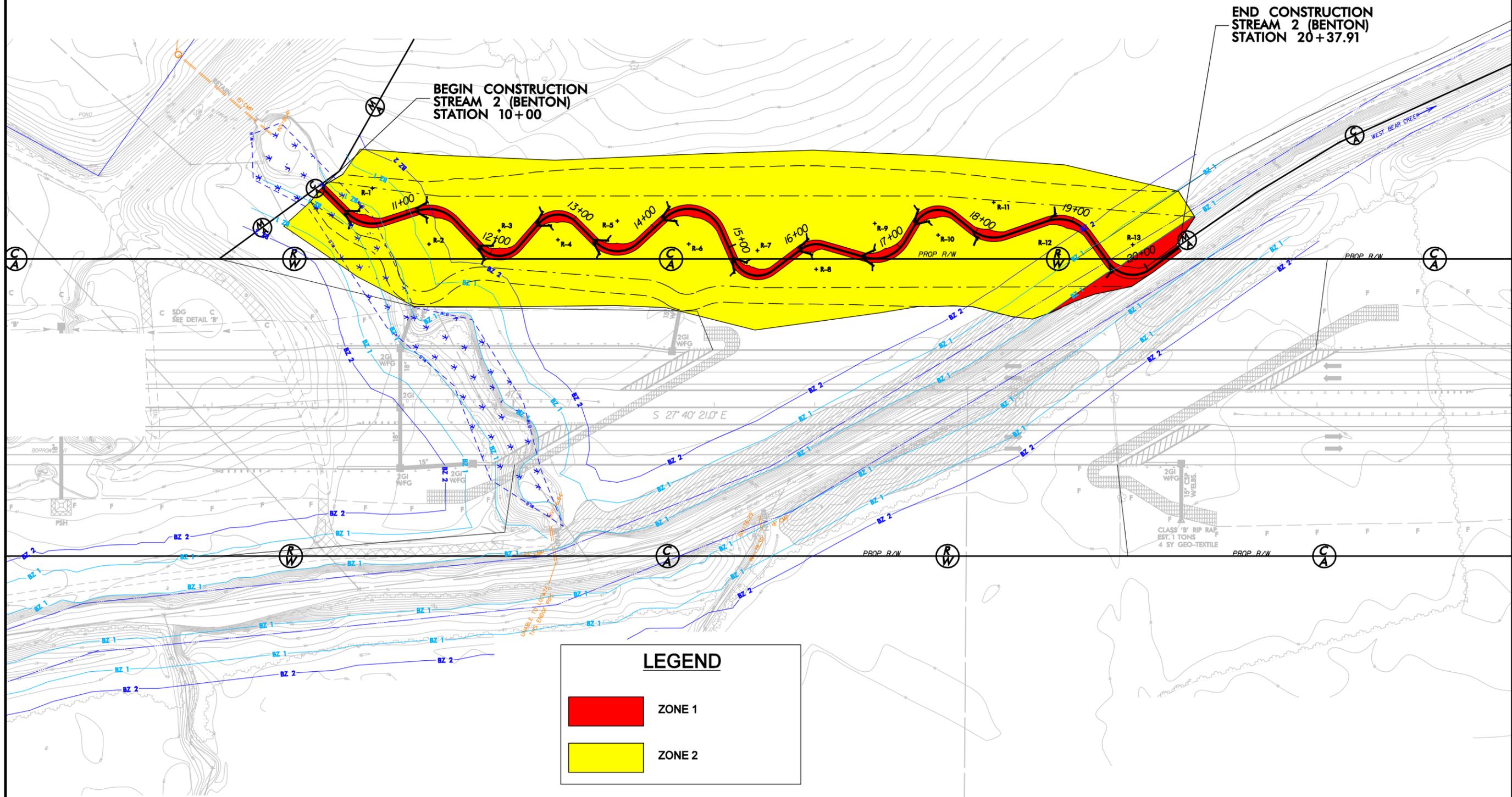
# STREAM 2 (BENTON) SITE PLANTING OVERVIEW



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>	SHEET NO.
STREAM 2	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	
HDR Engineering, Inc. of the Carolinas 3733 National Drive, Suite 207 Raleigh, N.C. 27612 N.C.B.E.L.S. License Number: F-0116	
BARNHILL CONTRACTING COMPANY	

PLOT DRIVER: NCDOT - pdf\_color\_eng-100.plt  
 USER: cmtyers  
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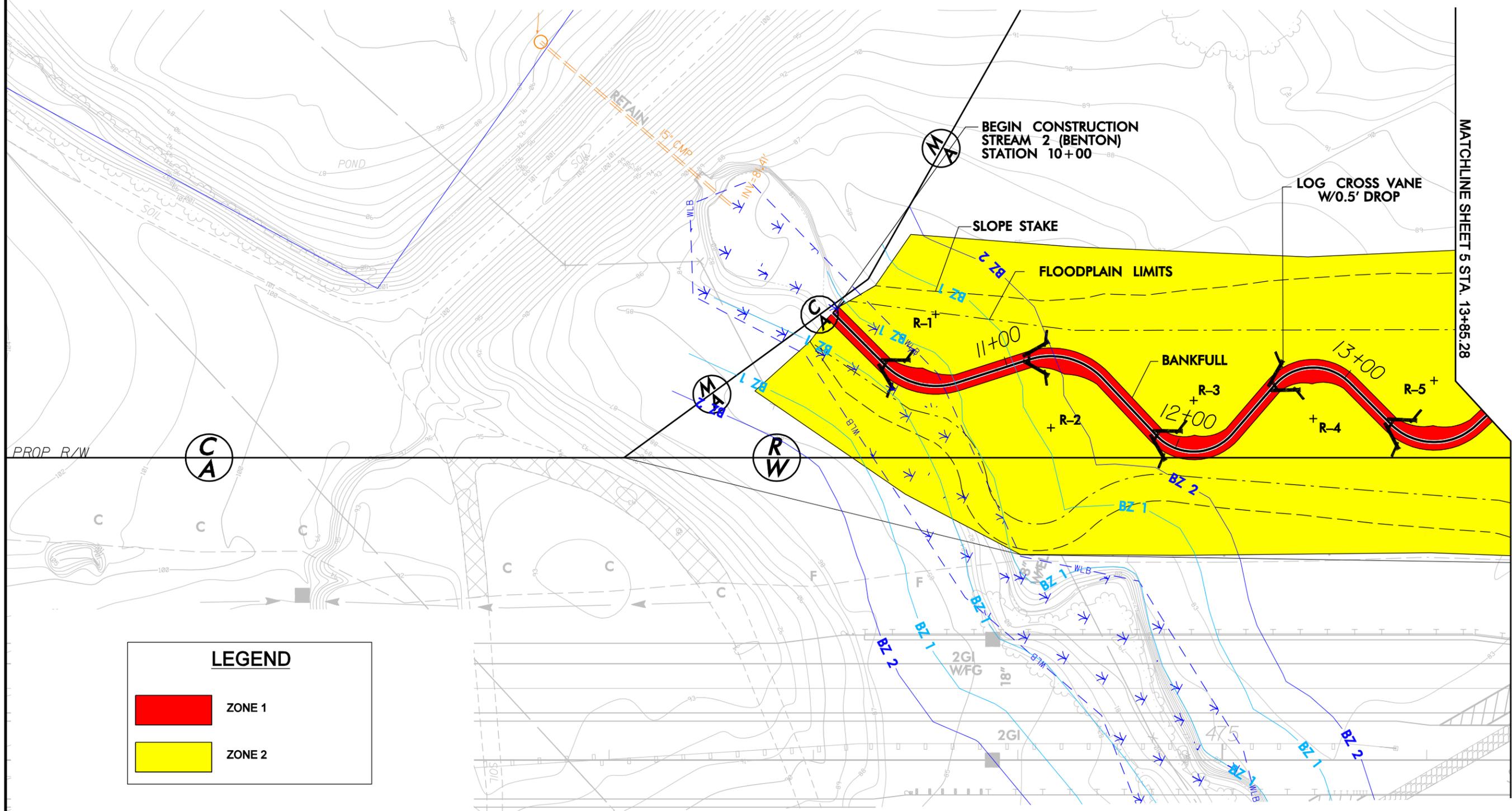
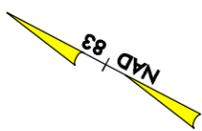
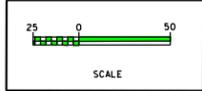
REVISIONS



PLOT DRIVER: NCDOT...  
 USER: cm Myers  
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 TIME: 10:19:31 AM  
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REVISIONS

PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>		SHEET NO.	
STREAM 2			
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER		
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 BARNHILL CONTRACTING COMPANY			



**LEGEND**

	ZONE 1
	ZONE 2

MATCHLINE SHEET 5 STA. 13+85.28

PLOT DRIVER: NCDOT...  
 USER: cmeyers  
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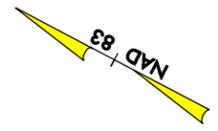
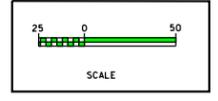
REVISIONS

MATCHLINE SHEET 5 STA. 13+85.28

**LEGEND**

ZONE 1

ZONE 2



PROJECT REFERENCE NO. <b>R-2554BB&amp;C</b>		SHEET NO.
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