Albemarle Restorations, LLC
Wetland Restoration
Stream Restoration
Wildlife Habitat

August 1, 2014

Heather Smith, Project Manager
Ecosystem Enhancement Program
NC Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, NC 27699-1652

RE: Hudson Property Mitigation Plan Comments
Contract # 004638
EEP IMS # 95361

Ms. Smith,

For your review, please see your plan comments for the above mentioned project from the letter dated July 25, 2014 followed by our responses in italics. Please also find attached a total of five (5) hard copies and one (1) cd of the completed PCN form and the Mitigation plan proper.

Feel free to contact me with any questions.

Thank you,

Ed Temple

POINT-BY-POINT RESPONSE:

Todd Bowers (EPA)

- Update NCDWQ to reflect change to NCDWR with the exception of citations.

  Update has been made in Section 4 – Baseline Information.

- Exhibits C-K do not denote the Reaches 1-5 on the map. No diagram of the Reaches was illustrated until the appendices. Recommend mapping these within the main body of the MP for clarity.

  Exhibits C, D, H, and K (immediately following the mitigation report) were revised to denote Reaches 1-5.

- Executive Summary (page 3): Project size is listed as 13.4 acres. This matches the rest of the document with the exception of page 126 that lists the project size as 12.6 acres

  Final project size is 13.49 acres which has been updated throughout the document including FEMA checklist info on page 126.

- Unclear on how many SMUs are to be generated. Most of the document states 2,700 SMUs but several tables refer to 2,891 lf of restored reaches.

  The project is providing EEP the mitigation they need which is 2,700 SMUs (as stated in the contract with Albemarle Restorations, LLC) however the project is delivering 2,981 SMUs.

- Where on the site is there a third order tributary? Only assumption made is that one of the upper reaches (Reach 1) is a second order stream by the time it enters the site. This would make the confluence with Reaches 2-4 third order however there is no discussion to support this assumption.

  There are 1st and 2nd order streams on this project and the revision has been made.

- Project Goals: There is no goal pertaining to the reestablishment of aquatic fauna such as benthic macroinvertebrates, amphibians, crayfish etc. I'm not suggesting that we put this under the auspices of performance standards (yet) but we need to start including biologics as a specific goal of these types of projects in order to carry out the Clean Water Act's purpose of maintaining the physical, chemical and biological integrity of waters of the United States. It would be a shame if all this habitat constructed was just to look pretty and nothing was living in it. We should begin to verify that indeed habitat is being utilized for the purpose intended and if we are to state that improving ecological function is a goal then we need to know the fauna side of the ecology is present (or not) in order to verify bona-fide ecological improvement. The biology scores from the NC DWQ Stream ID form are rather low (as expected for agriculture ditches) and I would like to see an improvement noted in future stream assessments following the restoration.

  Comment noted.

- Page 9: Need a citation for the NC DWQ Stream ID Forms Version 4.11

  The citation has been added.

- Page 11: Using the same NCDWQ Stream ID score for all five Reaches is inappropriate especially with reaches that have a wide difference in watershed sizes

  NCDWQ Stream ID scores have been revised and are provided in Appendix B.

- Page 12: Stream Mitigation Credits in Table 3 is listed at 2,904 which neither matches 2,700 SMUs or 2,891 lf of streams restored.

  The project is providing EEP the mitigation they need which is 2,700 SMUs (as stated in the contract with Albemarle Restorations, LLC) however the project is delivering 2,981 SMUs. Revisions have been made to provide clarification.

- Page 12: Restoration Approach in Table 3 does not match Priorities listed on page 126, which lists all at Priority 1. Reach 1 appears to be P1 but Reaches 2-4 appear to be PIII based on the provided plans (no lift, no shift, floodplain lowered to meet stream).

  Reach 1 has proposed alterations to dimension, pattern, and profile therefore qualifying as Priority 1. Reaches 2-4 contain areas of both Priority 1 and 2. Reach 5 is Priority 2. These revisions have been incorporated into the mitigation report and plan.

- Page 14, 6.2: Only 10% of a site's total stream credits should be withheld until two bankfull events in separate years has occurred. Table 4 on the previous page has this approach correct.

  Revision has been made to 10% in Section 6.2.

- Page 14, 7.1: Restoration of Reaches 2-4 description seems to be that of a PIII and not a P1/II approach

  Alterations to dimension, pattern, and profile are proposed for Reaches 1-4 therefore qualifying for Priority 1 and 2.

- Page 14: Was any plant community data recorded for the reference reach and if so, is that data being utilized to develop a planting guide?

  The reference reach for stream morphology is at Merchant's Millpond State Park. The plant community used as a reference for species selection is the area at the project site that is not included in the ownership but will connect to our project at both its upstream and downstream sides. The most commonly occuring species found there include: L. tulipifera, Q. alba, L. styraciflua, A. rubrum, Q. nigra, Q. phellos, P. taeda and P. occidentalis. The planting list has been revised to more closely resemble the species found there.

- Page 15: Where are the reference areas used to select vegetation

  See previous comment above.

- Page 15: Citation for "Dominant Plants for Major Wetland Types" is needed.

  Citation has been added.

- Page 15, 7.2: All other discussions for channel design only refer to C type and not Bc. Is the reference to Bc only for those locations where slope may exceed 2%?

  Reaches 1-4 will be low sinuosity C5-C6 stream types with downstream portions of Reaches 1 and 4 qualifying as C_b stream type because of increase in slope (>2%). Revisions have been made to reflect this information.

- Page 15: No mention of plant community or benthic macroinvertebrates for Reference Reach. Was a NCDWQ Stream ID form used on the reference reach?

  A NCDWQ Form was used on the reference reach and is provided in Appendix B along with the DWQ forms for the project reaches.

- Page 16, 7.2: discussion centers around the C5-C6 channel design. Higher slope in some reaches is discussed but B channel type is not mentioned.

  Reaches 1-4 will be low sinuosity C5-C6 stream types with downstream portions of Reaches 1 and 4 qualifying as C_b stream type because of increase in slope (>2%). Revisions have been made to reflect this information.

- Page 19: Table 6 may want to mention beavers as this is a very real possibility (anticipated activity) for needed repairs.

  Other potential issues including animal damage, disease or pest infestation, or damage from extreme weather events will be noted during monitoring, with any apparent problem areas mapped for inclusion into the monitoring report. The monitoring will also include any corrective actions taken or proposed.

- Page 19, 9.1.1: "Surface water flow must be documented to occur at least 2 times per year for 4 years out of the 7-year monitoring period". This seems like a strange metric for a 3rd Order perennial stream. Please explain rationale for this particular performance standard.

  As mentioned before, 1st and 2nd order streams are present for this project, not 3rd order.

- Page 20, 9.2.1: Please define "accelerated" in terms of erosion.

  "Accelerated" erosion can include evidence of bank sloughing and actively eroding banks due to the exceedance in critical bank height and lack of deep rooted stream bank vegetation.

- Page 21, Table 7: Cite the version of the CVS Protocol you are using. (2008?). I am aware that the 1998 Peet et. al. paper on the method is being used but it was not cited either.

  Version 4.2 2008 CVS Protocol will be used and the revisions have been made.

- Page 22, 10.4: Please define "excessive" in terms of scour or erosion.

  Similar to "accelerated", "excessive" can be interpreted to be more than the natural amount of erosion.

- Page 24, 10.7: Cite the version of CVS Protocol being used.

  Version 4.2 2008 CVS Protocol will be used and the revisions have been made.

- Page 26, 14.2: References need to be alphabetized and cross checked for use within the document.

  References have been alphabetized and cross checked.

- Page 76: As noted before, using the same NCDWQ Stream ID score for all five Reaches is inappropriate especially with reaches that have a wide difference in watershed sizes.

  NCDWQ Stream ID scores have been revised and are provided in Appendix B.

- Page 126: 12.6 acres of land for the project may be erroneous (13.4 acres listed in much of the rest of the document) see previous comment.

  Final project size is 13.49 acres which has been updated throughout the document including FEMA checklist info on page 126.

- Page 126: Clarify which priority restoration type is being used for each reach. There is some inconsistency with the rest of the document. See previous comment.

  Clarification has been made.

- Page 177: Recommend limiting sweetgum and red maple components of the planting plan to a combined maximum of 15%. A 27% planting rate for known aggressive volunteer species seems excessive.

  Planting schedule has been revised and no longer contains either Sweet Gum or Red Maple (see mitigation plan for revised planting schedule).

Eric Kulz (DWR)

- Based on a field visit and USDA soil mapping, it appears unlikely that all of the features proposed for restoration were streams, as no alluvial soils are present on site. All features on the site appear to

have been excavated to groundwater. While reaches 2/4 and 5 may have been a stream, it is likely that reaches 1 and 3 were ephemeral swales. Site soils along all proposed restoration features are

Craven fine sandy loam, which is described as "gently sloping, well-drained soils on ridges in uplands". The only soils exhibiting hydric characteristics on the site are within the excavated channels. In addition, the watershed size for reach 3 (26 acres) is extremely small to support a stream.

Historical aerial photos, specifically the 1938 aerial photograph of the site clearly shows defined channels within all reaches proposed for restoration. Reach 3 show wooded fingers branching out to the southwest and southeast above the reach proposed for restoration. The 1938 aerial also shows Reach 1 with a clearly defined meander pattern and commensurate amplitude consistent with a single thread natural channel. Reach 2 shows a minimum of four first order channels branching out east, southeast, and east upslope of the reach proposed for restoration. All reaches will be monitored with continuous recording gauges upstream and downstream of each reach to document continuous flow. Finally, the flood study performed for the project refined the drainage area calculations to approximately 35 acres. Delineating a precise drainage area remains a challenge for these type of projects due the general lack of defined topography and the manipulation of drainage patterns for agricultural purposes.

Scott McGill of Albemarle Restorations/Ecotone had a discussion with Eric Kulz regarding the drainage areas and his comment above. A similar response/explanation to what is given here was discussed with Eric and he stated he was content and approved to move forward.

- Should this project go forward as proposed, DWR will require groundwater monitoring wells installed in the thalweg near the top and bottom of reaches 1, 2 and 3. The wells shall be equipped with continuous–reading gauges capable of documenting sustained flow for at least 30 days during years with normal rainfall (demonstrating at least intermittent stream status).

  Stream flow monitoring will include groundwater monitoring gauges capable of recording water level data for extended periods of time. These gauges will be deployed in the thalweg at numerous locations as outlined in section 10.2, item 2 and 10.3, item 2 which indicate a minimum of three gauges be deployed in each reach, at the top, middle and bottom. Additional monitoring will include video recording of flow when it occurs. The success criteria for stream hydrology is stated in Section 9.1.2, two over bank events in separate years throughout the monitoring period. This is the success criteria intended to be used for this project due to these channels being designed as single thread channels (reaches 1-4).

- In addition, All features on-site must be evaluated by DWR Washington Regional Office personnel for applicability of the Neuse Riparian Buffer Rules in order to generates riparian buffer credit

  We are not generating riparian buffer credit for the project, only stream mitigation units.

- Review of the proposed planting list revealed that sweetgum and red maple are the two species to be planted in greatest numbers. It has been our observation that these species volunteer prolifically and based on research conducted by DWR on older mitigation sites, they will become major canopy species over time through natural processes. Planting of these species will result in the site becoming dominated with red maple and sweetgum by the end of the monitoring period. Please remove these species from the planting list

  Planting schedule has been revised and no longer contains either Sweet Gum or Red Maple (see mitigation plan for revised planting schedule).

Todd Tugwell, USACE

- Section 10.7 Vegetation Planting Monitoring Requirements, Page 18, states that vegetation monitoring plots shall make up a minimum of 1% of the planted portion of the site with a minimum of 4 plots. The EEP standard per the November 7, 2011 document Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation is 2% of the planted portion of the site. Please check the applicable EEP monitoring requirements to ensure you are including the correct standard.

  Per the Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation document, the previous text noting the minimum 1% of planted vegetation to be monitored has been changed to 2%.

MITIGATION PLAN

Hudson Property

Beaufort County, North Carolina
EEP Project #: 95361
Contract #: 004638
USACE Action ID: SAW-2012-01394

Tar-Pamlico River Basin
CU: 03020104 / TLW: 03020104010010

Prepared for:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Revised July, 2014

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Prepared by:

Albemarle Restorations, LLC
P.O. Box 176 – Fairfield, NC 27826
p (252) 333-0249 f (252) 926-9983

EXECUTIVE SUMMARY

This mitigation plan has been written in conformance with the requirements of the following:

- Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).
- NCDENR Ecosystem Enhancement Program In-Lieu Fee Instrument signed and dated July 28, 2010

These documents govern NCEEP operations and procedures for the delivery of compensatory mitigation.

The North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program has selected 13.49 acres of land positioned in the Tar-Pamlico river basin cataloging unit 03020104, for stream restoration to fulfill a portion of the Request for Proposals (RFP): Full Delivery Project Tar-Pamlico River Basin, RFP 16-004106. The RFP and subsequent contract(s) awarded by EEP provide compensatory stream, wetland and/or buffer mitigation within the Tar-Pamlico River Basin Cataloging Unit 03020104. Albemarle Restorations, LLC entered into a contract with the State of North Carolina on June 12, 2012 to deliver 2,700 stream mitigation units (SMUs) on the Hudson project site. An option to purchase a conservation easement has been signed and recorded on the 13.49 acres encompassing this project on July 26, 2011 at the Beaufort County Tax Office and Register of Deeds (Appendix A).

Albemarle Restorations, LLC proposes to restore 2,981 linear feet of stream (2,981 SMUs for the required 2,700 SMUs per EEP's contract) on the Hudson Property, located within the northeast quadrant of the intersection between Route 17 and Route 1127 (Possum Track Road) in Beaufort County, North Carolina. The project is comprised of 13.49 acres of agricultural land situated approximately 6 miles southeast of the Chocowinity Bay and Pamlico River confluence and 4.4 miles north of the Beaufort and Craven County line.

The site contains unnamed 1st and 2nd order tributaries that drain to Horse Branch which is located within the Chocowinity Creek watershed (USGS Cataloging Unit 03020104010010). The Chocowinity Creek watershed has been added as a TLW for the Tar-Pamlico River Basin according to the "Tar-Pamlico River Basin Restoration Priorities" draft document by NCEEP (dated: October, 2010). Historic aerial photographs show evidence of the natural headwater streams that were cleared and channelized for agriculture production.

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TABLES

1. RESTORATION PROJECT GOALS AND OBJECTIVES

EEP develops River Basin Restoration Priorities to guide its restoration activities within each of the state's 54 cataloging units. RBRPs delineate specific watersheds that exhibit both the need and opportunity for wetland, stream and riparian buffer restoration. These watersheds are called Targeted Local Watersheds (TLWs) and receive priority for EEP planning and restoration project funds.

The 2010 Tar-Pamlico River Basin Restoration Priorities identified the Chocowinity Creek Watershed (HUC: 03020104010010) as a Targeted Local Watershed (Tar-Pamlico River Basin Restoration Priorities, Oct 2010). The watershed is characterized by 41% agricultural and 53% forested area with 59% of the TLW unbuffered and receiving excess agricultural inputs (sediments and nutrients) from various facilities such as four (4) permitted hog farms.

The 2010 Tar-Pamlico River Basin RBRP identified discontinuity of resource lands to Natural Heritage Areas and nutrient and sediment loading as major stressors within this TLW. The Hudson Property Project was identified as a headwater stream and buffer restoration opportunity to improve water quality, terrestrial wildlife and anadromous fish habitat, especially downstream nursery and spawning habitats within the TLW. The primary objectives of this project are to restore naturally functioning headwater stream system across a newly forested floodplain in the lower reaches of the project area, and to restore stable single thread channels in the upper reaches where valley slopes are steeper.

The project goals address stressors identified in the TLW and include the following:

Goals outlined by the EEP in the "Tar-Pamlico River Basin Restoration Priorities":

- Promoting nutrient and sediment reduction in agricultural areas by restoring and preserving wetlands, streams and riparian buffers.
- Continuing targeted implementation of projects under the Nutrient Offset and Buffer programs, as well as focusing DOT sponsored restoration in areas where they will provide the most functional improvement to the ecosystem.

Goals specific to the Chocowinity Creek TLW:

- Implementing agricultural Best Management Practices (BMPs) to reduce nonpoint source inputs to the downstream estuary.
- Restore/improve downstream nursery ad spawning habitats for anadromous fish.
- Restore wildlife habitat and travel corridors between natural habitats.
- Restore natural floodplain hydrology and provide flood attenuation.
- Restore groundwater and surface water hydrology in heavily ditched headwater areas.

Project Specific Goals:

- Improve and sustain hydrologic connectivity/interaction and storm flow/flood attenuation.
- Reduce nutrient and sediment stressors to the reach and receiving watershed.
- Provide uplift in water quality functions.
- Improve aquatic and terrestrial habitats (complexity, quality).
- Improve and maintain riparian buffer habitat.

The project goals will be addressed through the following project objectives:

- Implement a sustainable, reference-based, rehabilitation of the reach dimension, pattern, and profile to provide needed capacity and competency.
- Support the removal of barriers to anadromous fish movement and to help improve nursery and spawning habitats.
- Strategically install stream structures and plantings designed to maintain vertical and lateral stability and improve habitat diversity/complexity.
- Provide a sustainable and functional bankfull floodplain feature.
- Enhance and maintain hydrologic connection between stream and adjacent floodplain/riparian corridors.
- Utilize the additional width of the swamp runs to provide natural filters for sediment and nutrients and diffuse flow from upstream runoff.
- Install, augment, and maintain appropriate riparian buffer with sufficient density and robustness to support native forest succession.
- Water quality enhancement through riparian forest planting and woody material installation, and increased floodplain interaction/overbank flooding.
- Restore the existing ditched streams to single and multi-thread headwater systems with forested riparian buffers.
- Provide ecologically sound construction techniques that will require minimal grading and disturbance.

2. SITE SELECTION

2.1 Directions to Site

The project, Hudson Site, consists of 13.49 acres positioned on 106.51 acres of agricultural land owned by Charles E. Hudson. The project located within the northeast quadrant of the intersection between Route 17 and Route 1127 (Possum Track Road) in Beaufort County, NC. More specifically, the project lies approximately 6 miles southeast of the Chocowinity Bay and Pamlico River confluence, 4.3 miles south of the town of Chocowinity, and 4.4 miles north of the Beaufort and Craven County line. The site can be accessed by heading west on Possum Track Road (Rt. 1127) from Route 17 for approximately 1.1 miles (Exhibit A).

2.2 Site Selection

The site was chosen for various reasons including but not limited to: headwater location within the Chocowinity Creek TLW, proximity to the 303d listed Chocowinity Bay, and the excellent opportunity available to restore and re-connect riparian headwater stream and swamp run systems with existing forest stands immediately adjacent to the project area. The site contains unnamed 1st and 2nd order tributaries with an upstream drainage area of approximately 190 acres that drain to Horse Branch which is located within the Chocowinity Creek TLW (see Exhibit B and H). Historic aerial photographs show evidence of the natural headwater streams that were cleared for agriculture production.

The majority of the site is used for crop production, primarily corn, soybeans and wheat. As a result, the lowering of local water tables, and in some cases the complete elimination of ground and surface water interaction, has occurred and the degradation of water quality and downstream anadromous fish spawning and nursery habitat have followed. According to the North Carolina Geologic map, the site lies within the Yorktown Formation and Duplin Formations which is a combination of fossiliferous clay and sand, shelly sand, sandy marl, and limestone. The site contains mostly low gradient non-hydric moderately drained soil types such as Craven fine sandy loam (CrB) and Goldsboro fine sandy loam (GoA) and within the Horse Branch floodplain the Muchalee loam (Me) hydric soil type is present (Exhibit C). Hydric soils are seen in the stream bank profile which shows the opportunity to raise the water table and re-establish normal base flow conditions. Historic aerial photographs from the years 1938, 1963, and 1979 show the extensive drainage network leading from southeast to northwest (Exhibits E, F, G).

Between the years of 1938 to 1963, extensive forest clearing and agricultural production occurred on the site, especially on the northwest portion of the site where the unnamed 2rd order tributary flows into Horse Branch. From 1938 to 1948, logging in the northeast corner was completed and by 1963, the entire project area was cleared and ditched for agriculture production. North Carolina Division of Water Quality Stream Identification Forms have been completed for the degraded headwater streams and are found in Appendix B (NC DWQ Stream ID Forms Version 4.11).

The project site and watershed conditions such as land use have remained relatively static with continued maintenance of agricultural land since 1979 (Exhibits B and I). This trajectory will remain the same with no proposed development trends within the project's watershed.

There are no known site constraints such as existing easements or crossings that would inhibit site access and/or completion of the project. Small farm road crossings/culverts present on both the upstream and downstream portions of the site will be removed as part of the restoration, and new culvert crossings will be installed at the confluence of Reach 1 and Reach 4, upper limit of Reach 5 to provide long term access to the mitigation site. An access road under the existing power line right-of-way along Possum Track Road will also be installed to serve as the main access point into the mitigation site.

3. SITE PROTECTION INSTRUMENT

3.1 Site Protection Instrument Summary Information

The land required for the construction, management and stewardship of this mitigation project includes portions of the following parcels. A copy of the land protection instrument(s) is included in Appendix A.

Table 1. Parcel information for project site

	Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage Protected
Parcel A	Charles E. Hudson	12024438	Beaufort	Option	Book 1650, Page 0079	13.49 AC

The recorded document(s) are not available at this time. The template easement documents are provided in Appendix A.

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

3.2 Site Protection Instrument Figure

Site protection instrument figure (Exhibit K) which shows the proposed easement limits in relation to the overall property is provided at the end of this report.

4. BASELINE INFORMATION

Project information					
Project name	HUDSON PROPERTY				
County	BEAUFORT				
Project Area (ac)	13.49 AC				
Project Coordinates (Lat and Long)	77˚ 06” 13.62’ W / 35˚ 26” 53.20’ N				
4.1 Project Watershed Summary Information					
Physiographic province	INNER COASTAL PLAIN				
River basin	TAR-PAMLICO RIVER BASIN				
USGS Hydrologic Unit 8-digit	03020104	USGS Hydrologic Unit 14-digit	03020104010010		
DWQ Sub-basin	CHOCOWINITY CREEK – HORSE BRANCH				
Project Drainage Area (acres)	190.86				
Project Drainage Area Percentage of Impervious Area	1.2 % (2.24 acres)				
CGIA Land Use Classification	2.01.01.07 Annual Row Crop Rotation				
4.2 Reach Summary Information					
Parameters	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5
Length of reach (linear feet)	766	516	611	503	689
Valley classification	VIII	VIII	VIII	VIII	VIII
Drainage area (acres)	40.51	74.63	35.21	150.35	190.86
NCDWR stream identification score	20.75	20.75	20.75	20.75	28
NCDWR Water Quality Classification	C;NSW	C;NSW	C;NSW	C;NSW	C;NSW
Morphological Description (stream type)	G5-G6	G5-G6	G5-G6	G5-G6	G5-G6
Evolutionary trend	Early (CEM)	Early (CEM)	Early (CEM)	Early (CEM)	Early (CEM)
Underlying mapped soils	GoA & CrB	CrB & Ly	CrB & Ly	CrB	CrB & Me
Drainage class	MW	MW & SP	MW & SP	MW	MW & P
Soil Hydric status	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric	Hydric
Slope (ft/ft)	0.009	0.006	0.008	0.004	0.003
FEMA classification	N/A	N/A	N/A	N/A	AE/X
Native vegetation community	Pasture/Crop	Pasture/Crop	Pasture/Crop	Pasture/Crop	Pasture/Crop
Percent composition of exotic invasive vegetation	N/A	N/A	N/A	N/A	N/A
4.3 Regulatory Considerations					
Regulation	Applicable?	Resolved?	Supporting Documents		
Waters of the United States – Section 404	YES				
Waters of the United States – Section 401	YES				
Endangered Species Act	NO				
Historic Preservation Act	NO				
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	NO				
FEMA Floodplain Compliance	NO				
Essential Fisheries Habitat	NO				

Table 2. Project information summary.

5. DETERMINATION OF CREDITS

Mitigation credits presented in Table 3 below are projections based upon site design. Upon completion of site construction the project components and credits data will be revised to be consistent with the as-built condition.

Hudson Property, Beaufort County EEP Project Number: 004638									
Mitigation Credits									
	Stream		Riparian wetland		Non-riparian wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	2,891						13.80 AC		
Project Components									
Project Component or Reach ID	Stationing/Location		Existing Footage/Acreage		Approach (PI, PII etc.)		Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Reach 1			766 LF		PI			833 LF	1:1
Reach 2			516 LF		PI/PII			532 LF	1:1
Reach 3			611 LF		PI/PII			445 LF	1:1
Reach 4			503 LF		PI/PII			437 LF	1:1
Reach 5			689 LF		PI			644 LF	1:1
Total			3,085 LF					2,891 LF	
Component Summation									
Restoration Level	Stream (linear feet)		Riparian Wetland (acres)		Non-riparian Wetland (acres)		Buffer (square feet)		Upland (acres)
			Riverine	Non-riverine					
Restoration	2,891 LF						544,935 SF (12.51 ac)		
Enhancement									
Enhancement I									
Enhancement II									
Creation									
Preservation									
BMP Elements									
Element	Location				Purpose/Function		Notes		
FB	Adjacent to stream				Buffer		100 feet on either side of stream centerline		
BMP ELEMENTS BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grasses Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forest Buffer									

Table 3. Proposed mitigation credit projections.

6. CREDIT RELEASE SCHEDULE

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described in Table 4 below.

Stream Credits			
Monitoring Year	**Credit Release Activity**	**Interim Release**	**Total Released**
0	Initial allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50% (60%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%*)
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%*)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%*)
6	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%*)
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	90% (100%*)

Table 4. Proposed credit release schedule.

6.1 Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCEEP without prior written approval of the DE upon satisfactory completion of the following activities:

a. Approval of the final Mitigation Plan

b. Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property

c. Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; Per the NCEEP Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.

d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

6.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after two bank-full events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bank-full events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the NCEEP will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

7. MITIGATION WORK PLAN

7.1 Target Stream Type(s) and Plant Communities

As stated within both the Site selection (Section 2.2) and Baseline data table (Section 4), the existing channelized reaches are classified as G5-G6 stream types. The channel evolution model is not applicable in this setting because the ditches continue to be maintained and channelized therefore the evolutionary trend is not able to move forward. The existing ditches are entrenched with low width-depth ratios and do not have active floodplains available. The target stream types for Reaches 1 through 4 are low sinuosity "C" channels. Reach 1 will be raised to reconnect to the existing floodplain elevation (Priority 1 restoration). Restoration of reaches 2, 3 and 4 will involve raising and re-aligning the channel invert/thalweg where possible and grading a functional floodplain that ties into the existing grade to mimic natural conditions (Priority 1/2 restoration) to ensure positive flow within the reach and from upslope areas. Reach 5 target stream type is a "D" channel with a high width-depth ratio and increased channel capacity due to the reach's close proximity to the Horse Branch Swamp (Priority 2 restoration).

To achieve these target stream types, reference reach data collected from an unnamed tributary to Bennett's Creek located in Merchant's Millpond State Park within the Chowan River Basin was used as a guide in the design process (see Exhibit J for reference reach location). Both the project and reference sites are located within the Outer Coastal Plain physiographic province.

The riparian plant communities chosen for the project are native to the area, with an emphasis on species that will provide habitat and a viable, yearlong food source for a wide range of animal and plant species. The adjacent forested wetlands and swamps within Horse Branch and Chocowinity Creek are home to wild turkeys, bear, whitetail deer, raccoon, squirrel, fox, migrating waterfowl, and a wide variety of amphibian and reptile species. The project is intended to provide food, habitat, and corridors to complement and enhance the existing ecosystem. Invasive and exotic species will not be planted on the site and if found, they will be removed through physical or chemical means during the planting phase. In selecting vegetation, we have considered reference riparian areas adjacent to the site and

"*Dominant Plants for Major Wetland Types*" published by the North Carolina Department of Environment Water Quality Section (NCDENR, 1997).

7.2 Design Methodology

In order to properly restore the degraded channels within the project area, the overall design goal is to convert the channelized reaches to more stable stream types. Because of the low entrenchment and width/depth ratios of the existing reach cross sections, reconfiguring the dimension, pattern, and profile of the channels are the most effective method of restoring a stable system. The project will create channels connected to the floodplain and the project area has been broken into five distinct reaches based on drainage area and landscape position.

For reaches 1 through 4, a single thread low sinuosity C5-C6 and C_b channel types (depending on % slope) was selected to provide a higher width-depth ratio and increased floodplain connection. After evaluating historic conditions (specifically the 1938 aerial), discussion with the IRT, and taking into account the slightly higher channel and valley slopes within this area, a single thread design channel was chosen. A headwater system/multi-thread "D" type channel has been chosen for Reach 5 to mimic the diffuse flow patterns and dense vegetation seen in undisturbed areas of Horse Branch.

Parameters for the proposed channel morphology are based upon the design stream type, historical conditions evident from mid 1900's aerial photography and data from the Millpond State park reference reach surveyed by Ecotone, Inc. Dimensionless ratios taken from the reference reach with dissimilar drainage areas allowed channel morphology data from the reference reaches to be used for this project.

7.3 Reference Reach

Natural channel design protocol calls for using a reference reach located in the same physiographic province as the reference site. The Merchant's Millpond site was chosen because it is located in the Inner Coastal Plain physiographic province as well as the Mid-Atlantic Coastal Plain ecoregion. It contains undisturbed first and second order tributaries in a similar landscape position to those found on the project site. Because much of the inner coastal plain has been developed for agricultural production, undisturbed reference sites are rare. The Merchant's Millpond State Park site offers an excellent opportunity to survey streams in an almost completely undisturbed condition. This reference reach surveyed contained both low gradient (<1%) single and multi-thread sections typical of low gradient and headwater system streams within the coastal plain region of North Carolina. The photo exhibit found in Appendix E show typical conditions encountered at the reference site.

Wolman pebble counts were attempted at the reference site and all mineral material collected was smaller than 2 millimeters, further validating the reference reach as a low energy sand bed system. Visual inspection of the project site, combined with soil survey data and anecdotal information from the landowner indicate that the soils on site are sand and loam. Native subsoil will form the bed and banks of the proposed channel, similar to the conditions seen at the reference site. It should also be noted that the reference site contained naturally occurring woody debris impregnated sand riffles, which will be utilized on the project site. Photos of these riffles are found in the Appendix E photo exhibit.

7.4 Design Parameters

TR-55 was run for each reach, and the two year flow (Q) was chosen as the basis for the design. See section 7.3 below for a detailed explanation of the derivation of hydrology for the site. Reaches 1 through 4 will be designed to hold the 2-year TR-55 flow and allow higher flows to escape the channel and spread into an area similar to the historic floodplain to provide greater sediment and pollutant attenuation. Near bank stress and erosion will be reduced by lowering the current flow velocities and sizing the channels to have minimal shear stress.

Riffles and pools will be constructed according to reference reach ratios derived from the Merchant's Millpond State Park reference reach site. Stable riffle slopes and pool depths will be utilized to accommodate high flow events and the movement of sediments. Riffle slopes will vary from 1 to 2 percent in reaches 1 though 4 where the low sinuosity C5-C6 channels are proposed. Pool depths will vary from 0.35 feet to 0.75 feet throughout the restoration with the deeper pools placed in sections where riffle slopes are higher. Pool spacing increases as a function of increasing channel width and will vary from 30 to 55 feet.

To mimic the riffle-run-pool morphology and the natural condition of low gradient, headwater coastal plain streams, constructed riffles composed of woody material of various sizes embedded into native subsoil material found onsite will be used to provide vertical stability and bed form diversity. These features are naturally occurring in the Mid-Atlantic Coastal Plain ecoregion and form the basis for stability in low gradient sand-based systems. Photographs of naturally occurring woody material impregnated riffles can be found in the reference reach information provided with this report.

The downstream portions of Reaches 1, 3, and 4 will have higher slopes (+/- 1.5 - 3%) to transition from the upstream low energy channels to the existing invert at the downstream end of the project limits. These transitional channels will mimic naturally occurring high energy systems, and the log drops are engineered to create conditions similar to those create by large woody debris jams seen in nature. Because natural debris jam dominated systems do not have "typical" spacing and slope patterns (as they are generally formed by random inputs of large woody materials to the channel), spacing of the log jams selected for this project is fairly standard with elevation changes of less than 0.5 feet at each structure. The log cross vanes will be installed within these sections to provide a stable transition and ensure long term vertical stability.

Reach 5 is designed as a typical headwater system and therefore does not have the typical design parameters associated with traditional natural channel design. This reach will have less bed form diversity due to the lower slope (<0.4%) and proximity to the Horse Branch floodplain. The headwater system channel geometry with high width ratio and minimal sinuosity will provide larger channel capacity and surface area to promote sediment and nutrient trapping and processing as well as hyporheic exchange. Reach 5 will be graded such to create diffuse flow patterns and multi-threaded channels.

Culverts and farm road crossings within Reaches 1-4 will be removed to complete the proposed channel work. A farm road crossing will install at the beginning of Reach 1 and will consist of a 24" HDPE Type S corrugated plastic pipe (CPP). Access road crossings for long term maintenance will be installed at the upper limit of Reach 5 and at the confluence of Reaches 1 and 4 to provide effective stormwater conveyance and a stable long term crossing to access the northern portions of the remaining property.

These crossings will consist of two 30 inch HDPE Type S corrugated CPP's. Proper sizing of the proposed culverts was completed using the N.C. Forestry Best Management Practices Manual (2006), specifically Appendix 9 entitled *Talbot's Table for Round Culvert Sizing*.

Sediment transport was not seen as a major design consideration for the project because all of the single thread channels are first or second order low energy tributaries found in the upper reaches of the watershed where little sediment supply exists. The intended stream condition will be stable, with little or no movement of non-organic bed material expected during storm events. Woody debris are expected to play a large role in forming and maintaining channel profile features, as the ultimate condition will be channels with low banks and riparian areas densely vegetated with native trees, shrubs and herbaceous material. Woody debris impregnated riffle structures and log cross vanes have been designed to mimic natural conditions of channels in a similar landscape position, and as the adjacent planted areas mature they will provide a steady supply of new woody materials to the channel.

The woody debris impregnated riffles will incorporate a mix of native subsoil material and woody debris that will remain in place during flows above bankfull. Traditional entrainment calculations cannot accurately assess potential transport or movement of woody debris. Studies conducted on large woody debris in streams focus on drag and buoyancy calculations, which do not reliably translate to a woody debris impregnated substrate condition. Because more than two-thirds of the proposed pieces of woody materials used in the riffles will be buried, both buoyancy and drag forces are expected to be negligible.

The steeper high energy transition areas or reaches 1, 3 and 4 will be stabilized using log vanes drop structures. Buoyancy and drag calculations have not been completed for these reaches because more than half of each log will be buried and the crossover points will be securely anchored with rebar. In addition, backfill behind each structure will be comprised of native substrate material and small woody debris, similar to riffle areas.

Reach 5 is designed to be a swamp run, typical of coastal plain streams. These systems have extremely low or nonexistent sediment transport rates, and the substrate is typically dominated by clay and silt with dense live woody root mass providing stability. The reach was not evaluated for entrainment because for the 10-year storm event, velocities values are less than 2 feet per second and shear stress values are less than 0.23 pounds per square foot.

By grading the site to create stable stream channels and planting the entire area with woody vegetation and a native wetland seed mix, the project will slow overland runoff and provide storage and water quality treatment before it reaches Horse Branch. Stream banks and immediate floodprone areas on both sides will be seeded, protected with coir erosion control matting and planted with live stakes. These improvements will also serve to make downstream primary and secondary fishery nursery areas more productive.

When completed, each reach segment will be designed to reach "bankfull elevation" and restore historic flow to a degraded riparian headwater system. This transition, from degraded stream channels surrounded by agricultural fields, to restored headwater stream/swamp runs, will provide water quality improvement through sediment, toxicant, and nutrient retention and reduction, production and export of food sources, and enhancement of wildlife habitat

7.5 Narrative of Data Analysis

7.5.1 Hydrology

Two delineation methods were used in determining the site's drainage area. The USGS National Hydrology Dataset Watershed Tool served as the primary delineation of the drainage basin which was then field verified and corrected to account for the presence of extensive ditch networks. Using the field verified drainage area of 196 acres, the 2, 10, 50, and 100 year recurrence interval discharges were calculated for each reach using a variety of methods including but not limited to: USDA TR-55 program, North Carolina State University (NCSU) Coastal Plain Regional Curve, and USGS StreamStats Regression equations. After assessing the variety of discharges from the different sources listed above, the design team chose the TR-55 discharges as they best represented the small watershed size of the project and fit in line with the Coastal Plain regional curve discharge estimates (see Table 5 below).

Reach Design Discharges (TR-55)									
Reach	Drainage Area (mi^2)	Drainage Area (ac)	Reach Length (ft)	Reach Slope (ft/ft)	2 Year (cfs)	10 Year (cfs)	25 Year (cfs)	50 Year (cfs)	100 Year (cfs)
Reach 1	0.065	41.77	833	0.006 / 0.029	7.4	23.2	26.6	34.6	43.5
Reach 2	0.078	50.20	532	0.0035	11.8	32.3	36.7	47.0	58.3
Reach 3	0.042	26.57	445	0.005 / 0.016	5.9	16.6	18.9	24.3	30.2
Reach 4	0.128	82.21	437	0.0035 / 0.020	19.2	52.5	59.7	76.3	94.5
Reach 5	0.267	170.66	644	0.003	38.9	109.6	124.7	160.1	199.5

Table 5. Reach Design Discharges

7.5.2 Hydraulics

A complete pre- and post- floodplain study has been completed by Ecosystem Services, LLC and is provided in Appendix C.

8. MAINTENANCE PLAN

Albemarle Restorations shall monitor the site on a regular basis and shall conduct a physical inspection of the site a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Component/Feature	**Maintenance through project close-out**
Stream	Routine channel maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation along the channel. Areas where stormwater and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting.

Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.
Pest Management	Other potential issues including animal damage, disease, or pest infestation, or damage from extreme weather events will be noted during monitoring, with any apparent problem areas mapped for inclusion into the monitoring report. The monitoring will also include any corrective actions taken or proposed.
Road Crossing	Road crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.

Table 6. Anticipated Maintenance Activities

9. PERFORMANCE STANDARDS

9.1 Stream Restoration Hydrology Performance Standards

9.1.1 Headwater System (Reach 5)

Surface water flow must be documented to occur at least 2 times per year for 4 years out of the 7-year monitoring period during normal rainfall conditions. Additional monitoring may be necessary in the event of abnormal climatic conditions.

9.1.2 Single Thread Channels (Reaches 1 - 4)

All restored channels shall receive sufficient flow through the monitoring period to maintain an Ordinary High Water Mark (OHWM). Field indicators of flow events include a natural line impressed on the bank; shelving; changes in soil characteristics; destruction of terrestrial vegetation; presence of litter and

debris; wracking; vegetation matted down, bent or absent; sediment sorting; leaf litter disturbed or washed away; scour; deposition; bed and bank formation; water staining; or change in plant community. In addition, two overbank flows shall be documented for each reach during the monitoring period using continuously monitored pressure transducers and crest gauges. All collected data and field indicators of water flow shall be documented in each monitoring report. The stream project shall remain stable and all other performance standards shall be met through two separate bankfull events, occurring in separate years, during the 7 year post construction monitoring period.

9.2 Stream Channel Restoration Stability Performance Standards

9.2.1 Headwater System (Reach 5)

All stream areas shall remain stable with no areas of accelerated erosion seen.

9.2.2 Single Thread Channels (Reaches 1 - 4)

1. Bank Height Ratio (BHR) shall not exceed 1.2 within restored reaches of the stream channel. This standard only applies to restored reaches of the channel where BHR is corrected through design and construction.
2. Entrenchment Ratio (ER) shall be no less than 2.2 within restored reaches of the stream channel. This standard only applies to restored reaches of the channel where ER is corrected through design and construction.

9.3 Planted Vegetation Performance Standards (Stream Buffer Areas)

1. At least 320 three year-old planted stems/acre must be present after year three. At year five, density must be no less than 260 five year-old planted stems/acre. At year 7, density must be no less than 210 seven year-old planted stems/acre.
2. Planted vegetation must average 10 feet in height in each plot at year 7 (as defined in the USACE 2003 SMGs). If this performance standard is met by year 5 and stem density is trending toward success (i.e., no less than 260 five year-old stems/acre) monitoring of vegetation on the site may be terminated provided written approval is provided by the USACE in consultation with the North Carolina Interagency Review Team (NCIRT).

10. MONITORING REQUIREMENTS

Monitoring Reports will be submitted to EEP by December 1st of the year in which the monitoring was conducted. In the unlikely event that the success criteria are not being achieved during the seven-year minimum monitoring period, with permission from EEP, corrective measures including re-grading, replacement of structures, replanting, removal of certain species, etc. will be performed. Annual monitoring data will be reported using the EEP monitoring template. The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of EEP databases for analysis, research purposes, and assist in decision making regarding project close-out.

Required	Parameter	Quantity	Frequency	Notes
	Dimension	As per November 2011 NCEEP monitoring requirements	Monitoring Years 1, 2, 3, 5, and 7	Cross-sections to be monitored over seven (7) years and shall include an assessment of bank height ratio and entrenchment ratio
	Bank Erosion Pins	As per November 2011 NCEEP monitoring requirements	Monitoring Years 1, 2, 3, 5, and 7	Bank pin arrays shall be installed at pool (bend) monitoring cross-sections; arrays shall be measured at time of cross-section surveys
	Profile	As per November 2011 NCEEP monitoring requirements	As needed	
	Substrate	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Concentrations of woody debris in constructed riffles will be visually assessed semi-annually/annually to determine if riffle areas are remaining stable.
	Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	A Crest Gauge and/or Pressure Transducer will be installed on site; the device will be inspected on a quarterly/semi-annual basis to document the occurrence of bankfull events on the project
	Vegetation	Quantity and location of vegetation plots will be determined in consultation with EEP	Monitoring Years 1, 2, 3, 5, and 7	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols (Peet et. al. 2008)
	Exotic and nuisance vegetation		Semi-annual	Locations of exotic and nuisance vegetation will be mapped
	Project boundary		Semi-annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped

Table 7. Monitoring data requirements.

10.1 General Stream and Wetland Monitoring Requirements

1. Site monitoring for all stream and/or wetland mitigation projects shall occur for seven full years (post construction) except in those circumstances provided for in this document where specific monitoring activities may be terminated as early as five years. If performance standards have not been met by year seven, additional monitoring may be required to ensure that a site is relatively stable with respect to anthropogenic or natural effects and that the target community is established on the site or the site (or portions of the site) may be deemed to be unacceptable for generation of compensatory mitigation credit.
2. Seven years of monitoring are not required for stream and/or wetland preservation reaches or areas which are subject to Monitoring Level 3 requirements of the USACE 2003 SMGs.
3. Success criteria as provided in the mitigation plan or in the permit conditions must be restated verbatim in the monitoring report.
4. Monitoring reports shall be completed for all seven years and provided to the Ecosystem Enhancement Program (EEP) for review by December 1st of each year that the site is required to be monitored. This is to ensure that any remedial action that may be necessary can be accomplished during the next planting season. Failure to provide monitoring reports by this deadline may result in additional monitoring.
5. Vegetation monitoring standards shall apply to all stream and/or wetland mitigation projects.

10.2 Stream Channel Surface Water Hydrology Monitoring Requirements (Reach 5)

1. Surface flow shall be documented using pressure transducers with a staff plat and/or and flow meters located near the lowest point of the proposed stream area.
2. Three flow monitoring stations will be located within each reach, one at the upstream limit of the reach, one at the downstream limit and one near the middle of the reach.
3. Other evidence of flow, including rack lines, sediment sorting, debris jams, localized scour and disturbed vegetation will also be visually assessed and documented during monitoring visits.

10.3 Stream Surface Water Hydrology Monitoring Requirements (Reaches 1 – 4)

1. Surface water flow shall be documented using pressure transducers and staff plates located near the channel thalweg.
2. Three flow monitoring stations will be located within each reach, one at the upstream limit of the reach, one at the downstream limit and one near the middle of the reach. In areas where one reach is contiguous with another reach, one flow monitoring station will be used to collect data for both reaches where appropriate.
3. Other evidence of flow, including an ordinary high water mark, rack lines, sediment sorting, pool and riffle formation and debris jams will be visually assed and documented during each monitoring visit.

10.4. Stream Channel Stability Monitoring Requirements (Reach 5)

1. Channel areas will be visually assessed to determine if undesirable changes to channel morphology are occurring.
2. If any areas of excessive scour or erosion are seen, those areas will be assessed to determine if remedial measures are necessary or if adaptive management strategies are necessary.

10.5 Stream Channel Stability Monitoring Requirements (Reaches 1 – 4)

3. As-built surveys shall be conducted upon completion of channel construction to document baseline conditions. As-built surveys shall include all measurements typically documented during subsequent channel geomorphological surveys. A longitudinal profile of the thalweg, water surface, bankfull, and top of bank, shall also be collected during the as-built survey of the constructed channel to compare with future geomorphological data, if necessary. Longitudinal profiles shall not be required during routine channel stability monitoring (years 1 through 7) unless the monitoring efforts demonstrate channel bank or bed instability, in which case additional longitudinal profiles may be required by the USACE along channel reaches of concern to track changes in the channel and demonstrate stability.
4. Reference stakes, indicating the surveyed station and corresponding to the as-built survey, shall be installed in the riparian buffer near the stream bank every 100 feet along the length of the stream.
5. Channel cross-sections shall be monitored for 7 years, with monitoring events occurring in years 1, 2, 3, 5, and 7. If the Sponsor/Permittee chooses to conduct supplemental monitoring, results may be considered towards meeting performance standards.
6. Per the USACE 2003 SMGs, permanent, monumented cross-sections shall be installed at a rate of 1 cross-section per 20 bankfull channel widths, with approximately 50% of cross-sections occurring at pools and 50% at riffles/ripples. All channel cross-sections shall include

measurements of Bank Height Ratio and Entrenchment Ratio, which shall be documented in monitoring reports.

7. At each monitored cross-section located on a stream bend (typically at pool locations), a bank pin array shall be installed along the outer bend of the stream. Bank pins may consist of chain, rebar, or wire driven horizontally into the bank face, and should be a minimum of 3 feet long. A minimum of one pin per 2 feet of bank height shall be installed vertically at each location, with the lowest pin installed just above the normal water line and additional pins installed at 2-foot intervals above the first. Vertical series of pins should be installed in at least three locations - at the monumented cross-section, the upstream third of the meander bend, and downstream third of the meander bend. The pins shall be installed flush to the face of the stream bank, and the length of exposed pin shall be measured and reported during each cross-section monitoring event. Once the exposure has been measured, the pin should be hammered flush with the face of the bank. Lateral movement of the stream banks as indicated by pin exposure shall be included in all monitoring reports. Additional bank pin arrays may be required by the USACE to document erosion along particular reaches of channel where concern over channel stability is identified during routine monitoring events. Bank pins are not required on channels with a bankfull width of less than 3 feet, unless indicated by the results of the monitoring or required by the USACE.

10.6 Visual Monitoring Requirements for Single Thread Streams (Reaches 1 - 4)

1. Visual monitoring of all sections of the project shall be conducted in each of the required seven years of monitoring to identify areas of concern in both the vegetated buffer and restored stream channel. The following requirements apply to all stream mitigation projects that are required to comply with Monitoring Levels 1 & 2 in the USACE 2003 SMGs, including all forms of Restoration and Enhancement (Level I and II).
2. Visual monitoring of all sections of the stream project shall be conducted twice per monitoring year. Generally, one visual monitoring event should be done in conjunction with other stream channel stability monitoring (e.g., cross-sections, bank pins, etc.). At least 5 months shall separate each visual monitoring event.
3. Within the stream channel, visual monitoring shall be conducted along the entire length of the channel to identify and document excessive lateral movement of the channel, bank instability, instability/failure of in-stream structures, structure piping, headcuts, beaver activity, excessive live stake mortality, invasive species, aggradation/excessive sediment deposition, or other potential problems with the channel. Visual monitoring of streams shall be conducted only by individuals that have been properly trained to assess the stability of streams and condition of in-stream structures.
4. Within the vegetated buffer, visual monitoring shall be conducted by walking throughout the entire site to identify and document areas of low stem density or poor plant vigor, invasive species, beaver activity, herbivory, encroachments, indicators of livestock access, or other areas of concern.
5. The results of the visual assessment shall be included in a plan view of the channel identifying the location of each feature of concern, along with a written assessment and photographic documentation of the feature. Once a feature of concern has been identified, that same feature shall be reassessed on all subsequent visual assessments. Photographs should be taken from the same location year-to-year to document progression of the problem. The monitoring reports

shall identify all features of concern and recommended courses of action, which may include continued monitoring, repair or other remedial action.

10.7 Vegetation Planting Monitoring Requirements

1. Seven permanent plots to sample vegetation shall be randomly located in each of the target communities. Plot sizes for the determination of stem density and vigor (height) shall be a minimum of 0.02 acre in size, and should typically be square or rectangular.
2. Vegetation monitoring plots shall make up a minimum of 1% of the planted portion of the site with a minimum of 4 plots.
3. Upon initial establishment of vegetation plots (baseline/year 0), the plot corners shall be marked in accordance with CVS Protocol (version 4.2 – 2008).
4. Within each plot, vegetation data collected will be in accordance with CVS Protocol (version 4.2 – 2008).
5. Vegetation plots shall be monitored for 7 years, with monitoring events occurring in years 1, 2, 3, 5, and 7. If supplemental monitoring occurs, results may be considered towards meeting performance standards.
6. At least 180 days, occurring between March 1 and November 30, must separate the completion of the initial vegetation planting and the initiation of the first year of monitoring (Year 1). If 180 days has not occurred since the completion of vegetation plantings, the first year of monitoring must occur during the following year.
7. Individual plot data for planted species must be provided. Plot data shall not be averaged over the entire site to obtain a single figure for stem density.
8. Enumeration of the density of planted species: density = number of living, planted stems per acre. “Stems are defined as individual plants, where plants with multiple shoots are treated as a single stem.
9. Live stakes planted on the stream banks shall not count toward meeting the stem density requirements.
10. Volunteer plants growing within plots may be considered on a case-by-case basis in determining whether a project has met the overall goal of reestablishing the vegetated buffer; however, volunteer plants shall be counted separately from planted vegetation in the monitoring reports. Monitoring events should also be used to evaluate the site for the presence of invasive species, which should be noted in the monitoring report.

11. LONG-TERM MANAGEMENT PLAN

Upon approval for close-out by the Interagency Review Team (IRT) the site will be transferred to a third party for long term management as described in EEP’s In Lieu Fee instrument. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

12. ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction, Albemarle Restorations will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, EEP will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized EEP will:

1. Notify the USACE as required by the Nationwide 27 permit general conditions.
2. Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
3. Obtain other permits as necessary.
4. Implement the Corrective Action Plan.
5. Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

13. FINANCIAL ASSURANCES

Pursuant to Section IV H and Appendix III of the Ecosystem Enhancement Program's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the U.S. Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by EEP. This commitment provides financial assurance for all mitigation projects implemented by the program.

14. OTHER INFORMATION

14.1 Definitions

Morphological description – the stream type; stream type is determined by quantifying channel entrenchment, dimension, pattern, profile, and boundary materials; as described in Rosgen, D. (1996), *Applied River Morphology, 2nd edition*

Native vegetation community – a distinct and reoccurring assemblage of populations of plants, animals, bacteria and fungi naturally associated with each other and their population; as described in Schafale, M.P. and Weakley, A. S. (1990), *Classification of the Natural Communities of North Carolina, Third Approximation*

Project Area - includes all protected lands associated with the mitigation project

14.2 References

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Natural Resources Conservation Service (2007), *Part 654 National Engineering Handbook: Stream Restoration Design*.

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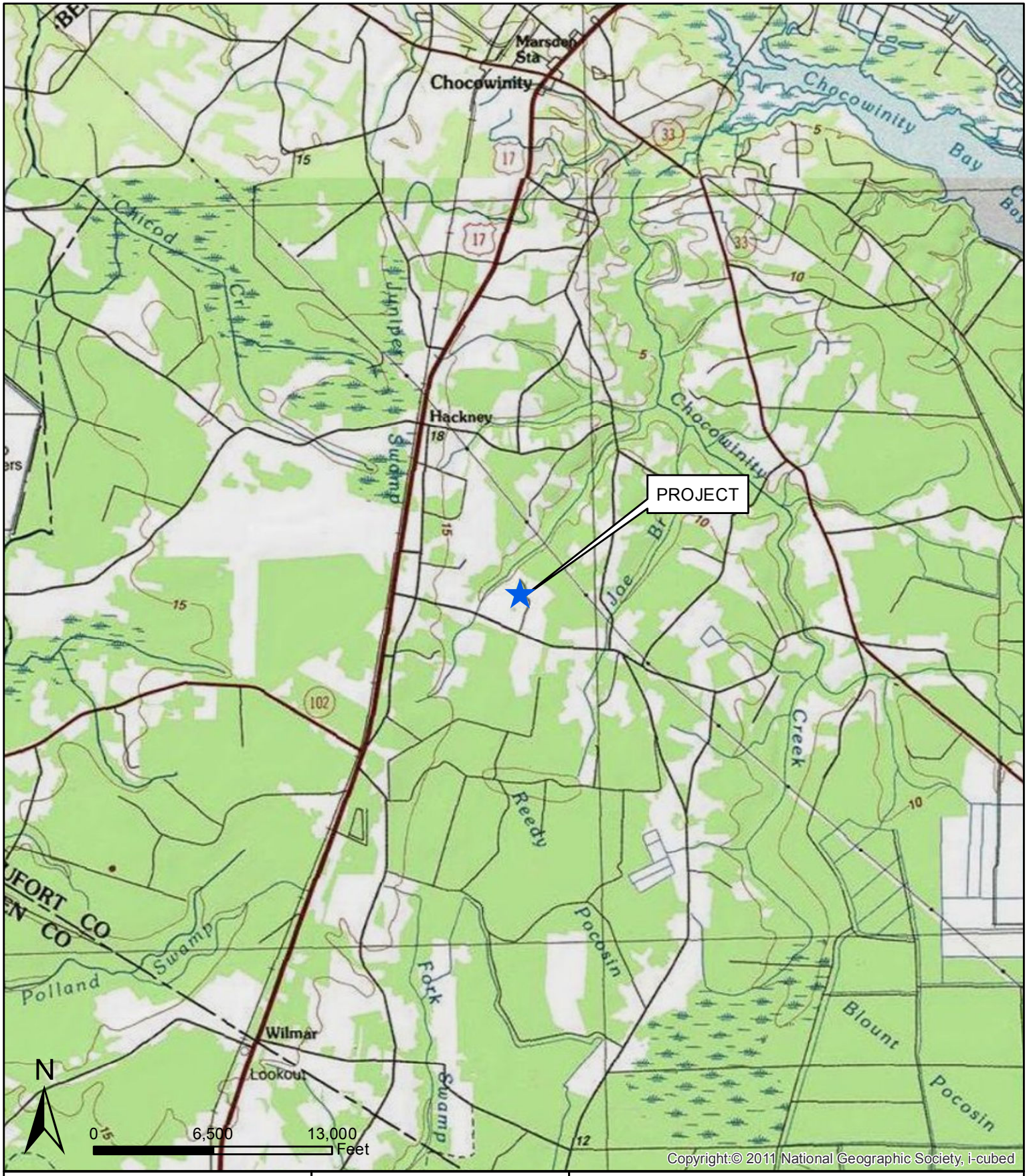

ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

P.O. BOX 176 FAIRFIELD, NC 27826
(252)333-0249 FAX (252)926-9983

EXHIBIT A

VICINITY MAP

SCALE: 1 inch = 7,000 feet

HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM

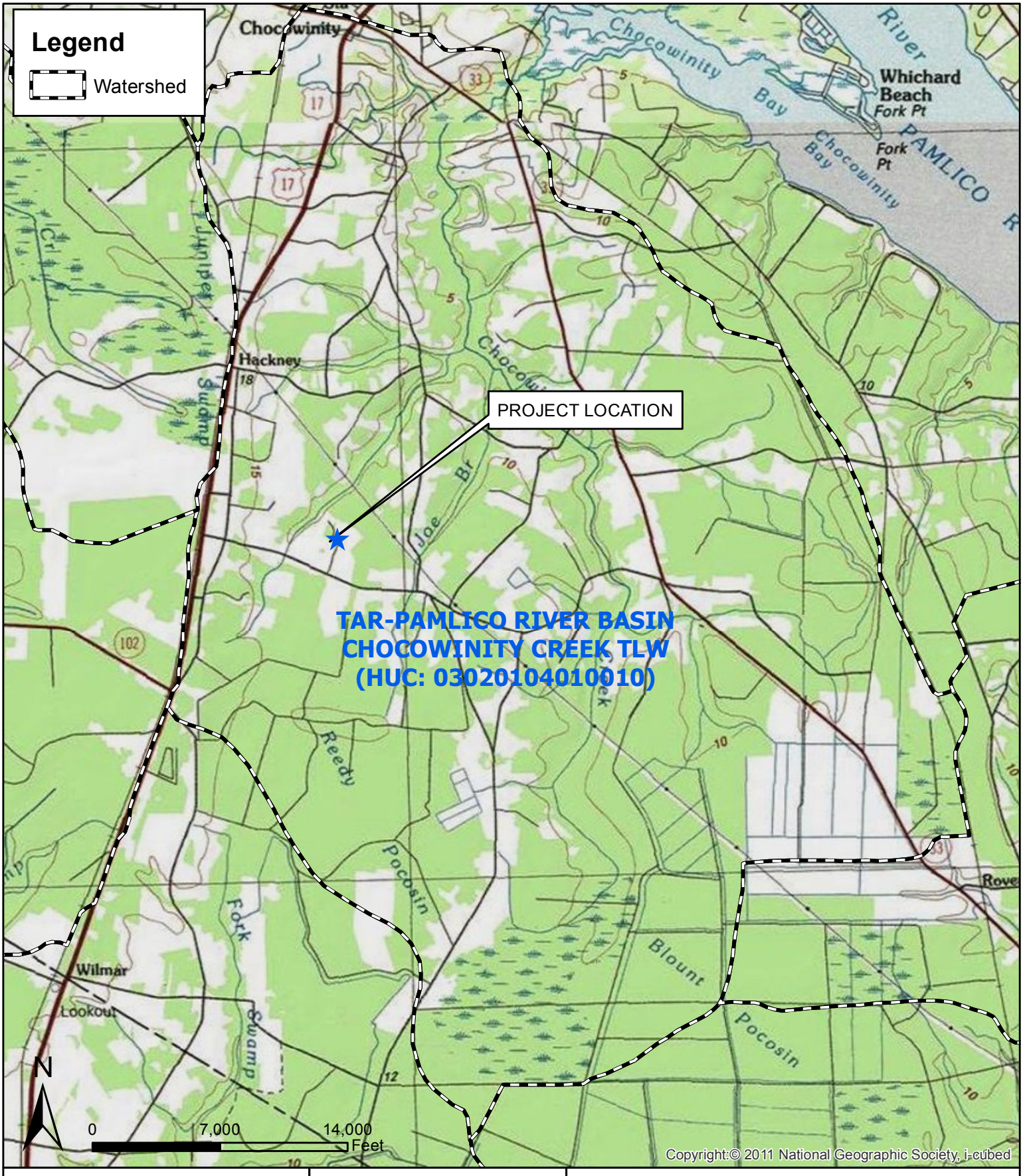

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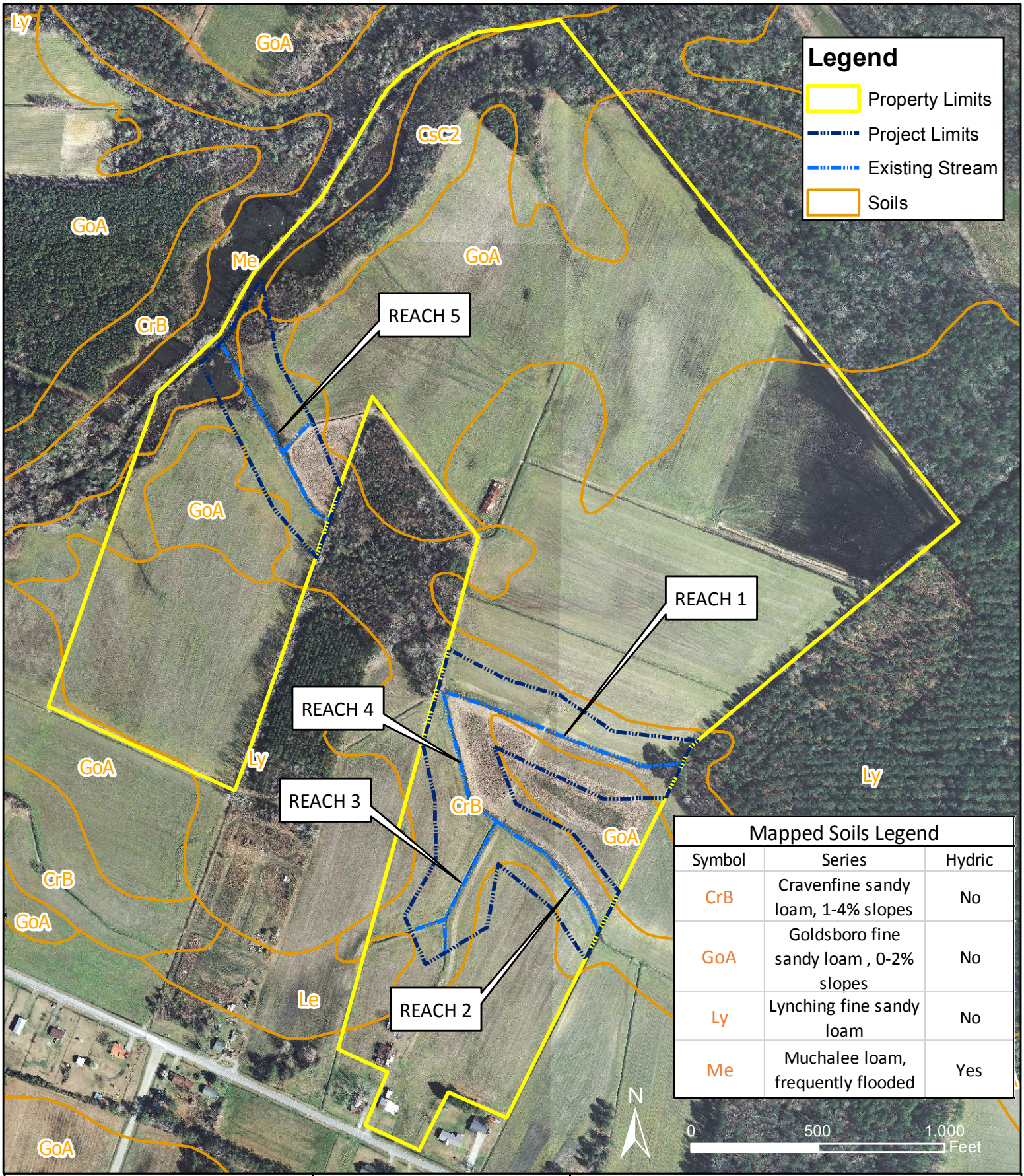
EXHIBIT B

PROJECT SITE WATERSHED

SCALE: 1 inch = 7,000 feet

HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM



Mapped Soils Legend		
Symbol	Series	Hydric
CrB	Cravenfine sandy loam, 1-4% slopes	No
GoA	Goldsboro fine sandy loam , 0-2% slopes	No
Ly	Lynching fine sandy loam	No
Me	Muchalee loam, frequently flooded	Yes

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EXHIBIT C

NRCS SOIL SURVEY

SCALE: 1 inch = 500 feet

HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM

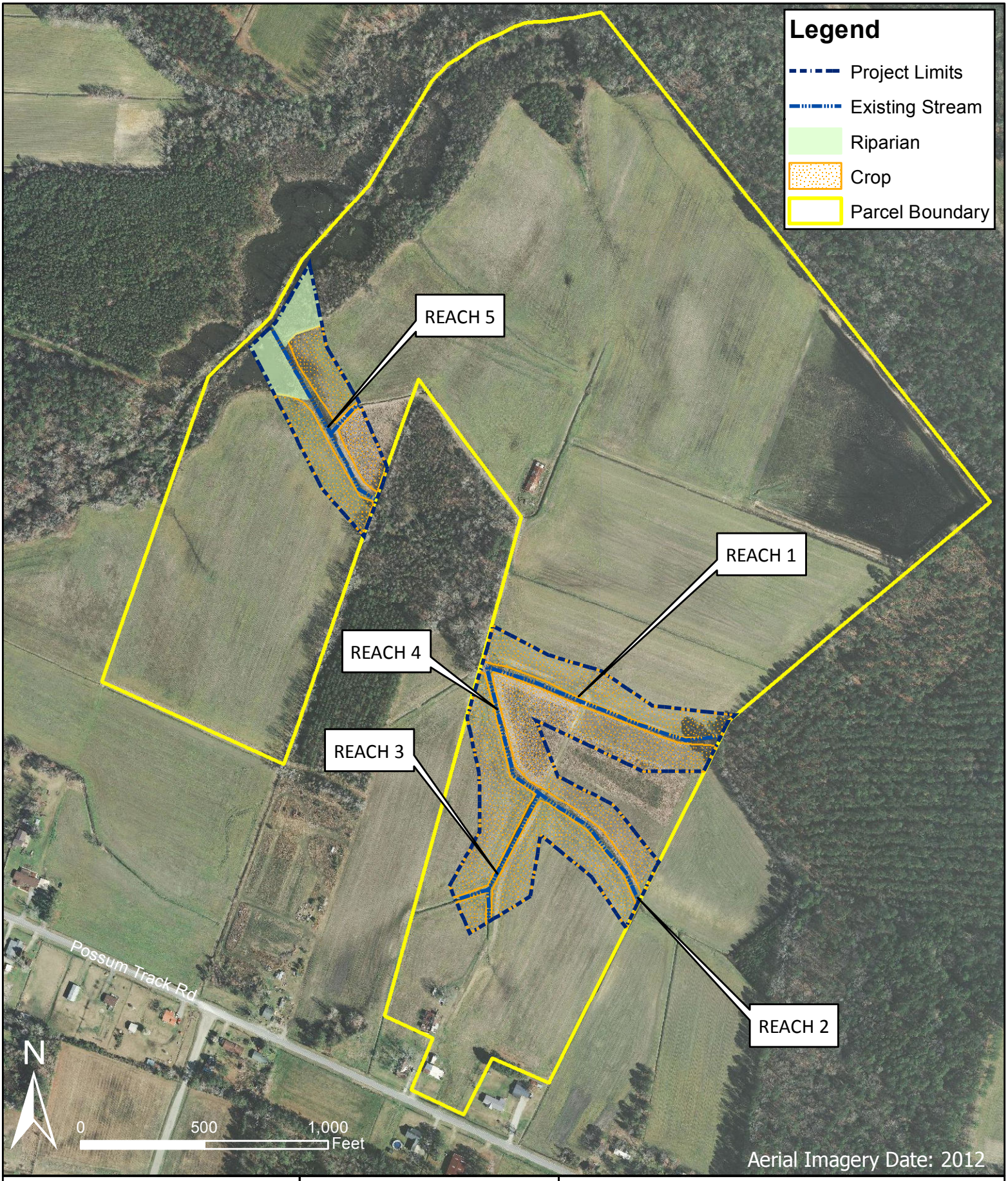

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EXHIBIT D

EXISTING CONDITIONS

SCALE: 1 inch = 500 feet

HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM

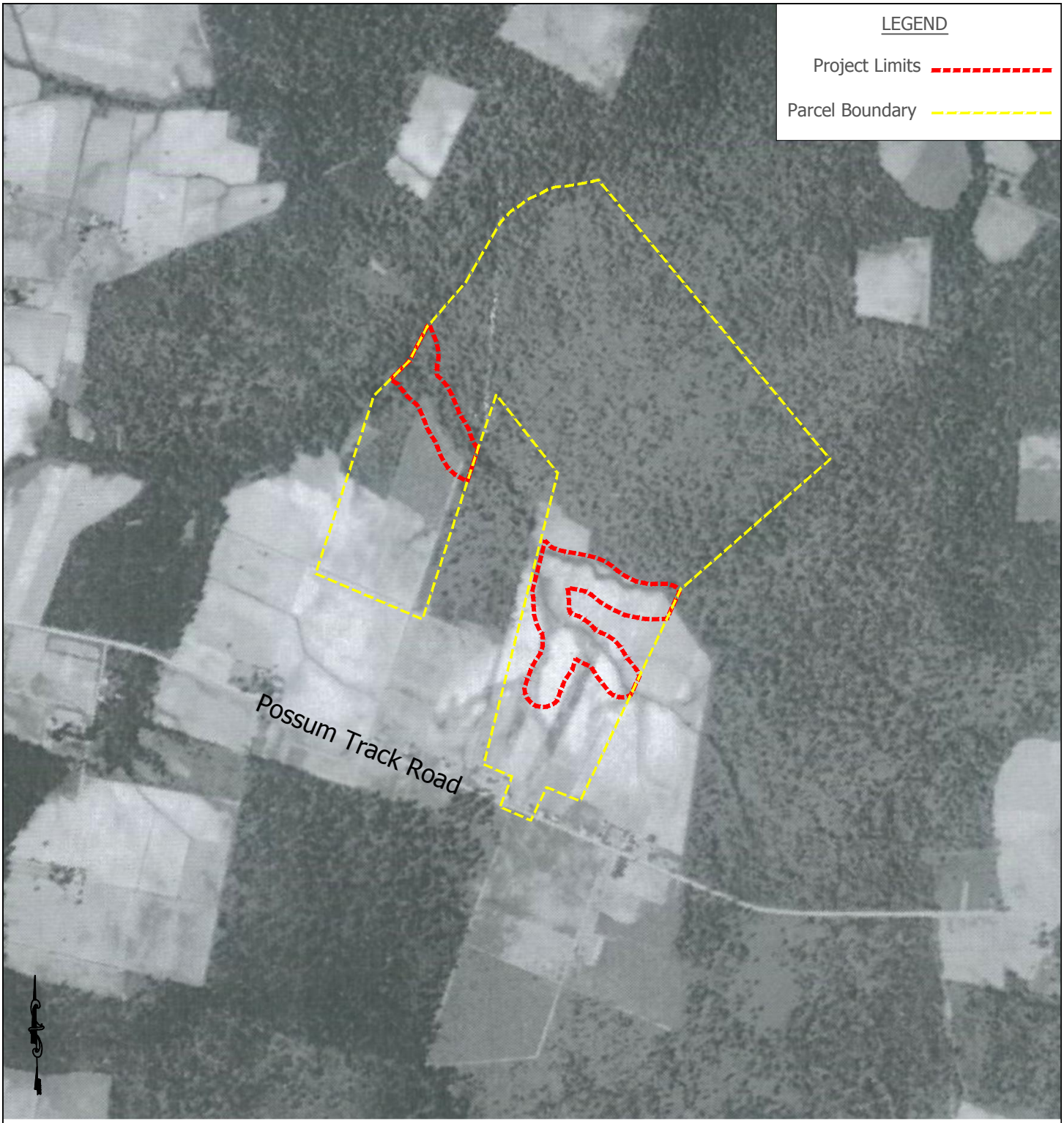


EXHIBIT E
HISTORIC AERIAL (1938)

Scale: N.T.S.	8/2013	Drawn By: WJV	
PREPARED BY:			HUDSON PROPERTY EEP# 004638 TAR-PAMLICO RIVER BASIN CHOCOWINITY CREEK TLW (HUC: 03020104010010)
ALBEMARLE RESTORATIONS, LLC WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION P.O. BOX 176 • FAIRFIELD, NC 27826 (252) 333-0249 • FAX (252) 926-9983		Ecosystem Enhancement PROGRAM	

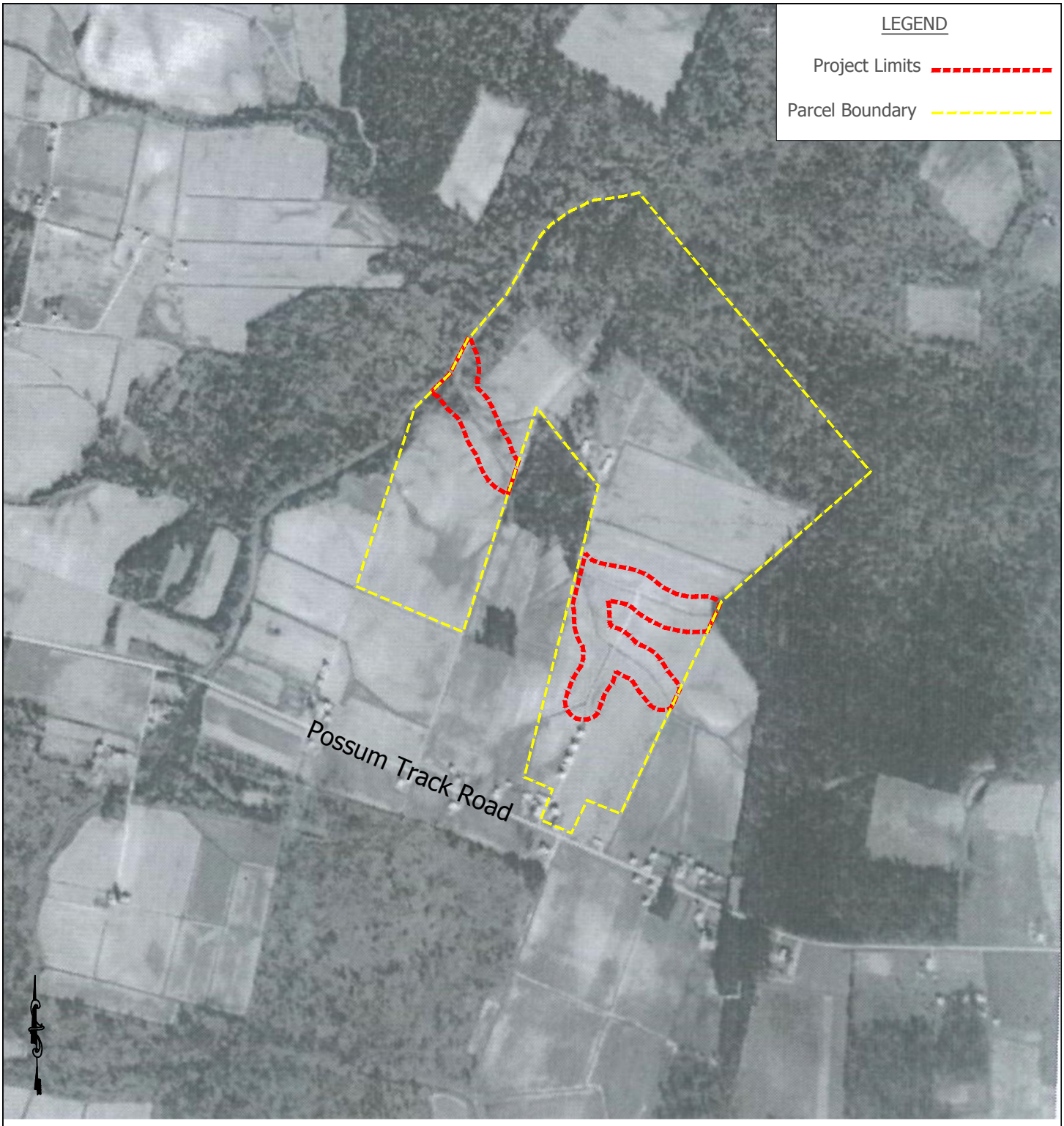


EXHIBIT F
HISTORIC AERIAL (1963)

Scale: N.T.S.	8/2013	Drawn By: WJV	
PREPARED BY:			HUDSON PROPERTY EEP# 004638 TAR-PAMLICO RIVER BASIN CHOCOWINITY CREEK TLW (HUC: 03020104010010)
ALBEMARLE RESTORATIONS, LLC WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION P.O. BOX 176 • FAIRFIELD, NC 27826 (252) 333-0249 • FAX (252) 926-9983		Ecosystem Enhancement PROGRAM	

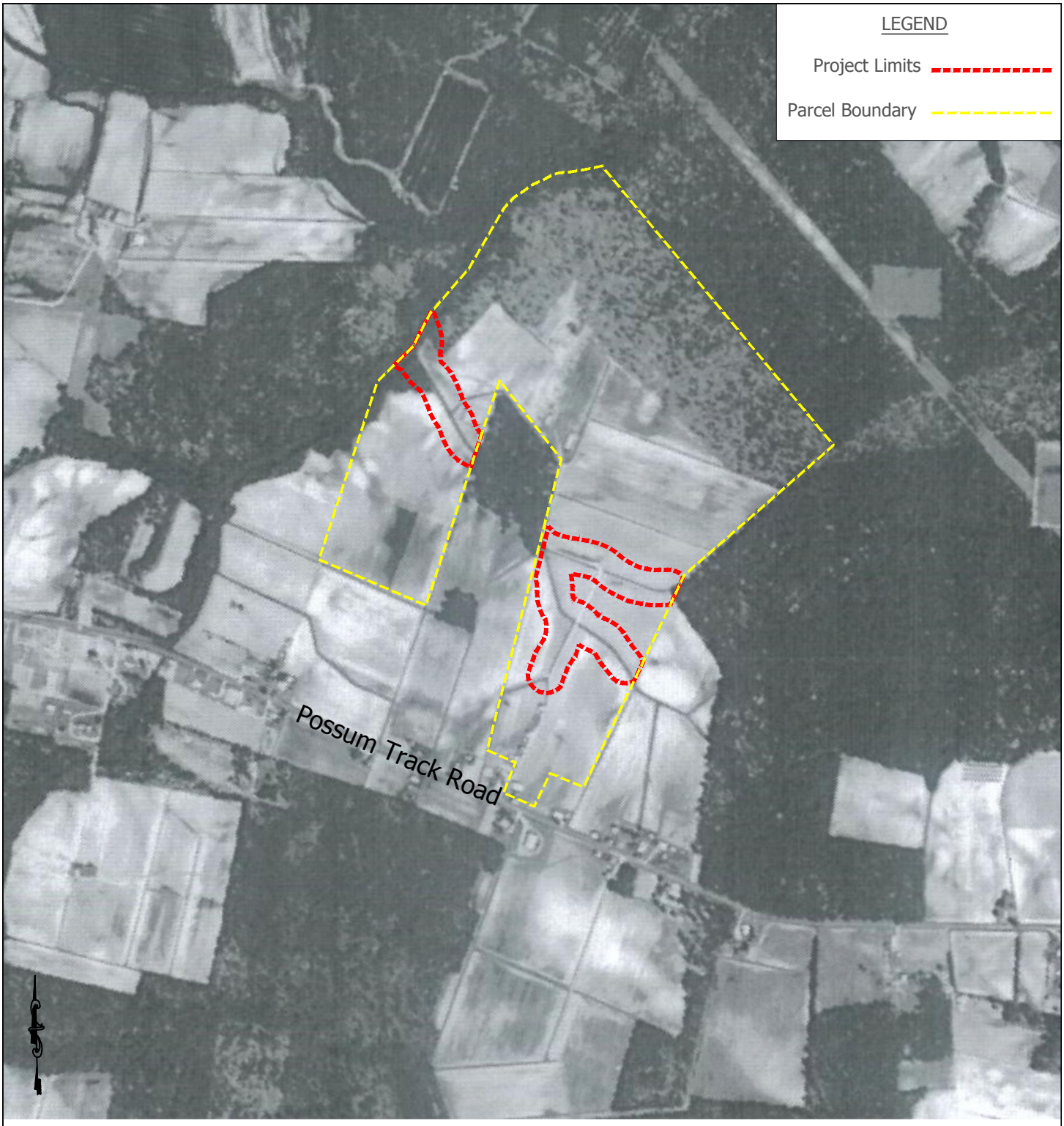
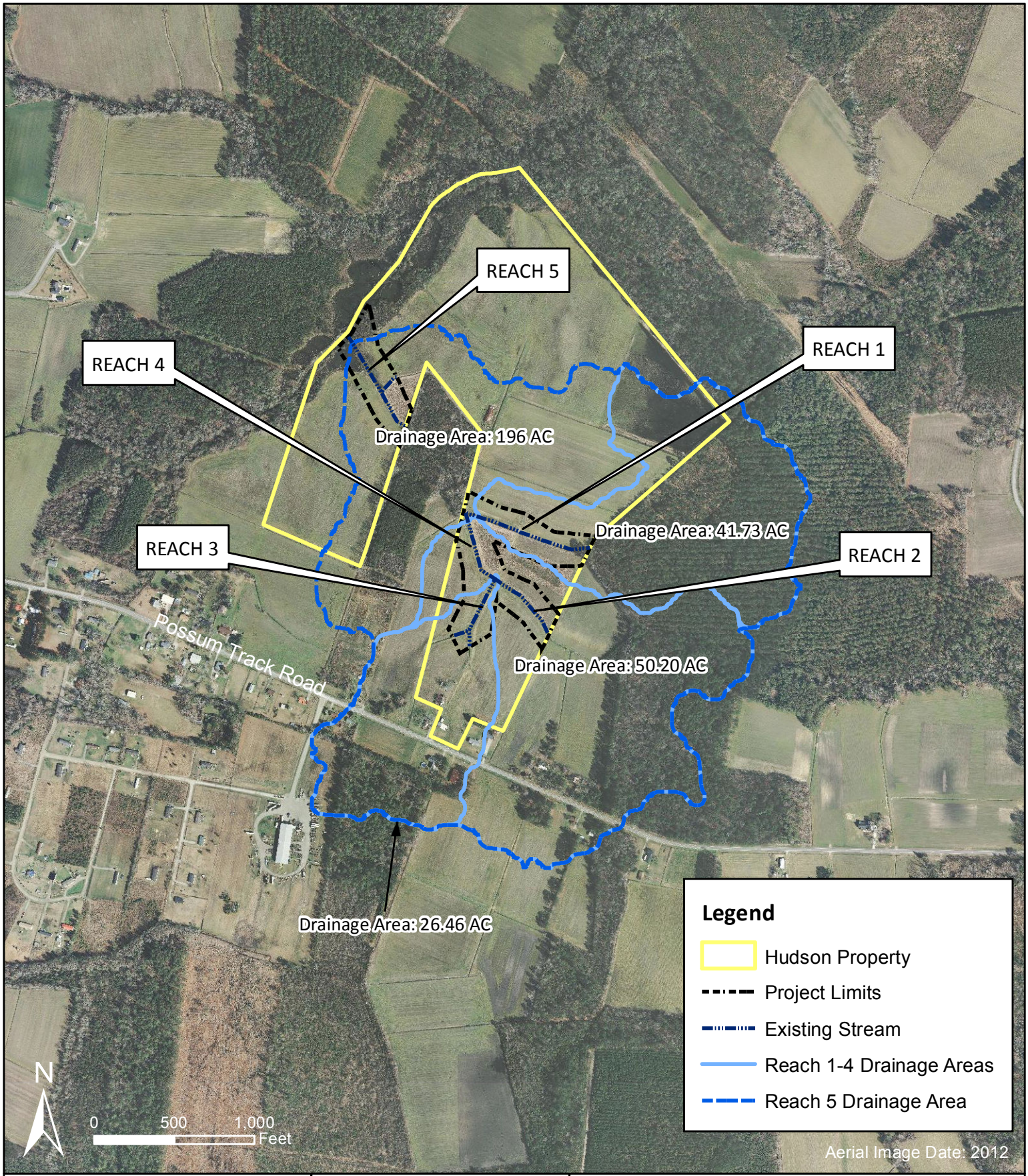


EXHIBIT G
HISTORIC AERIAL (1979)

Scale: N.T.S.	8/2013	Drawn By: WJV	
PREPARED BY:			HUDSON PROPERTY EEP# 004638 TAR-PAMLICO RIVER BASIN CHOCOWINITY CREEK TLW (HUC: 03020104010010)
ALBEMARLE RESTORATIONS, LLC WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION P.O. BOX 176 • FAIRFIELD, NC 27826 (252) 333-0249 • FAX (252) 926-9983		Ecosystem Enhancement PROGRAM	



ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

P.O. BOX 176 FAIRFIELD, NC 27826
(252)333-0249 FAX (252)926-9983

EXHIBIT H

PROJECT DRAINAGE AREA

SCALE: 1 inch = 800 feet

HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM

Exhibit I – Site Photographs

Photo #1: Facing upstream towards existing Forest Stand at proposed Reach 1

Photo #2: Facing upstream at end of proposed Reach 1 and 4 confluence

Exhibit I – Site Photographs

Photo #3: Facing upstream at proposed Reach 2

Photo #4: Facing upstream at existing culvert within proposed Reach 2

Exhibit I – Site Photographs

Photo #5: Facing upstream at upstream limits of proposed Reach 1

Photo #6: Horse Branch floodplain downstream of Reach 5

Exhibit I – Site Photographs

Photo #7: Facing downstream showing stream bank soil profile

Photo #8: Facing drift lines after storm event on proposed Reach 3

Exhibit I – Site Photographs

Photo #9: Facing upstream at confined flow path causing erosion from existing field

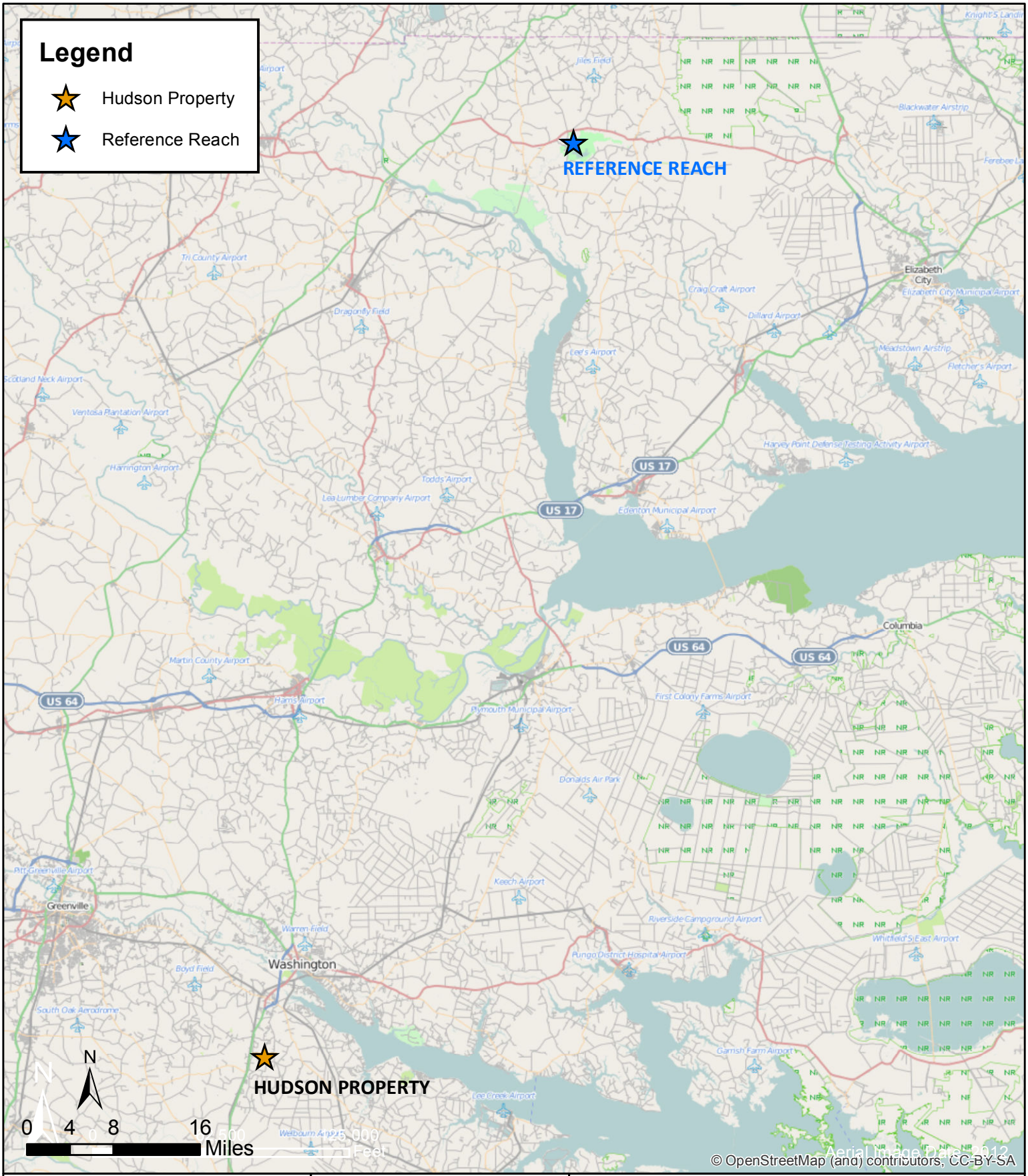


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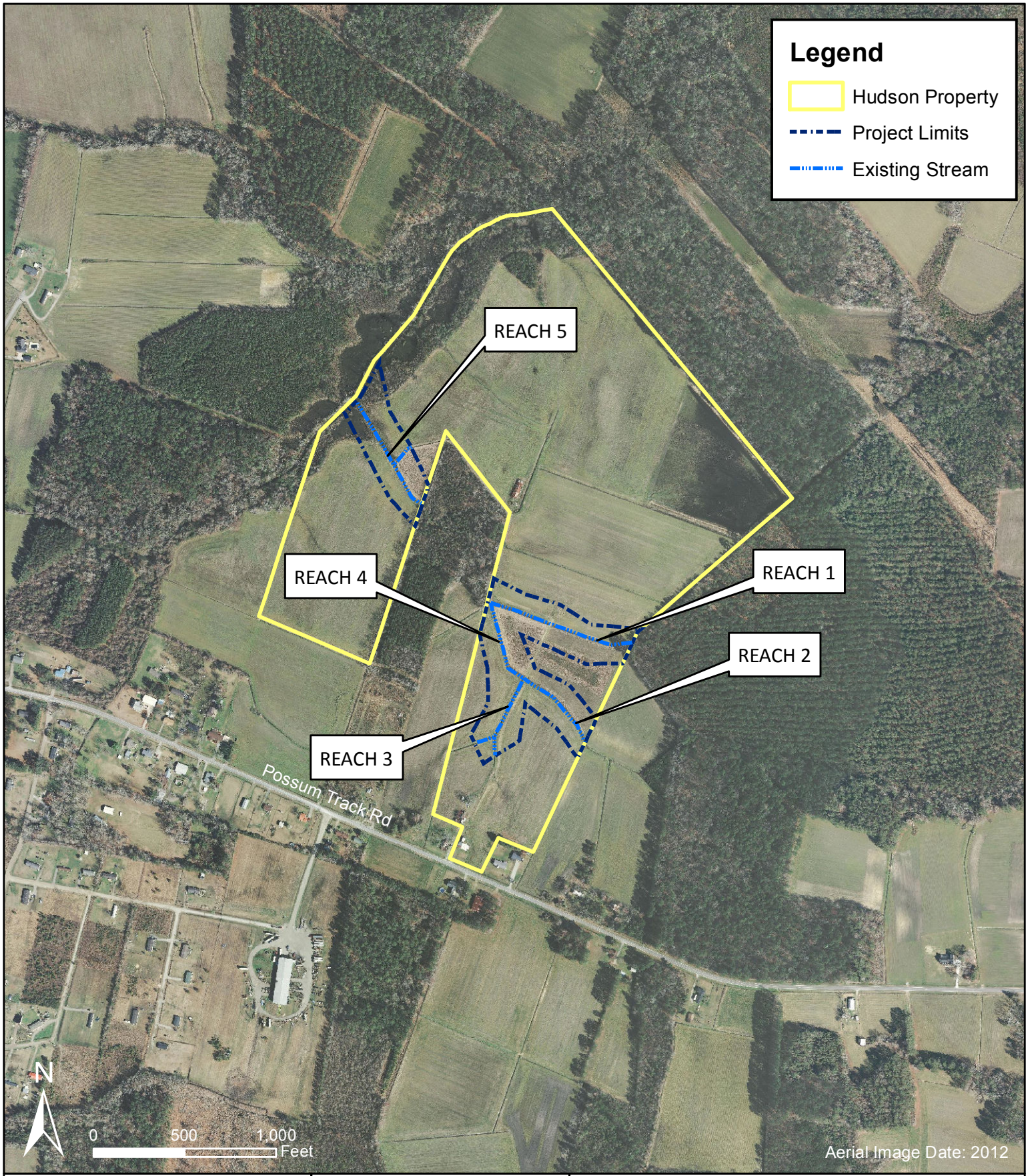
EXHIBIT J

REFERENCE REACH VICINITY MAP

SCALE: 1 inch = 12 miles

HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM



ALBEMARLE RESTORATIONS, LLC

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STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

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(252)333-0249 FAX (252)926-9983

EXHIBIT K

SITE PROTECTION INSTRUMENT FIGURE

SCALE: 1 inch = 700 feet

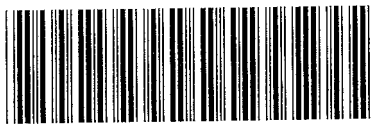
HUDSON PROPERTY
EEP# 004638
TAR-PAMLICO RIVER BASIN
CHOCOWINITY CREEK TLW
(HUC: 03020104010010)

Ecosystem Enhancement PROGRAM

APPENDIX A

SITE PROTECTION INSTRUMENT(S)

FOR REGISTRATION REGISTER OF DEEDS
Jennifer Leggett Whitehurst
Beaufort County, NC
August 15, 2011 12:36:59
Book 1759 Page 276-279
FEE: $23.00
INSTRUMENT # 2011004171



INSTRUMENT # 2011004171

PURCHASE OPTION AGREEMENT

THIS PURCHASE OPTION dated July 26, 2011, is given by Charles E. Hudson (hereinafter referred to as "SELLER") to Albemarle Restorations, LLC (hereinafter referred to as "AGENT").

SELLER is the owner of one parcel of real property located in Beaufort County, North Carolina, (hereinafter referred to as "PROPERTY") that is identified as PIN # 12024438, totaling 106.51 acres in the Beaufort County Tax Office and Deed Book 1650, Page 0079, Map Sheet 566200 in the Beaufort County Register of Deeds.

AGENT desires to obtain an option to purchase the right to restore, enhance and/or create up to 2,700 linear feet of streams and their associated wetlands, not to exceed a combine total of 15 acres but no less than 12 acres on the PROPERTY for mitigation and/or habitat conservation purposes, and to secure the protection in perpetuity of said streams and associated wetlands through the recordation of a conservation easement by the SELLER in the Land Records of Beaufort County, North Carolina, on the terms set forth below.

In consideration of the sum of ONE DOLLAR ($1.00) paid by the AGENT to the SELLER, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the

parties agree to the following:

1. Grant of Option. SELLER grants to AGENT first option to purchase the right to restore, enhance and/or create up to 2,700 feet of streams and their associated wetlands, not to exceed a combine total of 15 acres but no less than 12 acres on the PROPERTY for mitigation and/or habitat conservation purposes, and to secure the protection in perpetuity of said streams through the recordation of a conservation easement by the SELLER in the Land Records of Beaufort County, North Carolina, subject to the terms and conditions set forth below. The AGENT may exercise this option to purchase the rights and conservation easement(s) on the PROPERTY in varying amounts over the time frame of this option agreement. In the event of acceptance of this Option in part or in total by AGENT, SELLER agrees as follows:

a. That SELLER will allow AGENT, its subcontractors, employees, agents or assigns, the right to enter in and upon the PROPERTY to proceed with construction of the necessary stream restoration, enhancement and/or creation including, but not limited to, analyzing, collection of data, surveying and constructing and planting of mitigation site(s).

b. That SELLER will allow AGENT, its subcontractors, employees or agents or assigns, the right to enter in and upon the PROPERTY at reasonable times and upon reasonable advance notice for a period of seven (7) years from the date of completion of the mitigation to inspect, construct, replant, replace, maintain and repair the mitigation site. AGENT will save and hold SELLER harmless from damages associated with AGENT'S performance of the design, construction, and monitoring of the proposed stream mitigation project on the PROPERTY, until such time as the mitigation project has been approved as successful and complete by the North Carolina Ecosystem Enhancement Program (NC EEP) or their assigns.

2. Time. The AGENT'S option to purchase the easement(s) must be exercised in writing by AGENT on or before March 4, 2013. If the option to purchase is not exercised on or before that date, this option to

purchase shall automatically cease and terminate, neither party shall have any further rights hereunder, at law or in equity, and this Agreement shall be null and void, all without further action or documentation by either party.

3. Manner. The AGENT shall deliver to the SELLER written intent to exercise this option once the property is accepted by the NC EEP or their assigns, together with the Conservation Easement set forth in Exhibit A. SELLER shall then execute and deliver the Conservation Easement to the AGENT for review by the State of North Carolina (STATE). Once approved by the STATE, the AGENT shall record the Conservation Easement and be reimbursed by the NC EEP, at which time the exchange of purchase monies between SELLER and AGENT shall take place at an agreed upon time and place. The purchase price under this option shall be Ten Thousand Dollars ($10,000.00) per acre. The actual number of acres purchased shall be determined by survey. The failure of the SELLER to execute and return a fully executed copy of the Conservation Easement to the AGENT shall not affect the enforceability of this Agreement and this Agreement shall be binding upon and enforceable against the SELLER. The AGENT is solely responsible for all costs associated with the survey, transfer and recording of said Conservation Easement.

4. Rights and Obligations of the Parties if the Option is Exercised. In the event that AGENT exercises this option to purchase within the time and in the manner herein before provided, then thereafter the rights and obligations of the parties with respect to the Conservation Easement shall be governed by the terms and conditions contained in the Conservation Easement.

5. Time of the Essence. Time shall be of the essence of this Option Agreement.

IN WITNESS WHEREOF the parties have duly executed this Agreement and affixed their seals as of the date set forth above.

SELLER:

By: Charles E. Hudson (SEAL)
Charles E. Hudson

AGENT:

Albemarle Restorations, LLC

By: _____ (SEAL)

Edmund R. Temple, Jr. member/manager

HEATHER FINCH
Notary Public
Beaufort Co., North Carolina
My Commission Expires June 4, 2013

STATE OF NORTH CAROLINA,
COUNTY OF Beaufort

I, Heather Finch, a Notary Public for said County and State, do hereby certify that Charles E. Hudson personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the 26th day of July, 2011.

My Commission expires: 6/4/2013

Heather Finch
Notary Public

STATE OF NORTH CAROLINA,
COUNTY OF Beaufort

I, Heather Finch, a Notary Public for said County and State, do hereby certify that Edmund R. Temple, Jr., a member/manager of Albemarle Restorations, LLC, a limited liability company, personally appeared before me this day and acknowledged the due execution of the foregoing instrument on behalf of the company.

Witness my hand and official seal, this the 26th day of July, 2011.

My Commission expires: 6/4/2013

Heather Finch
Notary Public

HEATHER FINCH
Notary Public
Beaufort Co., North Carolina
My Commission Expires June 4, 2013

INSTRUMENT # 2014002057

FOR REGISTRATION REGISTER OF DEEDS
Jennifer Leggett Whitehurst
Beaufort County, NC
May 09, 2014 11:44:58 AM
Book 1845 Page 150-159
FEE: $26.00
NC REVENUE STAMP: $270.00
INSTRUMENT # 2014002057

STATE OF NORTH CAROLINA

CONSERVATION EASEMENT PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

BEAUFORT COUNTY
SPO File Number 07-U
Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS CONSERVATION EASEMENT DEED, made this 9th day of May, 2014, by Justin Trent Hill, ("**Grantor**"), whose mailing address is 2687 Haw Branch Road, Chocowinity, NC 27817, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Ecosystem Enhancement Program (formerly known as the Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between Albemarle Restorations, LLC, PO Box 176, Fairfield, NC 27826 and the North Carolina Department of Environment and Natural Resources, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 004638.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Ecosystem Enhancement Program is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Ecosystem Enhancement Program in the Department of Environment and Natural Resources, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in Chocowinity Township, Beaufort County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 13.499 acres and being conveyed to the Grantor by deed as recorded in **Deed Book** 1790 **at Page** 204 of the Beaufort County Registry, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement over the herein described areas of the Property, thereby restricting and limiting the use of the included areas of the Property to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept such Conservation Easement. This Conservation Easement shall be for the protection and benefit of Horse Branch, a tributary of Chocowinity Creek.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Easement Area consists of the following:

Tracts Numbers 1 & 2 containing a total of 13.499 acres as shown on the plats of survey entitled "Final Plat, Conservation Easement for the State of North Carolina, Ecosystem Enhancement Program, Hudson Project, SPO File No. 07-U, EEP Site No. 95361, Property of Justin Trent Hill," dated December 28, 2013 by True Line Surveying, P.C. PLS Number L-3990 and recorded in the Beaufort County, North Carolina Register of Deeds at **Plat Cabinet** I **, Slide** 16-8 .

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITES

The Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Easement Area is prohibited.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Easement Area not inconsistent with this Conservation Easement, and the right of access to the Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. Vegetative Cutting. Except as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Easement Area.

H. Roads and Trails. There shall be no construction of roads, trails, walkways, or paving in the Easement Area.

I. Signs. No signs shall be permitted in the Easement Area except interpretive signs describing restoration activities and the conservation values of the Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Easement Area may temporarily be used for good cause shown as needed for the survival of livestock and agricultural production on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no subdivision, partitioning, or dividing of the underlying Property owned by the Grantor in fee simple ("fee") that is subject to this Easement is allowed. Unless agreed to by the Grantee in writing, any future conveyance of the underlying fee and the rights conveyed herein shall be as a single block of property. Any future transfer of the fee simple shall be subject to this Conservation Easement. Any transfer of the fee is subject to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the N.C. Ecosystem Enhancement Program, whose mailing address is 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, and monitor the stream, wetland and any other riparian resources in the Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. The Grantee, its employees and agents, successors or assigns, shall be permitted to place fencing on the Property to restrict livestock access. Although the Grantee is not responsible for fence maintenance, the Grantee reserves the right to repair the fence, at its sole discretion.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Easement Area that is inconsistent with the purposes of this Easement and to require the restoration of such areas or features in the Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor-in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and

other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life, or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the

obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property. Such notification shall be addressed to: Justin McCorkle, General Counsel, US Army Corps of Engineers, 69 Darlington Avenue, Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Easement Area, and the right of quiet enjoyment of the Easement Area

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes.

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from

encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written.

Justin Trent Hill (SEAL)
JUSTIN TRENT HILL

NORTH CAROLINA
COUNTY OF BEAUFORT

I, William P. Mayo, Jr., a Notary Public in and for the County and State aforesaid, do hereby certify that Justin Trent Hill, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the 9th day of MAY, 2014.

Notary Public William P. Mayo, Jr.

WILLIAM P. MAYO, JR. NOTARY PUBLIC BEAUFORT COUNTY, N. C.

My commission expires: 8-20-2017

Albemarle Restorations
Hudson Project
Town of Chocowinity, Beaufort County, North Carolina

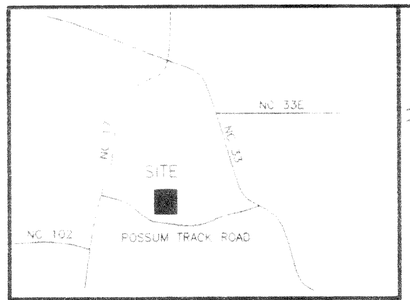
Area #1 of Restoration

Commencing at a point, said point being an iron pipe found along the northern right-of-way of Possum Track Road (SR 1127) in the Town of Chocowinity, Beaufort County, North Carolina. Said point also being the southeastern corner of the Robert Lee Clark property as recorded in Deed Book 871 Page 613, Beaufort County Registry and also the southwestern corner of the Charlie C. Clark property as recorded in Deed Book 04E Page 261. Thence from said point, leaving the northern right-of-way of Possum Tract Road in a northerly direction a bearing and distance of N 25°42'52" E 209.86 feet to an iron pipe found. Said point being the northeastern corner of the aforementioned Robert Lee Clark property as a southeastern corner of the Justin Trent Hill property (which is the subject property) as recorded in Deed Book 1790 Page 204. Thence a bearing and distance of N 66°31'04" W 210.35 feet to an iron pipe found. Said point being the northwestern corner of the aforementioned Robert Lee Clark property. Thence a bearing and distance of N 45°24'53" E 617.50 feet to a point and the **POINT OF BEGINNING.** Thence the following bearings and distances: N 35°16'25" W 203.54 feet to a point, N 51°47'17" W 217.34 feet to a point, S 08°50'07" W 205.80 feet to a point, S 57°52'54" W 231.17 feet to a point, N 28°50'15" W 200.06 feet, N 37°46'13" E 200.18 feet to a point, N 03°09'51" W 350.66 feet to a point, N 14°21'42" E 320.22 feet to a point, S 69°16'00" E 353.99 feet to a point, S 57°05'15" E 201.62 feet to a point, S 85°22'40" E 250.39 feet to a point, S 27°35'38" W 219.69 feet to a point, S 89°21'22" W 200.19 feet to a point, N 63°28'43" W 369.41 feet to a point, S 22°31'36" E 202.66 feet to a point, S 64°17'59" E 203.25 feet to a point, S 39°29'22" E 246.09 feet to a point, S 25°58'43" W 240.15 feet to a point and the **POINT OF BEGINNING** and containing 9.854 acres (429261 square feet) according to a plat by True Line Surveying, P.C. entitled "Conservation Easement Survey for The State of North Carolina Hudson Project", Contract Number 0046348, EPP Project / Case Number 95361, dated December 19, 2013.

Albemarle Restorations
Hudson Project
Town of Chocowinity, Beaufort County, North Carolina

Area #2 of Restoration

Commencing at a point, said point being an iron pipe found along the northern right-of-way of Possum Track Road (SR 1127) in the Town of Chocowinity, Beaufort County, North Carolina. Said point also being the southeastern corner of the Robert Lee Clark property as recorded in Deed Book 871 Page 613, Beaufort County Registry and also the southwestern corner of the Charlie C. Clark property as recorded in Deed Book 04E Page 261. Thence from said point along the right-of-way of Possum Track Road a bearing and distance of N 66°29'48" W 210.74 feet to an iron pipe found. Said point being a southern property corner of the Justin Trent Hill property (which is the subject property) as recorded in Deed Book 1790 Page 204. Thence a bearing and distance of N 66°32'09" W 187.45 feet to an iron pipe found. Said point also being the southeastern corner of the Blanch G. Hudson property as recorded in Deed Book 876 Page 891. Thence leaving the northern right-of-way of Possum Track Road in a northerly direction a bearing and distance of N 22°56'52" E 152.00 feet to an iron pipe set. Thence a bearing and distance of N 67°03'08" W 174.35 feet to an iron pipe set. Thence a bearing and distance of N 14°31'39" E 1726.01 feet to an iron pipe set. Thence a bearing and distance of N 38°00'47" W 557.99 feet to an iron pipe set. Said point also being the northwestern corner of the Blanche G. Hudson property as recorded in Deed Book 984 Page 301. Thence a bearing and distance of S 25°13'41" W 269.31 feet to a point and the **POINT OF BEGINNING.** Thence the following bearings and distances: S 21°45'18" W 246.15 feet to a point, N41°24'17" W 206.53 feet to a point, N 26°39'35" W 494.16 feet to a point, N 51°04'43" E 44.20 feet to a point, N 42°53'42" E 63.27 feet to a point, N 31°33'59" E 79.46 feet to a point, N 25°07'36" E 65.81 feet to a point, N 23°02'26" E 67.58 feet to a point, S 16°44'35" E 276.33 feet to a point, S 31°29'49" E 214.74 feet to a point, S 24°38'29" E 202.21 feet to a point and the **POINT OF BEGINNING** and containing 3.645 acres (158762 square feet) according to a plat by True Line Surveying, P.C. entitled "Conservation Easement Survey for The State of North Carolina Hudson Project", Contract Number 0046348, EPP Project / Case Number 95361, dated December 19, 2013.



VICINITY MAP (NOT TO SCALE)

I CERTIFY THAT I AM THE OWNER OF THE PROPERTY SHOWN ON THIS PLAT.

5-9-14 DATE

Justin Trent Hills OWNER

N/F
DIANE JONES PITTS
DB 1231 PG 757
PIN 5662-33-0560

N/F
DIANE JONES PITTS
DB 1231 PG 761
PIN 5662-33-2960

IPS OFFSET 25' FROM C/L OF CREEK

N/F
BESSIE C. CARAWAN
DB 993 PG 187
PIN 5662-25-9461

N/F
WILLIAM S. WARREN
DB 1728 PG 961
PIN 5662-27-4124

LEGEND

○	IPF	IRON PIPE FOUND
●	IPS	IRON PIPE SET
□	CMF	CONCRETE MONUMENT FOUND
△		STEEL BEAM
◇	CC	CONTROL CORNER
◇	CP	COMPUTED POINT
⊠	P/P	POWER POLE
	OPW	OVERHEAD POWER LINE
	R/W	RIGHT OF WAY
	S.F.	SQUARE FEET
	AC	ACRE
	DB	DEED BOOK
	PB	PLAT BOOK
⊕		EASEMENT CORNER W/ CAP
	PG	PAGE
	LF	LINEAR FEET
	15S	LOT HAS OFFSITE SEWER
	15SL	OFFSITE SEWER LOT
	15R	RECOMBINATION LOT
	200	EASEMENT CORNER NUMBER
		LINES NOT SURVEYED

NC GRID COORDINATES
N 623476.4571
E 2563360.5409

N18°37'56"E 1054.94'

AREA #2 OF RESTORATION
PORTION OF DB 1790 PG 204
158762 SF
3.645 AC

NOTE: REBAR SET WITH NUMBERED ALUMINUM CAPS AT EASMENT CORNERS

50' RIPARIAN BUFFER

APPROX. LOCATION 100 YEAR FEMA FLOOD

NOTE: LINE SEGMENTS L39-L53 ARE FOR 30' ACCESS EASEMENT DESCRIPTION ONLY

IPF 10.45' FROM C/L OF CREEK

N/F
CHARLIE C. CLARK
DB 04E PG 261
PIN 5662-32-5957

N/F
BLANCHE G. HUDSON
DB 984 PG 301
PIN 5662-43-2782

S18°49'56"W 1337.42'

N/F
ROBERT LEE WOOLARD, SR.
DB 1414 PG 341
PIN 5662-32-9773

N/F
JUSTIN TRENT HILL
DB 1790 PG 204
PIN 5662-54-0345
4695790 SF
107.801 AC

NC GRID NORTH NAD 83/2001

N/F
CHARLIE C. CLARK
DB 04E PG 261
PIN 5662-43-3182

1726.01'

30' CP&L UTILITY EASEMENT
15' EACH SIDE OF POWER POLES

N/F
BLANCHE G. HUDSON
DB 876 PG 891
PIN 5662-42-3267

POSSUM TRACK ROAD SR 1127 60' R/W (PUBLIC)

AREA #1 OF RESTORATION
PORTION OF DB 1790 PG 204
429261 SF
9.854 AC

NOTE: REBAR SET WITH NUMBERED ALUMINUM CAPS AT EASMENT CORNERS

NOTE: LINE SEGMENTS L39-L53 ARE FOR 30' ACCESS EASEMENT DESCRIPTION ONLY

NC GRID COORDINATES
N 622278.5505
E 2564667.8397

N45°24'53"E TIE LINE ONLY 617.50'

NOTE: L6 & L38 ARE TIE LINES ONLY

N/F
ROBERT LEE CLARK
DB 871 PG 613
PIN 5662-42-7113

N/F
CHARLIE C. CLARK
DB 04E PG 261
PIN 5662-52-3522

S25°42'52"W 1159.97'

N/F
CATHERINE T. WHICHARD
DB 1551 PG 357
PIN 5662-63-7146

S47°51'15"W 475.65'

S50°39'15"W 300.00'

S49°39'15"W 355.45'

NC GRID COORDINATES
N 624117.9386
E 2566290.1959

STEEL BEAM

N48°48'04"E 1239.83' TIE LINE ONLY

ED CONC. MON.

N/F
JUSTIN TRENT HILL
DB 1790 PG 204
PIN 5662-65-0465

2088.36'

S39°42'35"E

N/F
KAY DOWNS TOLER
DB 758 PG 778
PIN 5662-74-5477

N/F
WILLIAM DAVID FIELDS
DB 837 PG 277
PIN 5662-83-5980

NUMBER	DIRECTION	DISTANCE
L1	N66°31'04"W	210.35'
L2	S25°49'18"W	209.80'
L3	N66°32'09"W	187.45'
L4	N22°58'52"E	152.00'
L5	N67°03'08"W	174.35'
L6	S25°42'52"W	209.86'
L7	N18°37'56"E	25.00'
L8	N43°37'41"E	49.21'
L9	N51°04'43"E	158.19'
L10	N42°53'42"E	63.27'
L11	N31°33'59"E	79.46'
L12	N25°07'36"E	65.81'
L13	N23°02'26"E	67.58'
L14	N40°34'25"E	318.00'
L15	N29°41'25"E	285.30'
L16	N24°53'25"E	90.80'
L17	N41°34'25"E	122.55'
L18	N51°06'25"E	102.75'
L19	N63°00'25"E	143.21'
L20	N80°15'25"E	41.10'
L21	N75°34'25"E	110.30'
L22	N80°34'25"E	84.20'
L23	N63°44'25"E	46.80'
L24	S39°42'35"E	10.45'
L25	S26°58'28"W	155.55'
L26	N14°21'42"E	320.22'
L28	S27°35'38"W	219.69'
L29	S25°58'43"W	240.15'
L31	S21°45'18"W	246.15'
L32	N41°24'17"W	206.53'
L33	N51°04'43"E	44.20'
L35	S18°44'35"E	276.33'
L36	S31°29'49"E	214.74'
L37	S24°38'29"E	202.21'
L38	N68°29'48"W	210.74'
L39	S66°32'08"E	78.26'
L40	S66°32'11"E	30.21'
L41	S66°32'09"E	78.98'
L42	N20°47'03"E	170.84'
L43	N67°41'38"W	233.96'
L44	N14°02'52"E	1712.63'
L45	S18°49'56"W	298.05'
L46	N68°14'42"W	31.51'
L47	N21°45'18"E	28.85'
L48	N18°49'56"E	323.06'
L49	S38°00'47"E	334.43'
L50	S37°59'03"E	294.49'
L51	S14°04'01"W	1700.89'
L52	S67°41'38"E	237.21'
L53	S20°44'06"W	201.47'

NODE ID	NORTHING	EASTING
200	622712.0146	2565107.6262
201	622878.1884	2564990.0838
202	623012.6290	2564819.3129
203	622809.2723	2564787.7033
204	622686.3670	2564591.9151
205	622861.6152	2564495.4221
206	623019.8524	2564618.0323
207	623369.9810	2564598.6775
208	623680.1965	2564678.1066
209	623554.8753	2565009.1748
210	623445.3229	2565178.4361
211	623425.1455	2565428.0132
212	623230.4473	2565326.2540
213	623228.1978	2565126.0788
214	623393.1532	2564795.5389
215	623205.8560	2564873.1805
216	623117.8155	2565056.3211
217	622927.8966	2565212.8187
218	624239.1145	2564277.7642
219	624010.4951	2564186.5313
220	624165.4061	2564049.9367
221	624607.0314	2563828.2119
222	624634.8011	2563862.6010
223	624681.1540	2563905.6673
224	624748.8552	2563947.2625
225	624808.4382	2563975.2072
226	624870.6315	2564001.6588
227	624606.0120	2564081.2640
228	624422.9128	2564193.4544

Approved, Beaufort Co. Planning
NOT Subject To Subdivision Regulations
Subdivision Administrator 5-9-14 Date

200 0 200 400 600
Scale: 1" = 200'

STATE OF NORTH CAROLINA, BEAUFORT COUNTY

I, CURK T. LANE, DO HEREBY CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK 1790 PAGE 204 ETC.); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK 1790, PAGE 204; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 8TH DAY OF MAY, A.D., 2013

NORTH CAROLINA PROFESSIONAL SEAL L-3990 LAND SURVEYOR CURK T. LANE

SURVEYOR

L-3990
LICENSE NUMBER

THIS SURVEY IS OF ANOTHER CATEGORY SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

STATE OF NORTH CAROLINA, BEAUFORT COUNTY

THIS INSTRUMENT WAS PRESENTED FOR REGISTRATION AND RECORDING THIS 9th DAY OF May 2014 AT 11:38 am

Jennifer Leggett Whitehurst REGISTER OF DEEDS BY Elizabeth Haggett ASST. REG. OF DEEDS

RECORDED IN PB PC I PG S-16-8

CONSERVATION EASEMENT SURVEY FOR

THE STATE OF NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

HUDSON PROJECT, SPO FILE NO. 07-U, EEP SITE NO. 95361

PROPERTY OF JUSTIN TRENT HILL

TOWN OF CHOCOWINITY, BEAUFORT COUNTY
NORTH CAROLINA
MAY 8, 2014

SURVEYED BY:	
DRAWN BY:	MIKE
CHECKED BY:	
DRAWING NAME:	EASEMENT.DWG
SURVEY DATE:	
JOB NO.	483.008

TRUE LINE SURVEYING, P.C.

205 WEST MAIN STREET
CLAYTON, N.C. 27520
TELEPHONE: (919) 359-0427
FAX: (919) 359-0428
www.truelinesurveying.com

C-1859

PC-I S-16-8

APPENDIX B

BASELINE INFORMATION DATA

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Hudson Property
County Name:	Beaufort County
EEP Number:	95361
Project Sponsor:	Albemarle Restorations, LLC
Project Contact Name:	Edmund Temple
Project Contact Address:	P.O. Box 176 Fairfield, NC 27826
Project Contact E-mail:	edtemple@vol.com
EEP Project Manager:	Heather Smith

Project Description

The project will provide up to 2,700 SMUs to unnamed tributaries of Horse Branch in the Chocowinity Creek targeted local watershed (Catalog Unit: 03020104010010).

For Official Use Only

Reviewed By:

Date — **EEP Project Manager**

Conditional Approved By:

Date — **For Division Administrator FHWA**

☐ **Check this box if there are outstanding issues**

Final Approval By:

3-18-13

Date — **For Division Administrator FHWA**

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☑ Yes ☐ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☑ No ☐ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☑ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☑ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☑ No ☐ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☑ No ☐ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☑ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☑ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☑ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☑ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☑ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☑ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☑ Yes ☐ No
2. Does the project require the acquisition of real estate?	☑ Yes ☐ No ☐ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☑ No ☐ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☑ Yes ☐ No ☐ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☐ Yes ☑ No
2. Is the site of religious importance to American Indians?	☐ Yes ☐ No ☑ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☑ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☑ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☑ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☑ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☑ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☑ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☑ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☑ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☑ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☑ N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?	☐ Yes ☐ No ☑ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☑ N/A

Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☑ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☑ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☑ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☑ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☐ Yes ☑ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	☐ Yes ☐ No ☑ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☐ Yes ☑ No
2. Have the USFWS and the NCWRC been consulted?	☐ Yes ☐ No ☑ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☑ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☑ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☑ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☑ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☑ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☑ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☑ N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	☐ Yes ☑ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☑ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☑ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☑ N/A

Appendix A

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Hudson Property
County Name:	Beaufort County
EEP Number:	95361
Project Sponsor:	Albemarle Restorations, LLC
Project Contact Name:	Edmund Temple
Project Contact Address:	P.O. Box 176 Fairfield, NC 27826
Project Contact E-mail:	edtemple@vol.com
EEP Project Manager:	Heather Smith

Project Description

The project will provide up to 2,700 SMUs to unnamed tributaries of Horse Branch in the Chocowinity Creek targeted local watershed (Catalog Unit: 03020104010010).

For Official Use Only

Reviewed By:

Date — **EEP Project Manager**

Conditional Approved By:

Date — **For Division Administrator FHWA**

☐ **Check this box if there are outstanding issues**

Final Approval By:

3-18-13

Date — **For Division Administrator FHWA**

Albemarle Restorations, LLC

Wetland Restoration
Stream Restoration
Wildlife Habitat

March 12, 2013

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
ATTN: Ms. Heather Smith
1652 Mail Service Center
Raleigh, NC 27699-1652

RE: Task 1, Coastal Zone Management Act Requirements
EEP Contract #004638, IMS# 95361
Hudson Property Site, Beaufort County, NC

Dear Heather:

Please find attached a revised Categorical Exclusion Form, page 7, regarding the Coastal Zone Management Act (CZMA) question #4 for the above referenced project. A nationwide permit #27 will be required for the project and based on the North Carolina Department of Environment and Natural Resources (NCDENER), Division of Coastal Management (DCM) consistency concurrence letter dated March 12, 2012, to the US Army Corps of Engineers, Wilmington District, all 50 Nationwide permits are consistent with North Carolina's Coastal Management Program. In the event that a nationwide permit is not received for the mitigation project then an individual consistency certification from NCDENR DCM will be provided.

Please call me at 252-333-0249 or e-mail at edtemple@vol.com if you have any questions or comments.

Sincerely,

Edmund R. Temple, Jr.
Principal

P.O. BOX 204
GATESVILLE, NC 27938
PHONE (252)333-0249
FAX (252)357-4892

Albemarle Restorations, LLC

Wetland Restoration
Stream Restoration
Wildlife Habitat

January 16, 2013

Mr. John Hammond
Endangered Species Coordinator
US Fish and Wildlife Service, Raleigh Field Office
P.O. Box 33726
Raleigh, NC 27636-3726

RE: Hudson Property Stream Mitigation Project (Beaufort County)
Threatened and Endangered Species Project Review

Dear Mr. Hammond,

This is a follow up letter which provides additional habitat analysis information and conclusions on whether listed T&E species for Beaufort County will be affected by the proposed project.

The site is positioned on 15 acres of cropland located on a 106.51 acre farm within the northeast quadrant of the intersection between Route 17 and Route 1127 (Possum Track Road) in Beaufort County, NC. The site is situated approximately 6 miles southeast of the Chocowinity Bay and Pamlico River confluence and 4.4 miles north of the Beaufort and Craven County line. The project contains natural headwater streams that have been extensively ditched and cleared for agricultural production. Historical USDA photos show that the project site has been in continuous crop production since 1938.

An updated T&E species list for Beaufort County with habitat analyses for each species based on current on-site conditions is provided below.

We thank you in advance for your timely response and cooperation. Please feel free to contact me at (252) 333-0249 with any questions.

Sincerely,

Edmund R. Temple, Jr.
Principal

P.O. BOX 176
FAIRFIELD, NC 27826
PHONE (252)333-0249

Threatened and Endangered (T&E) Species List for Beaufort County

Common Name	Scientific Name	Federal Status	Record Status	Biological Conclusion
Vertebrates				
American eel	*Anguilla rostrata*	FSC	Current	No Effect
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	Current	No Effect
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current	No Effect
Black-throated green warbler	*Dendroica virens waynei*	FSC	Current	No Effect
Carolina gopher frog	*Rana capito capito*	FSC	Historic	No Effect
Eastern Henslow's sparrow	*Ammodramus henslowii susurrans*	FSC	Current	No Effect
Kemp's (Atlantic) ridley sea Turtle	*Lepidochelys kempii*	E	Current	No Effect
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	FSC	Historic	No Effect
Red wolf	*Canis rufus*	EXP	Current	No Effect
Red-cockaded woodpecker	*Picoides borealis*	E	Current	No Effect
West Indian manatee	*Trichechus manatus*	E	Current	No Effect
Invertebrate: Vascular Plant				
Grassleaf arrowhead	*Sagittaria weatherbiana*	FSC	Historic	No Effect
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Historic	No Effect
Sensitive joint-vetch	*Aeschynomene virginica*	T	Current	No Effect
Venus' fly-Trap	*Dionaea muscipula*	FSC	Current	No Effect

HABITAT ANALYSES

American eel

Atlantic eel is a catadromous fish found on the eastern coast of North America that lives in fresh water and estuaries. Eels are bottom dwellers and hide in burrows, tubes, snags, masses of plants, other types of shelters. They are found in a variety of habitats including streams, rivers, and muddy or silt-bottomed lakes during their freshwater stage, as well as oceanic waters, coastal bays and estuaries. Due to the proposed project's headwater location in the watershed and existing conditions, there is no suitable habitat for this species. Therefore, a biological conclusion of "No Effect" has been made.

Atlantic sturgeon

Atlantic sturgeon are anadromous fish that spawn in freshwater in the spring and early summer and migrate into "estuarine" and marine waters where they spend most of their lives. In some southern rivers a fall spawning migration may also occur. They spawn in moderately flowing water (46-76 cm/s) in deep parts of large rivers. Sub-adults and adults live in coastal waters and estuaries when not spawning, generally in shallow (10-50 m depth) nearshore areas dominated

by gravel and sand substrates.Due to the proposed project's headwater location in the watershed and existing conditions, there is no suitable habitat for this species. Therefore, a biological conclusion of "No Effect" has been made.

Bald eagle

Bald eagles prefer the open water of lakes, rivers, and marshes for their foraging habitat, and tall, mature trees for their nesting and roosting sites. The closer these habitats are together, the greater the attraction is for Bald eagles. The project area is currently tilled cropland with several degraded headwater streams (drainage ditches). Based on the habitat requirements and an onsite review, there is no suitable habitat for Bald Eagles within the project area, therefore a biological conclusion of "No Effect" has been made.

Black-throated green warbler

In southern Virginia and coastal North Carolina, black-throated green warblers are closely associated with Atlantic white cedar. Where cedar is scarce or absent, such as coastal South Carolina, these birds are found primarily in non-alluvial forested wetlands or transitional zones between upland and wetland. Black-throated green warblers are sometimes found in small or headwater riparian forests, but most observers suggest an association with forest stands growing in non-alluvial muck swamp. The project area is currently tilled cropland with several degraded headwater streams (drainage ditches). Based on the habitat requirements and an onsite review, there is no suitable habitat for this species within the project area, therefore a biological conclusion of "No Effect" has been made.

Carolina gopher frog

These rare frogs occur at scattered localities in the Sandhills and southeastern Coastal Plain. Little is known about their natural history outside the breeding season. Adults are secretive, spending most of their lives underground. Gopher frogs derive their common name from the fact that adults commonly use the burrows of the gopher tortoise (*Gopherus polyphemus*) as hiding places in the Deep South, but in North Carolina (where these tortoises do not occur), gopher frogs hide in stump holes, root tunnels and mammal and crayfish burrows. Based on the habitat requirements and an onsite review, there is no suitable habitat for this species within the project area, nor is suitable habitat likely to occur once the project is completed.

Eastern Henslow's sparrow

This species occupies ephemeral grassland habitats. Specific grassland features include: unbroken patches of at least 75 acres which are part of larger tracts (at least 400 acres); native grass species like little bluestem, prairie dropseed, blue joint, and Indian grass; few woody plants; substantial litter and old, erect grass stems; and fairly deep weed and grass growth. Periodic burning, light grazing, and controlled mowing produce these conditions. Reclaimed strip mines, fallow fields, powerline cuts, and restored prairie can also be used by this sparrow. Winter habitats include coastal grasslands, pine savannah, and pitcher plant bogs. The project area is currently tilled cropland with several degraded headwater streams (drainage ditches). Based on the habitat requirements and an onsite review, there is no suitable habitat for this species within the project area, therefore a biological conclusion of "No Effect" has been made.

Kemp's (Atlantic) Ridley sea turtle

Due to the projects distance from the Atlantic Ocean and Pamlico Sound, and lack of any suitable habitat, a biological conclusion of "No Effect" has been made.

Rafinesque's big-eared bat

This bat has a split range in North Carolina, in the southern Appalachians, and in the sandhills and coastal plain. Natural roost sites include hollow trees and caves, but throughout its range most records of this species are from abandoned buildings. Caves and mines are used by this bat in the upland portions of its range, including North Carolina. In abandoned structures, this bat is found in the darkest portions of the building, preferring windowless rooms such as bathrooms and closets; but in caves, areas receiving some natural light seem preferred. Sites along river systems and other permanent bodies of water nearby old growth forests are preferred. Based on the habitat requirements and an onsite review, there is no suitable habitat within the project area, nor is suitable habitat likely to occur once the project is completed. Therefore, a biological conclusion of "No Effect" has been made.

Red wolf

The last red wolves were found in coastal prairie and marsh habitat because this was the last area in which the animals were allowed to remain. Any habitat area in the southeastern United States of sufficient size, which provides adequate food, water, and the basic cover requirement of heavy vegetation, should be suitable habitat for the red wolf. Telemetry studies indicate that red wolf home range requirements vary from about 25 to 50 square miles. Given the current land use practices, the project lacks good foraging habitat, although wolves may travel through the site as they follow the drainage corridor. Due to their experimental population status, their presence cannot legally establish critical habitat. Therefore, a biological conclusion of "No Effect" has been made.

Red-Cockaded woodpecker

Red-Cockaded Woodpeckers (RCWs) require open stands of pine, containing trees at least 60 years old and living, in which to excavate their cavities. Longleaf pines (*Pinus palustris*) are most commonly used as cavity trees, but other species of southern pine such as loblolly pine (*Pinus taeda*), are also acceptable. Foraging habitat is provided in mature (greater than 30 years old) pine and mixed pine/hardwood stands ranging from 80 to 125 acres. Dense stands of hardwoods, or pine stands with a dense hardwood understory are avoided. The proposed project area is currently tilled cropland with several degraded headwater streams (ditches). Once restored, the project will function as a headwater system dominated by stands of bottomland hardwoods and pockets of emergent wetland vegetation. Based on the habitat requirements and an onsite review, there is no suitable habitat for RCWs within the project area, nor is suitable habitat likely to occur once the project is completed. Therefore, a biological conclusion of "No Effect" has been made.

West Indian manatee

The West Indian Manatee is an endangered species which inhabits both marine and freshwater environments. Based on the habitat requirements and an onsite review, there is no suitable habitat for Manatees within the project area, nor is suitable habitat likely to occur once the project is completed. Therefore, a biological conclusion of "No Effect" has been made.

Grassleaf arrowhead

This aquatic herbaceous plant is rooted to the ground with stems and leaves emerging above the water surface. This species is commonly found in waterways, marshes, swamps, drainage ditches, irrigation channels and rice crops in warmer temperate, sub-tropical and tropical environments. Currently, the distribution of this species is not found in this area. Based on the habitat requirements and an onsite review, there is no suitable habitat for this species within the project area, nor is suitable habitat likely to occur once the project is completed. Therefore, a biological conclusion of "No Effect" has been made.

Rough-leaved loosestrife

This species generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins (areas of dense shrub and vine growth usually on a wet, peaty, poorly drained soil) on moist to seasonally saturated sands and on shallow organic soils overlaying sand. Rough-leaf loosestrife has also been found on deep peat in the low shrub community of large Carolina bays (shallow, elliptical, poorly drained depressions of unknown origin). The grass-shrub ecotone, where rough-leaf loosestrife is found, is fire-maintained, as are the adjacent plant communities (longleaf pine - scrub oak, savanna, flatwoods, and pocosin). The proposed project area is currently tilled cropland with several degraded headwater streams (ditches). Once restored, the project will function as a headwater system dominated by stands of bottomland hardwoods and pockets of emergent wetland vegetation. Based on the habitat requirements and an onsite review, there is no suitable habitat for the Rough-leaved loosestrife within the project area, nor is suitable habitat likely to occur once the project is completed. Therefore, a biological conclusion of "No Effect" has been made.

Sensitive Joint Vetch

Sensitive-Joint Vetch grows in the intertidal zone where plants are flooded twice daily. These intertidal areas require lunar tides, not wind driven tides that are typically found in the project area. The species seems to prefer the marsh edge at an elevation near the upper limit of tidal fluctuation. It is usually found in areas where plant diversity is high (50 species per acre) and annual species predominate. Bare to sparsely vegetated substrates appear to be a habitat feature of critical importance to this plant. In North Carolina, it is frequently found in the estuarine meander zone of tidal rivers where sediments transported from upriver settle out and extensive marshes are formed. The project site is currently tilled cropland with several degraded headwater streams (ditches). Once restored, the project will function as a headwater stream system (swamp run) dominated by stands of bottomland hardwoods and pockets of emergent wetland vegetation. Based on the habitat requirements and an onsite review, there is no suitable habitat for Sensitive-Joint Vetch within the project area, nor is suitable habitat likely to occur once the project is completed.

Venus' flytrap

The Venus' flytrap is found in nitrogen- and phosphorus-poor environments, such as bogs and wet savannahs. Small in stature and slow growing, the Venus flytrap tolerates fire well, and depends on periodic burning to suppress its competition. Fire suppression threatens its future in the wild. It survives in wet sandy and peaty soils. Although it has been successfully transplanted and grown in many locales around the world, it is found natively only in North and South Carolina in the United States, specifically within a 60-mile radius of Wilmington, North Carolina. The project site is currently tilled cropland with several degraded headwater streams

(ditches). Once restored, the project will function as a headwater stream system (swamp run) dominated by stands of bottomland hardwoods and pockets of emergent wetland vegetation. Based on the habitat requirements and an onsite review, there is no suitable habitat for this species within the project area, nor is suitable habitat likely to occur once the project is completed.

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW 2013-02102** County: **Beaufort** U.S.G.S. Quad: **Hackney**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: **Albemarle Restorations, LLC**
Attn: Ed Temple
Address: **Post Office Box 206**
Fairfield, North Carolina 27826

Agent: ____
Address: ____

Property description: **Property consists of mostly farm fields with an area of swamp forest along Horse Branch.**
Size (acres) **approx. 108 acres** Nearest Town **Chocowinity**
Nearest Waterway **Chocowinity Creek** River Basin **Tar-Pamlico**
USGS HUC **03020104** Coordinates **35.447819 N -77.103757 W**
Location description: **Property known as the Hudson Farm is located south of Chocowinity; east of US Highway 17; and on the north side of Possum Track Road. The request was to make a jurisdictional determintation on four ditches (labelled on the map as Swamp Runs #1, #2, #3, and #4) These four ditches will be referred to as the project area.**

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters of the U.S. including wetlands on your project area have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on ___. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Washington, NC, at (252) 946-6481 to determine their requirements.

Placement of dredged or fill material within waters of the US and/or wetlands without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **William Wescott** at**910-251-4629.**

C. Basis For Determination **Swamp Runs #1, #2, and #4 showed evidence of flow and an ordinary high water mark (OHWM). Combined, these three ditches are approximately 2,000 linear feet in length. There are Section 404 wetlands adjacent to Swamp Run #4 at the point where it joins Horse Branch. Swamp Run #3 does not exhibit an OHWM but is located in a natural valley and connects a forested wetland to Swamp Run #2.**

D. Remarks

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information (This information applies only to approved jurisdictional determinations as indicated in B. above)

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by 12/27/2013.

It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: William Wescott

Date: **10/28/2013** Expiration Date: **10/28/2018**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the attached customer Satisfaction Survey or visit http://per2.nwp.usace.army.mil/survey.html to complete the survey online.

Copy furnished:

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **Albemarle Restorations, LLC**	File Number: **SAW 2013-02102**	Date: **10/28/2013**
Attached is:		See Section below
☐ INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
☐ PROFFERED PERMIT (Standard Permit or Letter of permission)		B
☐ PERMIT DENIAL		C
☒ APPROVED JURISDICTIONAL DETERMINATION		D
☐ PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
District Engineer, Wilmington Regulatory Division, **Attn: William Wescott** **2407 West Fifth Street** **Washington, North Carolina 27889** **910-251-4629**	Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
_____ Signature of appellant or agent.		

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn: _____, 69 Darlington Avenue, Wilmington, North Carolina 28403

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

NC DWQ Stream Identification Form Version 4.11

Date: 8/8/11	**Project/Site:** Hudson Reach 1	**Latitude:** 77-06-12
Evaluator: S. McGill	**County:** Beaufort	**Longitude:** 35-26-53
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20.75	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 8)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.25)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	(FACW = 0.75) OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 8/8/11	Project/Site: Hudson Reach 2	Latitude: 77-06-12
Evaluator: S. McGill	County: Beaufort	Longitude: 35-26-53
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20.75	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 8)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.25)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	(FACW = 0.75; OBL = 1.5 Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 8/8/11	**Project/Site:** Hudson Reach 3	**Latitude:** 77-06-12
Evaluator: S. McGill	**County:** Beaufort	**Longitude:** 35-26-53
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20.75	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 8)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.25)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	(FACW = 0.75; OBL = 1.5 Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 8/8/11	**Project/Site:** Hudson Reach 4	**Latitude:** 77-06-12
Evaluator: S. McGill	**County:** Beaufort	**Longitude:** 35-26-53
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 20.75	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 8)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	0.5	(1)	1.5
10. Natural valley	0	0.5	(1)	1.5
11. Second or greater order channel	(No = 0)		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5.5)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	(0)	1	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	(0)	0.5	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		(Yes = 3)	

C. Biology (Subtotal = 7.25)				
18. Fibrous roots in streambed	3	(2)	1	0
19. Rooted upland plants in streambed	3	(2)	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	(0.5)	1	1.5
24. Amphibians	0	(0.5)	1	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	(FACW = 0.75; OBL = 1.5 Other = 0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 8/8/11	**Project/Site:** Hudson Reach 5	**Latitude:** 77-06-12
Evaluator: S. McGill	**County:** Beaufort	**Longitude:** 35-26-53
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 26.5	**Stream Determination (circle one)** Ephemeral (Intermittent) Perennial	**Other** *e.g. Quad Name:*

A. Geomorphology (Subtotal = 10)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	(2)	3
2. Sinuosity of channel along thalweg	(0)	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	(1)	2	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	(0)	1	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = (3)	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	(1)	2	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	(1)	0.5	0
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = (3)	

C. Biology (Subtotal = 9.5)				
18. Fibrous roots in streambed	3	2	(1)	0
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	0	(0.5)	1	1.5
23. Crayfish	0	0.5	(1)	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	0	(0.5)	1	1.5
26. Wetland plants in streambed	FACW = 0.75; (OBL = 1.5) Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

Reach Merchants Mill Pond

NC DWQ Stream Identification Form Version 4.11

Date: 8/16/13	Project/Site: Hudson / Reference	Latitude: 76-41-19
Evaluator: K. Ashmun	County: Gates	Longitude: 36-26-29
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 28	Stream Determination (circle one) Ephemeral (Intermittent) Perennial	Other *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	(3)
2. Sinuosity of channel along thalweg	0	1	(2)	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	(1)	2	3
4. Particle size of stream substrate	0	(1)	2	3
5. Active/relict floodplain	0	1	(2)	3
6. Depositional bars or benches	(0)	1	2	3
7. Recent alluvial deposits	0	(1)	2	3
8. Headcuts	(0)	1	2	3
9. Grade control	0	(0.5)	1	1.5
10. Natural valley	0	0.5	1	(1.5)
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5)				
12. Presence of Baseflow	(0)	1	2	3
13. Iron oxidizing bacteria	0	(1)	2	3
14. Leaf litter	1.5	1	0.5	(0)
15. Sediment on plants or debris	0	(0.5)	1	1.5
16. Organic debris lines or piles	0	(0.5)	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8)				
18. Fibrous roots in streambed	3	2	1	(0)
19. Rooted upland plants in streambed	(3)	2	1	0
20. Macrobenthos (note diversity and abundance)	0	(1)	2	3
21. Aquatic Mollusks	(0)	1	2	3
22. Fish	(0)	0.5	1	1.5
23. Crayfish	0	0.5	(1)	1.5
24. Amphibians	0	0.5	(1)	1.5
25. Algae	0	0.5	(1)	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = (0)			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

APPENDIX C

MITIGATION WORK PLAN DATA & ANALYSES

APPENDIX C
MORPHOLOGY DATA TABLE

Parameter	Existing Stream			Design Stream			Existing Stream			Design Stream		
	min	median	max	min	median	max	min	median	max	min	median	max
Stream name	Reach 1			Reach 1			Reach 2			Reach 2		
Stream type	G5 - G6			low sinuosity C5 - C6			G5 - G6			low sinuosity C5 - C6		
Drainage area, DA (sq mi)	0.063			0.063			0.117			0.117		
Bankfull mean depth, d_{bkf} (ft)	0.52	0.60	0.45	0.42			0.91	0.94	0.92	0.67		
Bankfull width, W_{bkf} (ft)	3.83	3.36	6.02	9.02			7.20	5.97	6.87	14.83		
Width-to-depth ratio, [W_{bkf}/d_{bkf}]	7.37	5.64	13.52	21.40			7.88	6.38	7.47	22.00		
Bankfull cross-section area, A_{bkf} (sq ft)	1.99	2.00	2.68	3.80			6.58	5.59	6.32	10.00		
Bankfull max depth d_{max} (ft)	0.87	1.07	0.56	0.44	0.53	0.61	1.38	1.42	1.54	0.70	0.84	0.98
Bankfull Max depth ratio, [d_{max}/d_{bkf}]	1.67	1.80	1.26	1.04	1.25	1.45	1.51	1.52	1.67	1.04	1.25	1.45
Pool max depth, Pool d_{max} (ft)	0.40	0.50	0.60	0.72	0.93	1.15	0.40	0.50	0.60	1.16	1.48	1.84
Pool Max depth ratio, [Pool d_{max}/d_{bkf}]	0.77	0.84	1.35	1.72	2.20	2.72	0.44	0.53	0.65	1.72	2.20	2.72
Width flood-prone area, W_{fpa} (ft)	6.91	6.47	10.50	18.06	26.47	34.89	12.03	10.03	13.47	29.71	43.55	57.39
Entrenchment ratio, ER [W_{fpa}/W_{bkf}]	1.80	1.93	1.74	2.00	2.94	3.87	1.67	1.68	1.96	2.00	2.94	3.87
Meander length, L_m (ft)	0.00	0.00	0.00	112.06	135.86	164.59	0.00	0.00	0.00	184.31	223.46	270.72
Meander length ratio [L_m/W_{bkf}]	0.00	0.00	0.00	12.43	15.07	18.25	0.00	0.00	0.00	12.43	15.07	18.25
Radius of curvature, Rc (ft)	0.00	0.00	0.00	36.94	37.76	38.99	0.00	0.00	0.00	60.76	62.11	64.14
Radius of curvature ratio [Rc/W_{bkf}]	0.00	0.00	0.00	4.10	4.19	4.32	0.00	0.00	0.00	4.10	4.19	4.32
Belt width, W_{blt} (ft)	0.00	0.00	0.00	11.08	20.11	31.19	0.00	0.00	0.00	18.23	33.08	51.31
Meander width ratio [W_{blt}/W_{bkf}]	0.00	0.00	0.00	1.23	2.23	3.46	0.00	0.00	0.00	1.23	2.23	3.46
Pool length, L_p (ft)	0.00	0.00	0.00	4.72	8.41	14.98	0.00	0.00	0.00	14.18	20.59	27.00
Pool length ratio [L_p/W_{bkf}]	0.00	0.00	0.00	0.52	0.93	1.66	0.00	0.00	0.00	0.96	1.39	1.82
Pool-to-pool spacing, p-p (ft)	0.00	0.00	0.00	16.42	26.95	35.63	0.00	0.00	0.00	27.00	44.33	58.61
Pool-to-pool spacing ratio, [p-p/W_{bkf}]	0.00	0.00	0.00	1.82	2.99	3.95	0.00	0.00	0.00	1.82	2.99	3.95
Riffle length, L_{rif} (ft)	0.00	0.00	0.00	4.93	19.09	33.25	0.00	0.00	0.00	8.10	31.39	54.68
Riffle length ratio, [L_{rif}/W_{bkf}]	0.00	0.00	0.00	0.55	2.12	3.69	0.00	0.00	0.00	0.55	2.12	3.69
Valley length, VL (ft)	840.00			802.00			486.00			507.00		
Stream length, SL (ft)	846.00			833.00			516.00			532.00		
Valley Elevation Change, VE (ft)	6.00			6.00			1.50			1.50		
Stream Elevation Change, SE (ft)	8.00			5.00			3.00			1.50		
Valley slope, VS (ft/ft)	0.007			0.007			0.003			0.003		
Average water surface slope, S (ft/ft)	0.009			0.006			0.006			0.003		
Sinuosity, k = SL/VL (ft/ft)	1.01			1.04			1.06			1.05		
Riffle slope, S_{rif} (ft/ft)	0.00	0.00	0.00	0.006	0.016	0.025	0.00	0.00	0.00	0.003	0.008	0.012
Riffle slope ratio, [S_{rif}/S]	0.00	0.00	0.00	0.99	2.71	4.19	0.00	0.00	0.00	0.99	2.71	4.19
Pool slope, S_p (ft/ft)	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Pool slope ratio, [S_p/S]	0.00	0.00	0.00	1.10	1.23	1.23	0.00	0.00	0.00	1.10	1.23	1.23
Bankfull discharge, Q_{bkf} (cfs)	5.60	5.60	5.60	5.60	5.60	5.60	17.20	17.20	17.20	17.20	17.20	17.20
Bankfull mean velocity, u_{bkf} = Q/A (ft/s)	2.81	2.80	2.09	1.47	1.47	1.47	2.61	3.08	2.72	1.72	1.72	1.72
Bankfull wetted perimeter, WP (ft)	4.87	4.55	6.91	9.86			9.03	7.84	8.71	16.18		
Bankfull hydraulic radius, R (ft)	0.41	0.44	0.39	0.39			0.73	0.71	0.73	0.62		
Bankfull Mannings n (estimate)	0.039	0.039	0.039	0.050	0.050	0.050	0.039	0.039	0.039	0.050	0.050	0.050
Mannings bankfull discharge, Q_{bkf} (cfs)	4.07	4.29	5.29	4.64	4.64	4.64	19.80	16.57	18.96	4.64	4.64	4.64
Mannings bkf velocity, u_{bkf} = Q/A (ft/s)	2.05	2.15	1.98	1.22	1.22	1.22	3.01	2.96	3.00	1.22	1.22	1.22
Bankfull stream power, ω (lb/ft/s)	0.49	0.56	0.45	0.18	0.18	0.18	1.29	1.25	1.28	0.18	0.18	0.18
Bankfull shear stress, τ (lb/ft^2)	0.24	0.26	0.23	0.14			0.43	0.42	0.43	0.11		

APPENDIX C
MORPHOLOGY DATA TABLE

Existing Stream			Design Stream			Existing Stream			Design Stream			Reference Stream		
min	median	max	min	median	max	min	median	max	min	median	max	min	median	max
Reach 3			Reach 3			Reach 4			Reach 4			UT to Bennetts Creek (combined)		
G5 - G6			low sinuosity C5 - C6			G5 - G6			low sinuosity C5 - C6			low sinuosity C5 - C6		
0.055			0.055			0.235			0.235			0.92		
0.79	0.84	0.55	0.50			0.97	1.05	1.00	0.78			0.82	0.75	0.70
4.03	5.05	3.55	10.00			8.84	7.34	7.48	21.82			19.74	21.97	24.20
5.12	5.99	6.50	20.00			9.11	7.01	7.47	28.00			24.22	29.27	34.67
3.17	4.26	1.94	5.00			8.58	7.69	7.49	17.00			16.09	16.49	16.89
1.15	1.44	0.88	0.52	0.63	0.72	1.51	1.82	1.47	0.81	0.98	1.13	0.85	1.02	1.18
1.46	1.71	1.61	1.04	1.25	1.45	1.56	1.74	1.47	1.04	1.25	1.45	1.04	1.25	1.45
0.40	0.50	0.60	0.86	1.10	1.36	0.40	0.50	0.60	1.34	1.71	2.12	1.40	1.65	1.90
0.51	0.59	1.10	1.72	2.20	2.72	0.41	0.48	0.60	1.72	2.20	2.72	1.72	2.20	2.72
6.44	9.13	5.97	20.03	29.36	38.69	16.28	13.83	12.21	43.69	64.05	84.41	44.00	64.50	85.00
1.60	1.81	1.68	2.00	2.94	3.87	1.84	1.88	1.63	2.00	2.94	3.87	2.00	2.94	3.87
0.00	0.00	0.00	124.26	150.66	182.52	0.00	0.00	0.00	271.10	328.70	398.22	273.00	331.00	401.00
0.00	0.00	0.00	12.43	15.07	18.25	0.00	0.00	0.00	12.43	15.07	18.25	12.43	15.07	18.25
0.00	0.00	0.00	40.96	41.88	43.24	0.00	0.00	0.00	89.37	91.36	94.34	90.00	92.00	95.00
0.00	0.00	0.00	4.10	4.19	4.32	0.00	0.00	0.00	4.10	4.19	4.32	4.10	4.19	4.32
0.00	0.00	0.00	12.29	22.30	34.59	0.00	0.00	0.00	26.81	48.66	75.47	27.00	49.00	76.00
0.00	0.00	0.00	1.23	2.23	3.46	0.00	0.00	0.00	1.23	2.23	3.46	1.23	2.23	3.46
0.00	0.00	0.00	9.56	13.88	18.21	0.00	0.00	0.00	20.85	30.29	39.72	21.00	30.50	40.00
0.00	0.00	0.00	0.96	1.39	1.82	0.00	0.00	0.00	0.96	1.39	1.82	0.96	1.39	1.82
0.00	0.00	0.00	18.21	29.89	39.51	0.00	0.00	0.00	39.72	65.21	86.21	40.00	59.00	78.00
0.00	0.00	0.00	1.82	2.99	3.95	0.00	0.00	0.00	1.82	2.99	3.95	1.82	2.99	3.95
0.00	0.00	0.00	5.46	21.17	36.87	0.00	0.00	0.00	11.92	46.18	80.44	12.00	46.50	81.00
0.00	0.00	0.00	0.55	2.12	3.69	0.00	0.00	0.00	0.55	2.12	3.69	0.55	2.12	3.69
442.00			442.00			434.00			434.00			264.00		
460.00			445.00			503.00			437.00			264.00		
3.00			3.00			1.50			1.50			1.05		
4.00			2.25			2.00			1.50			1.07		
0.007			0.007			0.003			0.003			0.004		
0.009			0.005			0.004			0.003			0.004		
1.04			1.01			1.16			1.01			1.00		
0.00	0.00	0.00	0.005	0.014	0.021	0.00	0.00	0.00	0.006	0.016	0.025	0.004	0.011	0.017
0.00	0.00	0.00	0.99	2.71	4.19	0.00	0.00	0.00	0.99	2.71	4.19	0.99	2.71	4.19
0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.005	0.006	0.006
0.00	0.00	0.00	1.10	1.23	1.23	0.00	0.00	0.00	1.10	1.23	1.23	1.28	1.43	1.43
8.00	8.00	8.00	8.00	8.00	8.00	26.20	26.20	26.20	26.20	26.20	26.20	12.68	12.68	12.68
2.52	1.88	4.12	1.60	1.60	1.60	3.05	3.41	3.50	6.89	6.89	6.89	0.79	0.79	0.79
5.60	6.74	4.64	11.00			10.78	9.44	9.48	23.38			21.37		
0.57	0.63	0.42	0.45			0.80	0.82	0.79	0.73			0.75		
0.039	0.039	0.039	0.050	0.050	0.050	0.039	0.039	0.039	0.050	0.050	0.050	0.045	0.050	0.055
8.05	11.66	4.03	6.26	6.26	6.26	17.75	16.16	15.42	24.00	24.00	24.00	28.07	25.26	22.96
2.54	2.74	2.08	1.25	1.25	1.25	2.07	2.10	2.06	1.41	1.41	1.41	1.74	1.57	1.43
0.85	1.02	0.51	0.18	0.18	0.18	0.97	1.01	0.96	0.22	0.22	0.22	0.33	0.30	0.27
0.33	0.37	0.25	0.14			0.47	0.48	0.47	0.16			0.19	0.19	0.19

Appendix C
Reaches 1-5 Proposed Design Parameters

REACH 1

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	10
Depth (BF)	0.45
Flood-Prone Width	28
Sinuousity	1.030
Energy Gradient	0.006
n (Manning's)	0.05
Calculated Parameter	**Enter:**
Width/depth ratio	22.2
Cross-sectional area	4.5
Entrenchment ratio	2.8
Wetted perimeter	10.9
Hydraulic radius	0.4
Q (cfs)	5.8
Velocity (ft/sec)	1.3

REACH 2

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	18
Depth (BF)	0.72
Flood-Prone Width	39
Sinuousity	
Energy Gradient	0.0035
n (Manning's)	0.05
Calculated Parameters:	**Enter:**
Width/depth ratio	25.0
Cross-sectional area	13.0
Entrenchment ratio	2.2
Wetted perimeter	19.4
Hydraulic radius	0.7
Q (cfs)	17.4
Velocity (ft/sec)	1.3

REACH 3

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	12
Depth (BF)	0.55
Flood-Prone Width	28.73
Sinuousity	
Energy Gradient	0.005
n (Manning's)	0.05
Calculated Parameter	**Enter:**
Width/depth ratio	21.8
Cross-sectional area	6.6
Entrenchment ratio	2.4
Wetted perimeter	13.1
Hydraulic radius	0.5
Q (cfs)	8.8
Velocity (ft/sec)	1.3

REACH 4

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	23
Depth (BF)	0.80
Flood-Prone Width	
Sinuousity	
Energy Gradient	0.0035
n (Manning's)	0.05
Calculated Parameters:	**Enter:**
Width/depth ratio	28.8
Cross-sectional area	18.4
Entrenchment ratio	0.0
Wetted perimeter	24.6
Hydraulic radius	0.7
Q (cfs)	26.7
Velocity (ft/sec)	1.5

REACH 5

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	25
Depth (BF)	1.00
Flood-Prone Width	39
Sinuousity	
Energy Gradient	0.003
n (Manning's roughne	0.05
Calculated Parameter	**Enter:**
Width/depth ratio	25.0
Cross-sectional area	25.0
Entrenchment ratio	1.6
Wetted perimeter	27.0
Hydraulic radius	0.9
Q (cfs)	38.8
Velocity (ft/sec)	1.6

Appendix C
Reaches 1, 3, 4 Transition Sections Proposed Design Parameters

REACH 1

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	7
Depth (BF)	0.35
Flood-Prone Width	28
Sinuousity	1.030
Energy Gradient	0.029
n (Manning's)	0.05
Calculated Parameter	**Enter:**
Width/depth ratio	20.0
Cross-sectional area	2.5
Entrenchment ratio	4.0
Wetted perimeter	7.7
Hydraulic radius	0.3
Q (cfs)	5.8
Velocity (ft/sec)	2.4

REACH 3

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	9
Depth (BF)	0.45
Flood-Prone Width	28.73
Sinuousity	
Energy Gradient	0.016
n (Manning's)	0.05
Calculated Parameters:	**Enter:**
Width/depth ratio	20.0
Cross-sectional area	4.1
Entrenchment ratio	3.2
Wetted perimeter	9.9
Hydraulic radius	0.4
Q (cfs)	8.4
Velocity (ft/sec)	2.1

REACH 4

Stream Assessment Worksheet	
Input Parameter:	**Enter:**
Width (BF)	18
Depth (BF)	0.55
Flood-Prone Width	
Sinuousity	
Energy Gradient	0.02
n (Manning's)	0.05
Calculated Parameter	**Enter:**
Width/depth ratio	32.7
Cross-sectional area	9.9
Entrenchment ratio	0.0
Wetted perimeter	19.1
Hydraulic radius	0.5
Q (cfs)	26.9
Velocity (ft/sec)	2.7

APPENDIX D

PROJECT PLAN SHEETS (“11x17”)

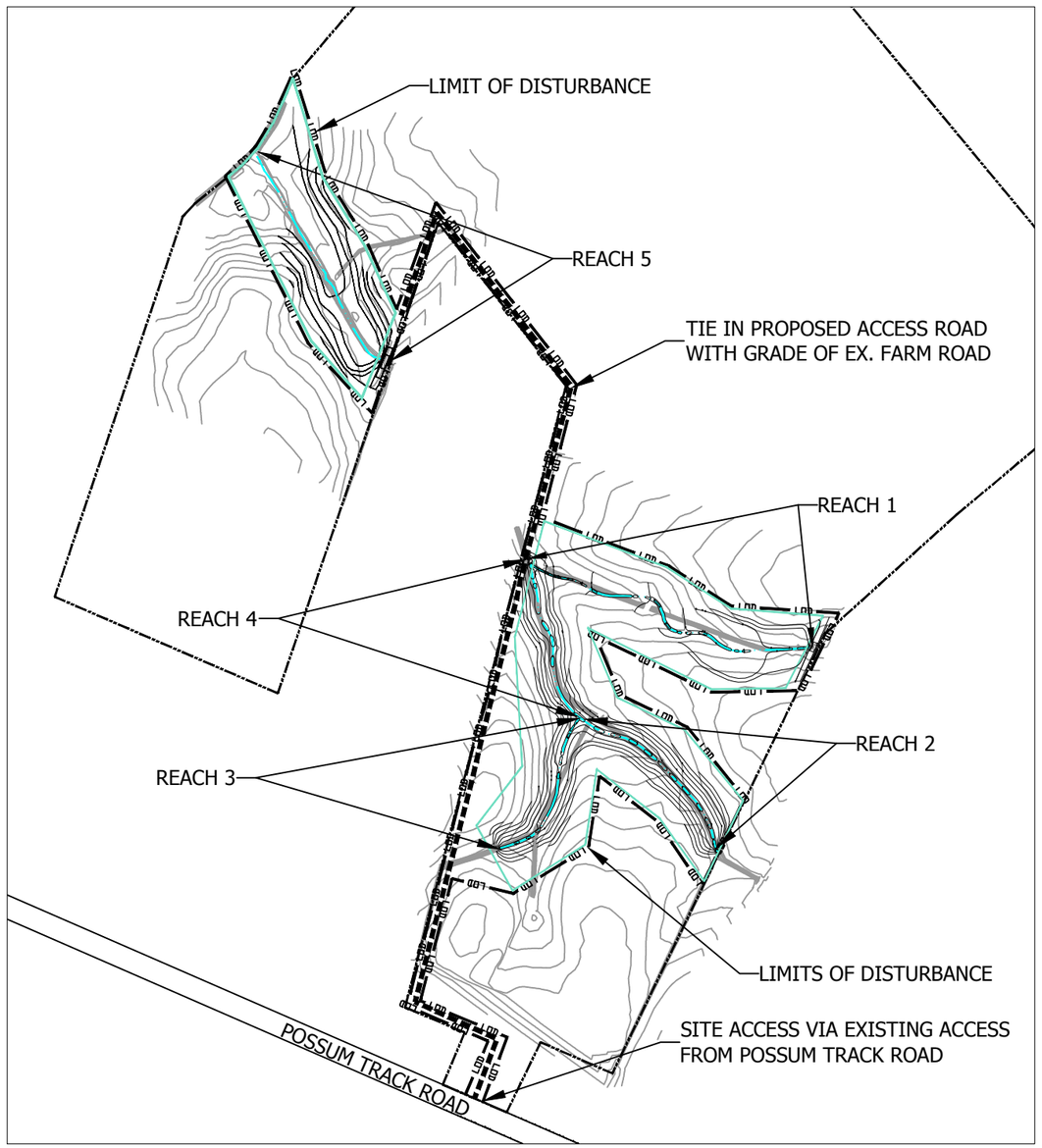
STREAM RESTORATION PROJECT
ALBEMARLE RESTORATIONS, LLC.
HUDSON SITE
BEAUFORT COUNTY
EEP PROJECT ID: 95361
EEP CONTRACT #: 004638

GENERAL NOTES:

1. This stream mitigation plan has been prepared for the North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program (NCEEP). The NCEEP has selected 13.4 acres of land positioned on 106.51 acres of the property owned by Charles E. Hudson for this full delivery contract, for stream restoration to fulfill a portion of the Request for Proposals (RFP): Full Delivery Project Tar-Pamlico River Basin, RFP 16-004106. The RFP and subsequent contract(s) awarded by EEP provide compensatory stream, wetland and/or buffer mitigation within the Tar-Pamlico River Basin Cataloging Unit 03020104. Albemarle Restorations, LLC entered into a contract with the State of North Carolina on June 12, 2012 to deliver 2,700 stream mitigation units on the Hudson project site. An option to purchase a conservation easement has been signed and recorded on the 13.4 acres encompassing this project on July 26, 2011 at the Beaufort County Tax Office and Register of Deeds.
2. Existing 1.0 foot topography within the project area was prepared by True Line Surveying. Other base information was derived from Beaufort County GIS data as amended and corrected by Albemarle Restorations, LLC based on field observations and ground surveys. Property boundary is based on Beaufort County GIS data and is currently being surveyed by True Line Surveying using permanent monumentation. If needed, any amendments to the plans will be completed and noted on future plans.
3. The Contractor shall notify Albemarle Restorations, LLC and the landowner's representative at least two (2) weeks prior to start of grading operations within the project area.
4. The Contractor is responsible for the location of all underground utilities prior to the start of construction. Any damages to utilities as a result of grading or other activities will be the sole responsibility of the Contractor and shall be repaired at the Contractors expense.
5. Access to the restoration areas shall be from Possum Track Road via proposed access road indicated hereon.
6. The Contractor will be responsible for any damage to private property, including but not limited to fences and private roads resulting from the execution of this contract. Repairs for any such damage will be made at the Contractors expense to the satisfaction of the private property owner and Albemarle Restorations, LLC.
7. All machinery, equipment and supplies for the project shall be stored in an upland location so as not to disturb any environmentally sensitive areas.
8. All stream work shall proceed upstream towards downstream.
9. Only work that can be completed within any given day shall be started.
10. Equipment is to be cleaned prior to mobilization to site and prior to leaving site to prevent the spread of invasive species.
11. A Nationwide 27 Permit, 401 Water Quality Permit, and Land Disturbance Permit will be obtained prior to the start of construction.

SEEDING NOTES:

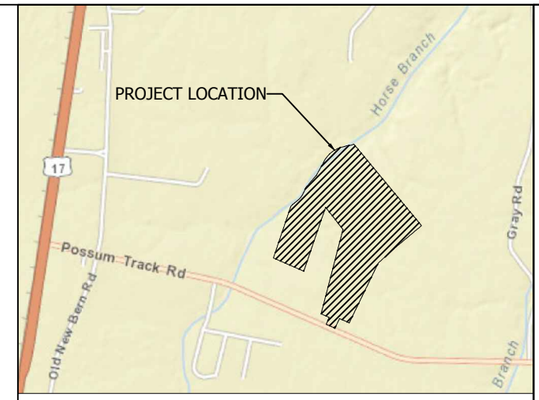
1. Prior to seeding, remove any mounds or surface irregularities not in conformance with grading plan. Areas that have experienced washing out, rilling, or sediment deposition shall be reconstructed and grades re-established by the Contractor in accordance with the plan or as otherwise directed by Albemarle Restorations, LLC.
2. After bringing the stream restoration areas to final grades, loosen soil by discing or scarifying to a depth of at least 3 inches.
3. Prior to seeding, remove all trash, debris and large objects such as stones that might interfere with the seeding operation.
4. Seeding of work areas is to be according to the seed mix provided on sheet P-2. Seed shall be spread with a broadcast spreader and may be mixed with dry sand to facilitate even spreading.



SITE OVERVIEW

0 400 800 Feet

SCALE: 1" = 400'



VICINITY MAP

Scale: 1" = 3000'

INDEX OF SHEETS

TITLE PLAN LEGEND

- PROPERTY BOUNDARY
- SURVEYED CONTOURS (1FT)
- PROPOSED EASEMENT LIMITS
- LOD LOD LIMITS OF DISTURBANCE
- PROPOSED STREAM CENTERLINE
- PROPOSED ACCESS ROAD

STREAM MITIGATION CREDIT SUMMARY

COMPONENT	LINEAR FEET	RATIO	SMU
Reach 1	833	1:1	833
Reach 2	532	1:1	532
Reach 3	445	1:1	445
Reach 4	437	1:1	437
Reach 5	644	1:1	644
Total	2,891		2,891

ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION, &
WILDLIFE HABITAT CREATION

P.O. BOX 176 •FAIRFIELD, NC 27826
(252) 333-0249 FAX (252) 926-9983

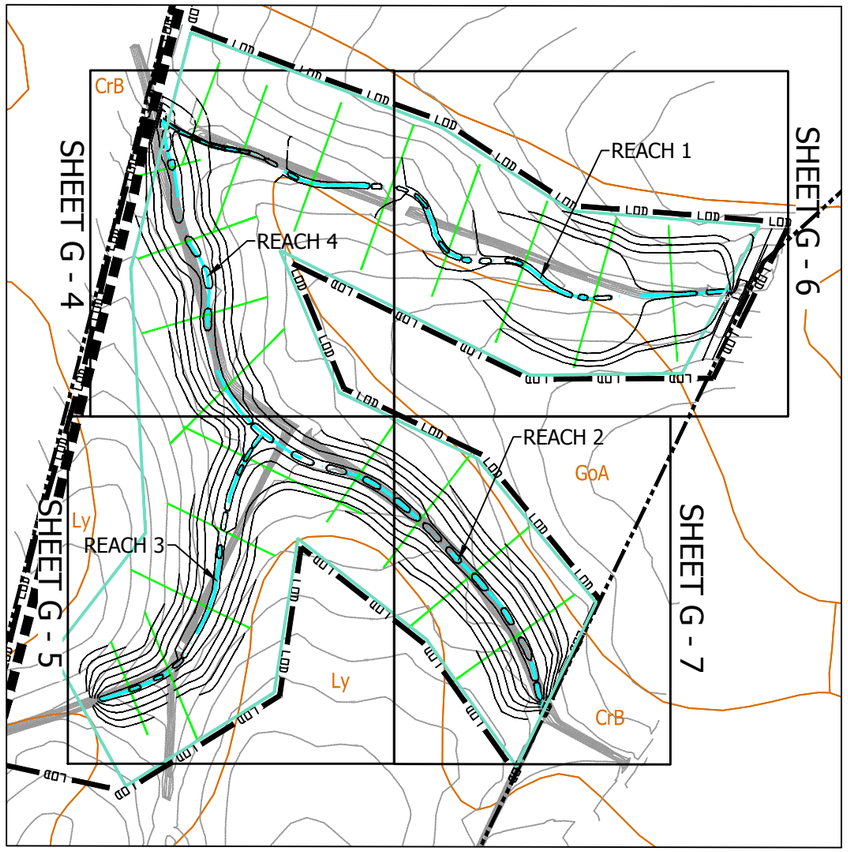
HUDSON PROPERTY
PLAN TITLE
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET T-1



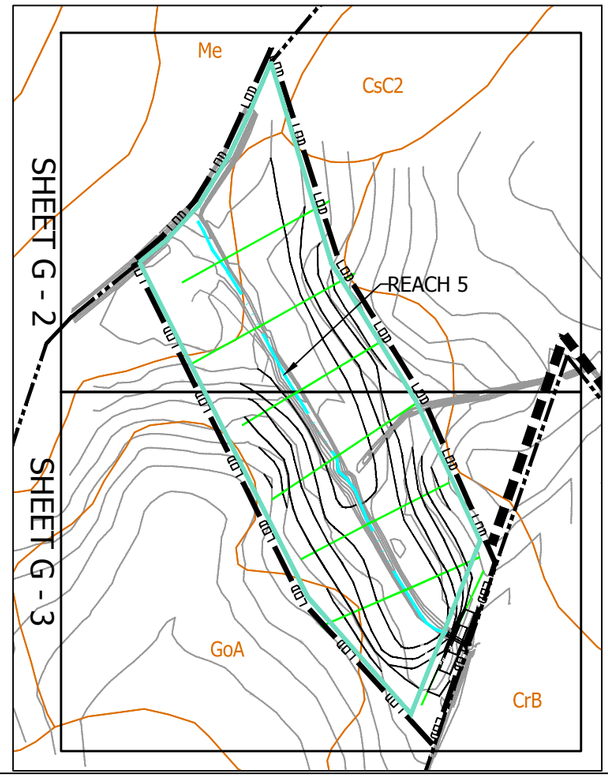
GRADING OVERVIEW

SCALE: 1" = 200'

0 200 400 Feet

GRADING LEGEND

- PROPERTY BOUNDARY
- SURVEYED CONTOURS (1FT)
- LIMIT OF DISTURBANCE (LOD)
- PROPOSED CONSERVATION EASEMENT LIMITS
- GoA — SOIL BOUNDARY
- CROSS SECTION
- PROPOSED CONTOURS (1FT)
- PROPOSED STREAM CENTERLINE
- PROPOSED ACCESS ROAD



SITE INFORMATION (not for bidding purposes)		
Total Area of Project	13.40	Acres
Area Disturbed	17.43	Acres
Total Cut	8,336.23	Cu. Yds.
Total Fill	3,859.89	Cu. Yds.
Offsite Waste/Borrow Area Location (Hudson Property)	4,476.34	Cu. Yds.

Mapped Soils Legend		
Symbol	Series	Hydric
CrB	Cravenfine sandy loam, 1-4% slopes	No
GoA	Goldsboro fine sandy loam , 0-2% slopes	No
Ly	Lynching fine sandy loam	No
Me	Muchalee loam, frequently flooded	Yes

*NOTE:
FOR OVERVIEW ONLY, SEE SHEET G-2 THROUGH G-7 FOR GRADING DETAILS

ALBEMARLE RESTORATIONS, LLC

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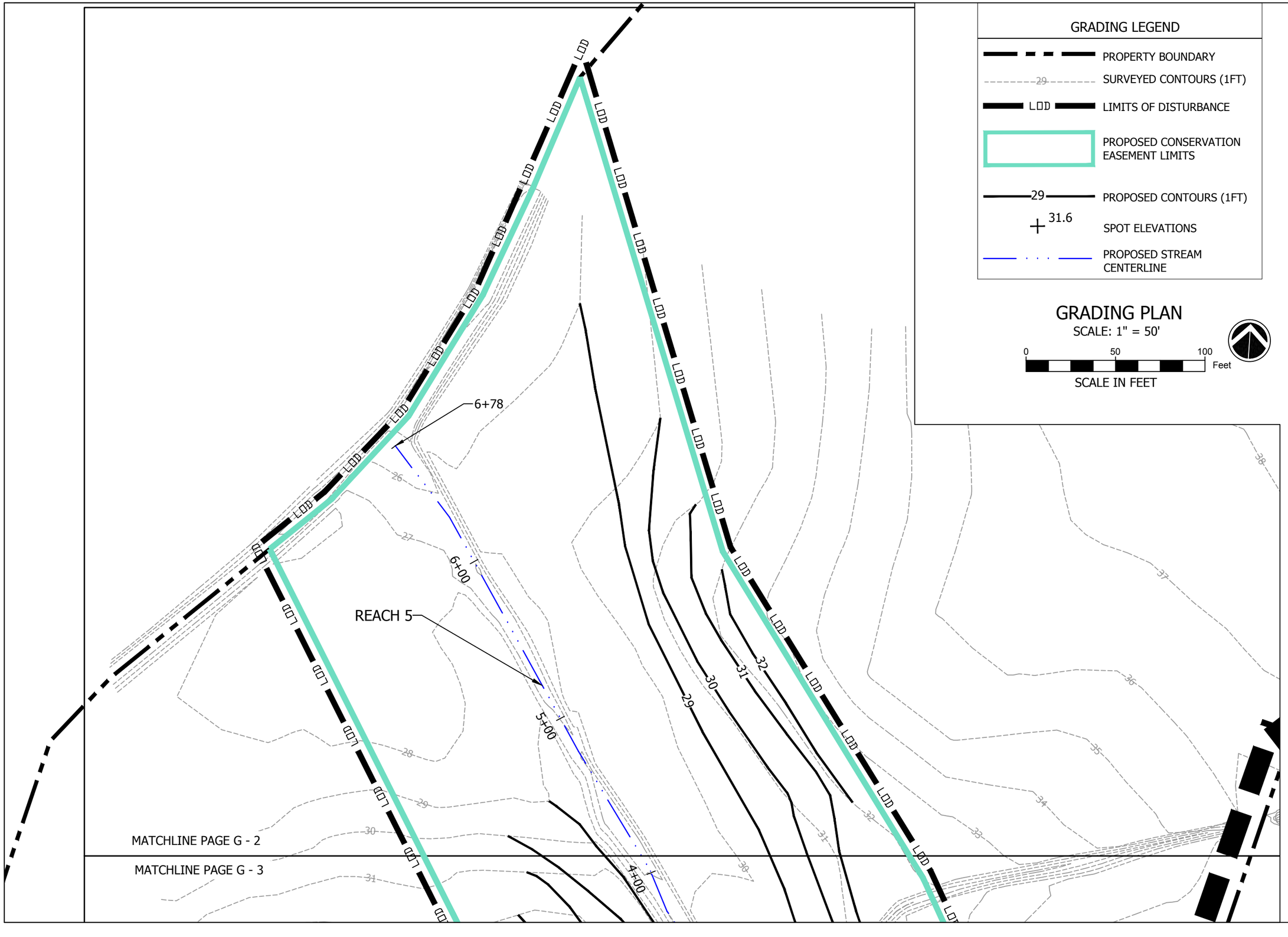
HUDSON PROPERTY
GRADING PLAN OVERALL
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET G-1



GRADING LEGEND

- PROPERTY BOUNDARY
- 29 SURVEYED CONTOURS (1FT)
- LOD LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- 29 PROPOSED CONTOURS (1FT)
- 31.6 SPOT ELEVATIONS
- PROPOSED STREAM CENTERLINE

GRADING PLAN

SCALE: 1" = 50'

0 50 100 Feet

SCALE IN FEET

ALBEMARLE RESTORATIONS, LLC

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HUDSON PROPERTY

GRADING PLAN

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET G-2

MATCHLINE PAGE G - 2

MATCHLINE PAGE G - 3

4+00

3+00

2+00

1+00

0+00

REACH 5

28.6

29.2

29.8

PROPOSED ROAD CROSSING
(SEE SHEET D-18)

LOD

GRADING PLAN

SCALE: 1" = 50'

0 50 100 Feet

SCALE IN FEET

GRADING LEGEND

- PROPERTY BOUNDARY
- 29 SURVEYED CONTOURS (1FT)
- LOD LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- 29 PROPOSED CONTOURS (1FT)
- 31.6 SPOT ELEVATIONS
- PROPOSED STREAM CENTERLINE

ALBEMARLE RESTORATIONS, LLC

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STREAM RESTORATION, &
WILDLIFE HABITAT CREATION

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HUDSON PROPERTY

GRADING PLAN

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET G-3

GRADING LEGEND

- PROPERTY BOUNDARY
- SURVEYED CONTOURS (1FT) — 29
- LIMITS OF DISTURBANCE — LOD
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED CONTOURS (1FT) — 29
- SPOT ELEVATIONS — 31.6
- PROPOSED STREAM CENTERLINE
- PROPOSED BANKFULL LIMITS
- LOW GRADIENT LOG DROP
- PROPOSED ACCESS ROAD

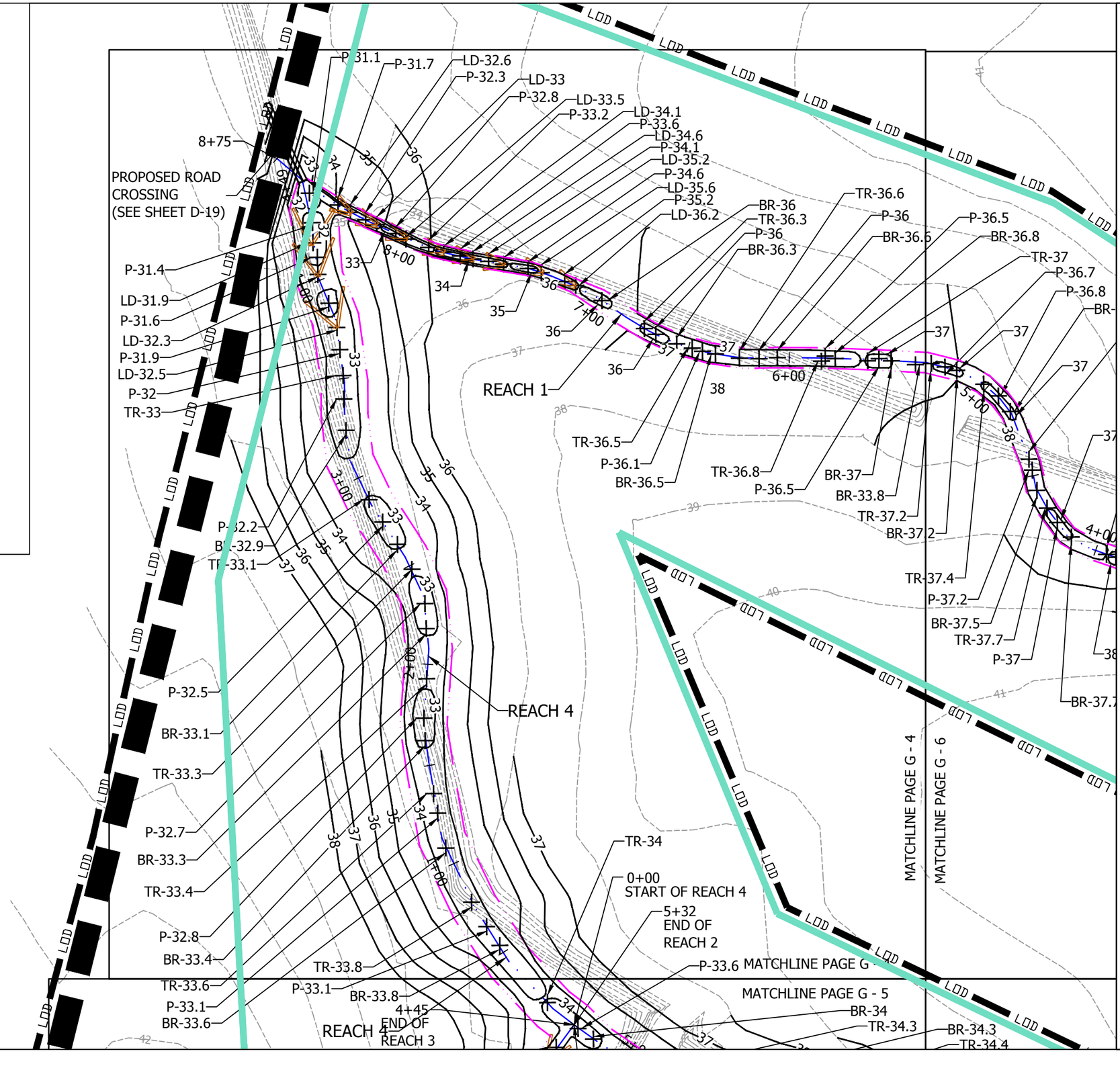
GRADING PLAN

SCALE: 1" = 50'

0 50 100 Feet

Spot Elevations Label Key

TR-33.1	Top of Riffle Elevation
BR-32.3	Bottom of Riffle Elevation
P-32.7	Pool Elevation
LD-31.1	Low Gradient Log Drop Structure Elevation



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(252) 333-0249 FAX (252) 926-9983

HUDSON PROPERTY

GRADING PLAN

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY
12/16/13	Adjust log vane angles	RBB

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET G-4

GRADING LEGEND

- PROPERTY BOUNDARY
- SURVEYED CONTOURS (1FT) — 29
- LIMITS OF DISTURBANCE — LOD
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED CONTOURS (1FT) — 29
- SPOT ELEVATIONS — 31.6
- PROPOSED STREAM CENTERLINE
- PROPOSED BANKFULL LIMITS
- LOW GRADIENT LOG DROP
- PROPOSED ACCESS ROAD

GRADING PLAN

SCALE: 1" = 50'

0 50 100 Feet

SCALE IN FEET

Spot Elevations Label Key	
TR-33.1	Top of Riffle Elevation
BR-32.3	Bottom of Riffle Elevation
P-32.7	Pool Elevation
LD-31.1	Low Gradient Log Drop Structure Elevation

24" TYPE S HDPE CULVERT TO BE INSTALLED FOR ACCESS ROAD

REACH 4

REACH 3

REACH 2

4+45 END OF REACH 3

5+32 END OF REACH 2

CONFLUENCE OF REACHES 2 AND 3

P-32.8 BR-33.4 TR-33.6 P-33.1 BR-33.6 TR-33.8 P-33.1 BR-33.8

P-33.5 LD-34.1 P-33.7 LD-34.5 P-34.1 LD-34.8 P-34.3 BR-34.8

TR-35.1 P-34.8 BR-35.1 TR-35.3 P-34.8 BR-35.3

TR-35.8 P-35.5 BR-35.8 TR-36 P-35.6 BR-36 TR-36.3 P-35.8 BR-36.3

TR-35.5 P-35.2 BR-35.5 TR-35.6 P-35 BR-35.6

P-36.3 TR-36.7 BR-36.5 P-35.9 TR-36.5

MATCHLINE PAGE G

MATCHLINE PAGE G - 5

BR-34 TR-34.3 BR-34.3 TR-34.4 P-34 BR-34.4 TR-34.6 P-33

MATCHLINE PAGE G - 5

MATCHLINE PAGE G - 7

ALBEMARLE RESTORATIONS, LLC

WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION

P.O. BOX 176 •FAIRFIELD, NC 27826
(252) 333-0249 FAX (252) 926-9983

HUDSON PROPERTY

GRADING PLAN

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement Program

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET G-5

GRADING LEGEND

- PROPERTY BOUNDARY
- 29 SURVEYED CONTOURS (1FT)
- LOD LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- 29 PROPOSED CONTOURS (1FT)
- 31.6 SPOT ELEVATIONS
- PROPOSED STREAM CENTERLINE
- PROPOSED BANKFULL LIMITS
- LOW GRADIENT LOG DROP

GRADING PLAN
SCALE: 1" = 50'

0 50 100 Feet

SCALE IN FEET

Spot Elevations Label Key	
TR-33.1	Top of Riffle Elevation
BR-32.3	Bottom of Riffle Elevation
P-32.7	Pool Elevation
LD-31.1	Low Gradient Log Drop Structure Elevation

REACH 1

0+00 START OF REACH 4

5+32 END OF REACH 2

PROPOSED ROAD CROSSING (SEE SHEET D-20)

MATCHLINE PAGE G - 4

MATCHLINE PAGE G - 6

MATCHLINE PAGE G - 5

MATCHLINE PAGE G - 7

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HUDSON PROPERTY

GRADING PLAN

BEAUFORT CO., NC

EEP PROJECT ID: 95361

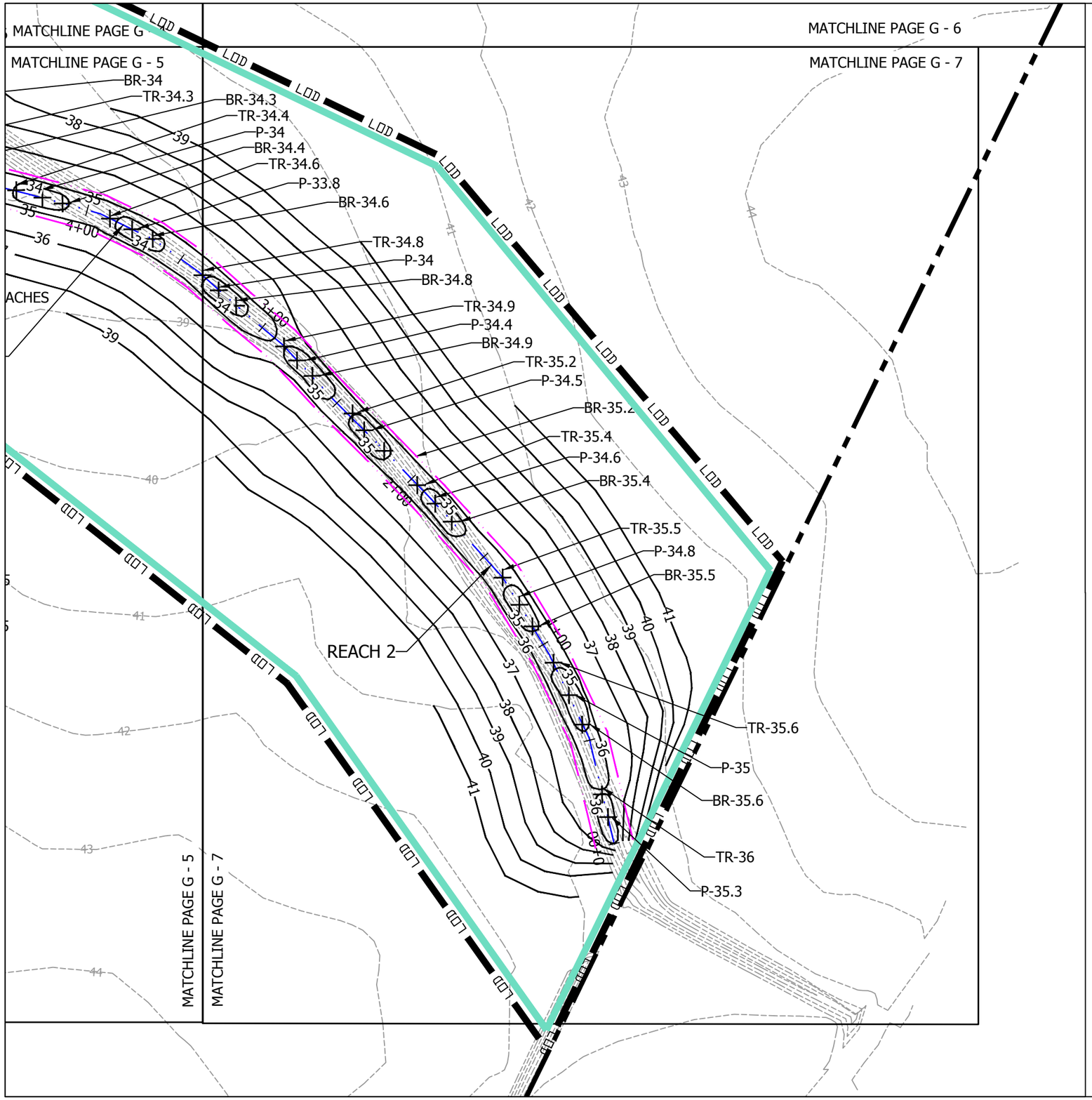
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET G-6



GRADING LEGEND

- PROPERTY BOUNDARY
- SURVEYED CONTOURS (1FT)
- LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED CONTOURS (1FT)
- SPOT ELEVATIONS
- PROPOSED STREAM CENTERLINE
- PROPOSED BANKFULL LIMITS

GRADING PLAN

SCALE: 1" = 50'

0 50 100 Feet

SCALE IN FEET

Spot Elevations Label Key	
TR-33.1	Top of Riffle Elevation
BR-32.3	Bottom of Riffle Elevation
P-32.7	Pool Elevation
LD-31.1	Low Gradient Log Drop Structure Elevation

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HUDSON PROPERTY

GRADING PLAN

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement Program

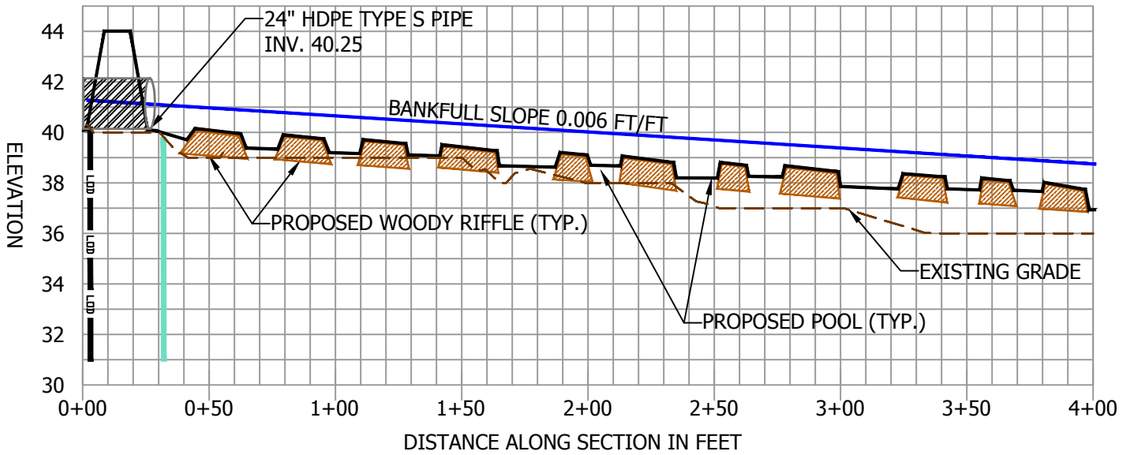
REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET G-7

REACH 1 & REACH 2 PROFILES

REACH 1 0+00 - 4+00

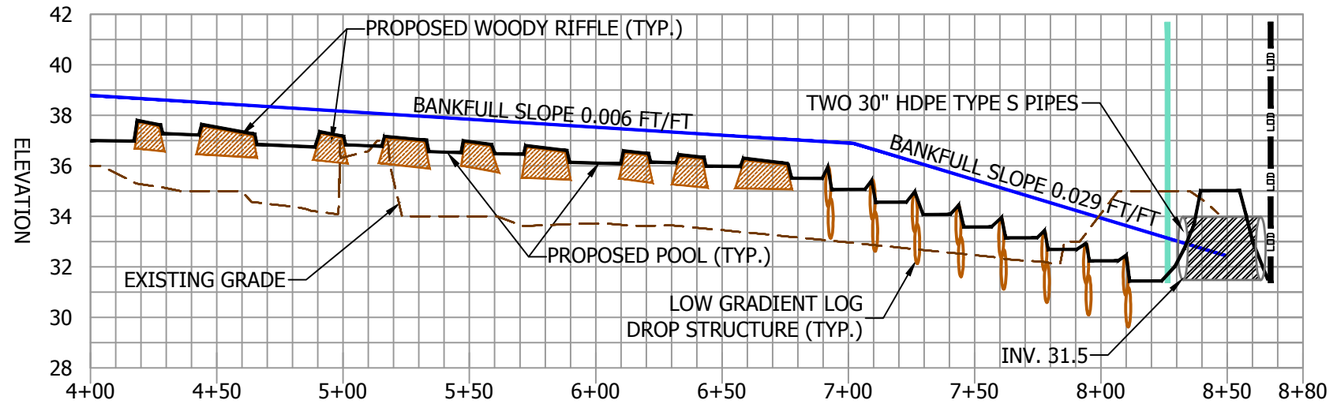


DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

PROFILE LEGEND

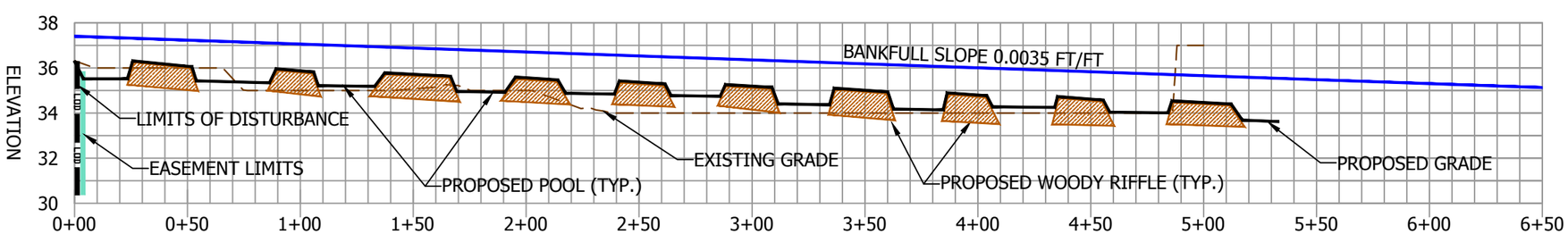
- LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED GRADING
- EXISTING GRADE
- BANKFULL SLOPE
- PROPOSED WOODY RIFFLE
- PROPOSED LOG DROP

REACH 1 4+00 - 8+50



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

REACH 2 PROFILE



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

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HUDSON PROPERTY
DETAILS & SECTIONS
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

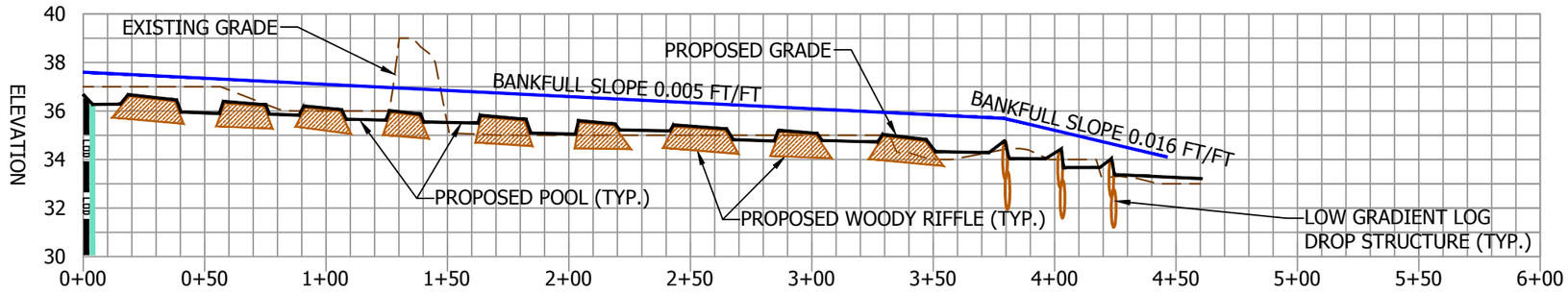
REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-1

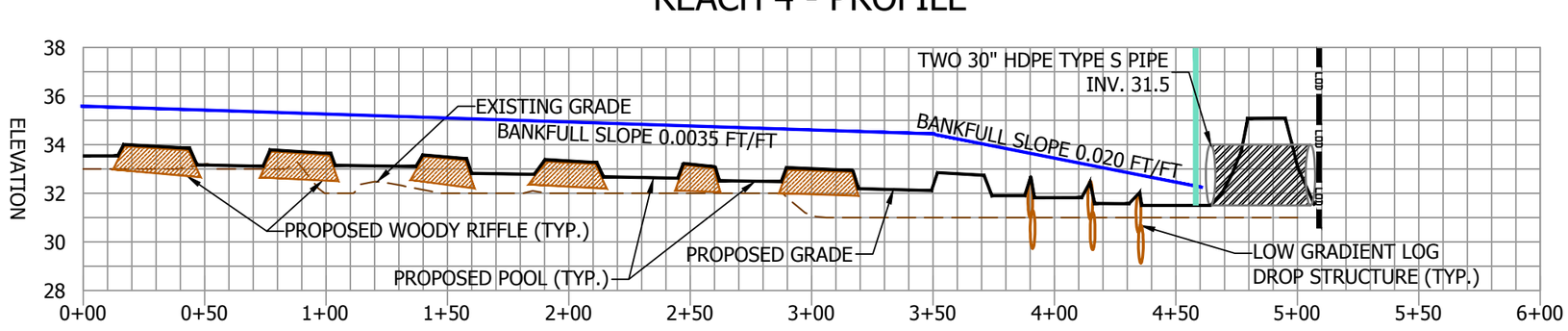
REACH 3 & 4 PROFILES

REACH 3 - PROFILE



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

REACH 4 - PROFILE



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

PROFILE LEGEND

- LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED GRADING
- EXISTING GRADE
- BANKFULL SLOPE
- PROPOSED WOODY RIFFLE
- PROPOSED LOG DROP

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DETAILS & SECTIONS
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

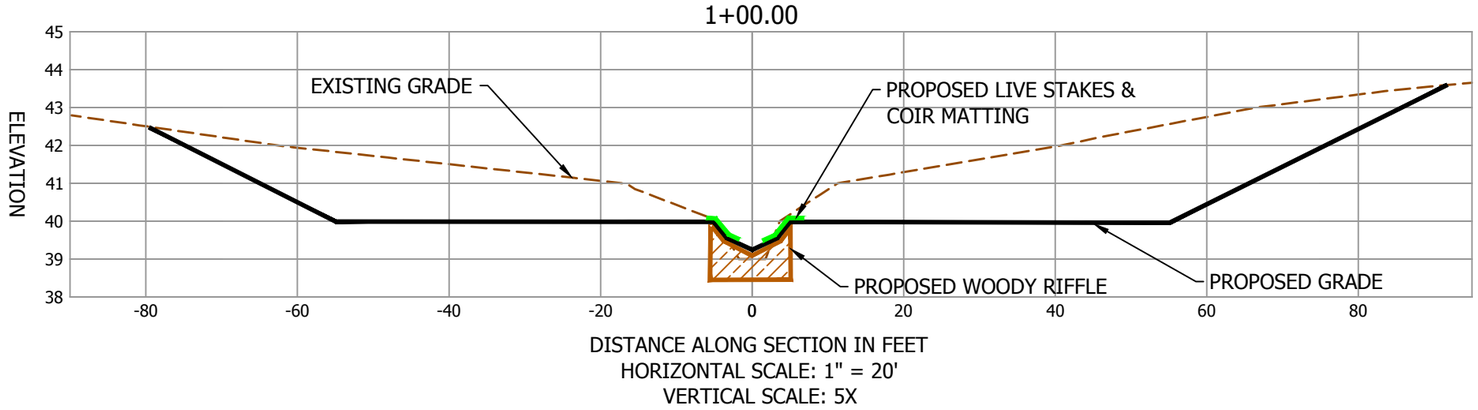
Ecosystem Enhancement Program

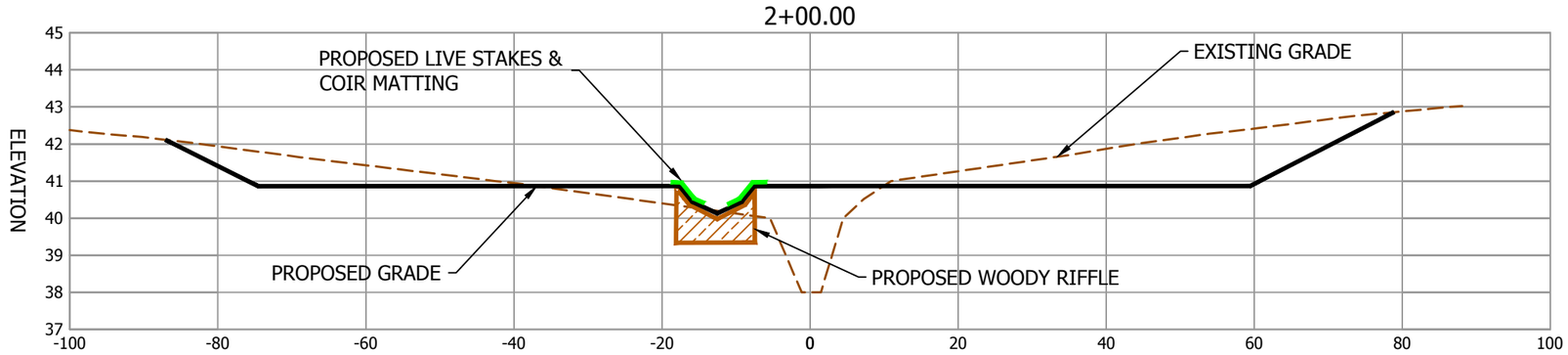
REVISIONS		
DATE	DESCRIPTION	REV. BY

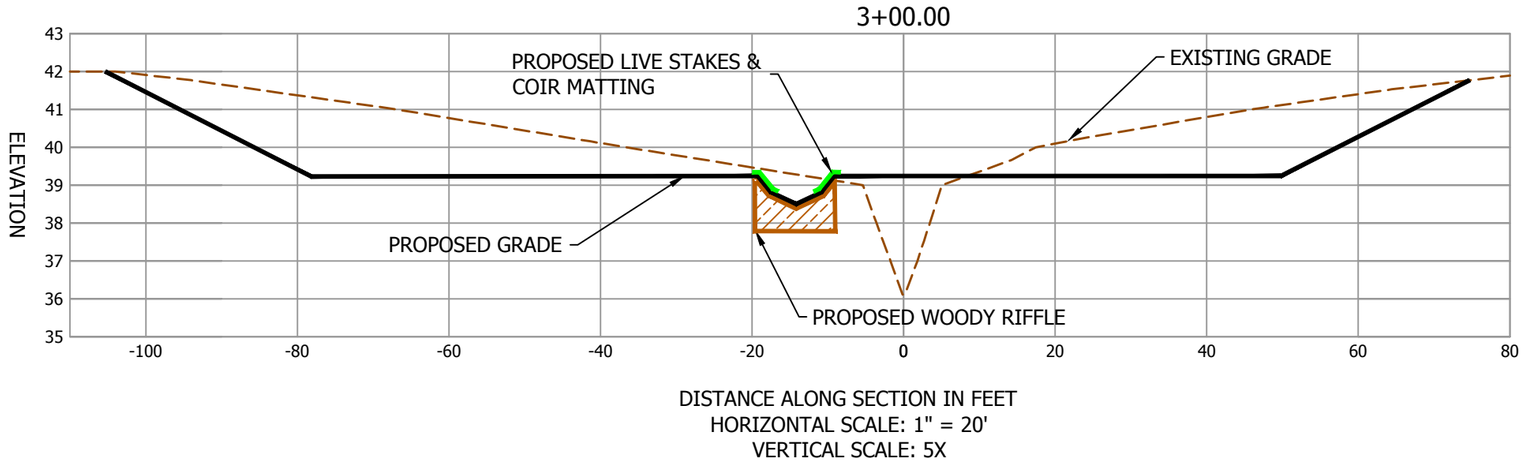
PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-2

REACH 1 CROSS SECTIONS







SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE

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HUDSON PROPERTY

DETAILS & SECTIONS

BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

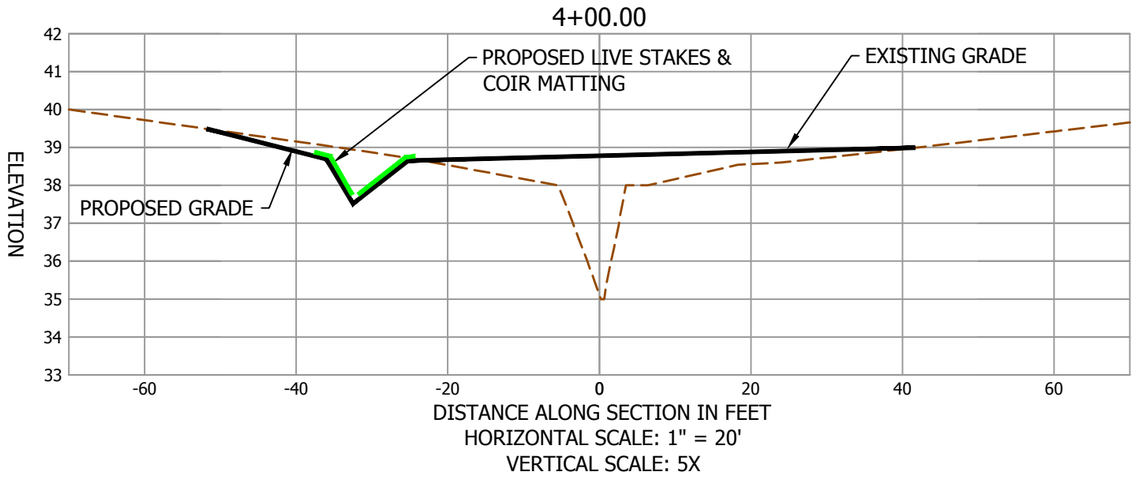
Ecosystem Enhancement Program

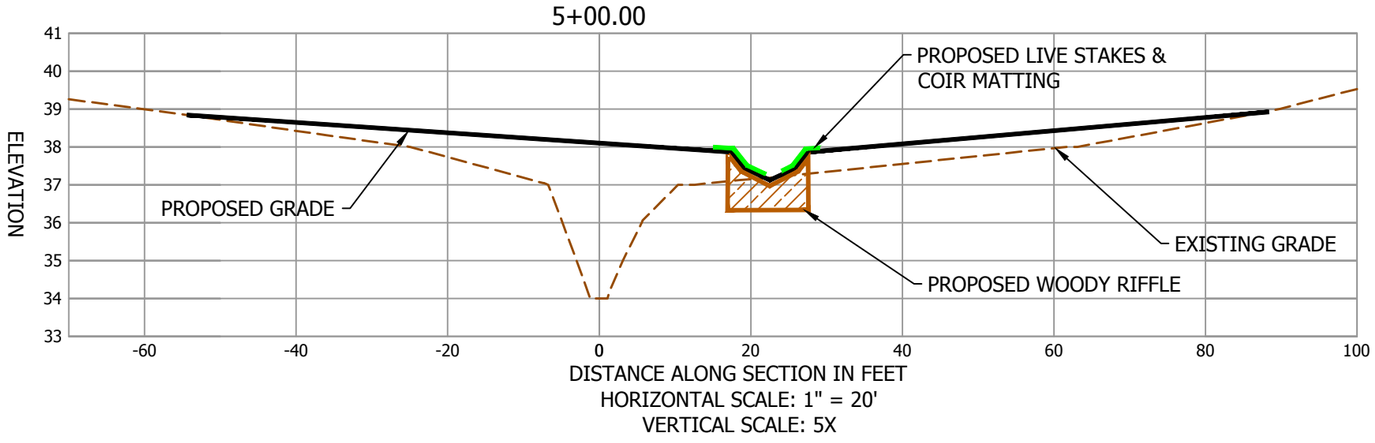
REVISIONS		
DATE	DESCRIPTION	REV. BY

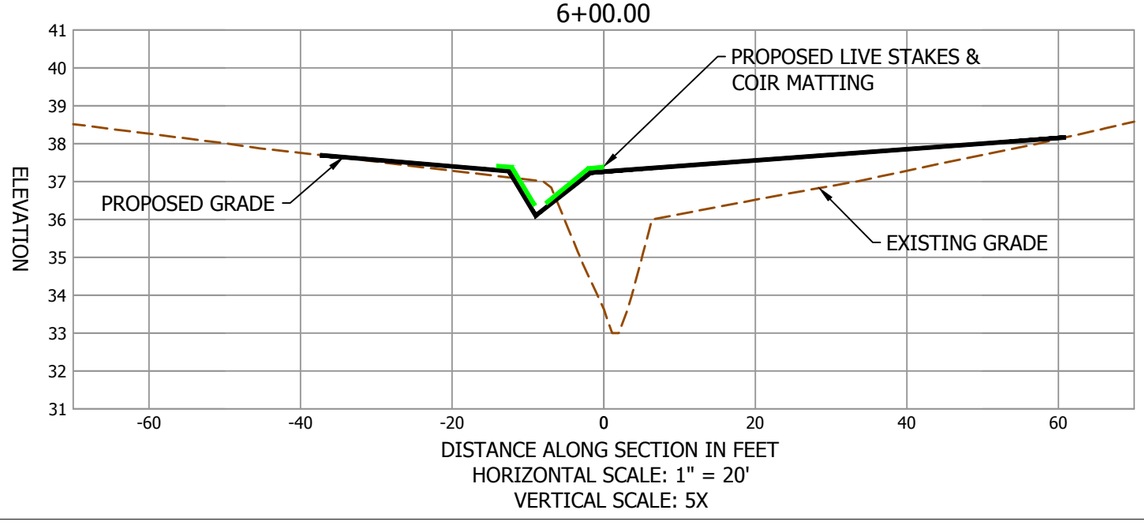
PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET D-3

REACH 1 CROSS SECTIONS







SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE

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DETAILS & SECTIONS

BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

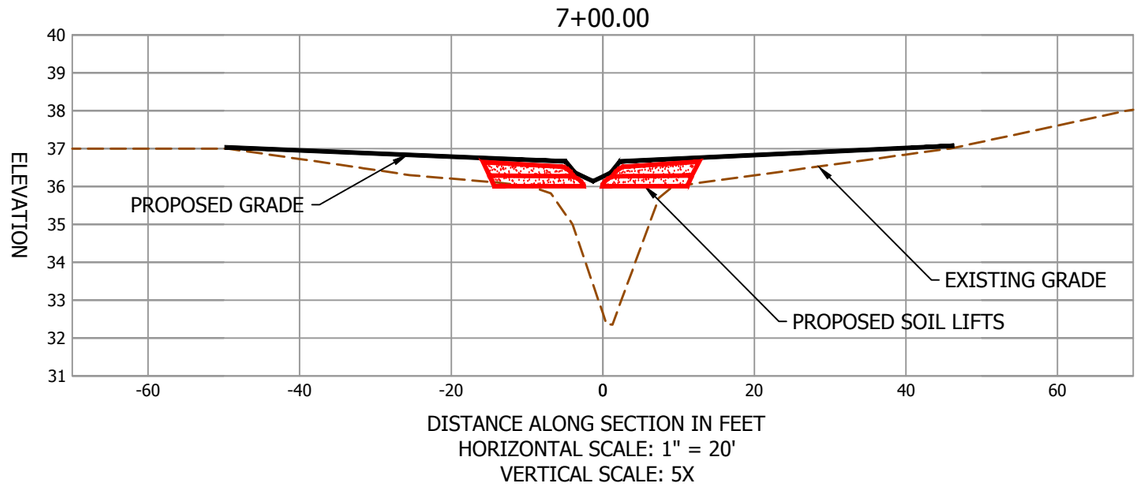
Ecosystem Enhancement PROGRAM

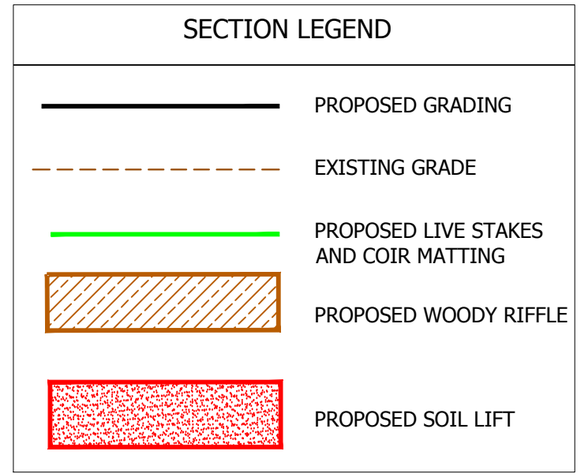
REVISIONS		
DATE	DESCRIPTION	REV. BY

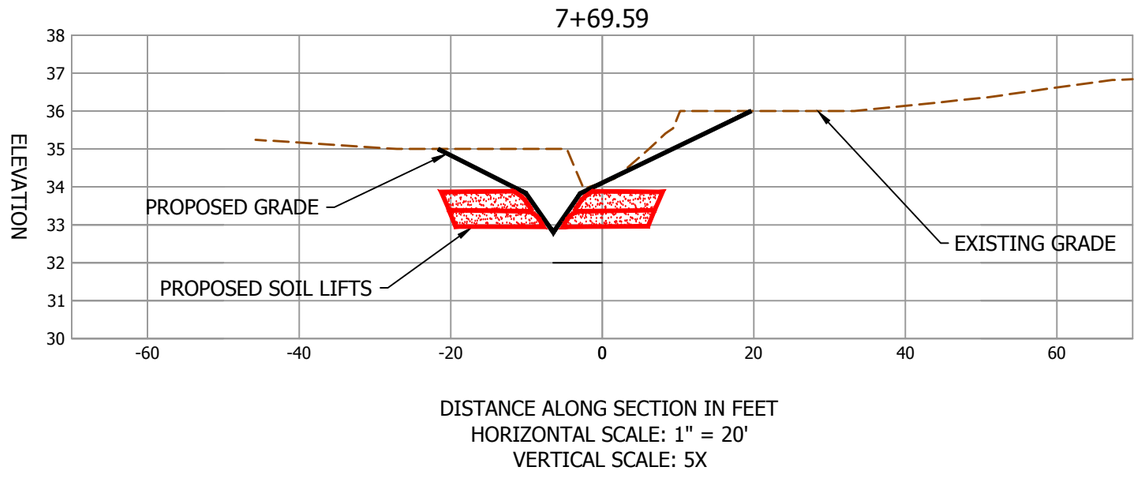
PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-4

REACH 1 CROSS SECTIONS







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HUDSON PROPERTY

DETAILS & SECTIONS

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB

DESIGNED: RBB

DRAWN: WJV

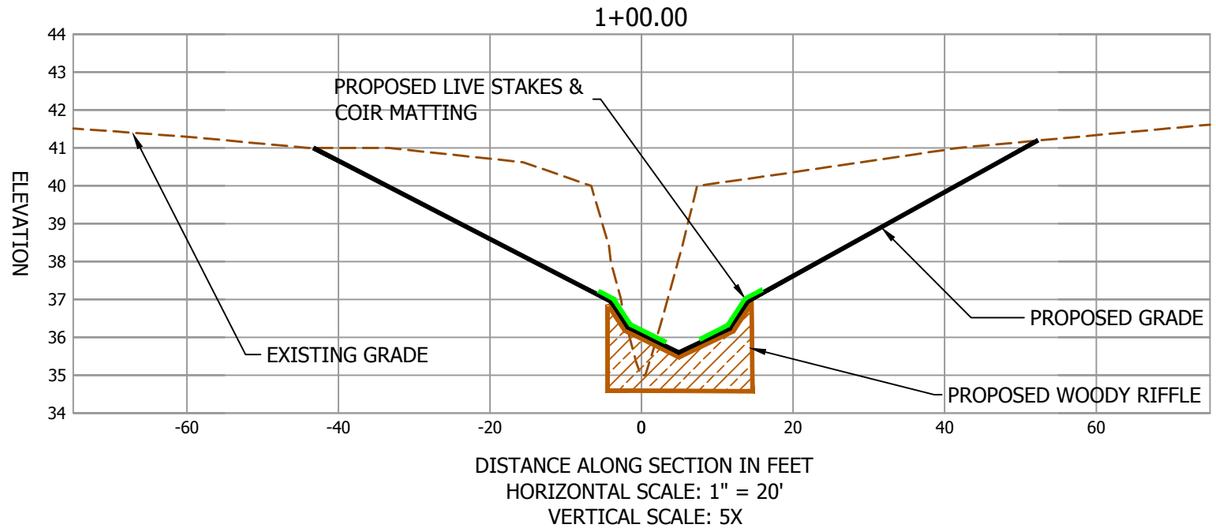
PROJECT NO. 1269

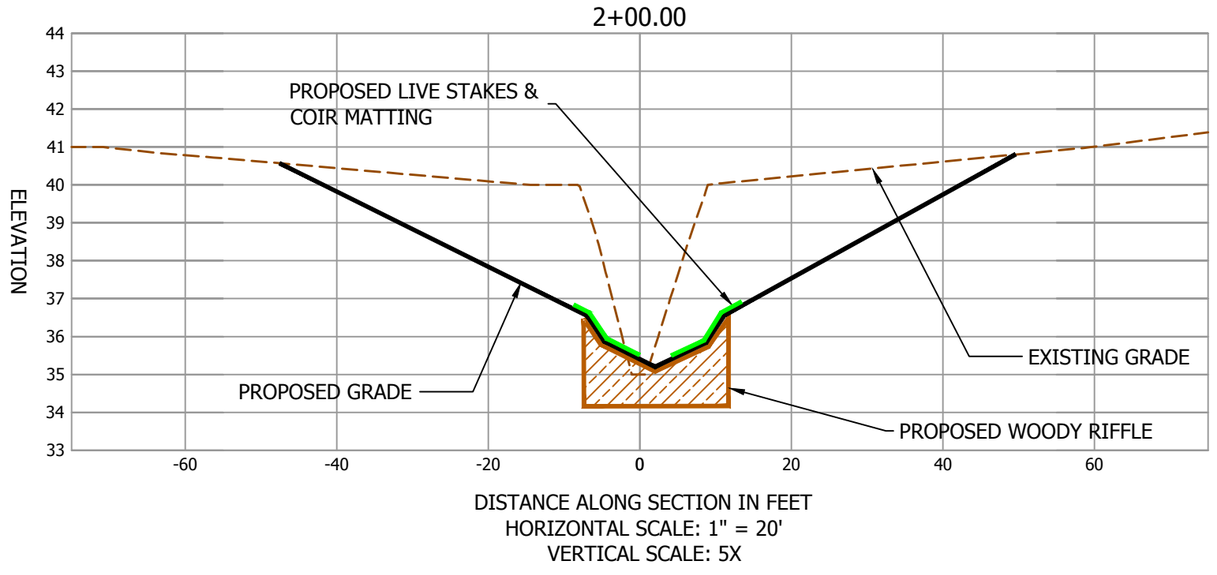
DATE: 07/07/14

SHEET:

SHEET D-5

REACH 2 CROSS SECTIONS





SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE

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HUDSON PROPERTY

DETAILS & SECTIONS

BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

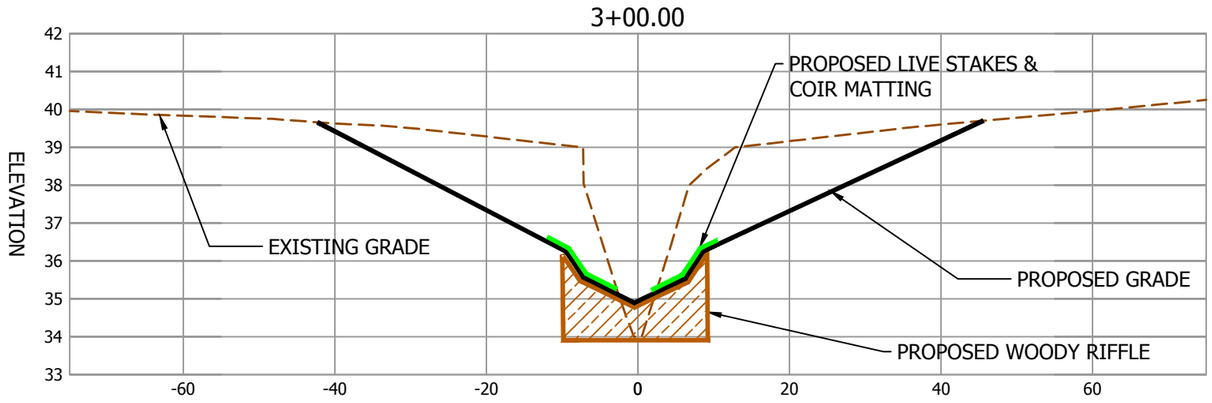
Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

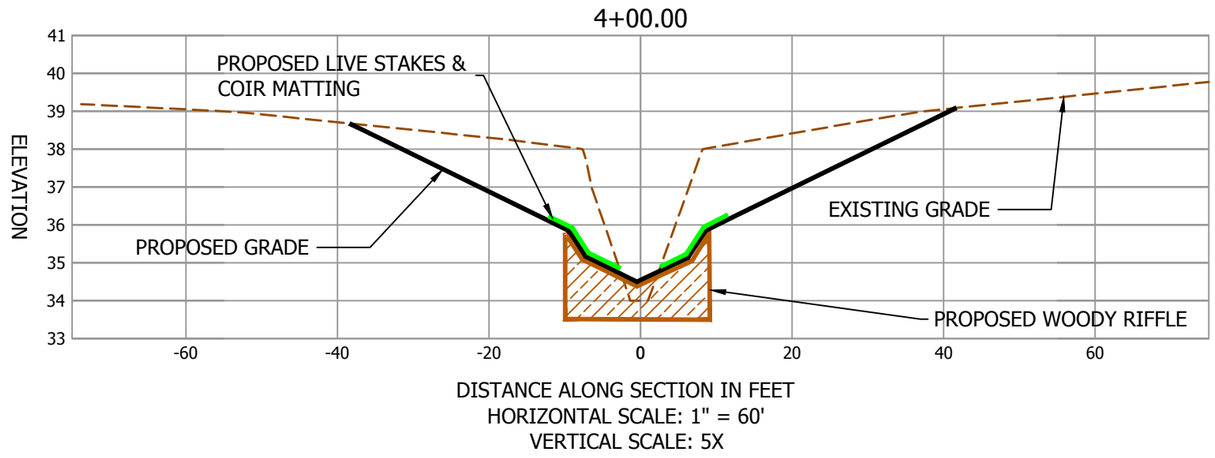
PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET D-6

REACH 2 CROSS SECTIONS



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 5X



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 5X

SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE

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HUDSON PROPERTY

DETAILS & SECTIONS

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Ecosystem Enhancement PROGRAM

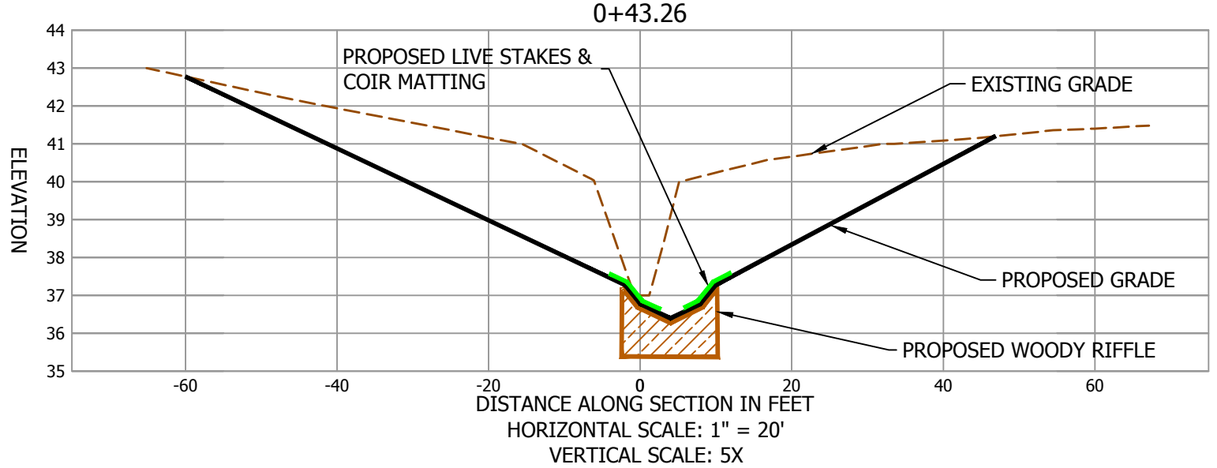
REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET D-7

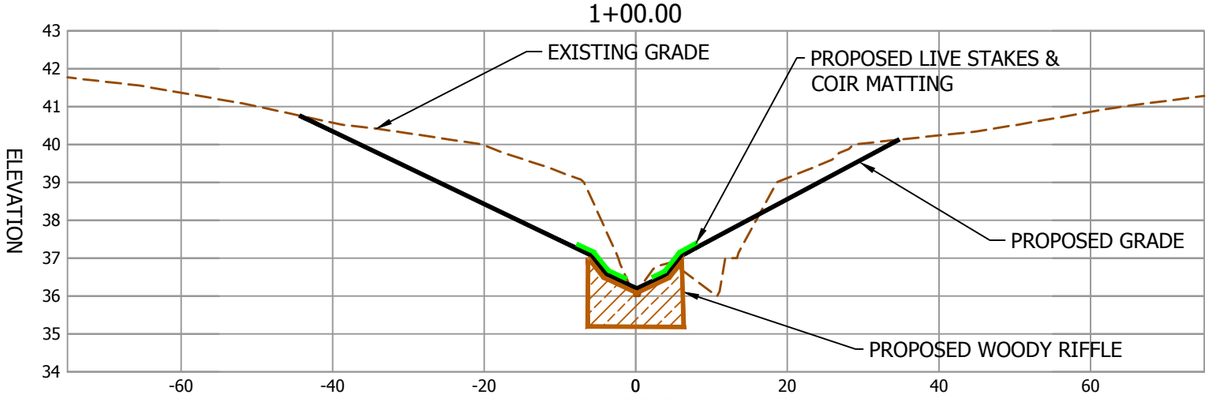
REACH 3 CROSS SECTIONS

0+43.26



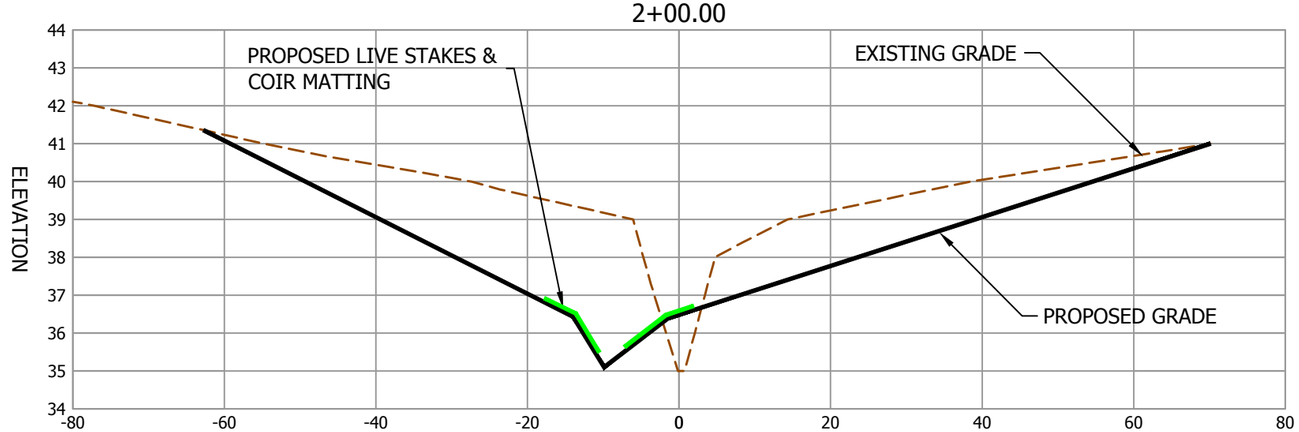
DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X

1+00.00



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X

2+00.00



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X

SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE

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HUDSON PROPERTY

DETAILS & SECTIONS

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REVISIONS		
DATE	DESCRIPTION	REV. BY

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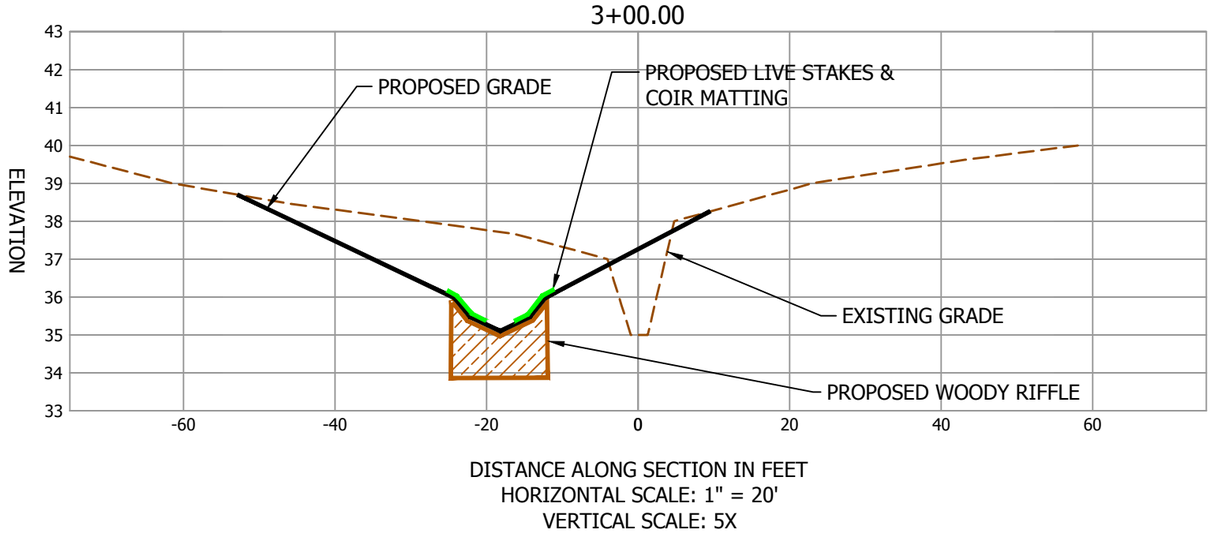
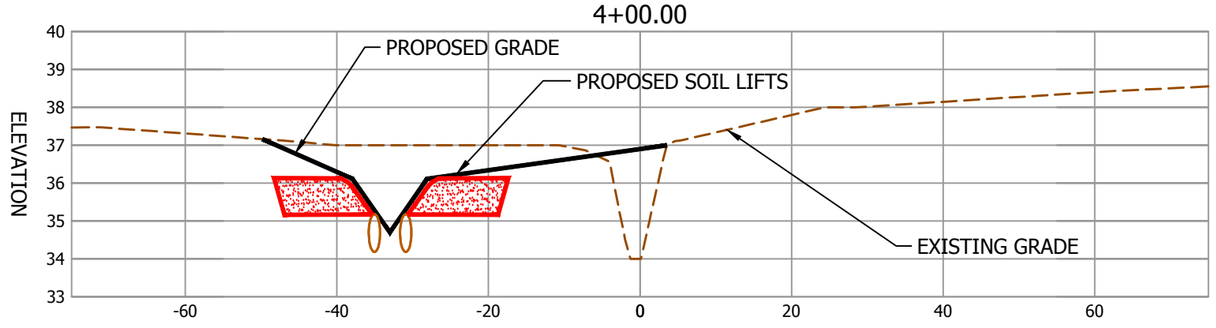
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-8

REACH 3 CROSS SECTIONS



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X

SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE
- PROPOSED SOIL LIFT

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HUDSON PROPERTY
DETAILS & SECTIONS
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EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

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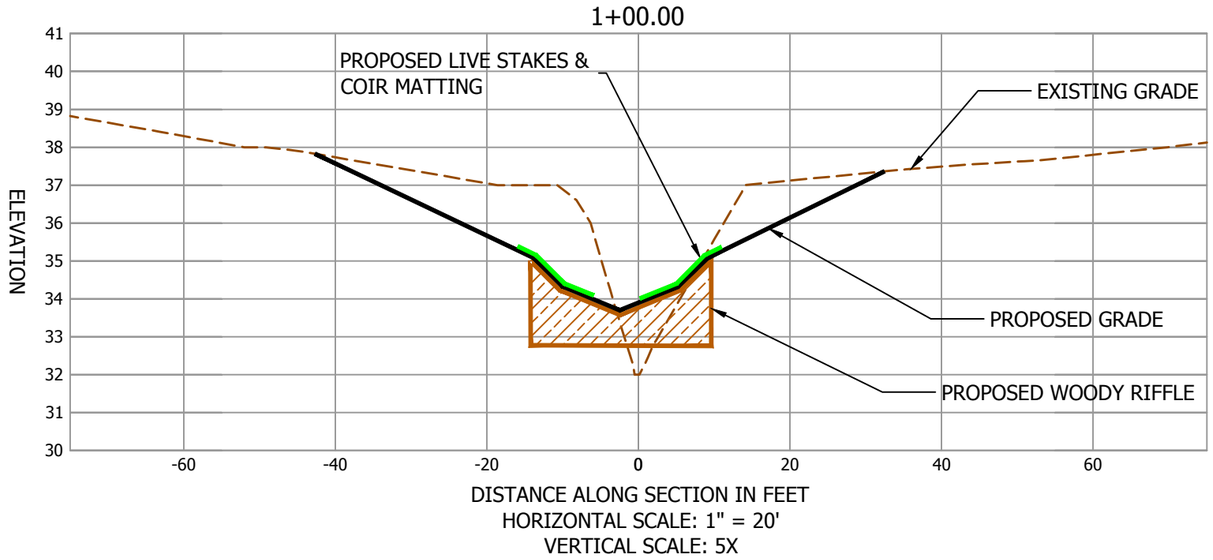
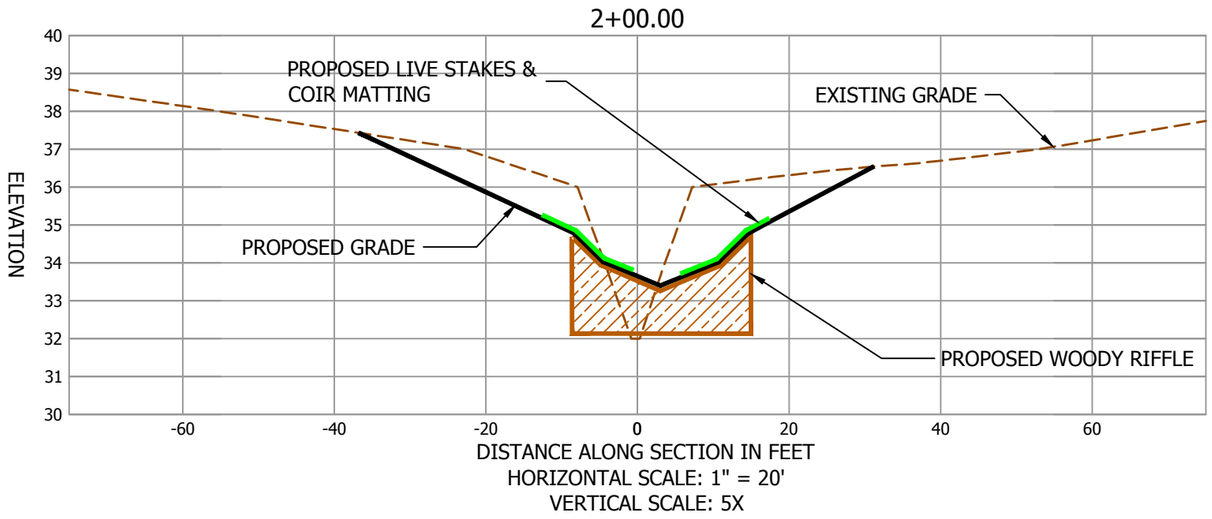
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-9

REACH 4 CROSS SECTIONS





SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE

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HUDSON PROPERTY

DETAILS & SECTIONS

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EEP CONTRACT #:004638

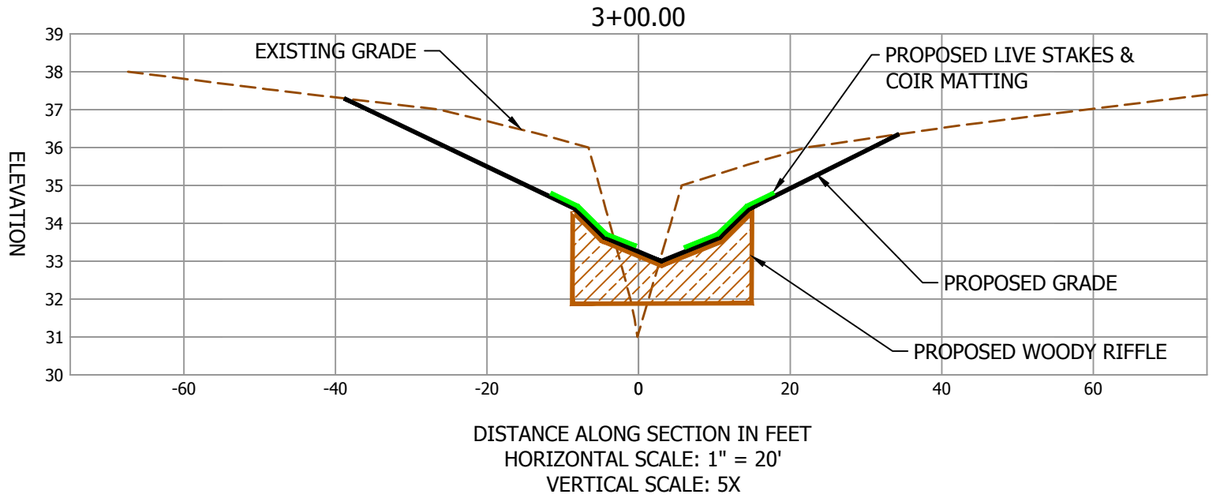
Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

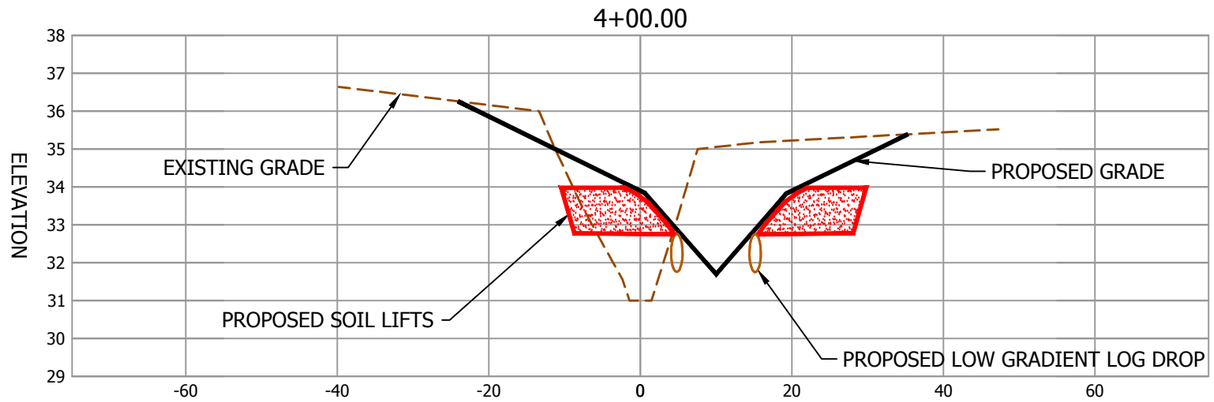
PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-10

REACH 4 CROSS SECTIONS



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 5X

SECTION LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPOSED LIVE STAKES AND COIR MATTING
- PROPOSED WOODY RIFFLE
- PROPOSED SOIL LIFT

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HUDSON PROPERTY

DETAILS & SECTIONS

BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

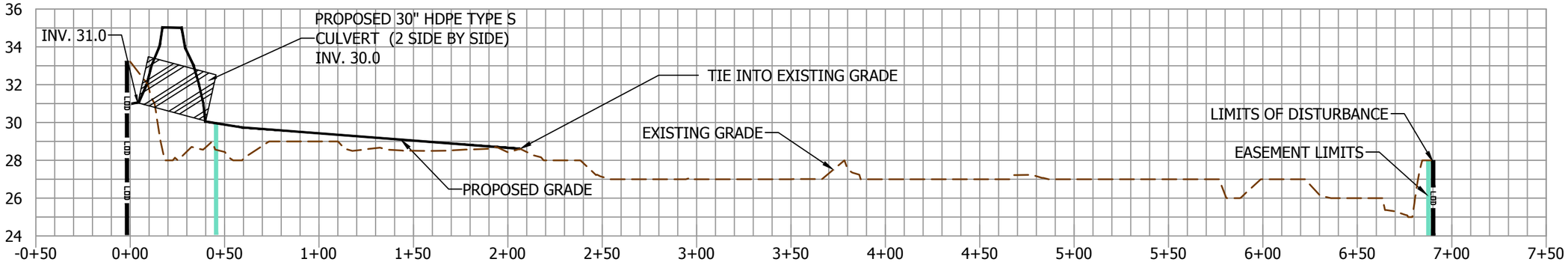
REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-11

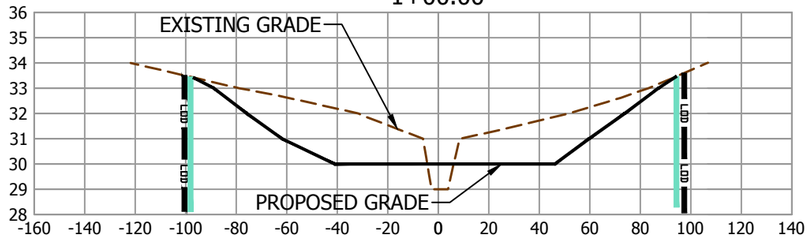
REACH 5 PROFILES AND CROSS SECTIONS

REACH 5 - PROFILE



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

1+00.00



DISTANCE ALONG SECTION IN FEET
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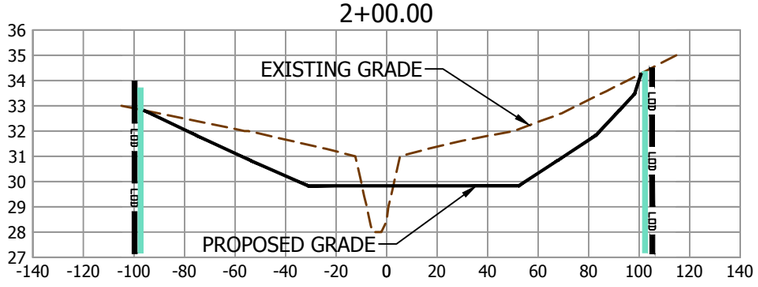
VERTICAL SCALE: 10X

2+00.00



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

LEGEND

- LOD LOD — LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED GRADING
- EXISTING GRADE

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STREAM RESTORATION, &
WILDLIFE HABITAT CREATION

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HUDSON PROPERTY
GRADING DETAIL
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/2014
SHEET:	

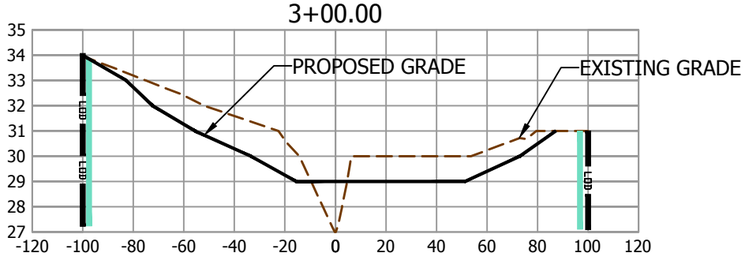
SHEET D-12

REACH 5 CROSS SECTIONS

LEGEND

- LOD — LOD — LIMITS OF DISTURBANCE
- PROPOSED CONSERVATION EASEMENT LIMITS
- PROPOSED GRADING
- EXISTING GRADE

3+00.00



DISTANCE ALONG SECTION IN FEET
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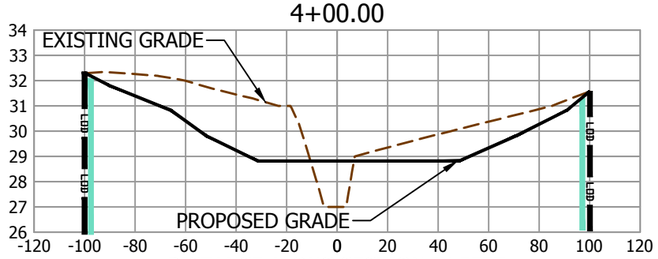
VERTICAL SCALE: 10X

4+00.00



DISTANCE ALONG SECTION IN FEET
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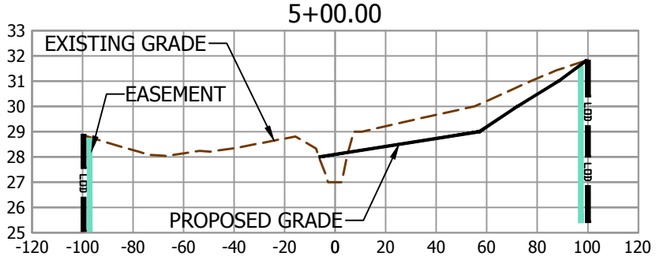
VERTICAL SCALE: 10X

5+00.00



DISTANCE ALONG SECTION IN FEET
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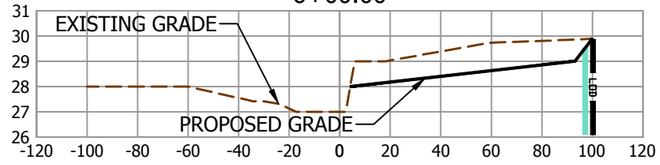
VERTICAL SCALE: 10X

6+00.00



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 60'
VERTICAL SCALE: 10X

ALBEMARLE RESTORATIONS, LLC

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STREAM RESTORATION, &
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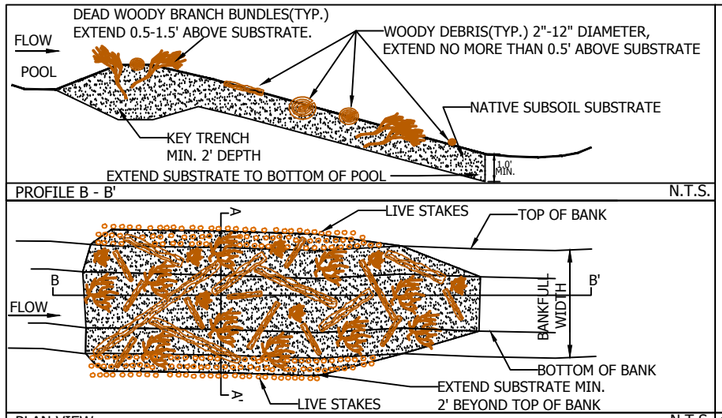
HUDSON PROPERTY
DETAILS & SECTIONS
2,990 SMU'S
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

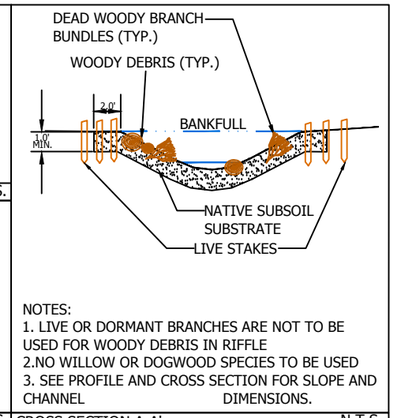
Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

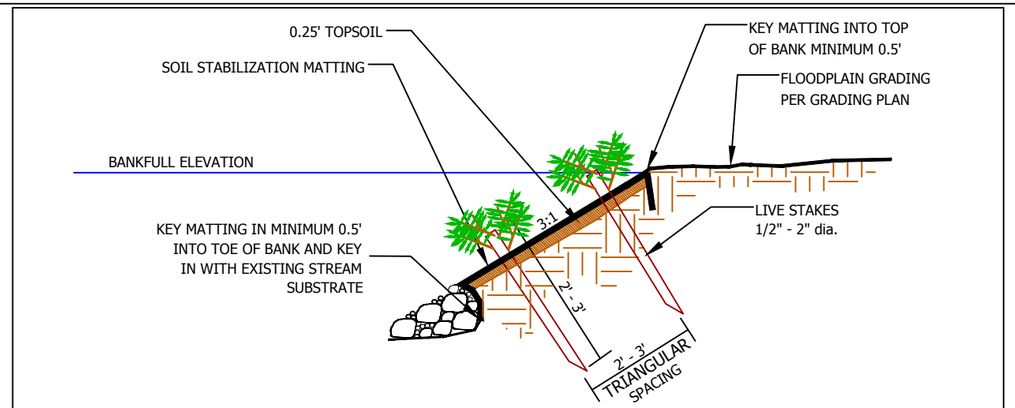
PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/2014
SHEET:	

SHEET D-13





WOODY DEBRIS RIFFLE DETAIL - COASTAL PLAIN



SOIL STABILIZATION MATTING AND LIVE STAKING DETAIL N.T.S

RIFFLE GRADE CONTROL STRUCTURE WITH EMBEDDED WOODY BRANCHES INSTALLATION

1. DESCRIPTION

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

2. MATERIALS

Riffle Substrate

1. Riffle substrate material shall be subsoil excavated on site.
2. The organic content of material shall be less than 5 percent by weight (not including Dead Woody Debris described below).

Dead Woody Debris

1. Dead woody material shall range in size between 2-12 inches in diameter (maximum) and 18-30 inches in length.
2. Dead woody branches shall be from native trees and shrubs. No exotic or invasive species are to be used.
3. All branches must be dead for more than three months and less than 12 months.
4. No willow (Salix) or shrub dogwood (Cornus serciea, Cornus mas or Cornus racemosa) species are to be used.

3. CONSTRUCTION

1. Work shall proceed from downstream to upstream.
2. Excavate existing channel to form subgrade of proposed riffle sequence.
3. Fill with cobble portion of riffle substrate mix.
4. Install dead branches in voids of gravel such that base of branches will be buried at least one foot in substrate mix and tips extend at least 0.5 foot to 1.5 feet above top of proposed grade.
5. Install gravel portion of riffle substrate mix, ensuring that branch tips are not buried. Create low flow channel at stream centerline by grading riffle substrate mix at 15:1 slope from banks toward center of channel.
6. Dead woody branches that extend more than 18" above the riffle substrate shall be trimmed.
6. Bottom of upstream riffle and top of downstream riffle are to be set at the same elevation.
7. Grade banks to bankfull elevation and grade floodplain as shown on grading plan. Grout channel bank areas of riffle structure (above base flow) with topsoil.

SOIL STABILIZATION MATTING AND LIVE STAKING INSTALLATION

1. DESCRIPTION

1. This work shall consist of installing soil stabilization matting and harvesting, transporting, installing and maintaining live staking materials.
2. Harvesting, transporting, and installation shall take place when plants are dormant (December 1 through April 1).
3. Soil stabilization matting and live stakes are to be installed after Riffle Grade Control Structure has been completed.

2. MATERIALS

Live Stakes

1. Live stakes shall be between one ½ inch and 2 inches in diameter.
2. Stakes shall be 3 to 5 feet in length and all side branckes shall be clipped flush with stem.
3. Live stakes shall consist of a mix of *Cornus amomum* - Silky dogwood and *Salix nigra* - Black willow

Soil Stabilization Matting

1. Matting shall be woven machine spun bristle coir twine made of coir fiber obtained from fesh water cured coconut husks.
2. Soil stabilization matting shall conform to the following specifications:
   - Weight: 29 oz/sy (ASTM D 3776)
   - Thickness: 0.35 in. (ASTM D 1777)
   - Dry Tensile Strength: Machine Direction - 2024 lbs/sf
     Cross Direction - 1160 lbs/sf
     (ASTM D 4595)
   - Wet Tensile Strength: Machine Direction - 1776 lbs/sf
     Cross Direction - 936 lbs/sf
     (ASTM D 4595)
   - Open Area: 38%

3. CONSTRUCTION

Soil Stabilization Matting:

1. Seed streambank areas with permanent seed mix.
2. Matting shall be placed within 48 hours after seeding operations have been completed. Matting shall be laid smoothly and firmly upon the seeded bed in the direction of the water flow with downslope edge keyed a minimum of one foot behind the boulder toe (between the boulder toe and geotextile fabric). Stretching shall be avoided.
3. Where more than one width of matting is required, the ends of each strip shall overlap at least 1 foot for both vertical and horizontal overlaps. Overlapping shall be done with the up-slope matting overlapping the down-slope matting and the upstream matting overlapping the downstream matting.
4. Matting shall be firmly fastened in place with staples driven vertically into the soil and flush with the surface. Staples shall be placed on 2-foot centers throughout the matting and along the edges of the matting.
5. The contractor shall excavate a shallow trench along the up-slope, down-slope, and vertical edges of the matting at both the upstream and downstream edges of the matting. The matting shall be keyed into the trench a minimum of 6 inches. Following the installation of the staples, the matting shall be backfilled with soil and tamped firmly.

Live Staking:

1. Cuttings shall be installed two (2) to three (3) feet apart using random, triangular spacing. The density of the spacing will range from two (2) to four (4) cuttings per square yard. Site variations may require spacing adjustments. The cuttings shall not be installed more than two (2) feet above the mean average water elevation (base flow) of the stream.
2. The basal end of the cutting shall be cleanly cut at an angle immediately before insertion into the soil. The top of the cutting shall be cut square for tamping.
3. Install the cuttings right side up, with any buds pointing upward. The cuttings shall be tamped into the ground for approximately four-fifths (4/5) of their length. The cuttings shall be tamped into the ground at vertical angle of ninety (90) degrees to the slope and at a horizontal angle of forty-five (45) degrees downstream. A three-eighths (3/8) of an inch iron bar can be used to make a pilot hole in compacted or rocky soils, or between imbricated rip rap boulders.
4. Foot compact around each cutting after it has been installed. Any cuttings that split during tamping shall be pulled out and replaced.
5. The top of the cutting shall be cut square again after installation to remove the damaged mushroom top.

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P.O. BOX 176 •FAIRFIELD, NC 27826
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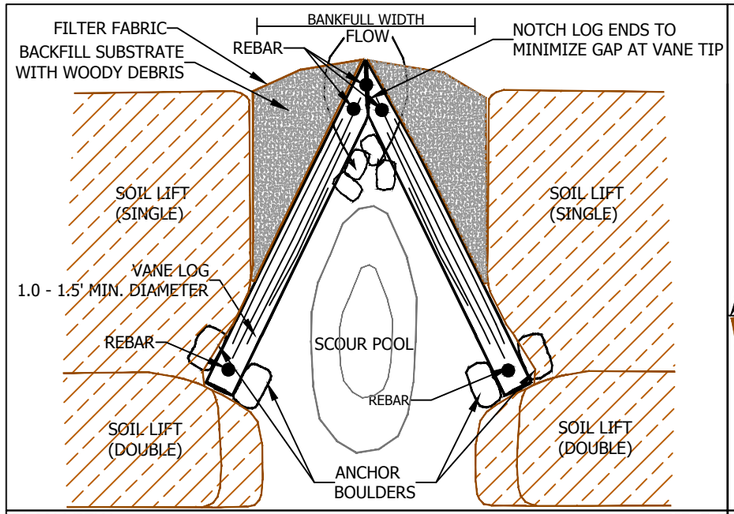
HUDSON PROPERTY
DETAILS & SECTIONS
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

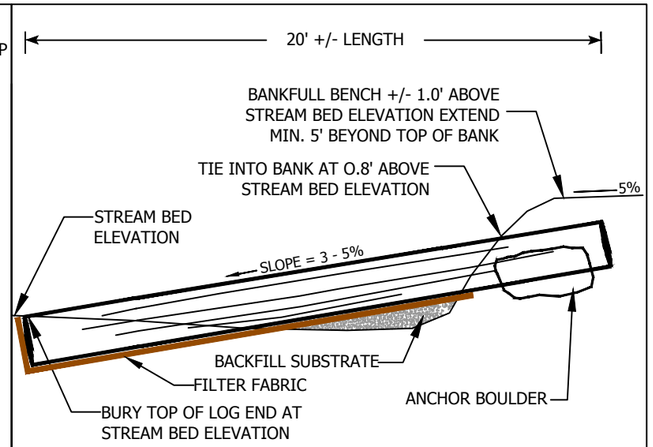
REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-14



PLAN VIEW N.T.S.



LOG DROP PROFILE N.T.S.

LOW GRADIENT LOG DROP DETAIL

LOW GRADIENT LOG DROP INSTALLATION

1. DESCRIPTION

This work shall consist of installing a low gradient log drop structure to provide grade control, bank stability and minimize near bank stress.

2. MATERIALS

Logs

Logs shall be hardwood species (No Liriodendron tulipifera), have a minimum length of 20 feet and a minimum diameter of 1.0 foot. All material shall be free of rot and evidence of pests. All branches and root mass shall be removed.

Backfill Substrate

1. Riffle substrate material shall be subsoil excavated on site.
2. The organic content of material shall be less than 5 percent by weight (not including Dead Woody Debris described below).

Dead Woody Debris

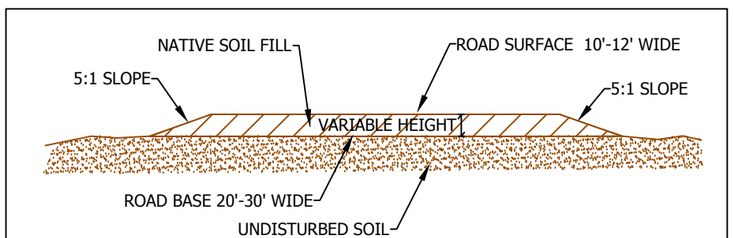
1. Dead woody material shall range in size between 2-12 inches in diameter (maximum) and 18-30 inches in length.
2. Dead woody branches shall be from native trees and shrubs. No exotic or invasive species are to be used.
3. All branches must be dead for more than three months and less than 12 months.
4. No willow (Salix) or shrub dogwood (Cornus serciea, Cornus mas or Cornus racemosa) species are to be used.

Anchor Boulders

Anchor boulders shall be consist of Class II Riprap.

3. CONSTRUCTION

1. Rough grade channel and floodplain areas prior to installing logs.
2. Excavate trench for vane log so that tip of log will be flush with proposed stream bed elevation at thalweg and log ties into the bank at approximately 0.8 times the bankfull elevation.
3. Install vane log and backfill with cobble/gravel backfill. Ensure that all voids have been filled on the upstream side of log and beneath.
4. Excavate trench for opposing vane log.
5. Install log with tip at same elevation as previously installed log and bank tie in point at same elevation as first log. logs shall be notched so that the lowest point is at the tip where the logs meet. Secure log tips with a 3 foot section of rebar.
6. Backfill remaining areas with cobble/gravel mix, ensuring that all voids have been filled.
7. Grade banks, seed and mulch per bank treatment specifications and details.



ACCESS ROAD DETAIL - SECTION VIEW N.T.S.

ACCESS ROAD INSTALLATION

1. DESCRIPTION

This work shall consist of installing a 25-30' wide access road to provide long term access to and from the mitigation site.

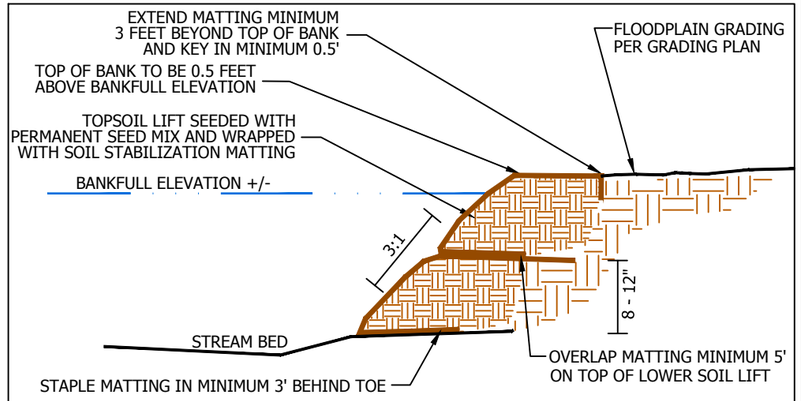
2. MATERIALS

Soil

Soil material shall consist of native soil excavated from within the construction limits that is free of debris, rocks, or other coarse material.

3. CONSTRUCTION

1. Rough grade access road by filling up to desired height/elevation with native soil depending on location within the site.
2. Rough grade the side slopes of the access road to a 5:1 slope.
3. Access road material shall be compacted to desired density.
4. Apply temporary seed mix to denuded areas.



NOTE:
SOIL LIFTS TO BE INSTALLED IN LOG VANE SECTIONS ONLY (SEE SHEET D-15): SOIL LIFTS EXTEND TO TOE OF BANK. SINGLE WRAP SOIL LIFTS ARE TO BE APPLIED ADJACENT TO LOG VANES, DOUBLE WRAP SOIL LIFTS ARE TO BE APPLIED INBETWEEN LOG VANES. SEE SOIL STABILIZATION MATTING AND LIVE STAKES DETAIL FOR MATTING SPECS.

SOIL LIFTS DETAIL N.T.S

SOIL LIFT INSTALLATION

1. DESCRIPTION

This work shall consist installation of soil lifts using coir fiber soil stabilization matting .

2. MATERIALS

Soil

Soil material for the soil lifts shall consist of soil excavated from within the construction limits or supplied topsoil that meets the specifications for topsoil. Fill material shall be compacted to 0.75 Proctor density.

Soil Stabilization Matting

1. Matting shall be woven machine spun bristle coir twine made of coir fiber obtained from fesh water cured coconut husks.
2. Soil stabilization matting shall conform to the following specifications:
   - Weight: 29 oz/sy (ASTM D 3776)
   - Thickness: 0.35 in. (ASTM D 1777)
   - Dry Tensile Strength: Machine Direction - 2024 lbs/sf
     Cross Direction - 1160 lbs/sf
     (ASTM D 4595)
   - Wet Tensile Strength: Machine Direction - 1776 lbs/sf
     Cross Direction - 936 lbs/sf
     (ASTM D 4595)
   - Open Area: 38%

3. CONSTRUCTION

1. Excavate stream bank down to stream bottom elevation.
2. Soil stabilization matting shall be placed from stream bottom, extending approximately 3 feet behind bank toe. Secure the back end of the matting with sod staples to prevent movement during backfill operations. Excess matting will extend toward the center of the channel and should be folded or rolled to avoid tears or puntures by equipment.
3. Where soil stabilization matting roll ends overlap (perpendicular to stream profile), overlap matting a minimum of 5 feet. One width of matting (6 feet) is to be used for the soil lift. No overlap of matting edges is allowed.
4. Backfill from back edge of matting to meet the proposed grade and compact to form a 3:1 slope.
5. Apply permanent seed mix to front portion of lift.
6. Extend excess soil stabilization matting along surface of slope and across top of lift a minimum of three feet, pulling matting taut but not stretched such that contact with soil is maintained in all areas.
10. Repeat steps 2 through 6 until desired elevation is met. Repeat steps 2 through 6 for double soil lift sections.
11. For double soil lift sections and the top final soil lift, extend excess soil stabilization matting along surface of slope and across floodplain a minimum of three feet, pulling matting taut but not stretched such that contact with soil is maintained in all areas.
12. Key soil stabilization matting into floodplain a minimum of 6 inches on rear edge of soil lift.

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HUDSON PROPERTY
DETAILS & SECTIONS
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY
12/16/13	Revise details and specs.	RBB

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

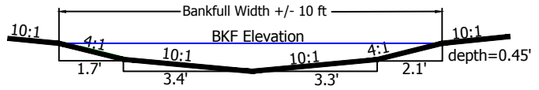
SHEET D-15

REACHES 1 - 4 LOW SLOPE TYPICAL SECTIONS

REACH 1

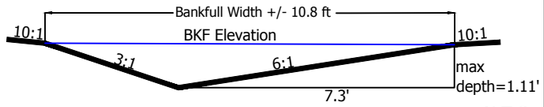
TYPICAL CROSS SECTION - RIFFLE

width=10' depth=0.5' max depth= 0.7' XS area=4.6 sf



TYPICAL CROSS SECTION - POOL

width=10.8' max depth=1.1'

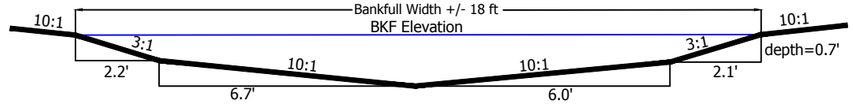


N.T.S.

REACH 2

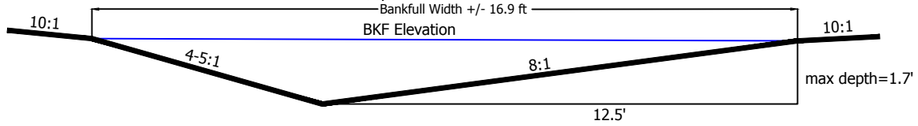
TYPICAL CROSS SECTION - RIFFLE

width=18' depth=0.7' max depth=1.35' XS area=15 sf



TYPICAL CROSS SECTION - POOL

width=16.9' max
depth=1.7'

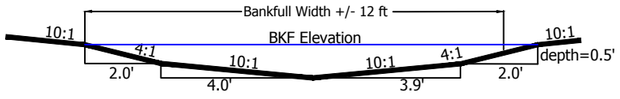


N.T.S.

REACH 3

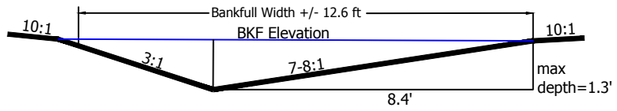
TYPICAL CROSS SECTION - RIFFLE

w=12' depth=0.5' max depth=0.9' XS area=4.6 sf



TYPICAL CROSS SECTION - POOL

width=12.6' max depth=1.3'

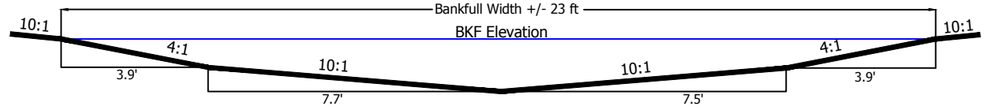


N.T.S.

REACH 4

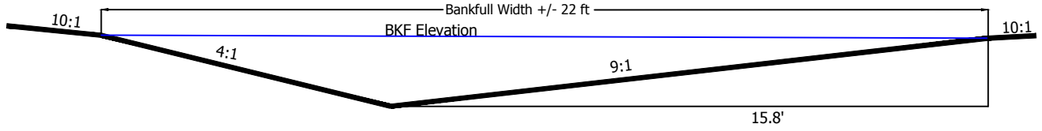
TYPICAL CROSS SECTION - RIFFLE

width=23' depth=0.8' max depth=1.4' XS area=19 sf



TYPICAL CROSS SECTION - POOL

width=23' max depth=1.8'



N.T.S.

ALBEMARLE RESTORATIONS, LLC

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WILDLIFE HABITAT CREATION

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(252) 333-0249 FAX (252) 926-9983

HUDSON PROPERTY

DETAILS & SECTIONS

BEAUFORT CO., NC

EEP PROJECT ID: 95361

EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB

DESIGNED: RBB

DRAWN: WJV

PROJECT NO. 1269

DATE: 07/07/14

SHEET:

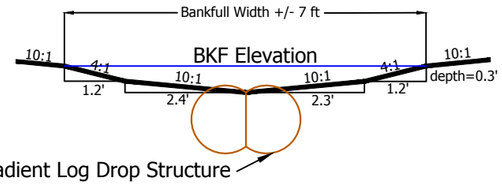
SHEET D-16

REACHES 1, 3 AND 4 TRANSITION TYPICAL SECTIONS

REACH 1

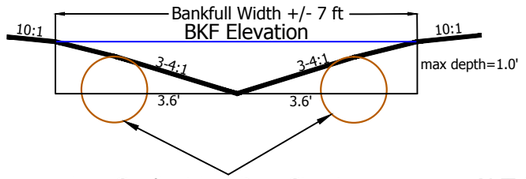
TYPICAL CROSS SECTION - RIFFLE

width=7' depth=0.3' max depth= 0.5' XS area=2.3 sf



TYPICAL CROSS SECTION - POOL

width=7' max depth=1.0'

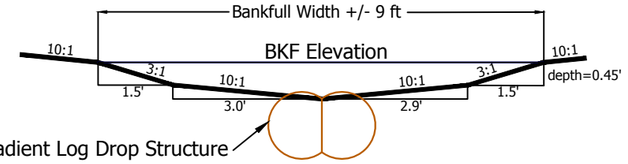


N.T.S.

REACH 3

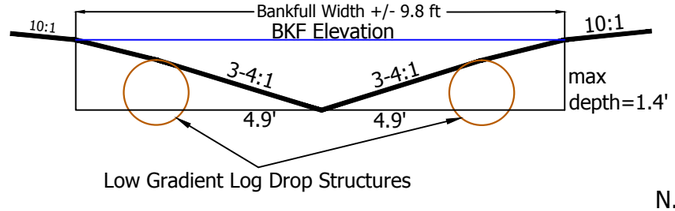
TYPICAL CROSS SECTION - RIFFLE

w=9' depth=0.45' max depth=0.7' XS area=4.2 sf



TYPICAL CROSS SECTION - POOL

width=9.8' max depth=1.4'

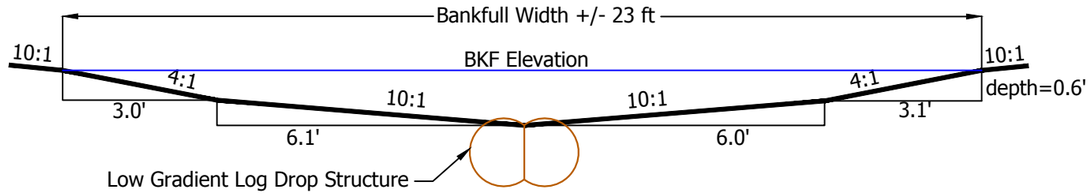


N.T.S.

REACH 4

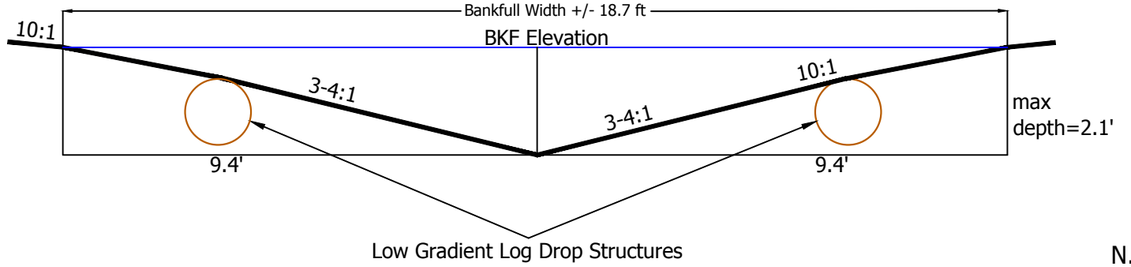
TYPICAL CROSS SECTION - RIFFLE

width=18.2' depth=0.6' max depth=1.0' XS area=12 sf



TYPICAL CROSS SECTION - POOL

width=18.7' max depth=2.1'



N.T.S.

ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION,
STREAM RESTORATION, &
WILDLIFE HABITAT CREATION
P.O. BOX 176 •FAIRFIELD, NC 27826
(252) 333-0249 FAX (252) 926-9983

HUDSON PROPERTY
DETAILS & SECTIONS
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

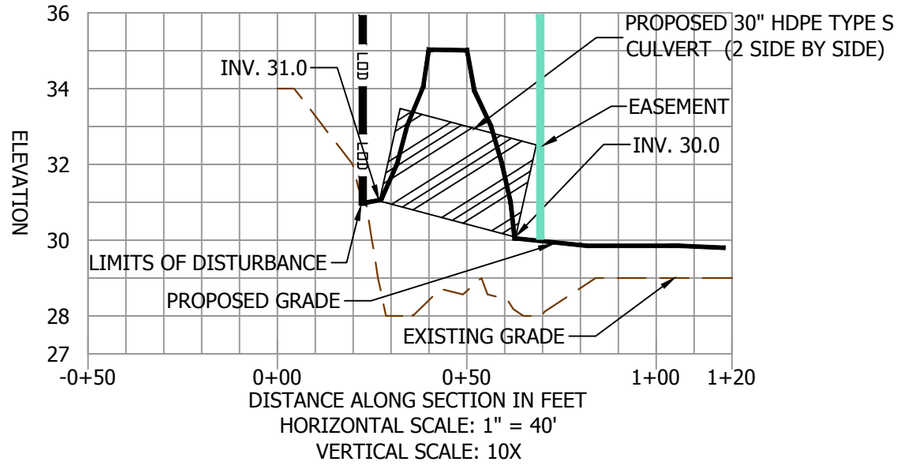
Ecosystem Enhancement PROGRAM

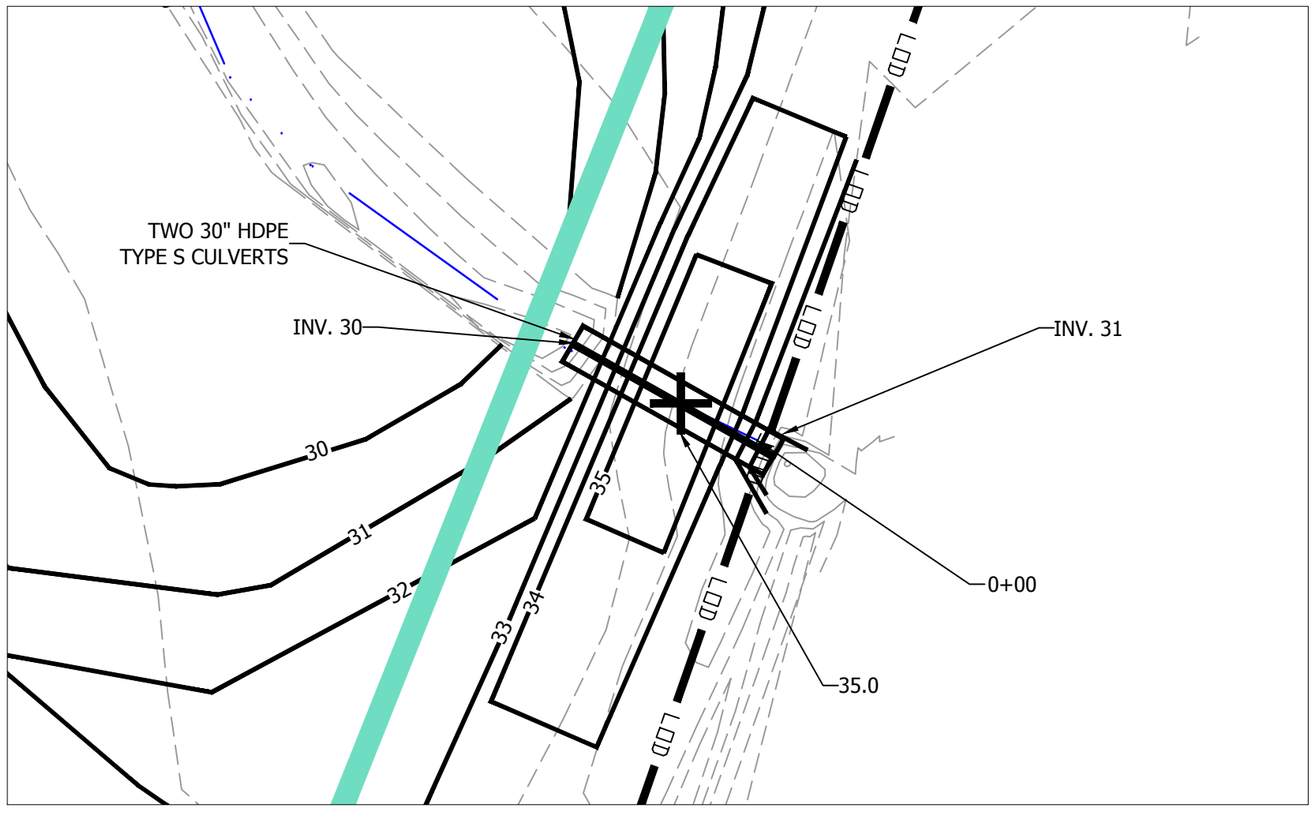
REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET D-17

Swamp Run Crossing





0 20 40 Feet

SWAMP RUN CROSSING
SCALE: 1" = 20'

PROFILE LEGEND

- EASEMENT LIMITS
- LOD LIMITS OF DISTURBANCE
- EXISTING GRADE
- PROPOSED GRADE

DETAIL LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPERTY BOUNDARY
- EASEMENT BOUNDARY
- LOD LIMITS OF DISTURBANCE
- PROPOSED STREAM CENTERLINE
- PROPOSED SPOT ELEVATION

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DETAILS & SECTIONS
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EEP PROJECT ID: 95361
EEP CONTRACT #:004638

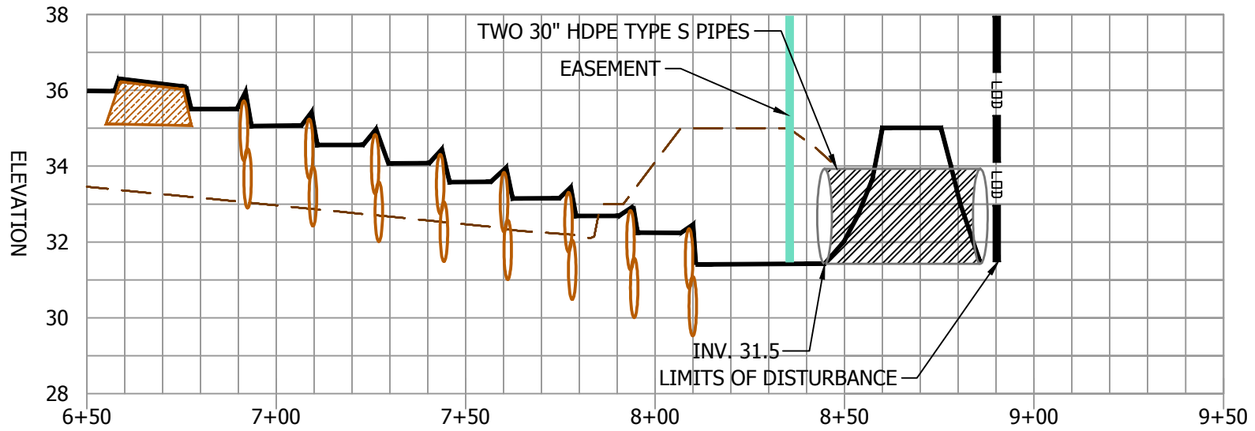
Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-18

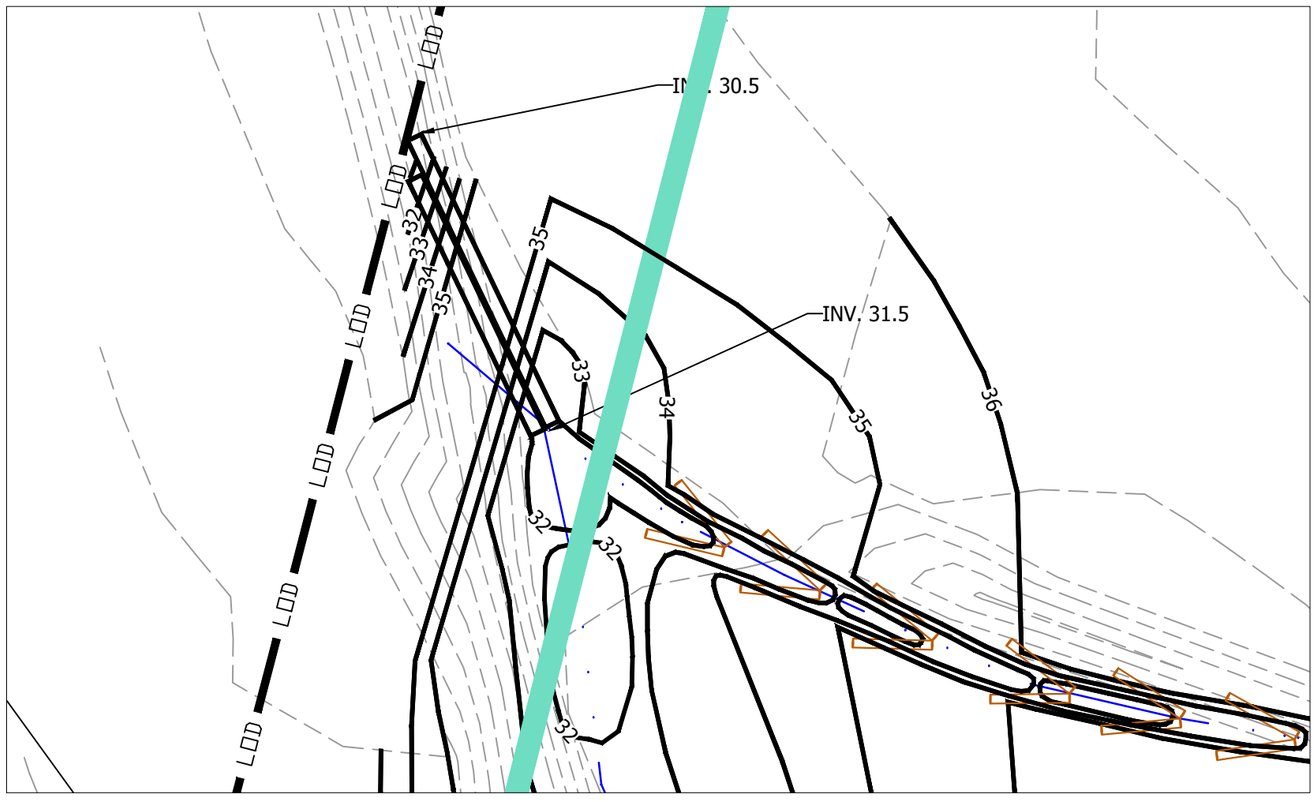
REACH 1 DOWN STREAM CULVERT



DISTANCE ALONG SECTION IN FEET
HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 10X

PROFILE LEGEND

- EASEMENT LIMITS
- LOD — LIMITS OF DISTURBANCE
- EXISTING GRADE
- PROPOSED GRADE
- PROPOSED LOG DROP STRUCTURES
- PROPOSED WOODY RIFFLE



0 20 40 Feet

REACH 1 DOWN STREAM CROSSING
SCALE: 1" = 20'

DETAIL LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPERTY BOUNDARY
- EASEMENT BOUNDARY
- LOD — LIMITS OF DISTURBANCE
- PROPOSED STREAM CENTERLINE
- \+ PROPOSED SPOT ELEVATION

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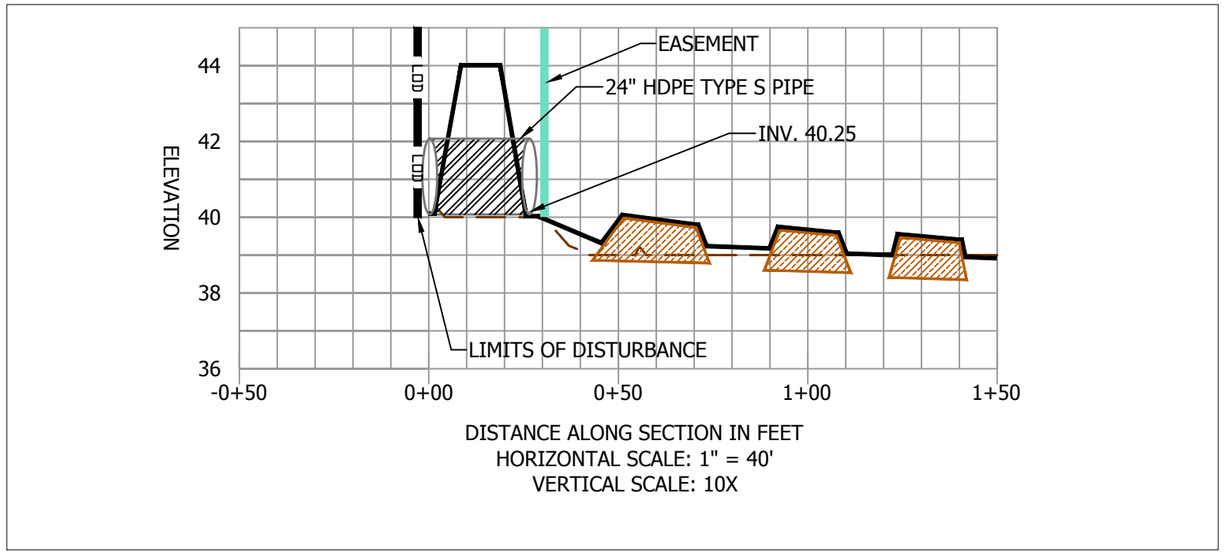
HUDSON PROPERTY
DETAILS & SECTIONS
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement Program

REVISIONS		
DATE	DESCRIPTION	REV. BY

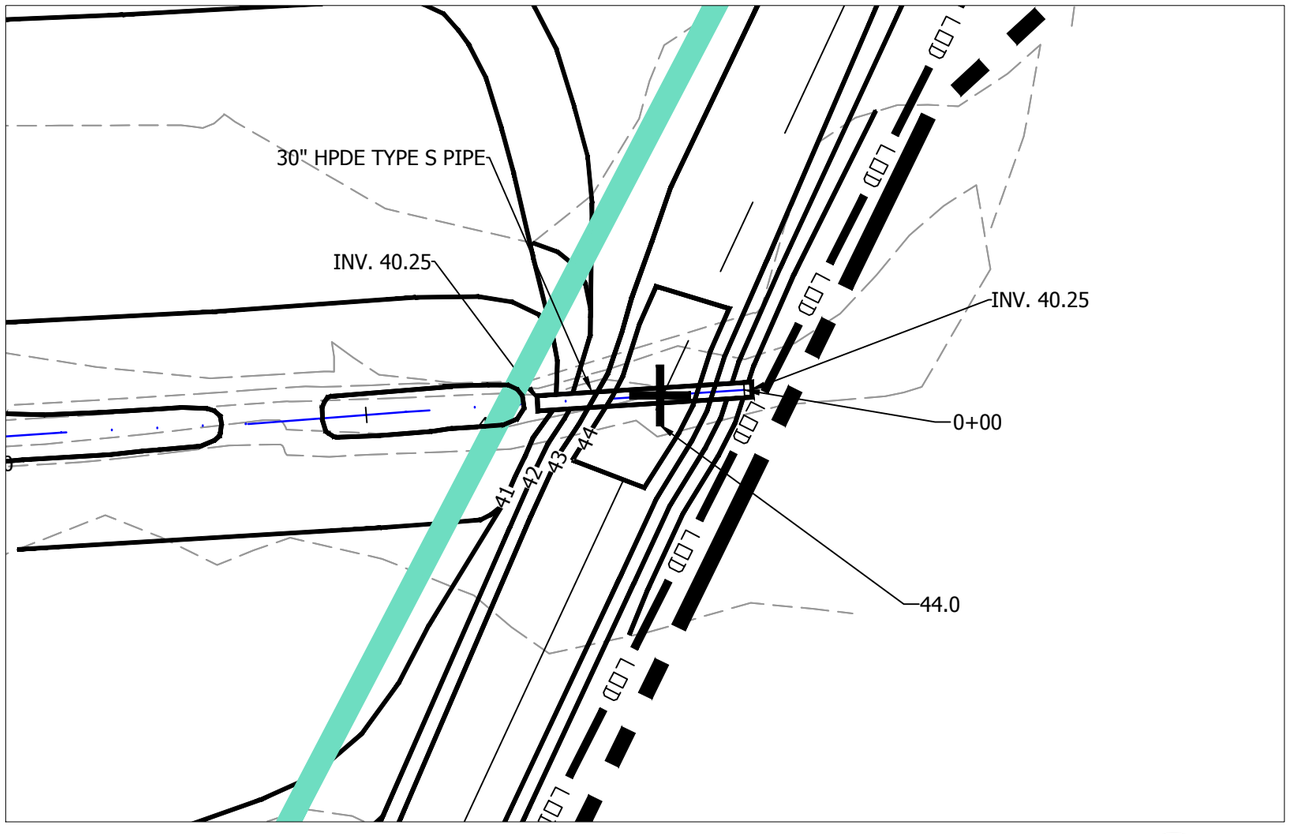
PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-19



PROFILE LEGEND

- EASEMENT LIMITS
- LOD LIMITS OF DISTURBANCE
- EXISTING GRADE
- PROPOSED GRADE
- PROPOSED WOODY RIFFLE



REACH 1 DOWN STREAM CROSSING
SCALE: 1" = 20'

DETAIL LEGEND

- PROPOSED GRADING
- EXISTING GRADE
- PROPERTY BOUNDARY
- EASEMENT BOUNDARY
- LOD LIMITS OF DISTURBANCE
- PROPOSED STREAM CENTERLINE
- PROPOSED SPOT ELEVATION

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HUDSON PROPERTY
DETAILS & SECTIONS
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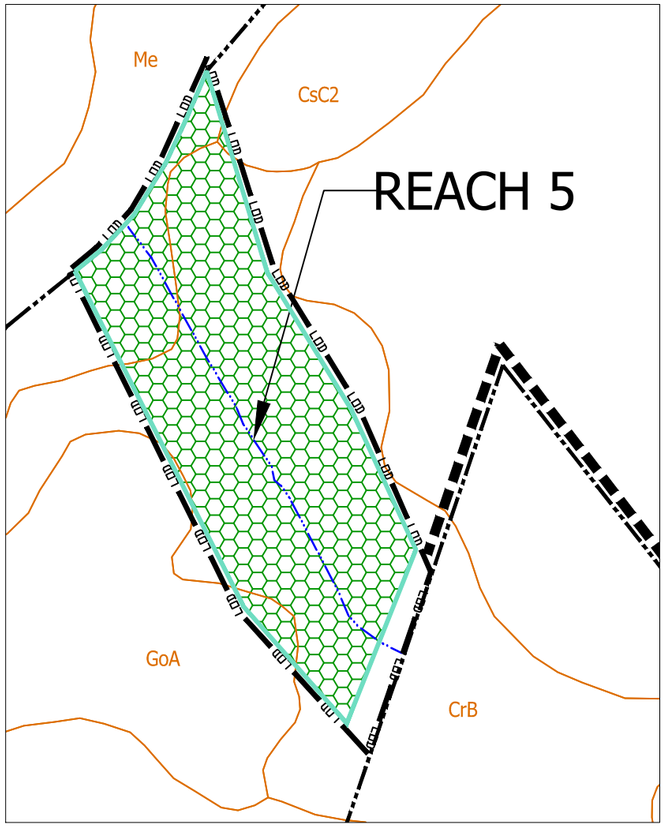
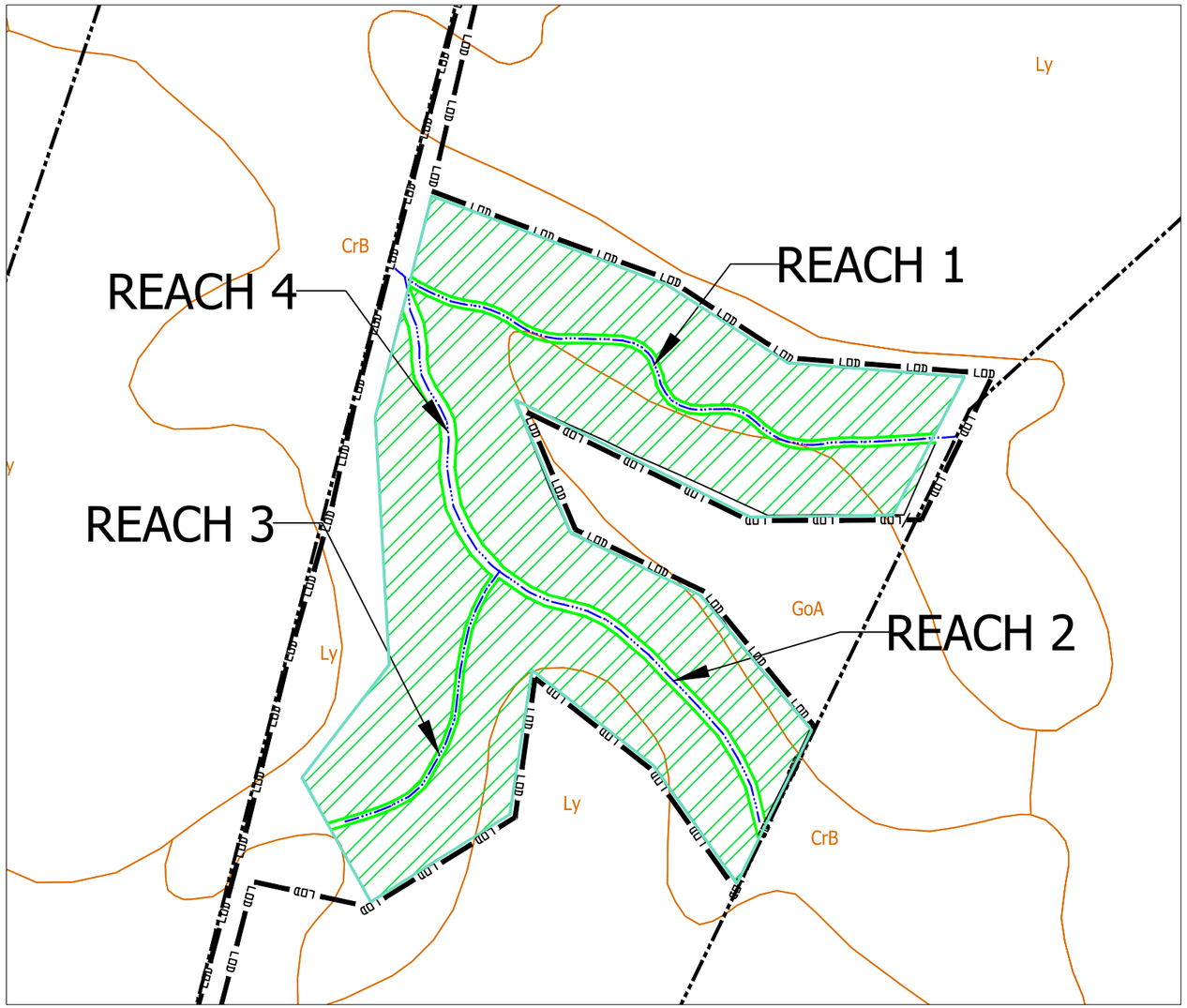
PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/14
SHEET:	

SHEET D-20





Mapped Soils Legend		
Symbol	Series	Hydric
CrB	Cravenfine sandy loam, 1-4% slopes	No
GoA	Goldsboro fine sandy loam , 0-2% slopes	No
Ly	Lynching fine sandy loam	No
Me	Muchalee loam, frequently flooded	Yes

PLANTING PLAN

SCALE: 1" = 200'

0 200 400 Feet

SCALE IN FEET

PLANTING LEGEND	
	PROPERTY BOUNDARY
GoA	SOIL BOUNDARY
	PROPOSED SWAMP RUN PLANTING AREA
	PROPOSED RIPARIAN RUN PLANTING AREA
	PROPOSED LIVE STAKE PLANTING AREA
	PROPOSED STREAM CENTERLINE

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HUDSON PROPERTY

PLANTING PLAN
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET P-1

PERMANENT SEED MIX: 12.51 ACRES

ERNMX #	ERNMX-301
Seeding Rate	20 lb per acre
Mix Type	Riparian Sites
Species List	28% Redtop Panicgrass, Coastal Plain NC Ecotype (Panicum rigidulum (P. stipitatum), Coastal Plain NC Ecotype)
	20% Beaked Panicgrass, SC Ecotype (Panicum anceps, SC Ecotype)
	20% River Oats, Coastal Plain NC Ecotype (Chasmanthium latifolium (Uniola latifolia), Coastal Plain NC Ecotype)
	20% Virginia Wildrye, 'Suther'-NC Ecotype (Elymus virginicus, 'Suther'-NC Ecotype)
	10% Switchgrass, 'Carthage', NC Ecotype (Panicum virgatum, 'Carthage', NC Ecotype)
	2% Leathery Rush, Coastal Plain NC Ecotype (Juncus coriaceus, Coastal Plain NC Ecotype)
	Total: 100%

Key:

Hudson Riparian Planting Schedule - 9.12 Acres					
Quantity	**Common Name**	**Scientific Name**	**Containerized**	**Bare Root**	**Spacing**
400	Willow Oak	Quercus phellos		2' - 4'	11X8
400	White Oak	Quercus bicolor	1gallon		11X8
600	White Oak	Quercus alba		2' - 4'	11X8
100	Water oak	Quercus nigra	1 gallon		11X8
300	Water oak	Quercus nigra		2' - 4'	11X8
250	Bald Cypress	Taxodium distichum	1 gallon		11X8
750	Yellow Poplar	Liriodendron tulipifera	1 gallon		11X8
1,000	Yellow Poplar	Liriodendron tulipifera		2' - 4'	11X8
200	Green Ash	Fraxinus pennsylvanica	1 gallon	2' - 4'	11X8
200	Green Ash	Fraxinus pennsylvanica		2' - 4'	11X8
375	Sycamore	Platanus occidentalis		2' - 4'	11X8
4,575	**Total Stems**				
502	**Stems per Acre**				
Row spacing 11 feet on center, tree spacing within rows 8 feet on center					

Key:

Hudson Swamp Run Bottomland Riparian Community Planting Schedule - 3.3 Acres					
Quantity	**Common Name**	**Scientific Name**	**Containerized**	**Bare Root**	**Spacing**
50	Willow Oak	Quercus phellos	1 gallon		11X8
100	Willow Oak	Quercus phellos		2' - 4'	11X8
70	Swamp White Oak	Quercus bicolor	1gallon		11X8
100	Swamp White Oak	Quercus bicolor		2' - 4'	11X8
120	Water oak	Quercus nigra	1 gallon		11X8
250	Bald Cypress	Taxodium distichum	1 gallon		11X8
250	Bald Cypress	Taxodium distichum		2' - 4'	11X8
70	Swamp Chestnut Oak	Quercus michauxii	1 gallon		11X8
100	Swamp Chestnut Oak	Quercus michauxii		2' - 4'	11X8
150	Green Ash	Fraxinus pennsylvanica	1 gallon		11X8
320	Sycamore	Platanus occidentalis		2' - 4'	11X8
120	Yellow Poplar	Liriodendron tulipifera		2' - 4'	11X8
120	White Oak	Quercus alba		2' - 4'	11X8
1,820	**Total Stems**				
552	**Stems per Acre**				
Row spacing 11 feet on center, tree spacing within rows 8 feet on center					

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HUDSON PROPERTY

PLANTING DETAIL

BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement PROGRAM

REVISIONS		
DATE	DESCRIPTION	REV. BY
12/16/13	change seed mix, plant schedules	RBB

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

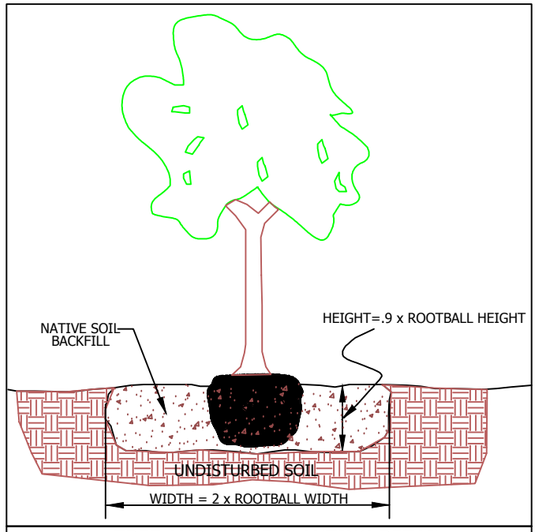
SHEET P-2

PLANTING SPECIFICATIONS

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

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

SEEDING NOTES:
1. Prior to seeding, remove any mounds or surface irregularities not in conformance with grading plan. Areas that have experienced washing out, rilling, or sediment deposition shall be reconstructed and grades re-established by the Contractor in accordance with the plan or as otherwise directed by Albemarle Restorations, LLC.
2. After bringing the work areas to final grades, loosen soil by discing or scarifying to a depth of at least 3 inches.
3. Prior to seeding, remove all trash, debris and large objects such as stones that might interfere with the seeding operation.
4. Seeding of work areas is to be according to the Seed Mix provided on sheet P-2 of this set. Seed shall be spread with a broadcast spreader and may be mixed with dry sand to facilitate even spreading.



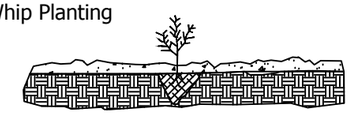
TREE AND SHRUB PLANTING DETAIL:
Container Grown Stock
NOT TO SCALE

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

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

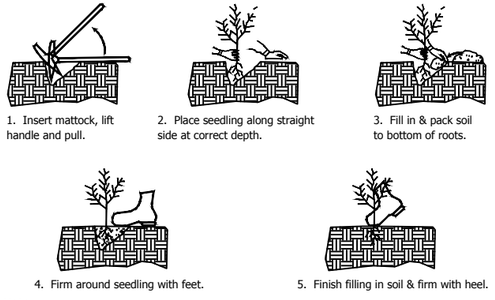
MAINTENANCE AND GUARANTEE
1. Plant material shall be maintained by the Contractor for one full year from the date of final inspection and acceptance by Albemarle Restorations, LLC. Maintenance shall include the removal and one-time replacement of all dead or diseased woody vegetation.
2. The Contractor shall guarantee a 100% survival of all plants for the one year period stated above, except in the case of damage by fire, animal damage, vandalism, or other events beyond the Contractors ability to control.
3. Plants which are 25% dead or more shall be considered dead.
4. Replacement plants shall be of the same type, size, and variety as the plants specified herein, or substitutions approved by Albemarle Restorations, LLC. Replacement plants shall be provided and installed subject to the requirements of these plans and specifications.

Seedling and Whip Planting



Correct and Incorrect Planting Depth

Mattock Planting



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

Source: Adapted from Forest Conservation Manual, 1991

Seedling and Whip Planting Techniques

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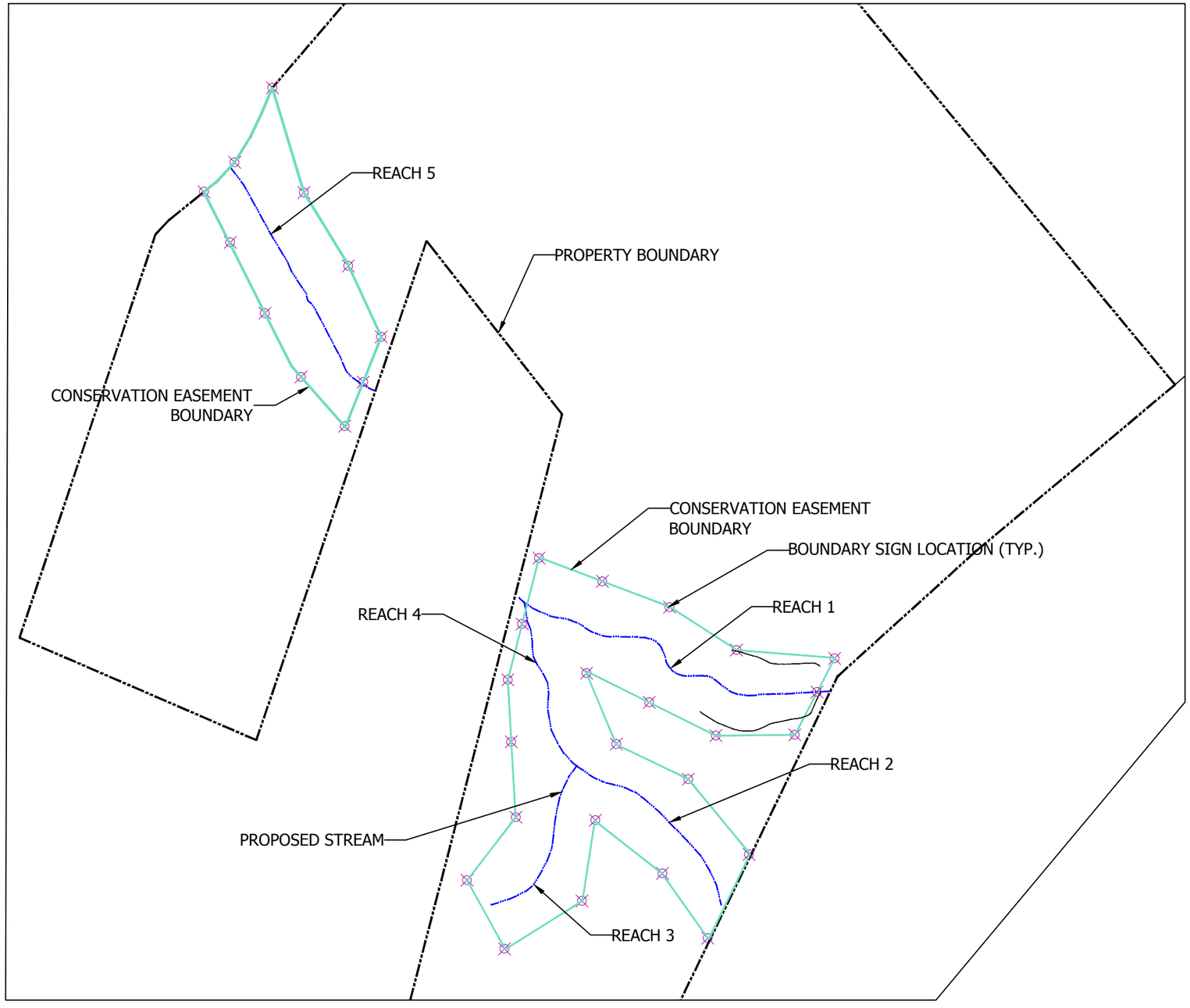
HUDSON PROPERTY
PLANTING DETAIL
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement Program

REVISIONS		
DATE	DESCRIPTION	REV. BY

PROJECT MANAGER: CKA/RBB
DESIGNED: RBB
DRAWN: WJV
PROJECT NO. 1269
DATE: 07/07/14
SHEET:

SHEET P-3



BOUNDARY MARKING PLAN

SCALE: 1" = 300'

0 300 600 Feet

BOUNDARY MARKING LEGEND

- PROPERTY BOUNDARY
- CONSERVAION EASEMENT BOUNDARY
- PROPOSED STREAM CENTERLINE
- BOUNDARY SIGN LOCATION

1) The Provider shall set 5/8" rebar 30" in length with 3-1/4" aluminum caps on all easement corners. Caps shall meet EEP specifications (Berntsen RBD5325 imprinted with NC State Logo # B9087 or equivalent). After installation, caps shall be stamped with the corresponding number from the table of coordinates contained in the project conservation easement.
2) The Provider shall place a 6-foot tall durable witness post at each corner in the conservation easement boundary. Posts shall be made of material that will last a minimum of 20 years. The Provider shall attach a conservation easement sign to each witness post and place additional signs at no more than 200-foot intervals on long boundary lines.

BOUNDARY SIGN DETAIL

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HUDSON PROPERTY
BOUNDARY MARKING PLAN
BEAUFORT CO., NC
EEP PROJECT ID: 95361
EEP CONTRACT #:004638

Ecosystem Enhancement Program

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PROJECT MANAGER:	CKA/RBB
DESIGNED:	RBB
DRAWN:	WJV
PROJECT NO.	1269
DATE:	07/07/2014
SHEET:	

SHEET B-1

Appendix E – Reference Reach Photographs

Photo #1: Facing upstream at reference riffle feature

Photo #2: Facing upstream at reference pool feature

Appendix E – Reference Reach Photographs

Photo #3: Facing upstream at reference riffle feature

Photo #4: Facing upstream at riffle composed of coarse sand and woody debris

Appendix E – Reference Reach Photographs

Photo #5: Facing downstream at reference riffle/fun complex

Photo #6: Facing downstream at reference riffle with embedded woody material

APPENDIX F

FLOODPLAIN STUDY

HUDSON PROPERTY

Flood Study Report

EEP Contract #: 004638

3 March 2014

Prepared for:
Ecosystem Enhancement Program
1601 Mail Service Center
Raleigh, NC 27699
877.623.6748

Prepared by:
Albemarle Restorations, LLC
P.O. Box 176
Fairfield, NC 27826
804.466.0794

NORTH CAROLINA PROFESSIONAL SEAL 040438 3/3/14 ENGINEER WILLIAM K. MUMAW

William K. Mumaw, PE Δ 540.239.1428

Table of Contents

Exhibits

Flood Study Report
Hudson Property
EEP Contract #: 004638

Section 1: Introduction

1.1 Executive Summary

This report documents the purpose, methods, and results of a Flood Study completed for the North Carolina Ecosystem Enhancement Program (NCEEP) for a proposed stream restoration project located in Beaufort, North Carolina. The proposed stream restoration project includes geomorphic modifications to five stream channels. One of these stream channels (Reach 5) is located within the 1% annual floodplain (Zone AE) of Horse Branch. The proposed work does not encroach on the floodway. This study evaluates the effect of the proposed activity on the existing floodplain elevations. The Flood Study included a review of available data, the re-creation of the currently defined 1% annual floodplain model, and the creation of a proposed floodplain model.

The study revealed that there is **"no rise"** in Base Flood Elevation (BFE) as a result of the proposed project. The proposed actions that are to occur within the limits of the floodplain cause negligible changes in the limits of the floodplain boundary but do not cause the flood elevation to increase.

1.2 Purpose of Study

This Flood Study was completed to determine the effect of the proposed restoration activities within the FEMA defined 1% annual floodplain (Zone AE) on the Base Flood Elevation. This study is being completed at the request of the NCEEP in conjunction with the North Carolina Floodplain Mapping Program. Projects that encroach in the Special Flood Hazard Area (SFHA) must comply with floodplain management regulations as a condition of participation in the NFIP.

1.3 Coordination

This project included coordination with the North Carolina Floodplain Mapping Program, the Ecosystem Enhancement Program, and personnel and contractors of FEMA. This coordination resulted in the need for the Study being identified and the acquisition of available hydrologic and hydraulic data that exists for the project area.

Section 2: Area Studied

2.1 Scope of Study

This Flood Study covers the geographic area surrounding Horse Branch adjacent to the project site in Beaufort County, North Carolina. The proposed restoration work will occur on an unnamed tributary (Reach 5) to Horse Branch that enters Horse Branch on the right bank between study cross section 93 and 92. The study does not include areas of Horse Branch upstream or downstream beyond what was required for hydraulic modeling purposes. A section of Horse Branch was analyzed as part of this project as identified in the exhibits to this report. All proposed stream restoration reaches that are not located in the currently defined 1% annual flood plain are excluded from this study since they will have no effect on the base flood elevations; however, a supplemental study was performed to assess the hydraulic performance of the proposed stream channels (Exhibit 8).

Section 3: Engineering Methods

3.1 Hydrologic Analyses

This report relied on data provided by the FEMA Engineering Library and published data found in the Flood Insurance Study (FIS) Report for Beaufort County, North Carolina and Incorporated Areas, dated January 2, 2004. The FEMA Engineering Library did not have a hydrologic analysis for the specific section of Horse Branch that this study is concerned with; however, they were able to provide HEC-2 outputs that confirmed hydrologic data referenced in the FIS Report. The peak discharge associated with the FIRM 1% probability annual storm event (referred herein as 100 year peak discharge) for Horse Branch were developed previously through the use of regional regression equations for urban and rural areas of the piedmont region of North Carolina. These equations use drainage area size as the input to estimate peak discharges. The drainage area that was used for the study reach of Horse Branch in the FIS study was measured at Gray Road, which is approximately 1.27 miles downstream of the project site and the study reach.

The 100 year peak discharge (*1,180 cfs*) calculated previously and documented in the FIS was used for this study. As part of the supplemental study, peak discharges of Horse Branch were also investigated using a point of analysis just downstream from the project site. This hydrologic study relied on the USGS Stream Stats model (http://water.usgs.gov/osw/streamstats/north_carolina.html), which provides an interactive map to derive both drainage areas and peak discharge rates using regression equations. More information can be found at the web link provided. A table summarizing the peak discharges for Horse Branch is shown below.

Table 1: Horse Branch Study Discharges					
Reach	*Drainage Area (mi²)*	*2 Year (cfs)*	*10 Year (cfs)*	*50 Year (cfs)*	*100 Year (cfs)*
Horse Branch Downstream (from FEMA FIS)	3.5	-	450.0	900.0	1180.0
Horse Branch Downstream (from USGS Stream Stats)	1.96	93.3	263.0	463.0	567.0
Horse Branch Upstream (from USGS Stream Stats and TR-55 estimates)	1.66	54.1	155.3	306.1	372.4

Additional peak discharges were estimated and used as part of the supplemental study. These discharges were estimated using the TR-55 methodology and are provided in the table below for informational purposes.

Table 2: Design Discharges (TR-55 Field Verified Watershed)						
Reach	*Drainage Area (mi²)*	*Drainage Area (ac)*	*2 Year (cfs)*	*10 Year (cfs)*	*50 Year (cfs)*	*100 Year (cfs)*
Reach 1	0.063	40.51	5.6	19.0	29.2	37.4
Reach 2	0.117	74.63	17.2	47.4	68.8	85.2
Reach 3	0.055	35.21	8.0	20.9	30.1	37.0
Reach 4	0.235	150.35	26.2	70.6	102.0	125.9
Reach 5	0.298	190.86	39.2	107.7	156.9	194.6

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of Horse Branch flooding were performed to recreate the FIRM referenced floodplain BFEs as well as to model the effects of the proposed restoration. The U.S. Army Corps of Engineers' HEC-RAS Version 4.1.0 was used to model Horse Branch during flood conditions. Cross sections were located at identified Base Flood Elevation contours, documented FIRM cross sections, and supplementally as necessary. National Flood Hazard Layers (NFHL) were acquired from FEMA and imported to establish the location of cross-sections and also the floodplain and floodway boundaries.

Channel roughness was calculated iteratively within the range provided in the FIS associated with Horse Branch. The FIS references channel roughness coefficients in the range of 0.02 to 0.06 and overbank roughness coefficients in the range of 0.16 to 0.20. The maximum values were used in order to derive elevations that conform to those reported in the FIRM. Site photos and aerial photography confirm the likelihood of high roughness coefficients.

Section 4: Mapping Methods

4.1 Vertical & Horizontal Datum

The study was performed using data either provided in or transformed to the North American Vertical Datum of 1988 (NAVD 88). All elevations shown or referenced in this study are referenced to NAVD 88. If comparisons are to be made to previously mapped elevations that reference the National Geodetic Vertical Datum of 1929 (NGVD29) a conversion factor of -1.07 feet can be applied in Beaufort County.

All data used in this study is georeferenced to the North Carolina State Plane (FIPS 3200) referenced to the North American Datum of 1983 (NAD83).

4.2 Base Map

Data for the development of base mapping was compiled from 20 foot DEM grid cells generated from LIDAR and distributed through NC OneMap. The topographic model used for extracting cross section data to assess the effect of the proposed restoration also included a ground run field survey for the subject property.

4.3 Floodplain and Floodway Delineation

The floodplain and floodway delineation that is depicted on the FIRM Panel 5662 J with effective date of May 15, 2003 is the result of a redelineated detailed study. The original hydraulic study provided through the FEMA Engineering Library was completed in 1982. Detailed information, including model parameters, was not able to be acquired through a reasonable research of data resources. The FIS report for the study area provided information regarding engineering methods and other documentation that was incorporated into this Flood Study. Geolocated NFHL data were imported into the drawing to provide a comparison to model results and can be seen in the map exhibits. The NFHL data provided elevation data of BFEs and cross sections along Horse Branch that were used as comparisons for the model results as well as known downstream conditions.

Section 5: Results

5.1 Floodplain Boundaries

The following table provides a summary of the hydraulic modeling results.

Table 3: Base Flood Water-Surface Elevation Comparison

Cross Section	*A*	*B*	*C*	*D*	*E*	*F*
	FIRM, 5/15/2003	*Model Estimates of FIRM*	*Increase (B-A)*	*Proposed Model Estimates*	*Increase (D-B)*	*Increase (D-A)*
89 (BFE)	28	28	0	28	0	0
90	-	28.76	-	28.77	0.01	-
91 (BFE)	30	30.17	0.17	30.22	0.05	0.22
92 (X-sec)	30.5	31.04	0.54	31.05	0.01	0.55
93 (BFE)	33	33.35	0.35	33.05	-0.30	0.05
94	-	33.76	-	33.43	-0.33	-
95 (BFE)	35	34.93	-0.07	34.80	-0.13	-0.20

The model approximating the existing FIRM base flood elevations are within 1’ of published values. The proposed conditions are also within 1’ of the existing base flood elevations. These results confirm that there is no significant rise in base flood elevation. The floodplain boundaries were plotted on the base mapping to estimate the changes in the extent of the floodplain boundary. The grading activities in the floodplain increase the extent of the floodplain boundary landward. The increase is less than 20’ and likely due to a decrease in ground elevation in the vicinity of the channel (excavation/bank grading), which allows for an increase in backwater without an increase in elevation. Other contributing differences include possible differences in compiled base mapping and roughness variability that were approximated in this study.

Section 6: Supplemental Study

6.1 Hydraulic Analysis

The supplemental study was provided to inform the design process and understand the expected 100 year flooding extents. Exhibit 8 provides detailed mapping and hydraulic calculations for this analysis. This study included a hydraulic analysis of the proposed design conditions using the hydrologic information provided in Table 2. The following table provides a summary of the hydraulic modeling results.

Table 4: Average Hydraulic Characteristics								
Stream Reach	*2yr Q (cfs)*	*2yr D (ft)*	*2yr V (ft/s)*	*10yr V (ft/s)*	*100yr V (ft/s)*	*2yr τ (lb/ft^2)*	*10yr τ (lb/ft^2)*	*100yr τ (lb/ft^2)*
1	5.6	0.50	1.78	2.24	2.56	0.44	0.50	0.65
2	17.2	1.06	1.34	1.80	2.16	0.17	0.24	0.29
3	8.0	0.76	1.32	1.70	2.00	0.16	0.23	0.29
4	26.2	2.15	0.65	1.09	1.64	0.04	0.08	0.17
5	39.2	0.80	1.16	1.55	2.04	0.23	0.34	0.47

D: Depth, V: Velocity, τ: Shear Stress

These values represent maximum cross-sectional parameters for each project reach. It should be noted that only select cross sections were examined as part of this analysis. Generally, calculated channel velocities and shear stress values are below ranges that would suggest instability.

Section 7: Select References

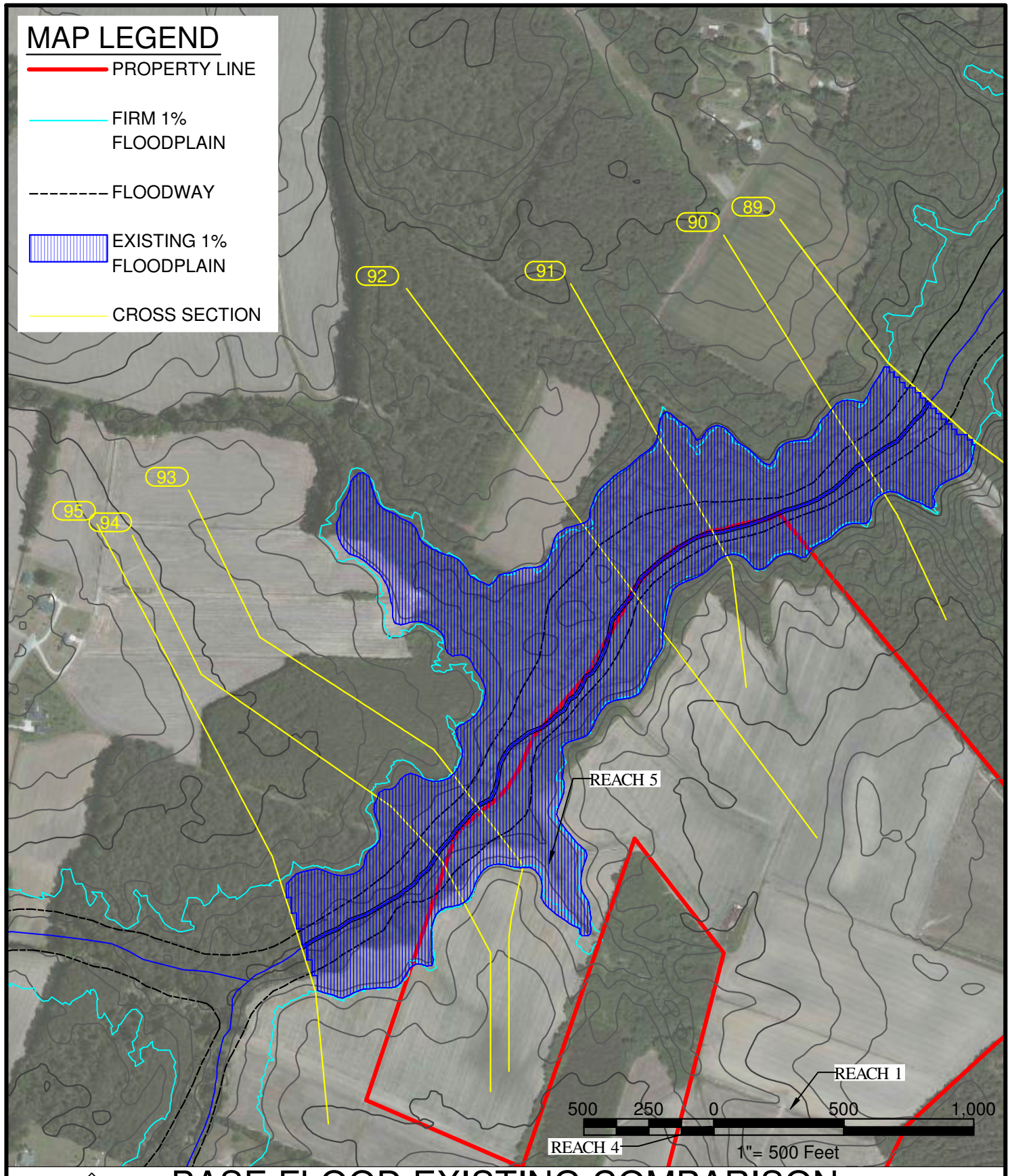
Federal Emergency Management Agency. (2004). Flood Insurance Study, Beaufort County, North Carolina (Unincorporated Areas). Washington, D.C.

U.S. Army Corps of Engineers, Hydrologic Engineering Center. (2010). HEC RAS River Analysis System, Version 4.1, Computer Program. Davis, California.

NC OneMap Geospatial Data. (2007). Statewide Elevation Contours – 2 Foot Interval.

Exhibit 1

Existing Base Flood Map



BASE FLOOD EXISTING COMPARISON
HUDSON PROPERTY

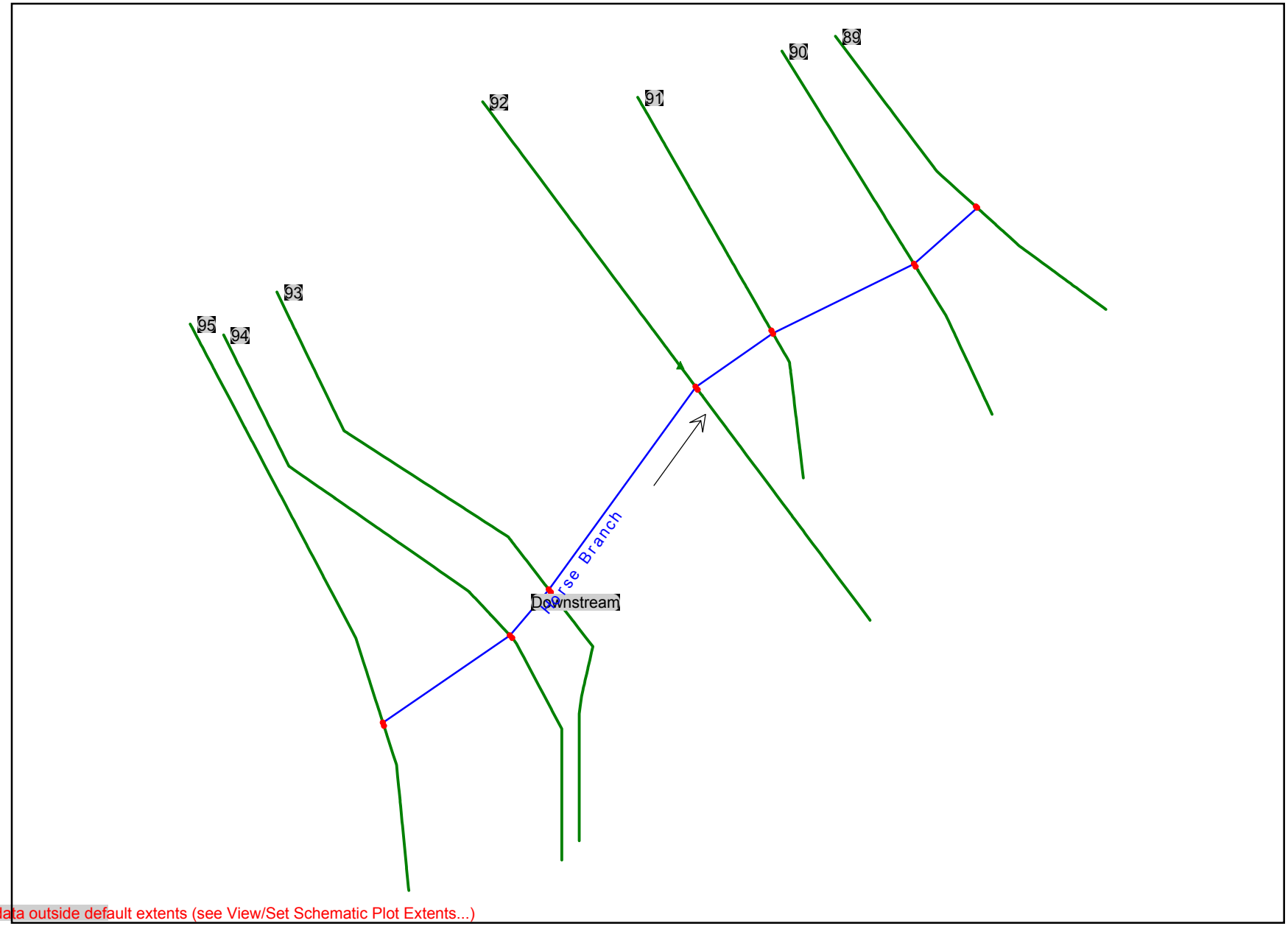
SOURCE: NC ONEMAP/NFHL

BEAUFORT COUNTY, NC

DATE: 3/3/14

Exhibit 2

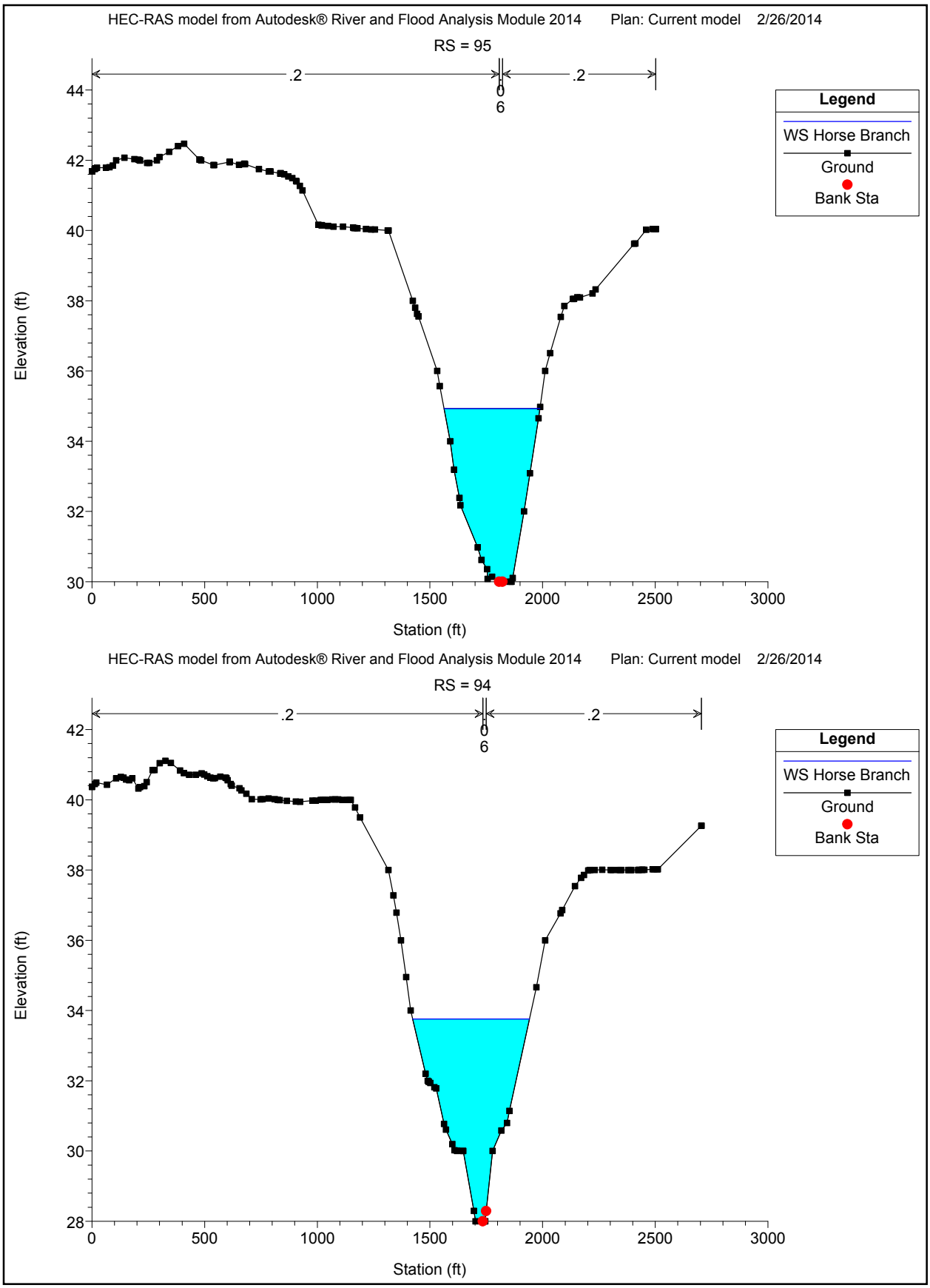
Existing Hydraulic Calculations & Cross Sections



Some schematic data outside default extents (see View/Set Schematic Plot Extents...)

HEC-RAS Plan: Current mode River: Horse Branch Reach: Downstream Profile: Horse Branch

Reach	River Sta	Profile	Q Total	Min Ch El	Max Chl Dpth	Hydr Radius	E.G. Slope	Vel Chnl	Vel Total	Flow Area	Top Width	Froude # Chl	Power Chan	Power Total	Shear Chan	Shear Total	Invert Slope
			(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(ft/s)	(sq ft)	(ft)		(lb/ft s)	(lb/ft s)	(lb/sq ft)	(lb/sq ft)	
Downstream	95	Horse Branch	1180.00	30.00	4.93	3.27	0.001991	3.20	0.85	1390.52	425.56	0.25	1.96	0.34	0.61	0.41	0.0031
Downstream	94	Horse Branch	1180.00	28.00	5.76	2.96	0.001701	3.26	0.77	1538.99	518.90	0.24	1.98	0.24	0.61	0.31	0.0000
Downstream	93	Horse Branch	1180.00	28.00	5.35	3.32	0.001658	3.08	0.79	1501.82	451.87	0.23	1.71	0.27	0.55	0.34	0.0001
Downstream	92	Horse Branch	1180.00	27.88	4.26	2.71	0.002829	2.82	0.84	1410.53	520.73	0.28	1.56	0.40	0.55	0.48	0.0048
Downstream	91	Horse Branch	1180.00	25.99	4.18	3.10	0.001648	2.61	0.71	1657.12	535.10	0.22	1.12	0.23	0.43	0.32	0.0031
Downstream	90	Horse Branch	1180.00	23.95	4.83	3.15	0.002693	3.65	0.98	1203.00	381.29	0.29	2.95	0.52	0.81	0.53	0.0005
Downstream	89	Horse Branch	1180.00	23.78	4.30	3.34	0.001875	2.80	0.76	1547.21	462.72	0.24	1.38	0.30	0.49	0.39	


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
RS = 95
.2
0
6
.2
Legend
WS Horse Branch
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
RS = 94
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0
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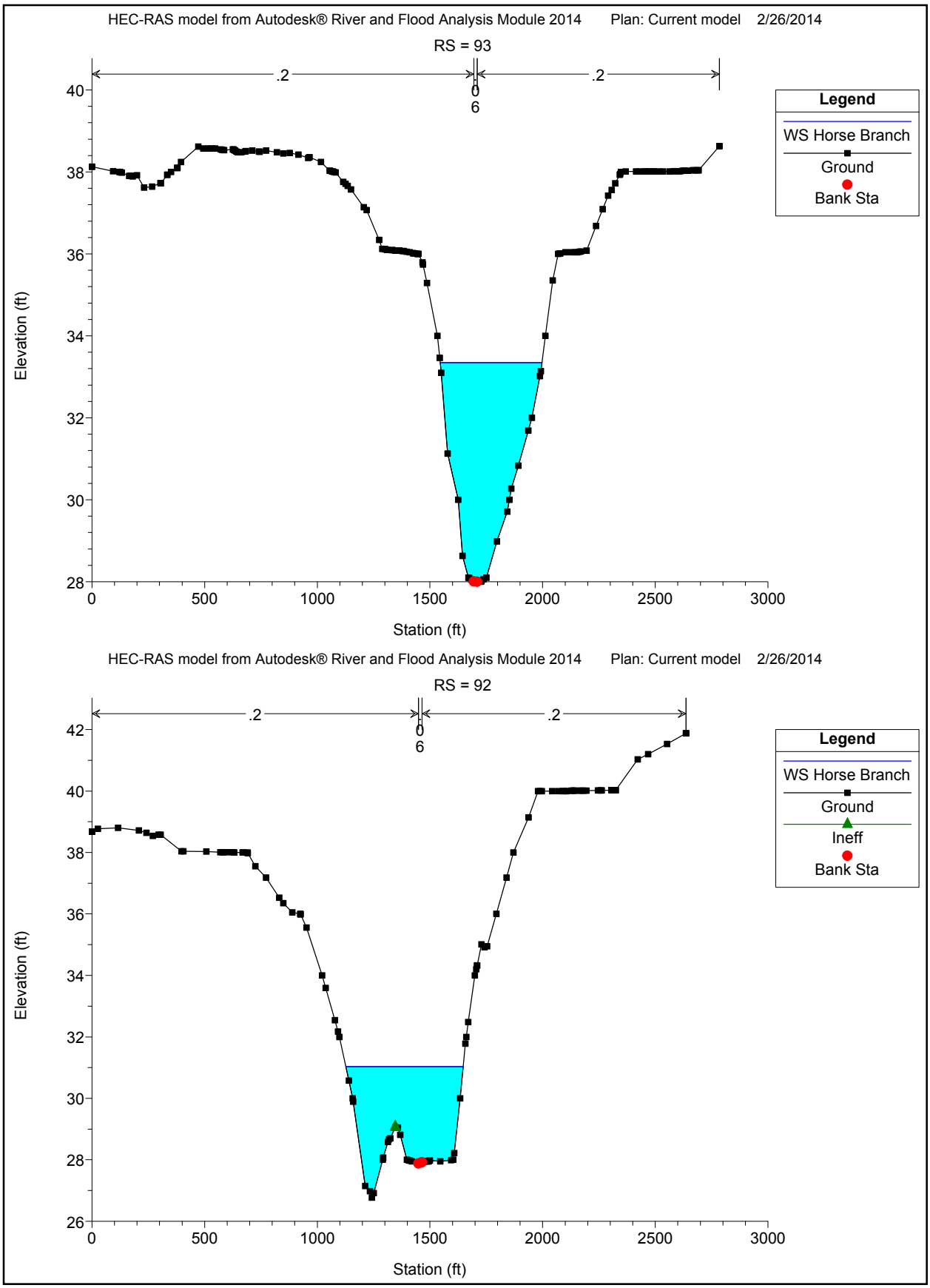
Legend
WS Horse Branch
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
RS = 93
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Legend
WS Horse Branch
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
RS = 92
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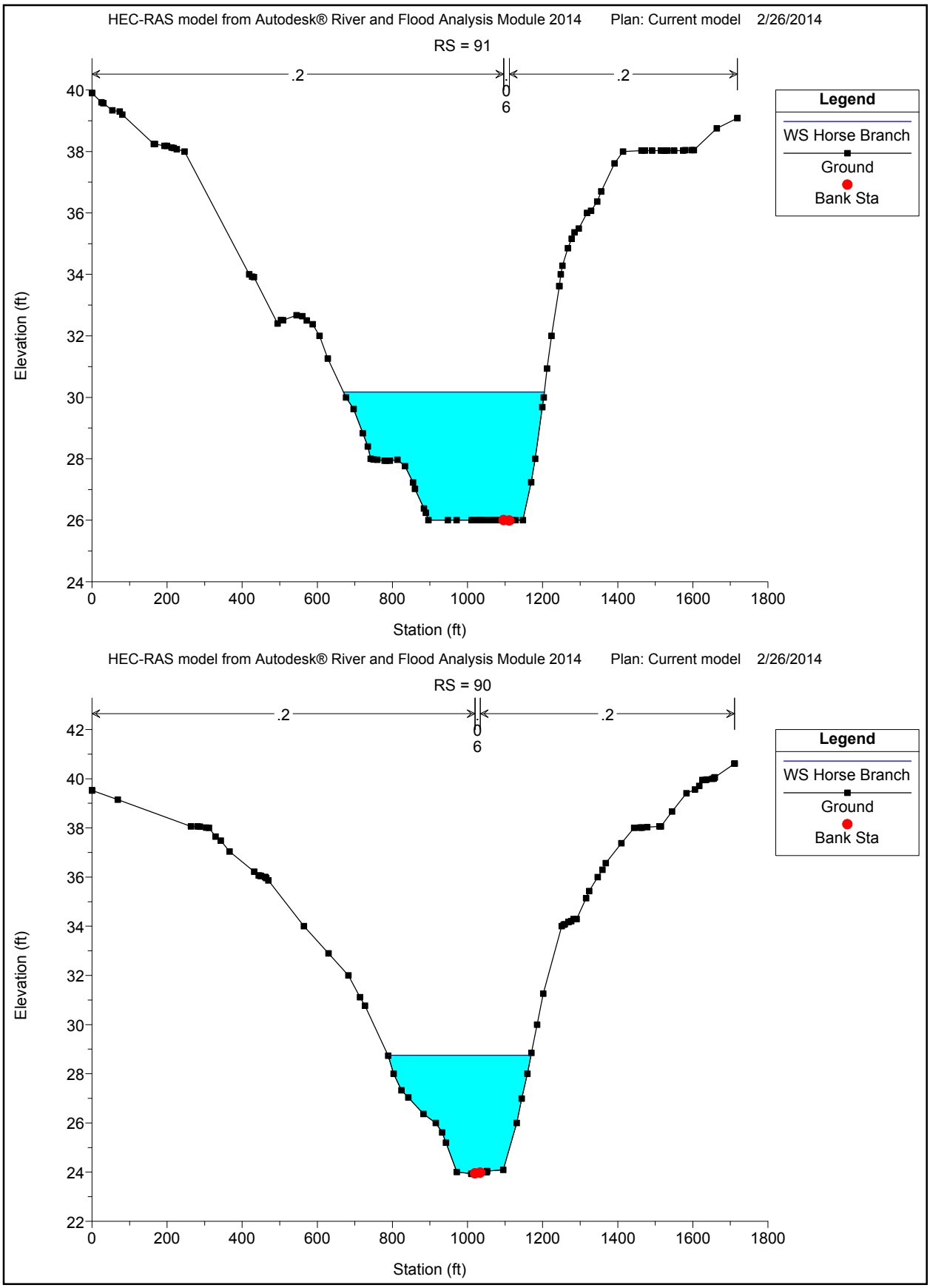
Legend
WS Horse Branch
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
RS = 91
.2
.2
.0
6
Legend
WS Horse Branch
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
RS = 90
.2
.2
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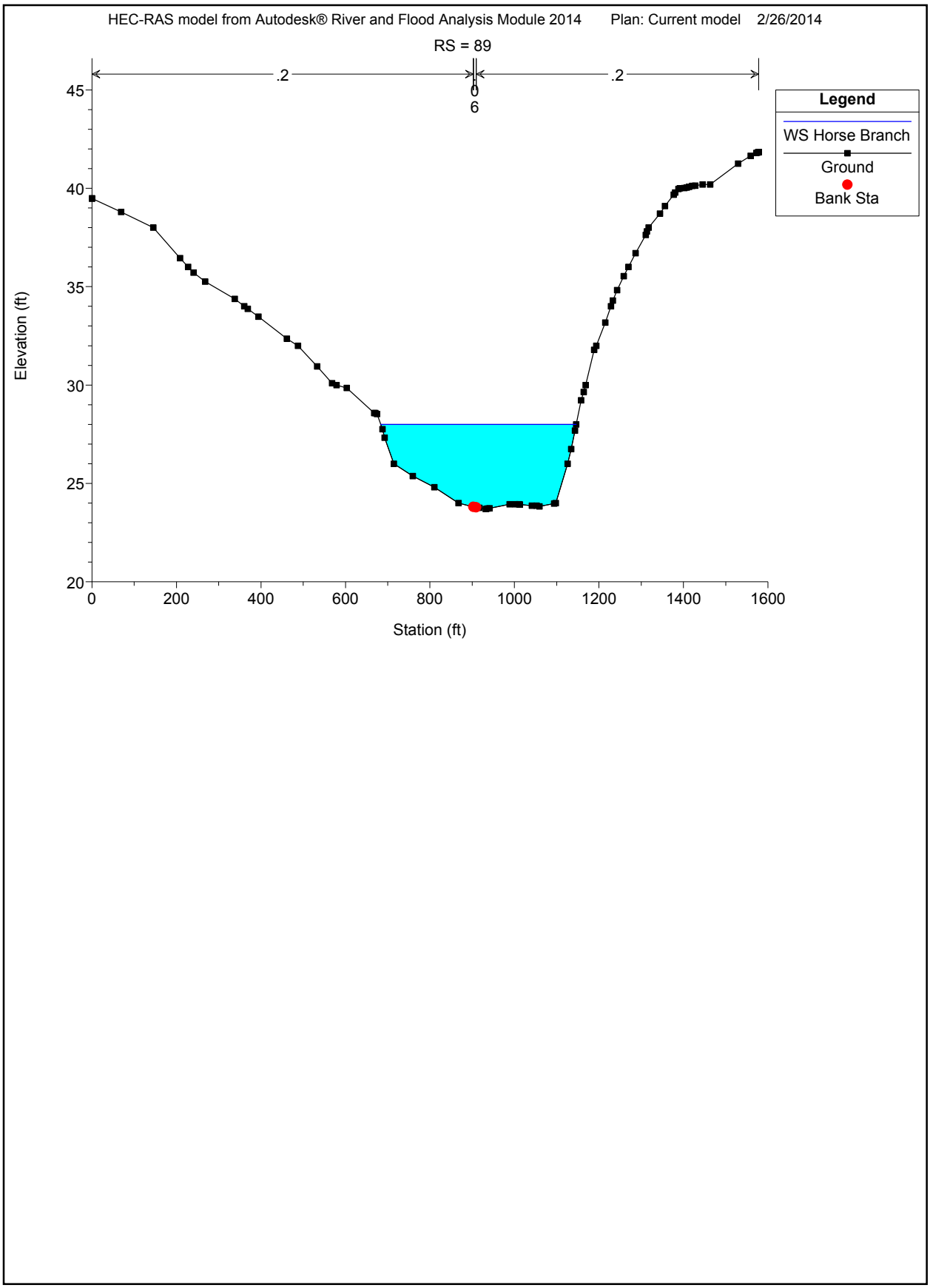
6
Legend
WS Horse Branch
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
RS = 89
.2
0
6
.2
Legend
WS Horse Branch
Ground
Bank Sta
Elevation (ft)
Station (ft)
45
40
35
30
25
20
0
200
400
600
800
1000
1200
1400
1600

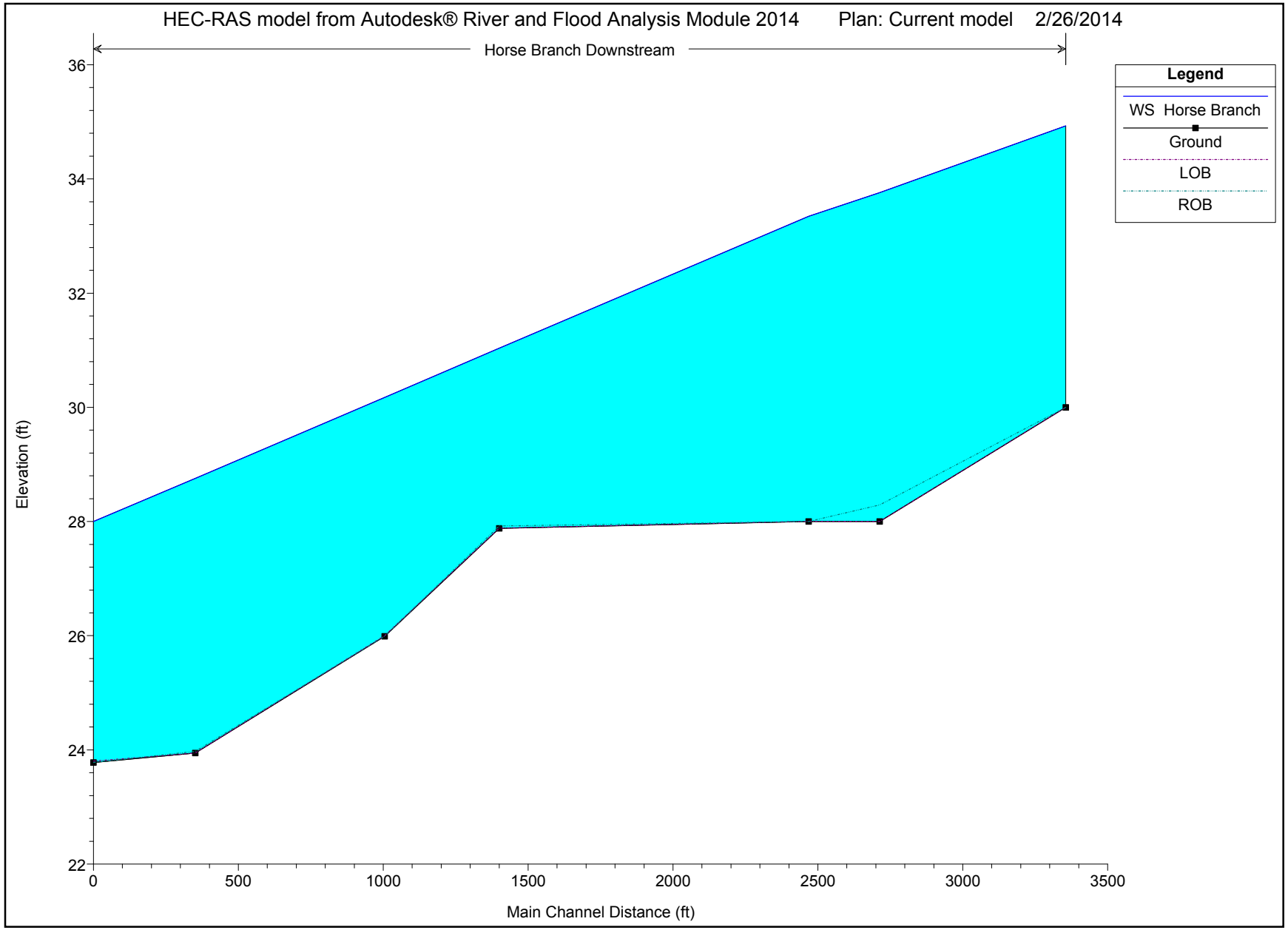
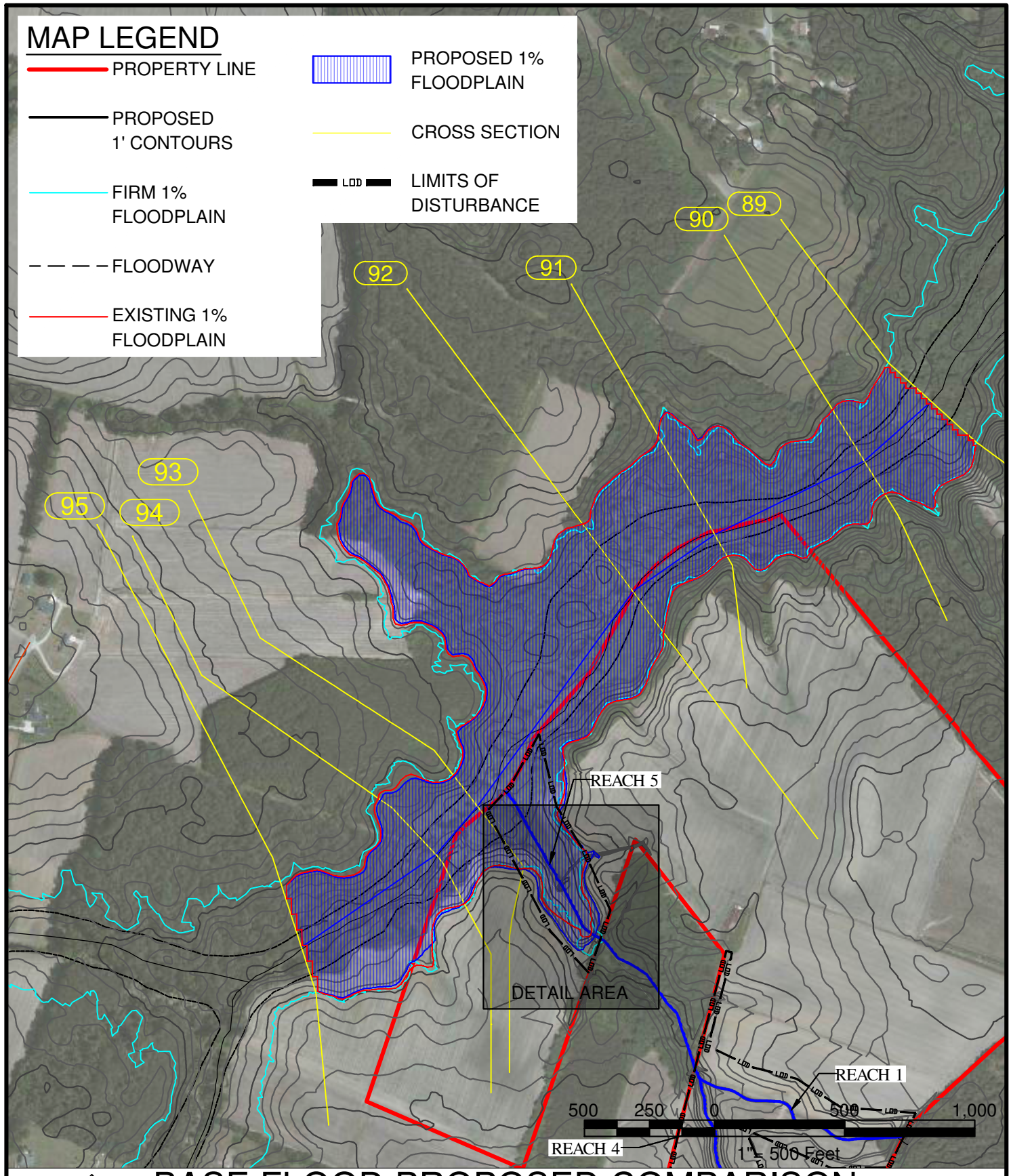

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014
Horse Branch Downstream
Legend
WS Horse Branch
Ground
LOB
ROB
Elevation (ft)
36
34
32
30
28
26
24
22
0
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)

Exhibit 3

Proposed Base Flood map & Detailed Area

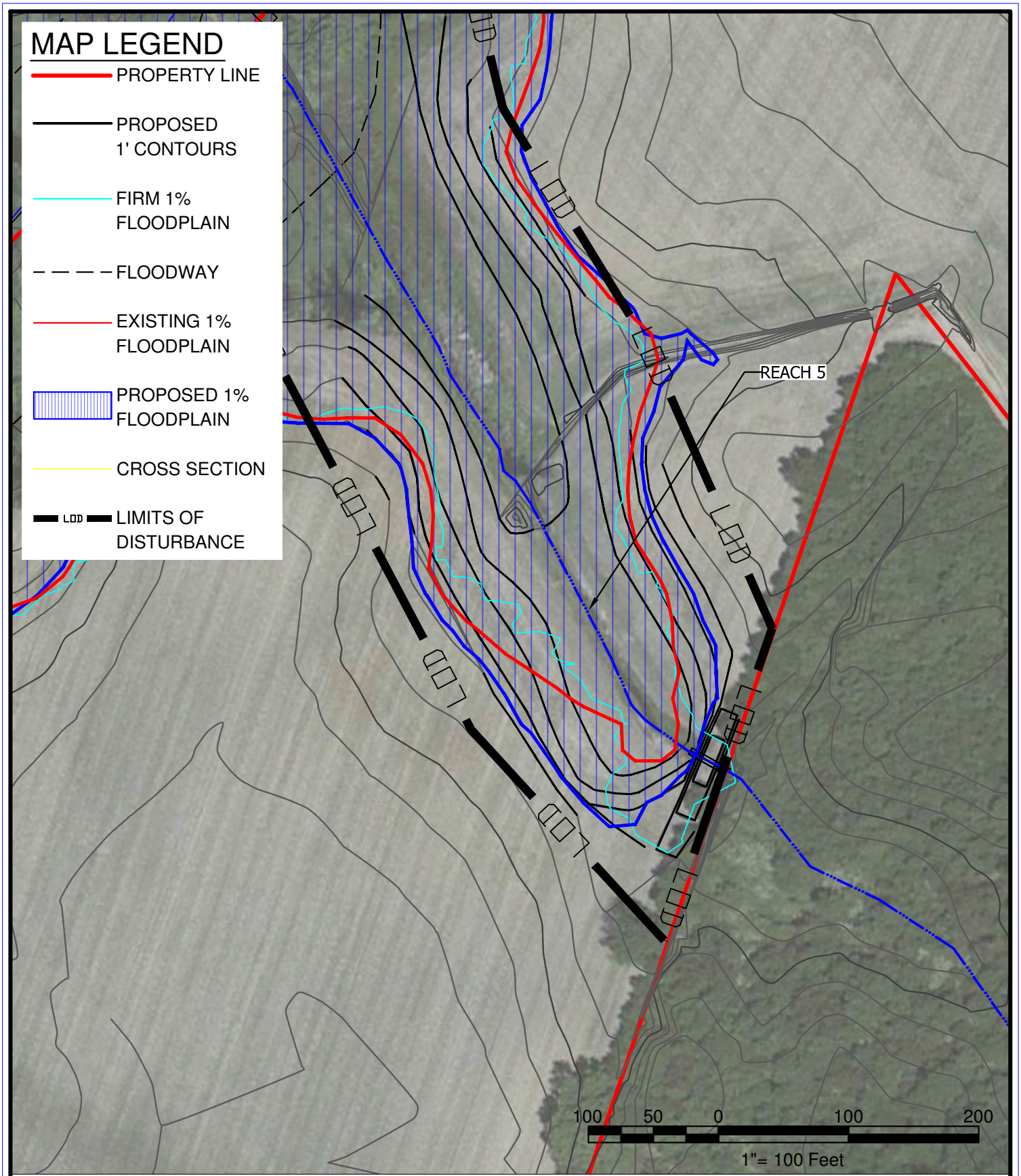


BASE FLOOD PROPOSED COMPARISON
HUDSON PROPERTY

SOURCE: NC ONEMAP/NFHL

BEAUFORT COUNTY, NC

DATE: 3/3/14



PROPOSED COMPARISON DETAIL
HUDSON PROPERTY

SOURCE: NC ONEMAP/NFHL

BEAUFORT COUNTY, NC

DATE: 3/3/14

Exhibit 4

Proposed Hydraulic Calculations & Cross Sections

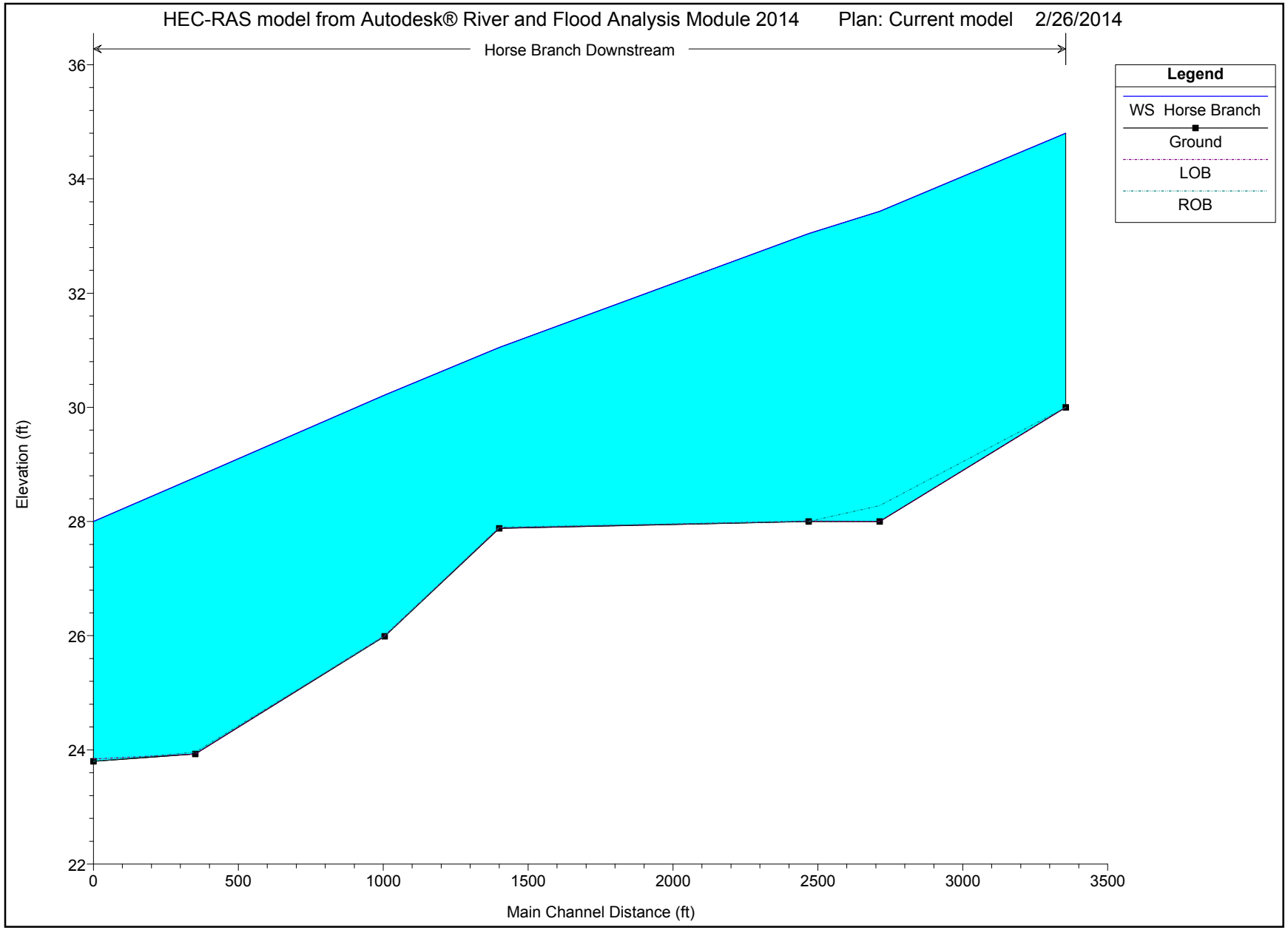

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
Horse Branch Downstream
Legend
WS Horse Branch
Ground
LOB
ROB
Elevation (ft)
36
34
32
30
28
26
24
22
0
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)

Exhibit 5

Correspondence

Kip Mumaw

From: Brubaker, Dan <Dan.Brubaker@ncdps.gov>
Sent: Tuesday, December 17, 2013 1:56 PM
To: Kip Mumaw
Subject: RE: Flood Study - UT Horse Branch

Good afternoon, Mr. Mumaw. Horse Branch and Horse Branch Tributary are both redelineated streams, taken from earlier flood studies. Unfortunately, we do not have a copy of the original hydraulic model. They may be available from the FEMA Engineering Library:

http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/how-order-technical-administrative-support

Sorry we couldn't help with this data request. Please let me know if I can help with anything else, though, or if you have any questions.

Best regards,

Dan Brubaker

John D. Brubaker, PE, CFM
NFIP Engineer
NC Department of Public Safety
NC Floodplain Mapping Program
4218 Mail Service Center
Raleigh, NC 27699-4218
(919) 825-2300
dan.brubaker@ncdps.gov
www.ncdps.gov

From: Kip Mumaw [mailto:kip@ecosystemllc.com]
Sent: Tuesday, December 17, 2013 11:09 AM
To: Brubaker, Dan
Subject: Flood Study - UT Horse Branch

Hi Mr. Brubaker,
I'm working on an EEP project in Beaufort County, NC and was hoping you would be able to send me the existing flood study information for Horse Branch in the vicinity of the project. Please find the attached EEP Checklist information for details on site location. If you should need any additional information or have any questions, please don't hesitate to contact me.

Thank you,

Kip Mumaw, PE
Manager

ECOSYSTEM SERVICES, LLC
270 Valentine Mill Road

Louisa, VA 23093
540.239.1428
www.ecosystemllc.com
EcosystemServicesFacebook
kip@ecosystemllc.com

~the creative solution~

Kip Mumaw

From: Lauren Gillooly <Lauren.Gillooly@riskmapcds.com>
Sent: Monday, December 30, 2013 10:27 AM
To: kip@ecosystemllc.com
Subject: Data Request Completion
Attachments: Final Payment Request.pdf

Kip,

Good morning, I have finished the research for your request **B1404089**. I was able to locate effective hardcopy HEC2 covering your area of interest (Between cross-sections 092-133) for **Horse Branch** in **Beaufort Co., NC**. Also I found handwritten hydrology for the unincorporated areas of Beaufort Co., but cannot verify hydrology. All data appears on microfiche therefore parts may be too blurred/bright making it difficult to read due to the quality of the originals. I have attached the final fees, if you wish to purchase the available data please let me know and send in the final payment. If you do NOT wish to purchase the available information please also let me know so that I may close your case. You will have two weeks from today to decide otherwise your case will be closed. Thank you.

Sincerely,
Lauren Gillooly

Exhibit 6

FEMA Released HEC-2 Calculations (1982)

HORSE

BRANCH

13 DEC 82 14:19:46

THIS RUN EXECUTED 13 DEC 82 14:19:46

OK.

```
**********************************************
 HEC2 RELEASE DATED NOV 75 UPDATED MARC 1982
 ERROR CORR -  01,02,03,04,05
 MODIFICATION -  50,51,52,53,54,55
**********************************************

T1 HORSE BRANCH OF CHOCOWINITY BASIN
T2 BEAUFORT COUNTY
T3      BASE FLOOD

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
      -0.       .       -0.       -0. -0.             -0.       -0.       -0.     18.510    -0.

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
      -0.       -0.     -1.000    -0.       -0.       -0.       -1.000    -0.       -0.       -0.

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
    200.000   110.000   -0.       -0.       -0.       -0.       -0.       -0.       -0.       -0.

J5  LPRNT     NUMSEC                        ********REQUESTED SECTION NUMBERS********
    -10.000   -0.       -0.       -0.       -0.       -0.       -0.       -0.       -0.       -0.
J6  IHLEG     ICOPY
      1.000   -0.       -0.       -0.       -0.       -0.       -0.       -0.       -0.       -0.

NC      .200      .200      .060      .100      .300      -0.       -0.       -0.       -0.       -0.
QT     5.000   448.000   903.000  1178.000  2062.000  1178.000    -0.       -0.       -0.       -0.
ET      -0.       -0.       -0.       -0.       -0.     10.400    -0.       -0.       -0.       -0.
X1     9.100    12.000   450.000   460.000     0.        0.       0.        -0.       -0.       -0.
GR    30.800      0.      25.100   200.000   16.100   270.000   12.700   450.000   11.500   451.000
GR    10.700   455.000    11.500   459.000   12.700   460.000   17.200   565.000   26.900   785.000
GR    25.600   885.000    28.000  1205.000    -0.       -0.       -0.       -0.       -0.       -0.

NC      -0.       -0.       -0.       .300      .500      -0.       -0.       -0.       -0.       -0.
X1     9.200    16.000   425.000   485.000   100.000   100.000   100.000     -0.       -0.       -0.
X3    10.000     -0.       -0.       -0.       -0.       -0.       -0.     18.540   18.440    18.440
GR    30.800      0.      25.100   200.000   16.100   270.000   15.800   425.000   14.500   432.000
GR    11.800   436.000    11.800   437.000   11.500   443.000   10.700   455.000   11.500   467.000
GR    13.700   476.000    15.800   485.000   17.200   565.000   21.780   665.000   26.100   885.000
GR    28.000  1205.000     -0.       -0.       -0.       -0.       -0.       -0.       -0.       -0.

SB     1.050    1.560     2.800     -0.      30.000    1.200   299.000    2.197    10.843   10.843
X1     9.300      0.       -0.       -0.     25.500   25.500   25.500     -0.       -0.       -0.
X2      -0.       -0.      1.000    17.670   19.200     -0.       -0.     -0.       -0.       -0.
X3    10.000     -0.       -0.       -0.       -0.       -0.       -0.   19.700   19.200    19.200
BT     9.000      0.      32.160      0.    270.000   22.850      0.    425.000   19.400      0.
BT   425.000   22.000      0.      485.000   22.000      0.     485.000   19.200      0.    665.000
```

BT	21.780	0.	885.000	26.130	0.	1205.000	28.000	0.	-0.	-0.
X1	9.400	12.000	450.000	460.000	100.000	100.000	100.000	-0.	-0.	-0.
GR	30.800	0.	25.100	200.000	16.100	270.000	12.700	450.000	11.500	451.000
GR	10.700	455.000	11.500	459.000	12.700	460.000	17.200	585.000	26.900	785.000
GR	25.600	885.000	28.000	1205.000	-0.	-0.	-0.	-0.	-0.	-0.
NC	-0.	-0.	-0.	.100	.300	-0.	-0.	-0.	-0.	-0.
QT	5.000	420.000	850.000	1100.000	1950.000	1100.000	-0.	-0.	-0.	-0.
XI	7.700	20.000	1080.000	1106.000	3400.000	3800.000	3600.000	-0.	-0.	-0.
GR	45.000	0.	38.600	468.000	35.000	723.000	22.400	880.000	23.500	896.000
GR	23.200	934.000	22.500	1055.000	20.300	1080.000	19.300	1097.000	18.700	1100.300
GR	19.300	1104.000	19.900	1106.000	21.400	1138.000	22.400	1312.000	23.200	1378.000
GR	30.500	1486.000	30.800	1551.000	35.000	1900.000	40.000	2400.000	45.000	4050.000
QT	5.000	360.000	735.000	960.000	1700.000	960.000	-0.	-0.	-0.	-0.
ET	-0.	-0.	-0.	-0.	-0.	8.400	-0.	-0.	-0.	-0.
X1	6.000	25.000	1231.000	1247.000	3600.000	3400.000	3465.000	-0.	-0.	-0.
GR	45.000	0.	37.700	650.000	39.100	893.000	38.400	1038.000	39.400	1041.000
GR	39.700	1050.000	29.700	1121.000	29.100	1231.000	25.900	1237.000	25.400	1240.000
GR	25.200	1243.000	25.400	1246.000	28.800	1247.000	28.500	1260.000	32.600	1268.000
GR	27.400	1279.000	29.100	1328.000	27.200	1390.000	31.400	1458.000	31.100	1586.000
GR	28.800	1652.000	29.200	1682.000	30.200	1692.000	40.000	2590.000	45.000	3290.000
QT	5.000	75.000	166.000	225.000	426.000	225.000	-0.	-0.	-0.	-0.
X1	13.000	11.000	348.500	361.000	4180.000	3980.000	4080.000	-0.	-0.	-0.
GR	48.700	0.	44.000	200.600	40.600	346.000	39.500	348.500	35.500	352.000
GR	35.500	357.000	39.500	361.000	40.100	363.000	46.400	622.000	48.000	740.000
GR	48.600	940.000	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.
ET	-0.	-0.	-0.	-0.	-0.	10.400	-0.	-0.	-0.	-0.
X1	16.100	8.000	365.000	389.000	1300.000	1100.000	1200.000	-0.	-0.	-0.
GR	52.600	0.	50.800	200.000	47.900	365.000	41.900	371.000	41.900	382.000
GR	47.600	389.000	51.300	589.000	54.000	789.000	-0.	-0.	-0.	-0.
NC	-0.	-0.	-0.	.300	.500	-0.	-0.	-0.	-0.	-0.
X1	16.200	10.000	378.000	382.000	100.000	100.000	100.000	-0.	-0.	-0.
X3	10.000	-0.	-0.	-0.	-0.	-0.	-0.	48.020	48.020	-0.
GR	52.600	0.	50.800	200.000	47.900	365.000	46.350	378.000	42.070	378.000
GR	42.070	382.000	46.350	382.000	47.600	389.000	51.300	589.000	54.000	789.000
SB	1.000	1.610	2.800	-0.	5.000	1.000	12.570	0.	43.210	43.210
X1	16.300	0.	-0.	-0.	90.500	90.500	90.500	-0.	-0.	-0.
X2	-0.	-0.	1.000	46.350	48.960	-0.	-0.	-0.	-0.	-0.
X3	10.000	-0.	-0.	-0.	-0.	-0.	-0.	49.960	49.960	-0.
BT	5.000	0.	52.770	0.	200.000	51.700	0.	380.000	49.960	0.
BT	589.000	51.490	0.	789.000	54.590	0.	-0.	-0.	-0.	-0.
X1	16.400	8.000	365.000	389.000	100.000	100.000	100.000	-0.	-0.	-0.
GR	52.600	0.	50.800	200.000	47.900	365.000	41.900	371.000	41.900	382.000
GR	47.600	389.000	51.300	589.000	54.000	789.000	-0.	-0.	-0.	-0.

QT	5.000	20.000	55.000	75.000	150.000	75.000	-0.	-0.	-0.	-0.
NC	-0.	-0.	-0.	.100	.300	-0.	-0.	-0.	-0.	-0.
ET	-0.	-0.	-0.	-0.	-0.	9.100	-0.	-0.	404.000	409.560
X1	17.100	12.000	404.000	409.000	900.000	900.000	900.000	-0.	-0.	-0.
GR	58.400	0.	56.000	200.000	55.700	265.000	53.200	400.000	54.000	404.000
GR	49.100	404.000	49.100	409.000	52.000	409.000	53.200	414.000	55.100	459.000
GR	56.900	659.000	57.900	859.000	-0.	-0.	-0.	-0.	-0.	-0.
NC	-0.	-0.	-0.	.300	.500	-0.	-0.	-0.	-0.	-0.
ET	-0.	-0.	-0.	-0.	-0.	10.400	-0.	-0.	-0.	-0.
X1	17.200	10.000	403.500	409.500	100.000	100.000	100.000	-0.	-0.	-0.
X3	10.000	-0.	-0.	-0.	-0.	-0.	-0.	56.000	56.000	-0.
GR	58.400	0.	56.000	200.000	55.700	265.000	54.400	403.500	51.300	403.500
GR	51.300	409.500	54.400	409.500	55.100	459.000	56.900	659.000	57.900	859.000
SB	1.000	1.660	2.800	-0.	3.000	1.000	24.000	.218	48.440	48.440
X1	17.300	0.	-0.	-0.	44.000	44.000	44.000	-0.	-0.	-0.
X2	-0.	-0.	1.000	55.300	56.750	-0.	-0.	-0.	-0.	-0.
X3	10.000	-0.	-0.	-0.	-0.	-0.	-0.	56.750	56.750	-0.
BT	5.000	0.	59.580	0.	200.000	57.800	0.	406.500	56.750	0.
BT	659.000	58.110	0.	859.000	58.600	0.	-0.	-0.	-0.	-0.
X1	17.400	12.000	404.000	409.000	30.000	30.000	30.000	-0.	2.000	-0.
GR	58.400	0.	56.000	200.000	55.700	265.000	53.200	400.000	54.000	404.000
GR	49.100	404.000	49.100	409.000	52.000	409.000	53.200	414.000	55.100	459.000
GR	56.900	659.000	57.900	859.000	-0.	-0.	-0.	-0.	-0.	-0.
X1	18.200	14.000	620.000	626.500	30.000	30.000	30.000	-0.	-0.	-0.
X3	10.000	-0.	-0.	-0.	-0.	-0.	-0.	58.300	58.300	-0.
GR	61.000	0.	60.000	100.000	59.300	620.000	54.310	620.000	54.310	620.600
GR	52.700	620.600	52.700	621.600	51.800	623.250	52.600	624.900	52.600	625.900
GR	54.310	625.900	54.310	626.500	59.340	626.500	59.000	1575.000	-0.	-0.
SB	1.000	1.560	2.700	-0.	6.300	1.000	31.260	.024	51.800	51.800
X1	18.300	0.	-0.	-0.	10.000	10.000	10.000	-0.	-0.	-0.
X2	-0.	-0.	1.000	57.550	58.000	-0.	-0.	-0.	-0.	-0.
X3	10.000	-0.	-0.	-0.	-0.	-0.	-0.	60.000	59.000	-0.
BT	4.000	0.	61.000	0.	100.000	60.000	0.	629.000	60.000	0.
BT	1575.000	59.000	0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.
X1	18.400	0.	-0.	-0.	50.000	50.000	50.000	-0.	-0.	-0.
EJ	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.	-0.

ARY PRINTOUT TABLE 150

SECND	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	*01K
9.100	0.	0.	0.	10.70	448.00	16.53	14.66	16.58	19.03	3.00	607.22	102.71
9.100	0.	0.	0.	10.70	903.00	17.88	15.53	17.93	19.01	3.50	1016.15	207.11
9.100	0.	0.	0.	10.70	1178.00	18.51	15.85	18.56	19.04	3.72	1226.84	269.94
9.100	0.	0.	0.	10.70	2062.00	20.16	16.70	20.22	19.02	4.27	1834.08	472.83
9.200	100.00	0.	0.	10.70	448.00	16.55	13.04	16.70	8.53	1.82	245.92	153.42
9.200	100.00	0.	0.	10.70	903.00	18.00	14.03	18.12	13.38	2.76	327.16	246.89
9.200	100.00	0.	0.	10.70	1178.00	18.52	14.53	18.70	9.64	2.52	996.15	379.44
9.200	100.00	0.	0.	10.70	2062.00	20.27	15.84	20.37	10.20	3.04	1605.09	645.52
9.300	25.50	19.20	17.67	10.70	448.00	16.55	0.	16.70	8.52	1.82	246.02	153.53
9.300	25.50	19.20	17.67	10.70	903.00	18.11	0.	18.22	12.54	2.71	333.59	255.04
9.300	25.50	19.20	17.67	10.70	1178.00	18.85	0.	19.00	14.05	3.12	378.12	314.27
9.300	25.50	19.20	17.67	10.70	2062.00	20.91	0.	20.99	7.19	2.69	1864.12	769.19
9.400	100.00	0.	0.	10.70	448.00	16.78	14.65	16.81	14.27	2.68	677.76	118.59
9.400	100.00	0.	0.	10.70	903.00	18.33	15.50	18.37	12.85	3.01	1167.77	251.88
9.400	100.00	0.	0.	10.70	1178.00	19.13	15.83	19.16	12.03	3.13	1445.60	339.60
9.400	100.00	0.	0.	10.70	2062.00	21.05	16.65	21.09	11.56	3.54	2196.81	606.58
7.000	3600.00	0.	0.	18.70	420.00	23.16	21.56	23.22	21.31	2.66	504.24	90.99
7.000	3600.00	0.	0.	18.70	850.00	24.18	22.61	24.24	19.75	3.04	1030.11	191.26
7.000	3600.00	0.	0.	18.70	1100.00	24.56	22.89	24.73	18.85	3.17	1290.19	253.39
7.000	3600.00	0.	0.	18.70	1950.00	26.06	23.66	26.12	16.38	3.47	2077.91	481.81
6.000	3465.00	0.	0.	25.20	360.00	30.21	28.71	30.25	19.51	2.39	553.12	81.50
6.000	3465.00	0.	0.	25.20	735.00	31.18	29.55	31.22	20.64	2.84	1001.20	161.78
6.000	3465.00	0.	0.	25.20	960.00	31.58	29.75	31.62	21.14	3.04	1266.93	208.81
6.000	3465.00	0.	0.	25.20	1700.00	32.58	30.43	32.62	21.59	3.44	2022.79	365.87
13.000	4080.00	0.	0.	35.50	75.00	39.50	37.20	39.57	25.37	2.15	34.96	14.60
13.000	4080.00	0.	0.	35.50	166.00	41.01	38.21	41.14	28.15	2.96	79.68	31.29
13.000	4080.00	0.	0.	35.50	225.00	41.61	38.72	41.76	28.69	3.26	137.90	42.01
13.000	4080.00	0.	0.	35.50	426.00	42.82	39.98	42.98	30.05	3.85	345.75	77.72
16.100	1200.00	0.	0.	41.90	75.00	44.12	42.98	44.22	51.04	2.51	29.85	10.50
16.100	1200.00	0.	0.	41.90	166.00	45.49	43.69	45.64	46.73	3.09	53.67	24.28
16.100	1200.00	0.	0.	41.90	225.00	46.14	44.07	46.31	47.25	3.39	66.44	32.73
16.100	1200.00	0.	0.	41.90	426.00	47.70	45.10	47.97	52.84	4.21	101.29	58.60
16.200	100.00	0.	0.	42.07	75.00	45.35	44.28	45.86	400.00	5.72	13.10	3.75
16.200	100.00	0.	0.	42.07	166.00	46.80	45.82	48.00	724.07	8.76	18.94	6.17
16.200	100.00	0.	0.	42.07	225.00	47.41	46.67	49.13	883.91	10.53	21.38	7.55
16.200	100.00	0.	0.	42.07	426.00	49.07	49.07	49.64	371.35	8.15	165.63	22.11

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
16.300	90.50	49.95	46.35	42.07	75.00	46.44	0.	46.73	193.19	4.29	17.48	5.40
16.300	90.50	49.95	46.35	42.07	166.00	50.31	0.	50.32	8.15	1.35	463.02	58.16
16.300	90.50	49.95	46.35	42.07	225.00	50.61	0.	50.62	3.81	1.51	560.89	71.82
16.300	90.50	49.96	46.35	42.07	426.00	51.06	0.	51.08	18.81	2.17	729.86	98.22
16.400	100.00	0.	0.	41.90	75.00	46.85	42.98	46.87	2.95	.92	81.80	43.68
16.400	100.00	0.	0.	41.90	166.00	50.33	43.70	50.33	1.04	.81	531.13	162.96
16.400	100.00	0.	0.	41.90	225.00	50.63	44.08	50.64	1.50	1.00	629.46	183.80
16.400	100.00	0.	0.	41.90	426.00	51.12	45.10	51.15	3.59	1.62	814.90	224.92
17.100	900.00	0.	0.	49.10	20.00	50.82	49.89	50.91	86.38	2.33	8.59	2.15
17.100	900.00	0.	0.	49.10	55.00	51.55	50.65	51.87	247.27	4.49	12.25	3.50
17.100	900.00	0.	0.	49.10	75.00	52.14	51.01	52.52	257.23	4.94	15.21	4.68
17.100	900.00	0.	0.	49.10	150.00	53.62	52.14	54.18	284.27	6.22	34.85	8.90
17.200	100.00	0.	0.	51.30	20.00	52.35	52.00	52.51	226.82	3.16	6.33	1.33
17.200	100.00	0.	0.	51.30	55.00	53.56	52.67	53.90	169.00	3.88	14.18	4.23
17.200	100.00	0.	0.	51.30	75.00	54.30	52.99	54.57	165.38	4.17	17.98	5.83
17.200	100.00	0.	0.	51.30	150.00	55.86	53.98	56.32	168.42	5.50	27.29	11.56
17.300	44.00	56.75	55.30	51.30	20.00	52.43	0.	52.57	182.63	2.94	6.80	1.48
17.300	44.00	56.75	55.30	51.30	55.00	53.78	0.	53.99	148.08	3.70	14.88	4.52
17.300	44.00	56.75	55.30	51.30	75.00	54.43	0.	54.67	145.90	4.00	18.76	6.19
17.300	44.00	56.75	55.30	51.30	150.00	56.85	0.	56.85	4.14	.98	651.17	73.76
17.400	30.00	0.	0.	51.10	20.00	52.84	51.89	52.93	82.96	2.30	8.71	2.20
17.400	30.00	0.	0.	51.10	55.00	54.22	52.65	54.41	127.80	3.53	15.68	4.86
17.400	30.00	0.	0.	51.10	75.00	54.86	53.00	55.10	134.71	3.95	20.33	6.46
17.400	30.00	0.	0.	51.10	150.00	56.85	54.14	56.93	51.29	3.04	150.65	20.94
18.200	30.00	0.	0.	51.80	20.00	53.32	53.14	53.57	424.30	4.03	4.96	.97
18.200	30.00	0.	0.	51.80	55.00	54.73	53.88	55.01	241.58	4.26	12.90	3.54
18.200	30.00	0.	0.	51.80	75.00	55.34	54.21	55.65	209.77	4.44	16.91	5.18
18.200	30.00	0.	0.	51.80	150.00	57.07	55.27	57.51	214.04	5.33	28.12	10.25
18.300	10.00	59.00	57.55	51.80	20.00	53.50	0.	53.67	255.83	3.40	5.88	1.25
18.300	10.00	59.00	57.55	51.80	55.00	54.85	0.	55.10	201.90	4.00	13.74	3.87
18.300	10.00	59.00	57.55	51.80	75.00	55.47	0.	55.75	183.71	4.23	17.74	5.53
18.300	10.00	59.00	57.55	51.80	150.00	57.25	0.	57.65	192.53	5.12	29.30	10.81
18.400	50.00	0.	0.	51.80	20.00	54.16	53.14	54.23	65.93	2.12	9.45	2.46
18.400	50.00	0.	0.	51.80	55.00	55.61	53.88	55.74	85.67	2.96	18.61	5.91
18.400	50.00	0.	0.	51.80	75.00	56.23	54.19	56.40	94.18	3.30	22.69	7.73
18.400	50.00	0.	0.	51.80	150.00	58.15	55.27	58.43	120.65	4.27	35.17	13.66

AR

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	9.100	448.00	16.53	0.	0.	5.03	282.67	0.
	9.100	903.00	17.88	1.35	0.	5.98	324.14	0.
	9.100	1178.00	18.51	.63	0.	6.21	343.38	0.
	9.100	2062.00	20.15	1.65	0.	7.36	393.57	0.
	9.200	448.00	16.65	0.	.12	0.	60.00	100.00
	9.200	903.00	18.00	1.35	.13	0.	60.00	100.00
	9.200	1178.00	18.62	.62	.12	0.	345.75	100.00
	9.200	2062.00	20.27	1.65	.11	0.	394.47	100.00
	9.300	448.00	16.65	0.	.00	0.	60.00	25.50
	9.300	903.00	18.11	1.46	.11	0.	60.00	25.50
	9.300	1178.00	18.85	.74	.23	0.	60.00	25.50
	9.300	2062.00	20.91	2.05	.64	0.	413.46	25.50
	9.400	448.00	16.78	0.	.13	0.	290.33	100.00
	9.400	903.00	18.33	1.56	.23	0.	338.10	100.00
	9.400	1178.00	19.13	.79	.28	0.	362.26	100.00
	9.400	2062.00	21.05	1.92	.13	0.	420.71	100.00
	7.000	420.00	23.16	0.	6.38	0.	452.40	3600.00
	7.000	850.00	24.18	1.02	5.85	0.	534.87	3600.00
	7.000	1100.00	24.66	.48	5.54	0.	547.36	3600.00
	7.000	1950.00	26.06	1.39	5.01	0.	585.83	3600.00
	6.000	360.00	30.21	0.	7.05	0.	393.79	3465.00
	6.000	735.00	31.18	.97	7.00	0.	566.35	3465.00
	6.000	960.00	31.58	.40	6.92	0.	706.58	3465.00
	6.000	1700.00	32.58	1.00	6.52	0.	809.20	3465.00
	13.000	75.00	39.50	0.	9.29	0.	12.49	4080.00
	13.000	166.00	41.01	1.51	9.84	0.	72.43	4080.00
	13.000	225.00	41.61	.60	10.03	0.	122.61	4080.00
	13.000	426.00	42.82	1.21	10.29	0.	223.55	4080.00
	16.100	75.00	44.12	0.	4.63	0.	15.94	1200.00
	16.100	166.00	45.49	1.36	4.48	0.	18.98	1200.00
	16.100	225.00	46.14	.65	4.53	0.	20.42	1200.00
	16.100	426.00	47.70	1.56	4.88	0.	28.74	1200.00
	16.200	75.00	45.35	0.	1.22	0.	4.00	100.00
	16.200	166.00	46.80	1.46	1.32	0.	4.00	100.00
	16.200	225.00	47.41	.61	1.28	0.	4.00	100.00
*	16.200	426.00	49.07	1.65	1.38	0.	170.25	100.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	16.300	75.00	46.44	0.	1.09	0.	4.00	90.50
*	16.300	166.00	50.31	3.87	3.50	0.	308.18	90.50
*	16.300	225.00	50.61	.30	3.19	0.	341.60	90.50
*	16.300	426.00	51.06	.46	1.99	0.	406.82	90.50
	16.400	75.00	46.85	0.	.41	0.	22.03	100.00
	16.400	166.00	50.33	3.47	.02	0.	308.88	100.00
	16.400	225.00	50.63	.31	.02	0.	342.38	100.00
	16.400	426.00	51.12	.49	.05	0.	414.41	100.00
	17.100	20.00	50.82	0.	3.97	0.	5.00	900.00
	17.100	55.00	51.55	.73	1.23	0.	5.00	900.00
	17.100	75.00	52.14	.59	1.51	0.	5.56	900.00
	17.100	150.00	53.62	1.48	2.50	0.	4[illegible].46	900.00
	17.200	20.00	52.35	0.	1.53	0.	6.00	100.00
	17.200	55.00	53.66	1.31	2.11	0.	6.00	100.00
	17.200	75.00	54.30	.63	2.15	0.	6.00	100.00
	17.200	150.00	55.86	1.56	2.24	0.	6.00	100.00
	17.300	20.00	52.43	0.	.08	0.	6.00	44.00
	17.300	55.00	53.78	1.35	.12	0.	6.00	44.00
	17.300	75.00	54.43	.65	.13	0.	6.00	44.00
	17.300	150.00	56.85	2.42	.99	0.	524.04	44.00
	17.400	20.00	52.84	0.	.41	0.	5.00	30.00
	17.400	55.00	54.22	1.37	.44	0.	5.90	30.00
	17.400	75.00	54.86	.64	.43	0.	8.58	30.00
	17.400	150.00	56.85	1.99	.[illegible]	0.	142.12	30.00
	18.200	20.00	53.32	0.	.48	0.	5.30	30.00
	18.200	55.00	54.73	1.40	.51	0.	6.50	30.00
	18.200	75.00	55.34	.62	.48	0.	6.50	30.00
	18.200	150.00	57.07	1.73	.22	0.	6.50	30.00
	18.300	20.00	53.50	0.	.17	0.	5.30	10.00
	18.300	55.00	54.85	1.35	.13	0.	6.50	10.00
	18.300	75.00	55.47	.62	.13	0.	6.50	10.00
	18.300	150.00	57.25	1.78	.18	0.	6.50	10.00
	18.400	20.00	54.16	0.	.67	0.	5.30	50.00
	18.400	55.00	55.61	1.45	.75	0.	6.50	50.00
	18.400	75.00	56.23	.63	.76	0.	6.50	50.00
	18.400	150.00	58.15	1.92	.90	0.	6.50	50.00

FLOODWAY DATA, BASE FLOOD
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
9.100	154.	920.	1.3	19.5	18.5	1.0
A — 9.200	60.	425.	2.8	19.6	18.6	1.0
9.300	60.	439.	2.7	19.9	18.9	1.0
9.400	174.	1113.	1.1	20.0	19.1	.9
B — 7.000	178.	806.	1.4	25.7	24.7	1.0
C — 6.000	256.	320.	1.0	32.5	31.6	.9
D — 13.000	13.	74.	3.1	42.6	41.6	1.0
16.100	21.	74.	3.0	46.5	46.1	.4
16.200	4.	22.	10.3	47.5	47.4	.1
E — 16.300	80.	263.	.9	50.7	50.6	.1
16.400	37.	216.	1.0	50.8	50.6	.2
17.100	5.	17.	4.4	52.4	52.1	.3
17.200	6.	18.	4.2	54.3	54.3	0.
17.300	6.	25.	3.0	55.4	54.4	1.0
17.400	5.	23.	3.3	55.7	54.9	.8
18.200	7.	21.	3.6	55.9	55.3	.6
F — 18.300	7.	24.	3.1	56.5	55.5	1.0
18.400	7.	27.	2.8	56.8	56.2	.6

Exhibit 7

EEP Floodplain Requirements Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Hudson Property – Stream Mitigation Project
Name of stream or feature:	UT Horse Branch – Chocowinity Creek
County:	Beaufort County
Name of river basin:	Tar-Pamlico River (CU: 03020104)
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Beaufort County
DFIRM panel number for entire site:	Panel: 5662 Number: 370013
Consultant name:	Albemarle Restorations, LLC
Phone number:	(252) 333-0249
Address:	P.O. Box 176 Fairfield, NC 27826

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500".

The North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program has selected 13.49 acres of land positioned on 106.51 acres of the property owned by Charles E. Hudson for this full delivery contract, for stream restoration to fulfill a portion of the Request for Proposals (RFP): Full Delivery Project Tar-Pamlico River Basin, RFP 16-004106. The RFP and subsequent contract(s) awarded by EEP provide compensatory stream, wetland and/or buffer mitigation within the Tar-Pamlico River Basin Cataloging Unit 03020104. Albemarle Restorations, LLC entered into a contract with the State of North Carolina on June 12, 2012 to deliver 2,700 stream mitigation units on the Hudson project site. See attached map as requested.

Hudson Property – Stream Restoration Summary

Reach	**Length**	**Priority**
Reach 1	*833*	*One (Restoration)*
Reach 2	*532*	*One/Two (Restoration)*
Reach 3	*445*	*One/Two (Restoration)*
Reach 4	*437*	*One/Two (Restoration)*
Reach 5	*644*	*Two (Restoration)*

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

☉ Yes ○ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☑ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation: Zone AE and Zone X

Check if applies:

☑ AE Zone

- ☉ Floodway
- ○ Non-Encroachment

○ None

☐ A Zone

○ Local Setbacks Required

○ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

○ Yes ◉ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

○ Yes ◉ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)

Name of Local Floodplain Administrator: Billy Merrill, PLS, CFM (City of Greenville)
Phone Number: 252-329-4478

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

☐ No Action

☑ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements:

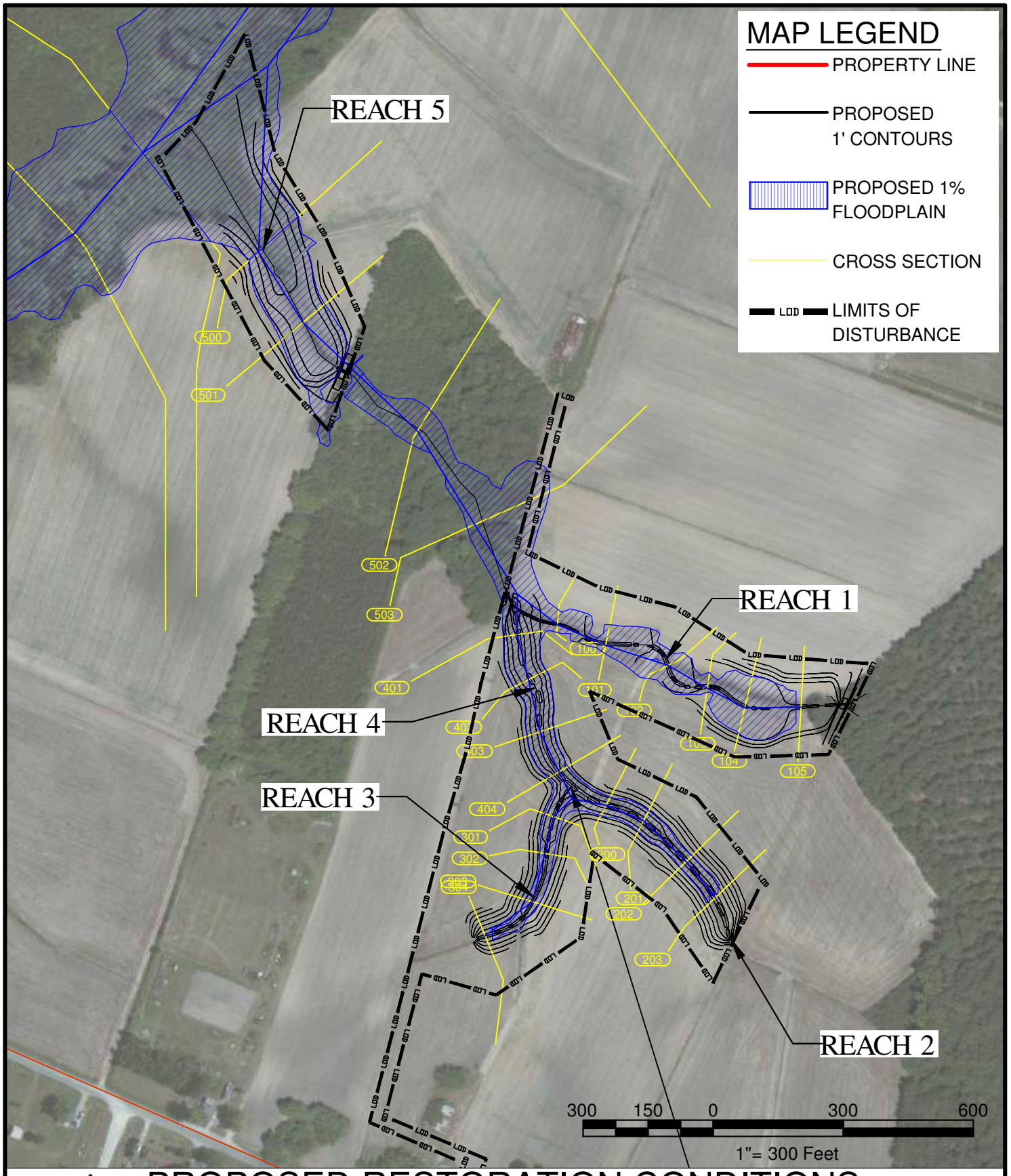
Comments: Flood Study has been performed showing “no rise” in base flood elevations due to the proposed project.

Name: William K. Mumaw, PE Signature: 

Title: Engineer Date: 2/26/14

Exhibit 8

Supplemental Hydraulic Study

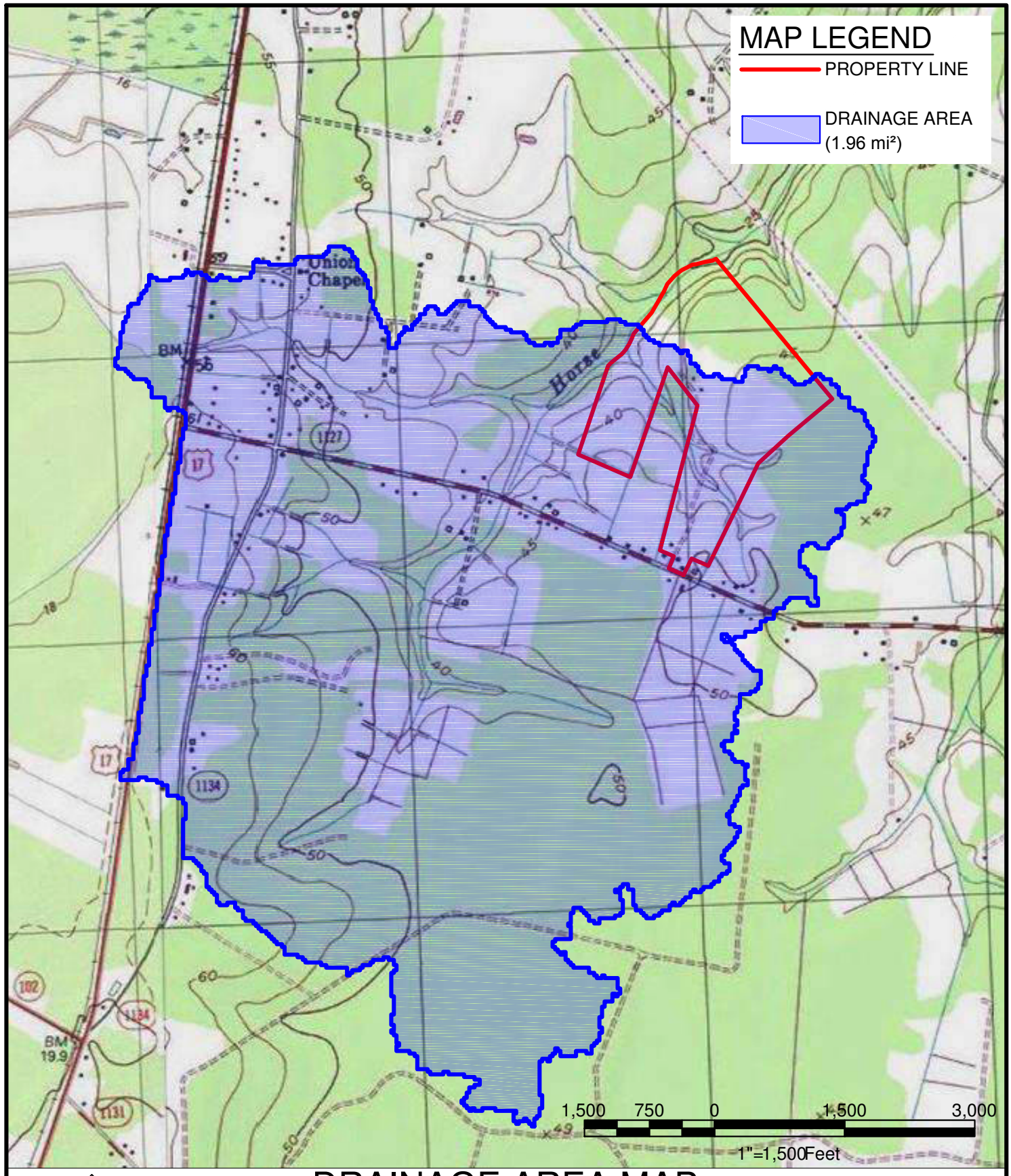


PROPOSED RESTORATION CONDITIONS
HUDSON PROPERTY

SOURCE: NC ONEMAP

BEAUFORT COUNTY, NC

DATE: 3/3/14



DRAINAGE AREA MAP
HUDSON PROPERTY

SOURCE: USGS STREAM STAT BEAUFORT COUNTY, NC DATE: 2/26/14

USGS North Carolina StreamStats

Streamstats Ungaged Site Report

Date: Wed Feb 26 2014 11:03:54 Mountain Standard Time
Site Location: North_Carolina
NAD27 Latitude: 35.4522 (35 27 08)
NAD27 Longitude: -77.1063 (-77 06 23)
NAD83 Latitude: 35.4524 (35 27 09)
NAD83 Longitude: -77.1060 (-77 06 22)
Drainage Area: 1.96 mi2
Percent Urban: 9.4 %
Percent Impervious: 1.2 %

Peak Flows Region Grid Basin Characteristics

100% Peak Southeast US 2009 5158 (1.96 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	1.96	1	9000
Percent Area in Region 1 (percent)	0.000	0	100
Percent Area in Region 2 (percent)	0.000	0	100
Percent Area in Region 3 (percent)	0.000	0	100
Percent Area in Region 4 (percent)	100.000	0	100
Percent Area in Region 5 (percent)	0.000	0	100

Urban Flows Region Grid Basin Characteristics

100% Peak urban Coastal Plain FS007-00 (1.96 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	1.96	0.04	41
Area of Impervious Surfaces (percent)	1.17 (below min value 2)	2	54.6

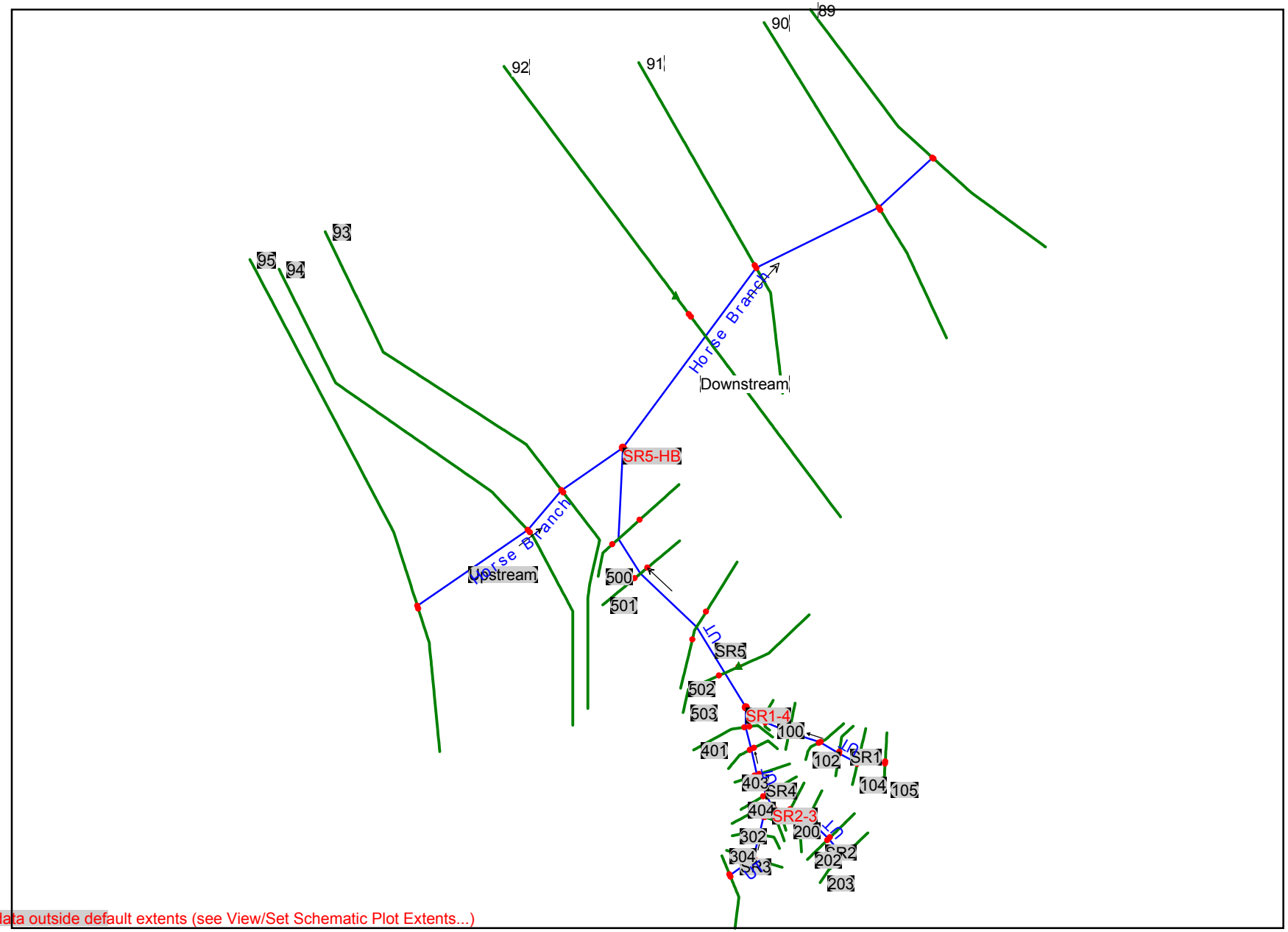
Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Peak Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	93.3	35		53.6	162
PK5	188	34		108	324
PK10	263	35		150	463
PK25	369	38		203	673
PK50	463	40		246	871
PK100	567	42		291	1100
PK200	664	44		329	1340
PK500	814	48		384	1720

Urban Flows Region Grid Streamflow Statistics

Statistic	Flow (ft^3/s)	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2U	48.7				
PK5U	116				
PK10U	180				
PK25U	328				
PK50U	434				
PK100U	555				



Some schematic data outside default extents (see View/Set Schematic Plot Extents...)

HEC-RAS Plan: Current mode

River	Reach	River Sta	Profile	Q Total	Min Ch El	Max Chl Dpth	Hydr Radius	E.G. Slope	Vel Chnl	Vel Total	Flow Area	Top Width	Froude # Chl	Power Chan	Power Total	Shear Chan	Shear Total	Invert Slope
				(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(ft/s)	(sq ft)	(ft)		(lb/ft s)	(lb/ft s)	(lb/sq ft)	(lb/sq ft)	
UT	SR1	105	2yr	5.60	39.63	0.38	0.20	0.059267	2.64	2.63	2.13	10.79	0.99	2.14	1.91	0.81	0.73	0.0049
UT	SR1	105	10yr	19.00	39.63	0.64	0.22	0.030959	3.21	2.24	8.49	37.71	0.81	3.00	0.97	0.93	0.43	0.0049
UT	SR1	105	50yr	29.20	39.63	0.74	0.27	0.029985	3.58	2.29	12.77	48.06	0.83	3.90	1.14	1.09	0.50	0.0049
UT	SR1	105	100yr	37.40	39.63	0.80	0.29	0.030141	3.84	2.36	15.87	54.29	0.84	4.63	1.29	1.21	0.55	0.0049
UT	SR1	104	2yr	5.60	39.00	0.42	0.23	0.001086	0.52	0.38	14.84	63.64	0.15	0.01	0.01	0.03	0.02	0.0039
UT	SR1	104	10yr	19.00	39.00	0.71	0.38	0.001127	0.77	0.49	38.68	102.36	0.16	0.04	0.01	0.05	0.03	0.0039
UT	SR1	104	50yr	29.20	39.00	0.84	0.44	0.001206	0.89	0.55	52.95	119.69	0.18	0.05	0.02	0.06	0.03	0.0039
UT	SR1	104	100yr	37.40	39.00	0.92	0.49	0.001232	0.96	0.59	63.87	131.42	0.18	0.07	0.02	0.07	0.04	0.0039
UT	SR1	103	2yr	5.60	38.61	0.49	0.19	0.014414	1.72	1.53	3.65	19.38	0.52	0.52	0.26	0.30	0.17	0.0088
UT	SR1	103	10yr	19.00	38.61	0.79	0.28	0.010047	2.19	1.38	13.73	48.12	0.48	0.86	0.25	0.39	0.18	0.0088
UT	SR1	103	50yr	29.20	38.61	0.91	0.33	0.009978	2.45	1.45	20.18	60.13	0.50	1.14	0.30	0.47	0.21	0.0088
UT	SR1	103	100yr	37.40	38.61	0.88	0.33	0.019532	3.34	2.01	18.64	57.18	0.69	2.94	0.80	0.88	0.40	0.0088
UT	SR1	102	2yr	5.60	37.58	0.62	0.24	0.004967	1.21	1.00	5.60	23.45	0.32	0.16	0.07	0.14	0.07	0.0038
UT	SR1	102	10yr	19.00	37.58	0.90	0.34	0.006529	1.93	1.27	14.99	43.63	0.40	0.56	0.18	0.29	0.14	0.0038
UT	SR1	102	50yr	29.20	37.58	1.07	0.29	0.005797	2.09	1.17	25.02	87.14	0.39	0.67	0.12	0.32	0.10	0.0038
UT	SR1	102	100yr	37.40	37.58	1.25	0.40	0.002990	1.70	0.88	42.38	105.00	0.29	0.34	0.07	0.20	0.08	0.0038
UT	SR1	101	2yr	5.60	36.95	0.40	0.20	0.005132	1.12	0.66	8.52	42.80	0.32	0.14	0.04	0.12	0.06	0.0159
UT	SR1	101	10yr	19.00	36.95	0.62	0.30	0.004760	1.46	0.78	24.40	80.24	0.33	0.26	0.07	0.18	0.09	0.0159
UT	SR1	101	50yr	29.20	36.95	0.68	0.35	0.006605	1.83	1.00	29.26	82.94	0.40	0.50	0.15	0.27	0.15	0.0159
UT	SR1	101	100yr	37.40	36.95	0.54	0.24	0.042468	3.96	2.05	18.26	76.71	0.97	5.46	1.29	1.38	0.63	0.0159
UT	SR1	100	2yr	5.60	35.01	0.67	0.34	0.057636	3.44	3.44	1.63	4.56	1.02	4.16	4.16	1.21	1.21	0.0032
UT	SR1	100	10yr	19.00	35.01	1.22	0.28	0.024952	3.89	3.05	6.23	21.89	0.76	4.56	1.32	1.17	0.43	0.0032
UT	SR1	100	50yr	29.20	35.01	1.49	0.24	0.011377	3.18	1.56	18.76	76.62	0.54	2.28	0.27	0.71	0.17	0.0032
UT	SR1	100	100yr	37.40	35.01	1.87	0.53	0.001763	1.53	0.73	51.57	97.15	0.22	0.23	0.04	0.15	0.06	0.0032
UT	SR2	203	2yr	17.20	35.34	1.22	0.61	0.001706	1.08	1.00	17.26	28.25	0.21	0.10	0.06	0.09	0.06	-0.0003
UT	SR2	203	10yr	47.40	35.34	1.74	0.86	0.002071	1.65	1.34	35.30	40.87	0.25	0.29	0.15	0.17	0.11	-0.0003
UT	SR2	203	50yr	68.80	35.34	2.01	1.01	0.002136	1.88	1.47	46.79	46.31	0.26	0.40	0.20	0.21	0.13	-0.0003
UT	SR2	203	100yr	85.20	35.34	2.17	1.10	0.002201	2.04	1.56	54.73	49.70	0.27	0.50	0.23	0.24	0.15	-0.0003
UT	SR2	202	2yr	17.20	35.37	0.74	0.47	0.014405	2.15	2.15	8.00	16.98	0.55	0.91	0.91	0.42	0.42	0.0060
UT	SR2	202	10yr	47.40	35.37	1.25	0.68	0.008564	2.65	2.41	19.67	28.96	0.48	1.34	0.87	0.51	0.36	0.0060
UT	SR2	202	50yr	68.80	35.37	1.53	0.80	0.006810	2.81	2.39	28.80	35.67	0.45	1.47	0.82	0.52	0.34	0.0060
UT	SR2	202	100yr	85.20	35.37	1.69	0.88	0.006506	2.98	2.45	34.80	39.31	0.44	1.68	0.88	0.56	0.36	0.0060
UT	SR2	201	2yr	17.20	34.56	1.08	0.60	0.001672	1.07	0.96	17.90	29.82	0.21	0.09	0.06	0.09	0.06	0.0029
UT	SR2	201	10yr	47.40	34.56	1.73	0.95	0.001381	1.43	1.12	42.14	44.33	0.21	0.18	0.09	0.13	0.08	0.0029
UT	SR2	201	50yr	68.80	34.56	2.05	1.13	0.001302	1.59	1.19	57.64	50.94	0.21	0.23	0.11	0.15	0.09	0.0029
UT	SR2	201	100yr	85.20	34.56	2.19	1.20	0.001486	1.78	1.32	64.69	53.70	0.22	0.32	0.15	0.18	0.11	0.0029
UT	SR2	200	2yr	17.20	34.29	1.20	0.65	0.001567	1.06	1.00	17.24	26.55	0.20	0.09	0.06	0.08	0.06	0.0021
UT	SR2	200	10yr	47.40	34.29	1.87	0.95	0.001359	1.45	1.17	40.48	42.37	0.21	0.19	0.09	0.13	0.08	0.0021
UT	SR2	200	50yr	68.80	34.29	2.20	1.13	0.001292	1.61	1.24	55.66	49.19	0.21	0.24	0.11	0.15	0.09	0.0021
UT	SR2	200	100yr	85.20	34.29	2.31	1.18	0.001560	1.84	1.39	61.26	51.48	0.23	0.35	0.16	0.19	0.12	0.0021
UT	SR3	304	2yr	8.00	36.54	0.78	0.44	0.005055	1.32	1.30	6.14	13.82	0.33	0.21	0.18	0.16	0.14	0.0039
UT	SR3	304	10yr	20.90	36.54	1.08	0.57	0.006718	2.08	1.89	11.05	19.31	0.41	0.69	0.45	0.33	0.24	0.0039
UT	SR3	304	50yr	30.10	36.54	1.25	0.63	0.006881	2.39	2.07	14.56	22.87	0.43	0.98	0.56	0.41	0.27	0.0039
UT	SR3	304	100yr	37.00	36.54	1.34	0.67	0.007224	2.61	2.19	16.87	24.99	0.45	1.24	0.66	0.47	0.30	0.0039
UT	SR3	303	2yr	8.00	35.99	0.49	0.33	0.007233	1.44	1.32	6.06	18.51	0.39	0.28	0.19	0.19	0.15	0.0085
UT	SR3	303	10yr	20.90	35.99	0.86	0.52	0.004844	1.78	1.43	14.62	27.91	0.35	0.43	0.23	0.24	0.16	0.0085
UT	SR3	303	50yr	30.10	35.99	1.03	0.62	0.004597	1.98	1.52	19.83	32.12	0.35	0.55	0.27	0.28	0.18	0.0085
UT	SR3	303	100yr	37.00	35.99	1.15	0.68	0.004340	2.07	1.56	23.79	34.65	0.35	0.61	0.29	0.30	0.19	0.0085
UT	SR3	302	2yr	8.00	35.00	0.69	0.56	0.006221	1.60	1.60	5.01	8.54	0.37	0.35	0.35	0.22	0.22	0.0068
UT	SR3	302	10yr	20.90	35.00	1.25	0.60	0.005070	1.92	1.83	11.42	18.63	0.36	0.52	0.35	0.27	0.19	0.0068
UT	SR3	302	50yr	30.10	35.00	1.55	0.62	0.003511	1.93	1.61	18.66	29.31	0.31	0.49	0.22	0.25	0.14	0.0068
UT	SR3	302	100yr	37.00	35.00	1.67	0.66	0.003622	2.09	1.66	22.30	33.43	0.32	0.60	0.25	0.29	0.15	0.0068

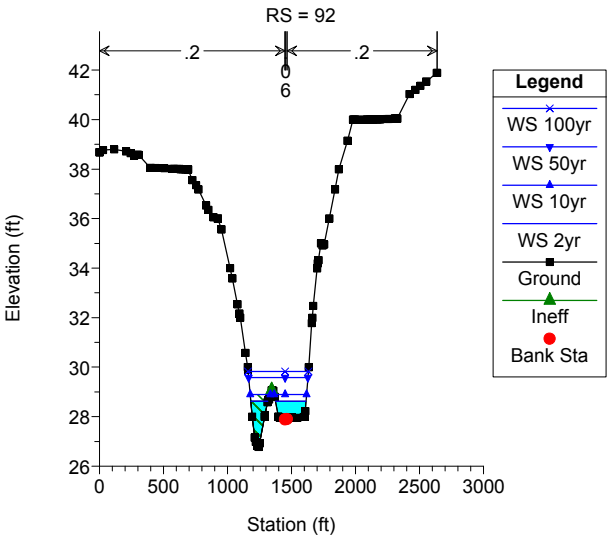
HEC-RAS Plan: Current mode (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	Max Chl Dpth	Hydr Radius	E.G. Slope	Vel Chnl	Vel Total	Flow Area	Top Width	Froude # Chl	Power Chan	Power Total	Shear Chan	Shear Total	Invert Slope
				(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(ft/s)	(sq ft)	(ft)		(lb/ft s)	(lb/ft s)	(lb/sq ft)	(lb/sq ft)	
UT	SR3	301	2yr	8.00	34.41	1.07	0.52	0.001453	0.90	0.84	9.57	18.16	0.19	0.06	0.04	0.06	0.05	0.0033
UT	SR3	301	10yr	20.90	34.41	1.73	0.78	0.000811	1.03	0.79	26.36	33.39	0.16	0.07	0.03	0.07	0.04	0.0033
UT	SR3	301	50yr	30.10	34.41	2.06	0.88	0.000680	1.09	0.77	39.03	43.83	0.15	0.08	0.03	0.07	0.04	0.0033
UT	SR3	301	100yr	37.00	34.41	2.16	0.92	0.000789	1.22	0.84	43.83	47.32	0.16	0.11	0.04	0.09	0.05	0.0033
UT	SR4	404	2yr	26.20	34.00	1.24	0.83	0.001930	1.22	1.21	21.61	25.73	0.23	0.13	0.12	0.11	0.10	0.0081
UT	SR4	404	10yr	70.60	34.00	1.90	1.07	0.002090	1.83	1.63	43.21	40.12	0.26	0.37	0.23	0.20	0.14	0.0081
UT	SR4	404	50yr	102.00	34.00	2.22	1.20	0.002152	2.10	1.78	57.32	47.28	0.27	0.53	0.29	0.25	0.16	0.0081
UT	SR4	404	100yr	125.90	34.00	2.22	1.20	0.003281	2.59	2.20	57.31	47.27	0.33	1.00	0.54	0.38	0.25	0.0081
UT	SR4	403	2yr	26.20	33.16	2.02	0.97	0.000313	0.68	0.57	45.84	47.18	0.10	0.02	0.01	0.03	0.02	0.0013
UT	SR4	403	10yr	70.60	33.16	2.66	1.32	0.000550	1.14	0.88	79.85	60.03	0.14	0.08	0.04	0.07	0.05	0.0013
UT	SR4	403	50yr	102.00	33.16	2.97	1.49	0.000651	1.37	1.02	99.80	66.46	0.15	0.13	0.06	0.10	0.06	0.0013
UT	SR4	403	100yr	125.90	33.16	2.92	1.46	0.001095	1.74	1.31	96.00	65.28	0.20	0.28	0.13	0.16	0.10	0.0013
UT	SR4	402	2yr	26.20	33.00	2.17	1.36	0.000064	0.39	0.29	90.85	66.68	0.05	0.00	0.00	0.01	0.01	0.0093
UT	SR4	402	10yr	70.60	33.00	2.79	1.72	0.000161	0.73	0.52	136.05	79.07	0.08	0.02	0.01	0.03	0.02	0.0093
UT	SR4	402	50yr	102.00	33.00	3.10	1.88	0.000215	0.91	0.63	161.35	85.52	0.09	0.04	0.02	0.04	0.03	0.0093
UT	SR4	402	100yr	125.90	33.00	3.02	1.84	0.000367	1.16	0.82	154.40	83.57	0.12	0.08	0.03	0.07	0.04	0.0093
UT	SR4	401	2yr	26.20	32.00	3.17	1.64	0.000032	0.32	0.24	107.88	65.48	0.03	0.00	0.00	0.01	0.00	-0.0073
UT	SR4	401	10yr	70.60	32.00	3.78	1.83	0.000100	0.65	0.46	152.33	82.52	0.06	0.01	0.01	0.02	0.01	-0.0073
UT	SR4	401	50yr	102.00	32.00	4.08	1.74	0.000148	0.84	0.57	180.22	102.76	0.08	0.03	0.01	0.03	0.02	-0.0073
UT	SR4	401	100yr	125.90	32.00	3.99	1.75	0.000240	1.05	0.74	170.77	97.08	0.10	0.05	0.02	0.05	0.03	-0.0073
UT	SR5	503	2yr	39.20	34.00	1.13	0.77	0.000942	0.76	0.76	51.32	114.89	0.15	0.03	0.03	0.05	0.05	0.0001
UT	SR5	503	10yr	107.70	34.00	1.67	1.07	0.001368	1.15	1.15	93.62	168.50	0.20	0.11	0.11	0.09	0.09	0.0001
UT	SR5	503	50yr	156.90	34.00	1.94	1.21	0.001548	1.33	1.33	118.26	195.19	0.21	0.15	0.15	0.12	0.12	0.0001
UT	SR5	503	100yr	194.60	34.00	1.71	1.09	0.004136	2.02	2.02	96.37	171.68	0.34	0.57	0.57	0.28	0.28	0.0001
UT	SR5	502	2yr	39.20	33.98	0.25	0.21	0.061137	2.62	2.62	14.98	70.50	1.00	2.12	2.12	0.81	0.81	0.0123
UT	SR5	502	10yr	107.70	33.98	0.46	0.38	0.050256	3.47	3.47	31.02	82.46	1.00	4.10	4.10	1.18	1.18	0.0123
UT	SR5	502	50yr	156.90	33.98	0.57	0.46	0.047840	3.88	3.88	40.44	87.67	1.01	5.34	5.34	1.38	1.38	0.0123
UT	SR5	502	100yr	194.60	33.98	0.65	0.52	0.045789	4.11	4.11	47.32	90.95	1.00	6.11	6.11	1.49	1.49	0.0123
UT	SR5	501	2yr	39.20	29.37	0.76	0.56	0.001693	0.86	0.86	45.81	82.20	0.20	0.05	0.05	0.06	0.06	0.0019
UT	SR5	501	10yr	107.70	29.37	1.50	1.05	0.000764	1.00	0.91	118.15	112.59	0.15	0.06	0.05	0.06	0.05	0.0019
UT	SR5	501	50yr	156.90	29.37	1.75	1.21	0.000868	1.19	1.06	147.73	122.50	0.17	0.10	0.07	0.09	0.07	0.0019
UT	SR5	501	100yr	194.60	29.37	1.96	1.33	0.000847	1.28	1.12	174.19	130.46	0.17	0.12	0.08	0.09	0.07	0.0019
UT	SR5	500	2yr	39.20	29.00	1.04	0.87	0.000229	0.41	0.41	95.72	109.90	0.08	0.01	0.01	0.01	0.01	0.0011
UT	SR5	500	10yr	107.70	29.00	1.80	1.34	0.000241	0.56	0.56	191.89	143.06	0.09	0.01	0.01	0.02	0.02	0.0011
UT	SR5	500	50yr	156.90	29.00	2.03	1.47	0.000324	0.69	0.69	226.60	153.66	0.10	0.02	0.02	0.03	0.03	0.0011
UT	SR5	500	100yr	194.60	29.00	2.24	1.62	0.000334	0.75	0.75	259.38	159.60	0.10	0.03	0.03	0.03	0.03	0.0011
Horse Branch	Upstream	95	2yr	54.40	30.00	0.87	0.68	0.003956	1.42	0.47	115.08	168.58	0.27	0.30	0.08	0.21	0.17	0.0031
Horse Branch	Upstream	95	10yr	155.30	30.00	1.80	1.24	0.002157	1.70	0.50	308.45	248.17	0.22	0.41	0.08	0.24	0.17	0.0031
Horse Branch	Upstream	95	50yr	306.10	30.00	2.54	1.71	0.002079	2.10	0.59	516.26	302.11	0.23	0.70	0.13	0.33	0.22	0.0031
Horse Branch	Upstream	95	100yr	372.40	30.00	2.80	1.88	0.002076	2.24	0.63	595.43	317.15	0.24	0.81	0.15	0.36	0.24	0.0031
Horse Branch	Upstream	94	2yr	54.40	28.00	1.65	1.12	0.001126	1.14	0.42	128.47	114.67	0.16	0.13	0.03	0.11	0.08	0.0000
Horse Branch	Upstream	94	10yr	155.30	28.00	2.63	1.13	0.001573	1.85	0.50	308.48	273.82	0.20	0.47	0.06	0.25	0.11	0.0000
Horse Branch	Upstream	94	50yr	306.10	28.00	3.26	1.50	0.001947	2.38	0.61	502.38	334.40	0.23	0.93	0.11	0.39	0.18	0.0000
Horse Branch	Upstream	94	100yr	372.40	28.00	3.54	1.66	0.001875	2.47	0.62	600.53	362.33	0.23	1.01	0.12	0.41	0.19	0.0000
Horse Branch	Upstream	93	2yr	54.40	28.00	1.93	1.33	0.000196	0.47	0.15	371.00	278.64	0.07	0.01	0.00	0.02	0.02	0.0001
Horse Branch	Upstream	93	10yr	155.30	28.00	2.87	2.02	0.000301	0.79	0.24	653.69	322.87	0.09	0.04	0.01	0.05	0.04	0.0001
Horse Branch	Upstream	93	50yr	306.10	28.00	3.41	2.37	0.000585	1.26	0.37	834.65	351.89	0.13	0.14	0.03	0.11	0.09	0.0001
Horse Branch	Upstream	93	100yr	372.40	28.00	3.68	2.55	0.000634	1.38	0.40	931.93	365.32	0.13	0.18	0.04	0.13	0.10	0.0001
Horse Branch	Downstream	92	2yr	93.31	27.88	1.85	0.62	0.009598	1.96	0.64	146.92	371.75	0.41	0.86	0.23	0.44	0.37	0.0048
Horse Branch	Downstream	92	10yr	263.00	27.88	2.12	0.85	0.023891	3.83	1.23	214.12	411.70	0.67	5.72	1.55	1.49	1.26	0.0048
Horse Branch	Downstream	92	50yr	463.00	27.88	2.80	1.52	0.003770	2.15	0.66	702.46	462.86	0.29	0.85	0.24	0.40	0.36	0.0048
Horse Branch	Downstream	92	100yr	567.00	27.88	3.05	1.74	0.003494	2.27	0.69	817.78	470.88	0.29	0.96	0.26	0.42	0.38	0.0048

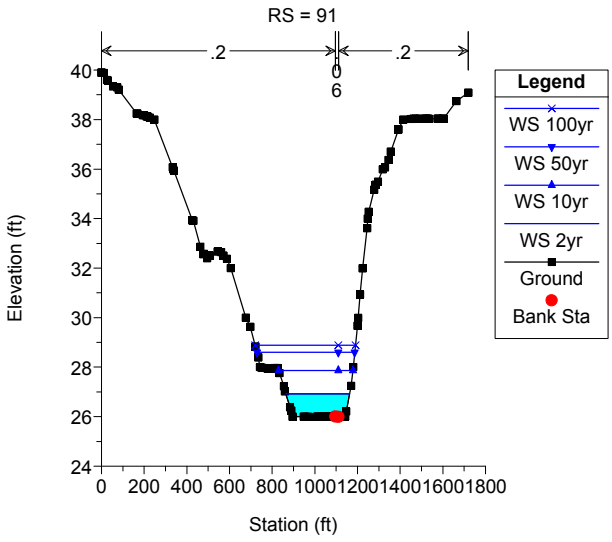
HEC-RAS Plan: Current mode (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	Max Chl Dpth	Hydr Radius	E.G. Slope	Vel Chnl	Vel Total	Flow Area	Top Width	Froude # Chl	Power Chan	Power Total	Shear Chan	Shear Total	Invert Slope
				(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(ft/s)	(sq ft)	(ft)		(lb/ft s)	(lb/ft s)	(lb/sq ft)	(lb/sq ft)	
Horse Branch	Downstream	91	2yr	93.31	25.99	0.94	0.84	0.002377	1.15	0.37	252.68	299.43	0.21	0.16	0.05	0.14	0.13	0.0031
Horse Branch	Downstream	91	10yr	263.00	25.99	1.87	1.59	0.001695	1.55	0.47	555.69	349.23	0.20	0.31	0.08	0.20	0.17	0.0031
Horse Branch	Downstream	91	50yr	463.00	25.99	2.61	1.91	0.001663	1.91	0.53	876.36	458.83	0.21	0.52	0.10	0.27	0.20	0.0031
Horse Branch	Downstream	91	100yr	567.00	25.99	2.90	2.15	0.001622	2.03	0.56	1010.94	470.92	0.21	0.59	0.12	0.29	0.22	0.0031
Horse Branch	Downstream	90	2yr	93.31	23.93	1.63	1.14	0.001745	1.42	0.45	205.67	180.43	0.20	0.25	0.06	0.18	0.12	0.0004
Horse Branch	Downstream	90	10yr	263.00	23.93	2.56	1.55	0.002472	2.30	0.64	410.70	265.16	0.25	0.90	0.15	0.39	0.24	0.0004
Horse Branch	Downstream	90	50yr	463.00	23.93	3.24	1.93	0.002771	2.84	0.76	605.84	313.22	0.28	1.58	0.26	0.56	0.33	0.0004
Horse Branch	Downstream	90	100yr	567.00	23.93	3.52	2.11	0.002848	3.05	0.81	698.64	331.32	0.29	1.90	0.30	0.62	0.37	0.0004
Horse Branch	Downstream	89	2yr	93.31	23.80	1.22	0.90	0.001902	1.17	0.33	282.23	315.24	0.19	0.16	0.04	0.13	0.11	
Horse Branch	Downstream	89	10yr	263.00	23.80	2.04	1.47	0.001901	1.68	0.46	572.51	389.38	0.21	0.39	0.08	0.23	0.17	
Horse Branch	Downstream	89	50yr	463.00	23.80	2.69	1.98	0.001901	2.03	0.55	837.04	421.67	0.22	0.62	0.13	0.31	0.24	
Horse Branch	Downstream	89	100yr	567.00	23.80	2.97	2.22	0.001901	2.18	0.59	955.57	429.39	0.23	0.74	0.16	0.34	0.26	

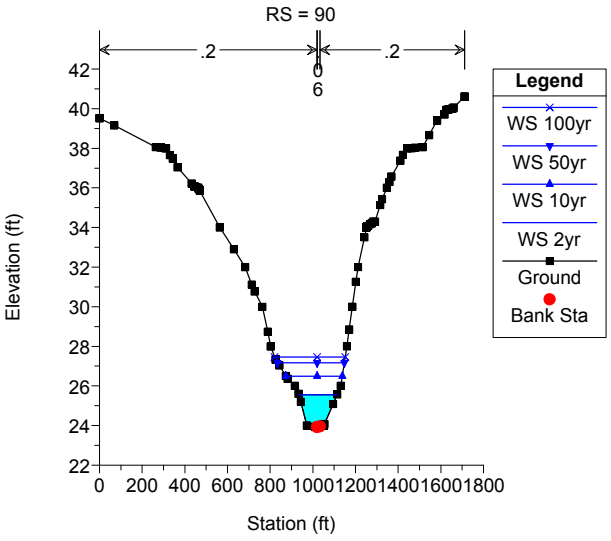
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



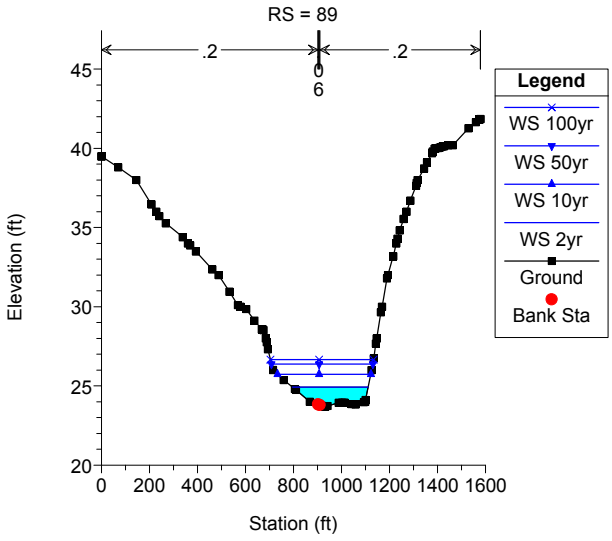
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



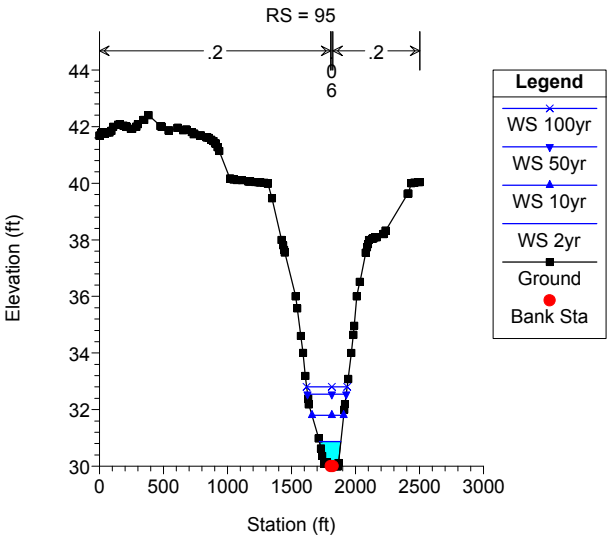
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



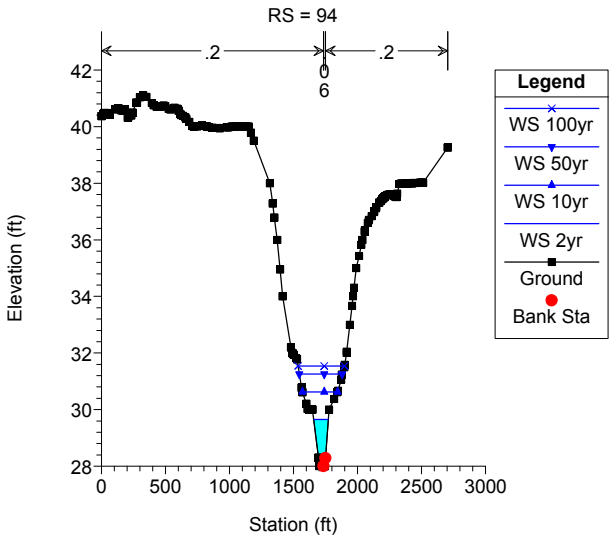
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



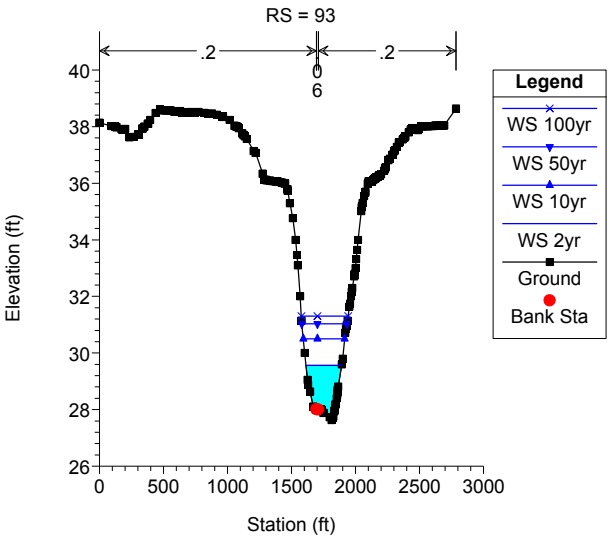
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



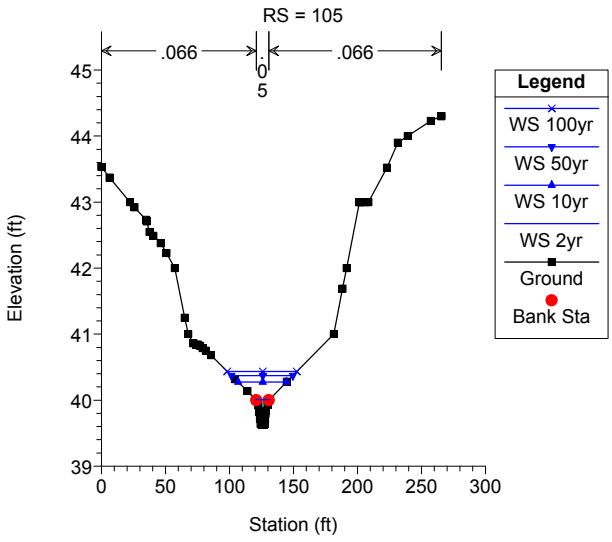
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



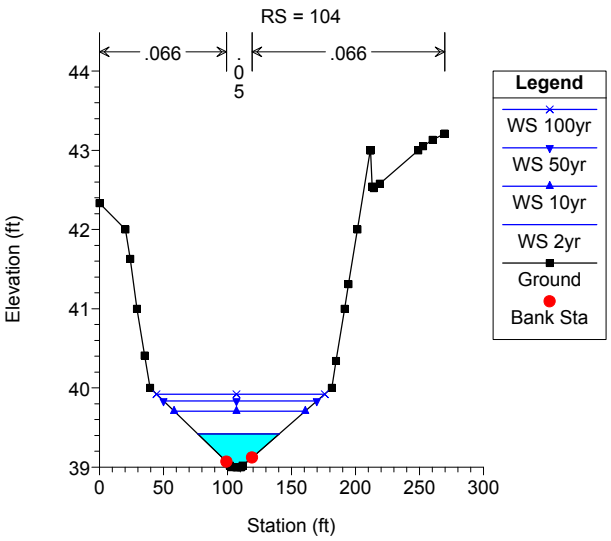
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



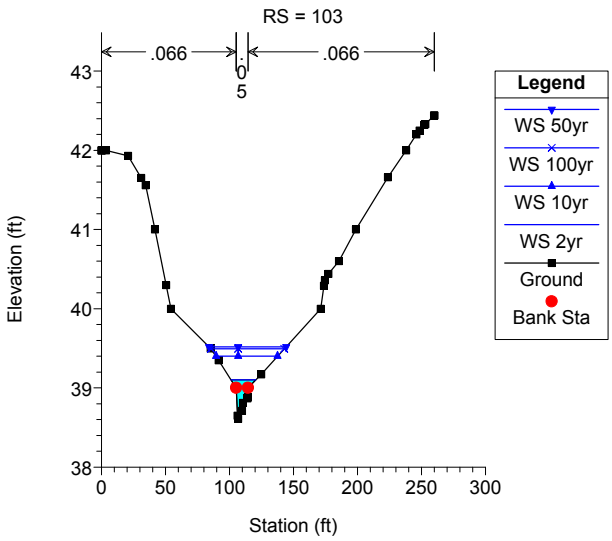
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



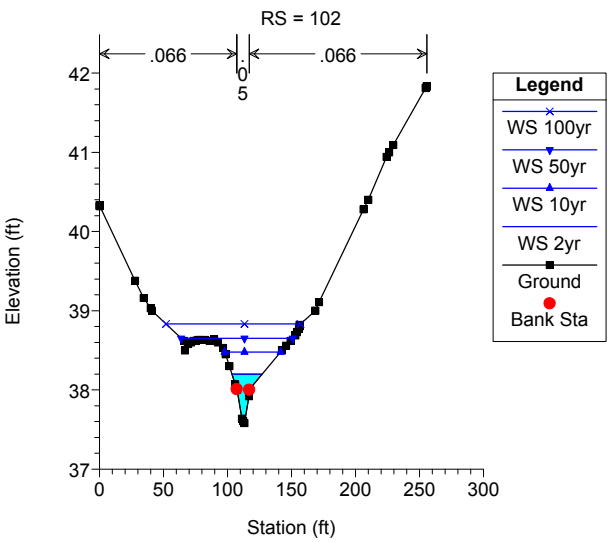
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



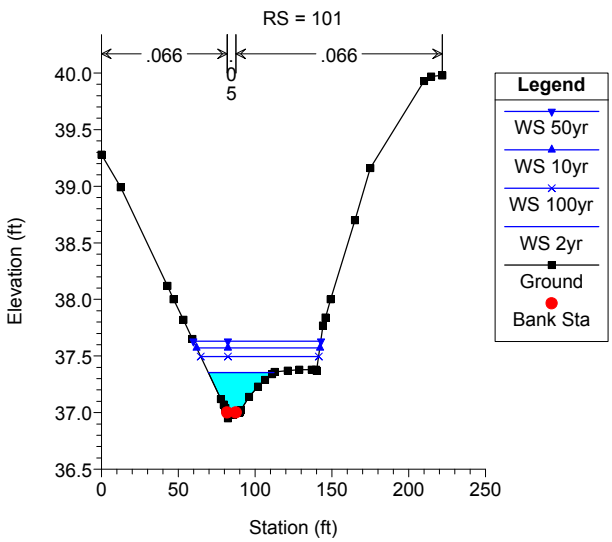
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

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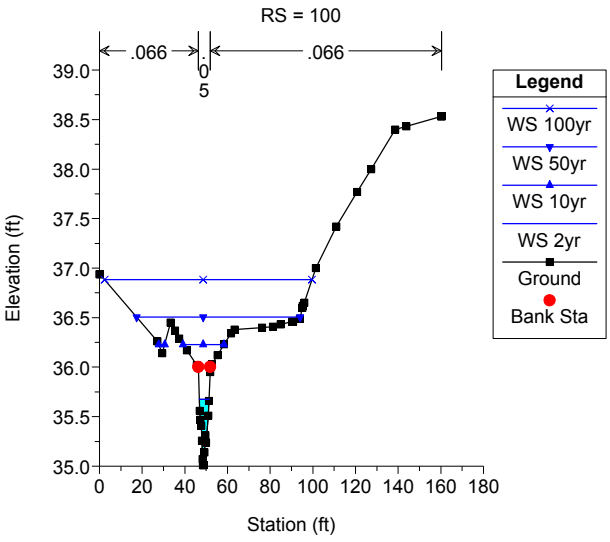

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

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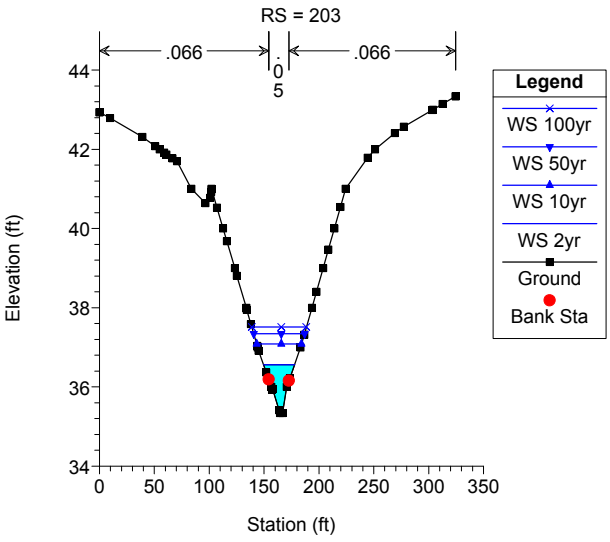

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

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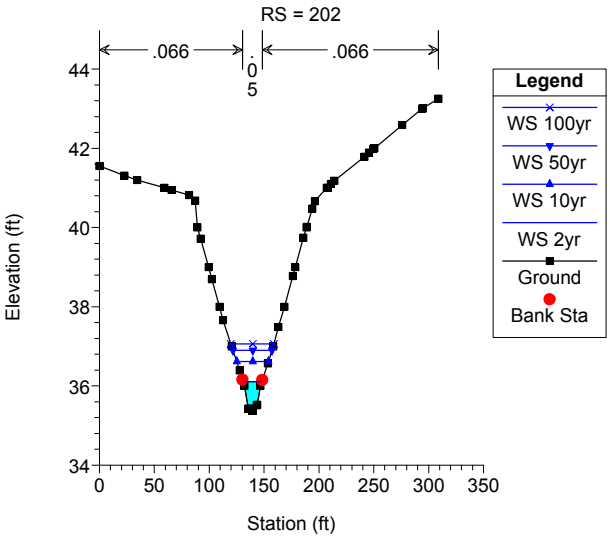

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

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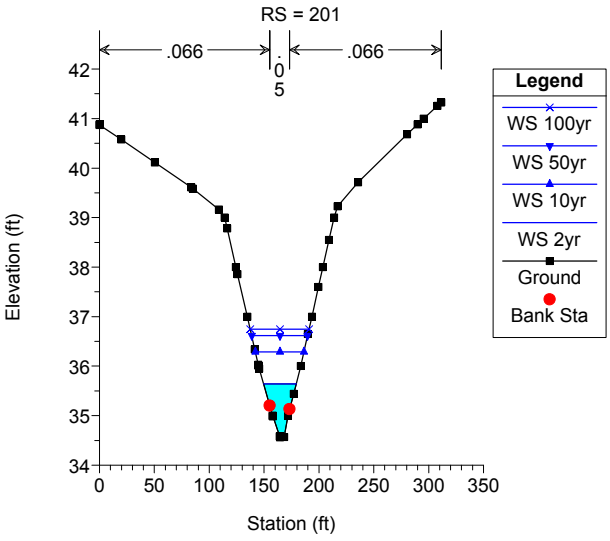

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

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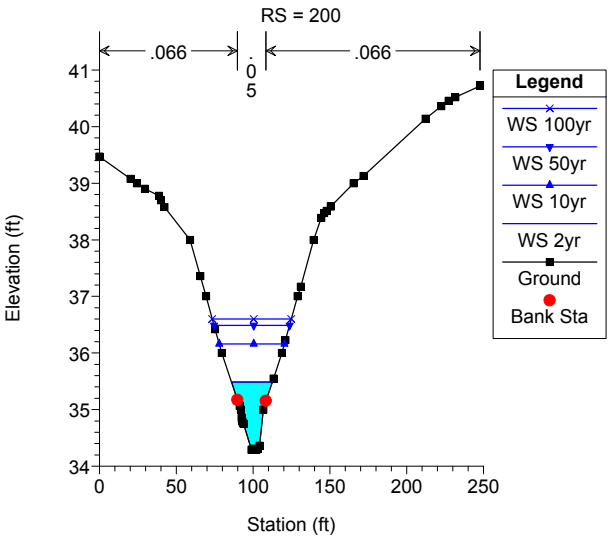

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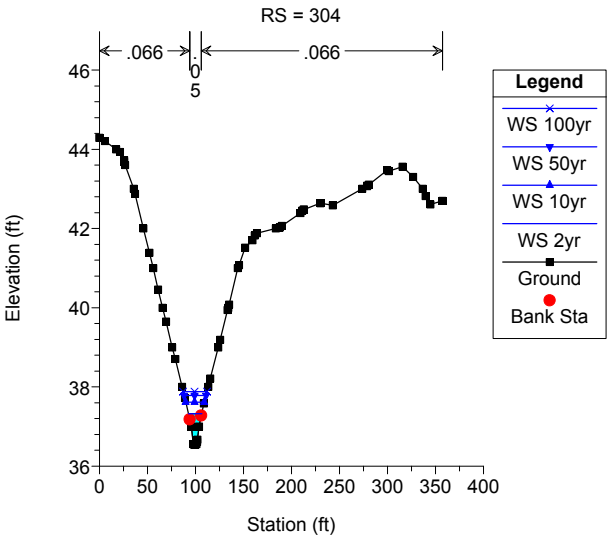
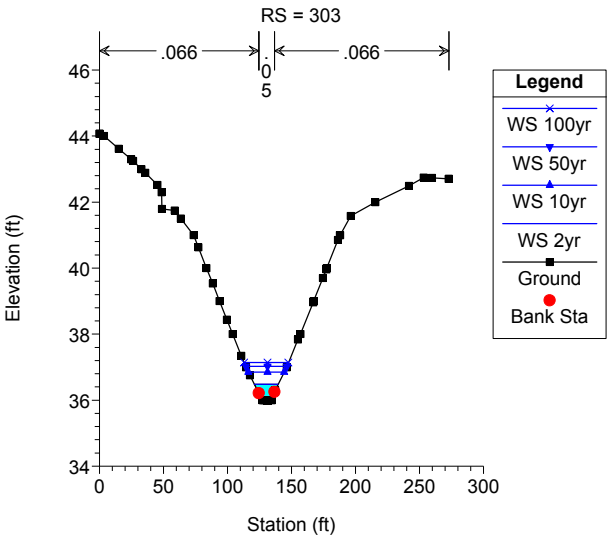


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



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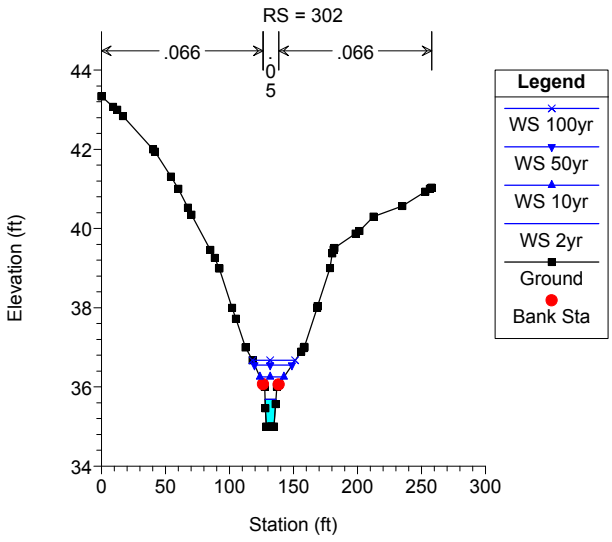
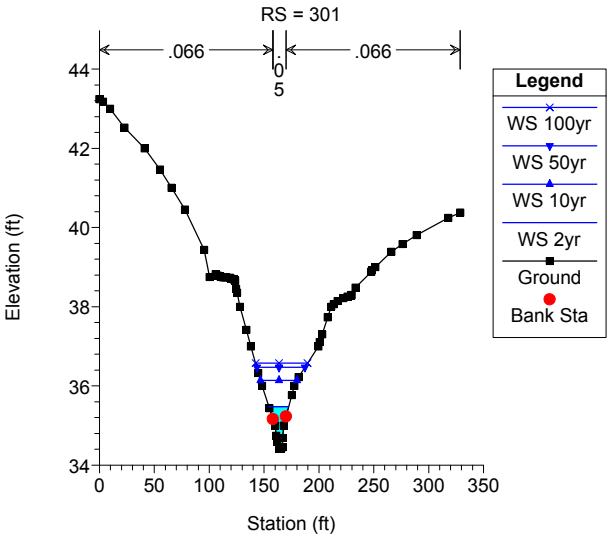
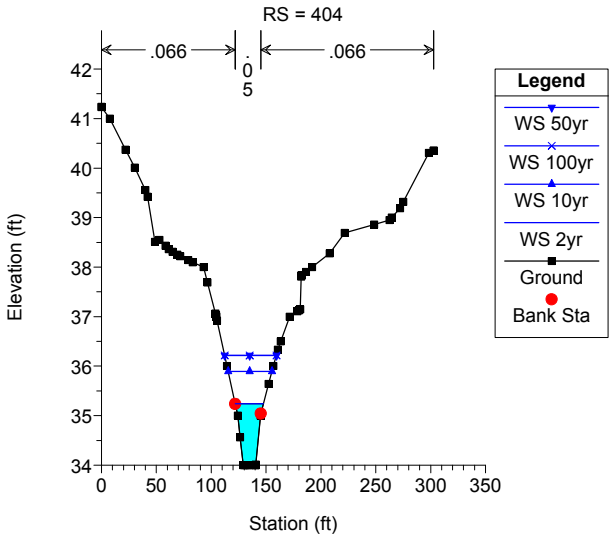


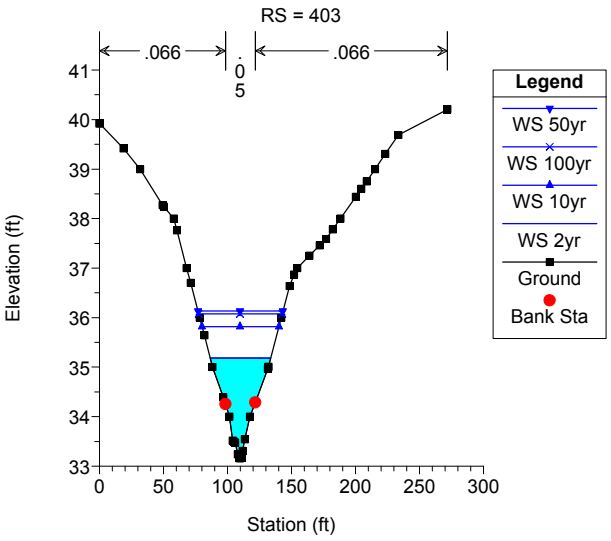
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



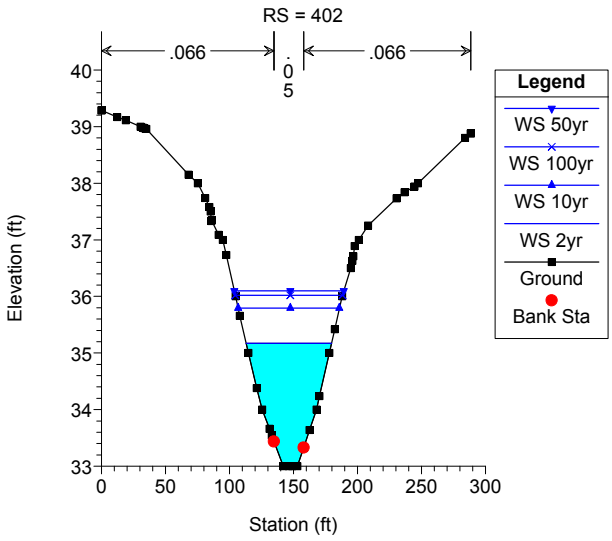
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



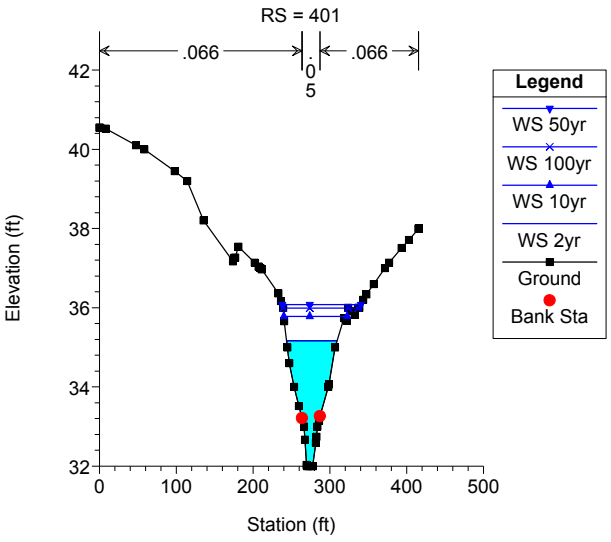
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



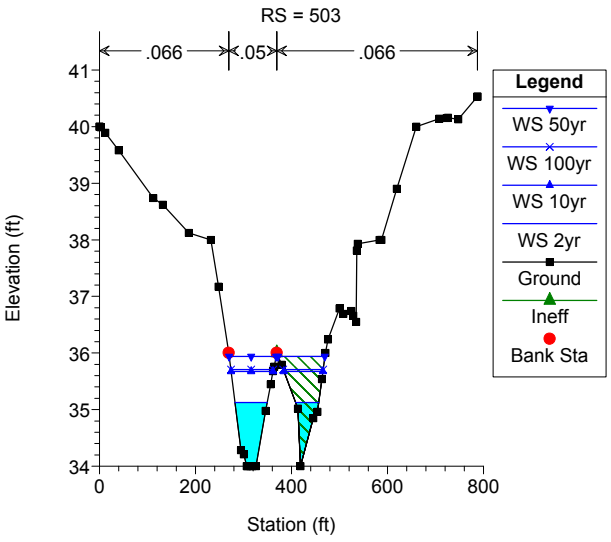
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



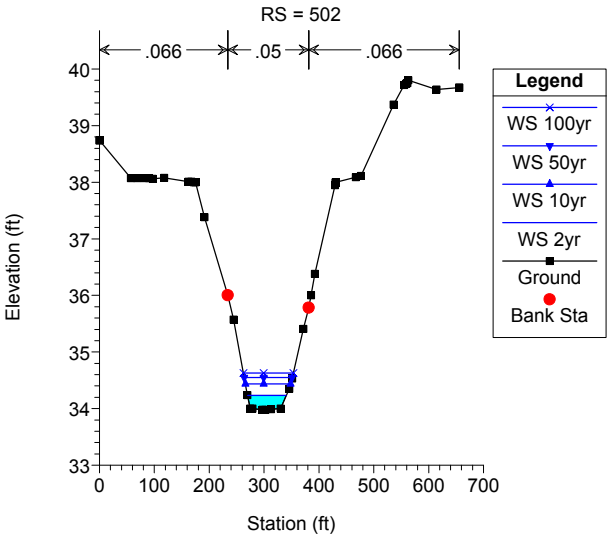
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



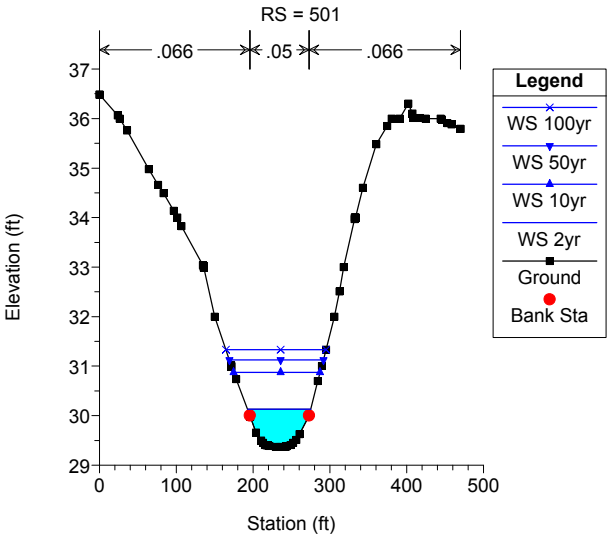
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014



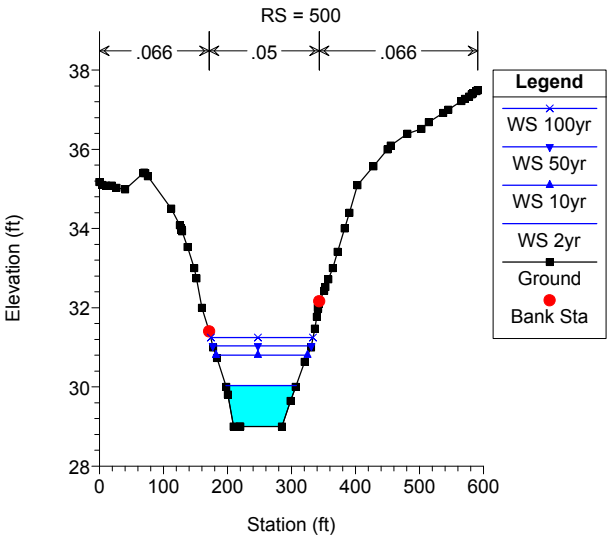
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

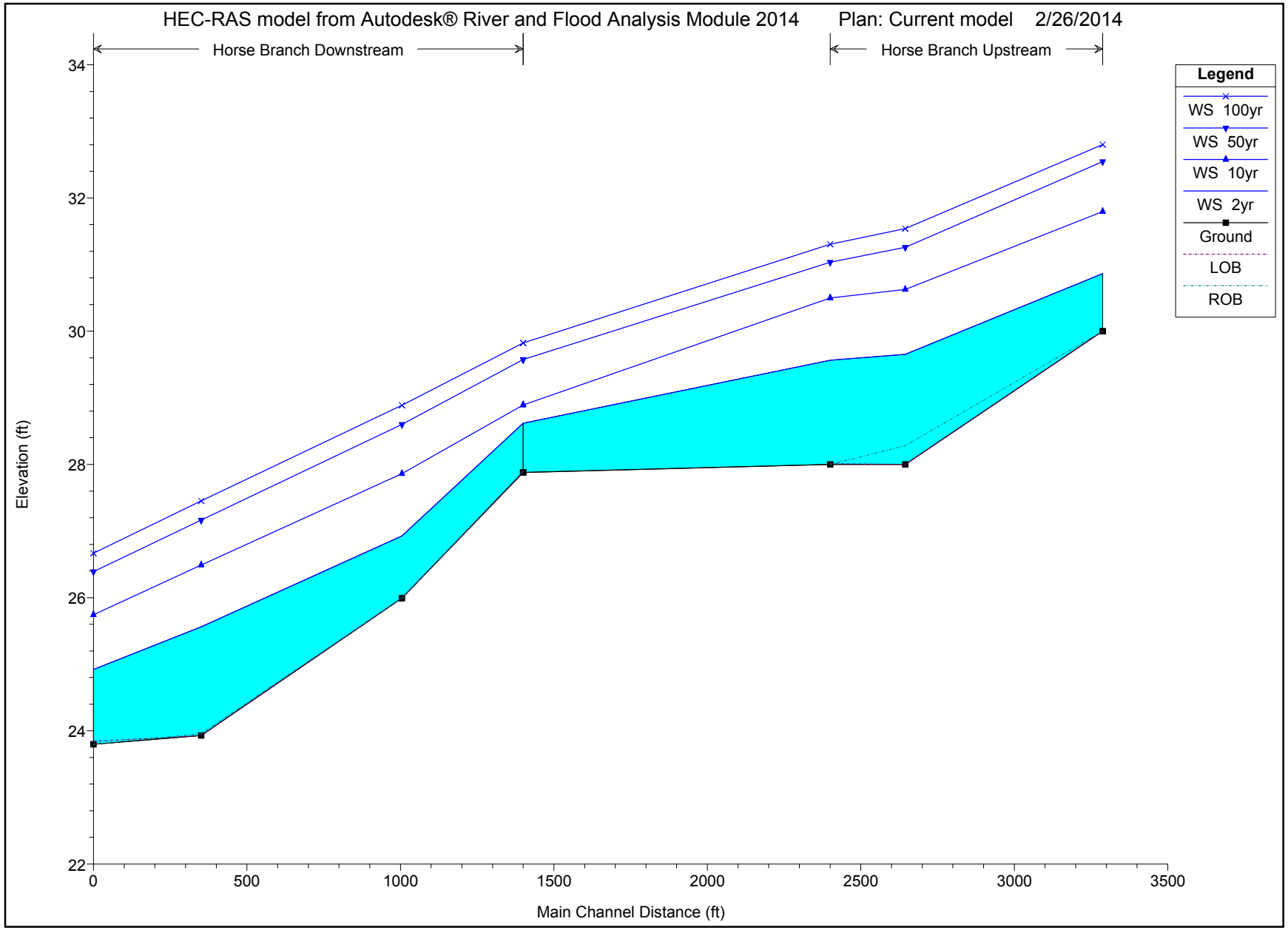


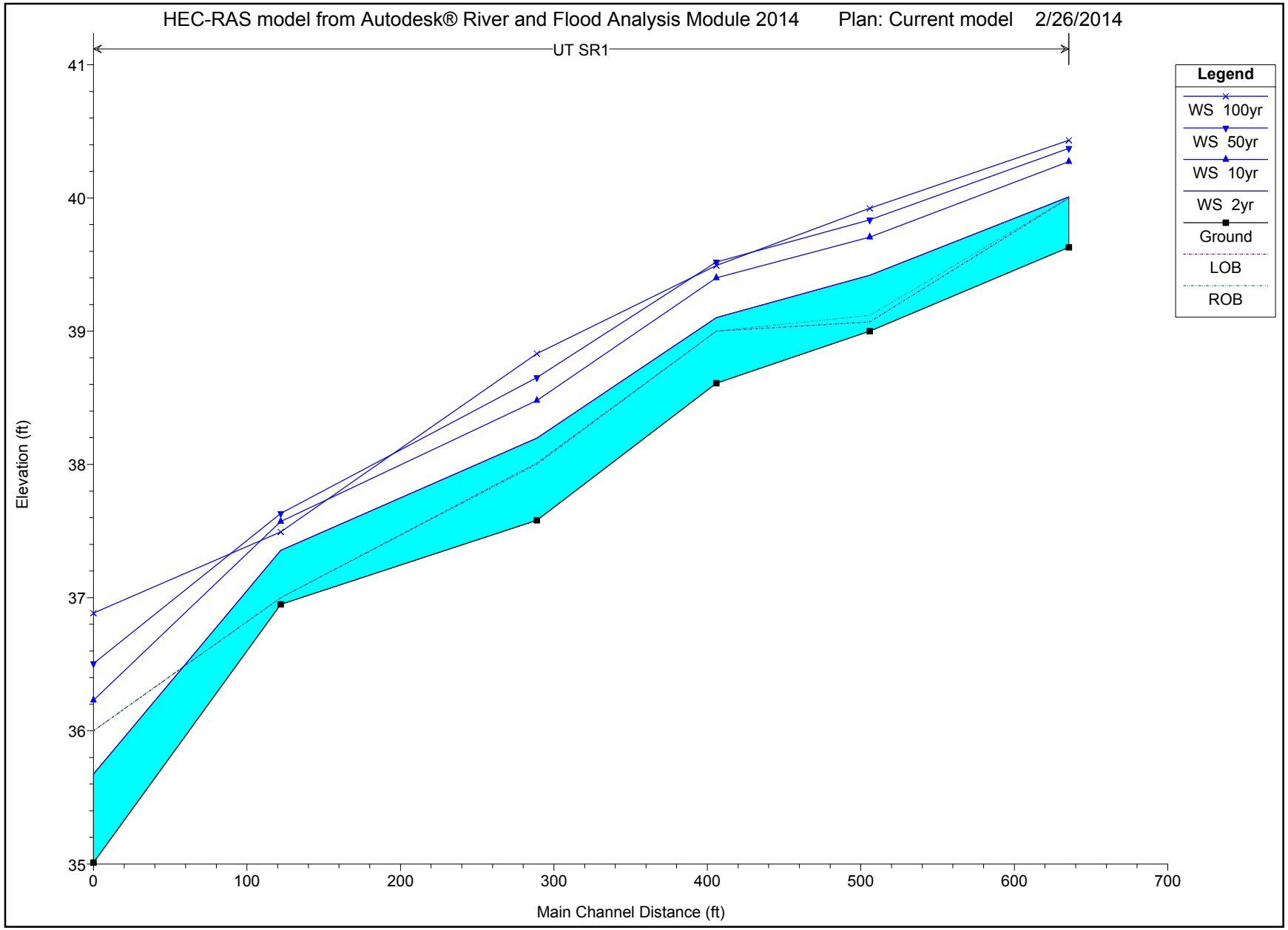
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

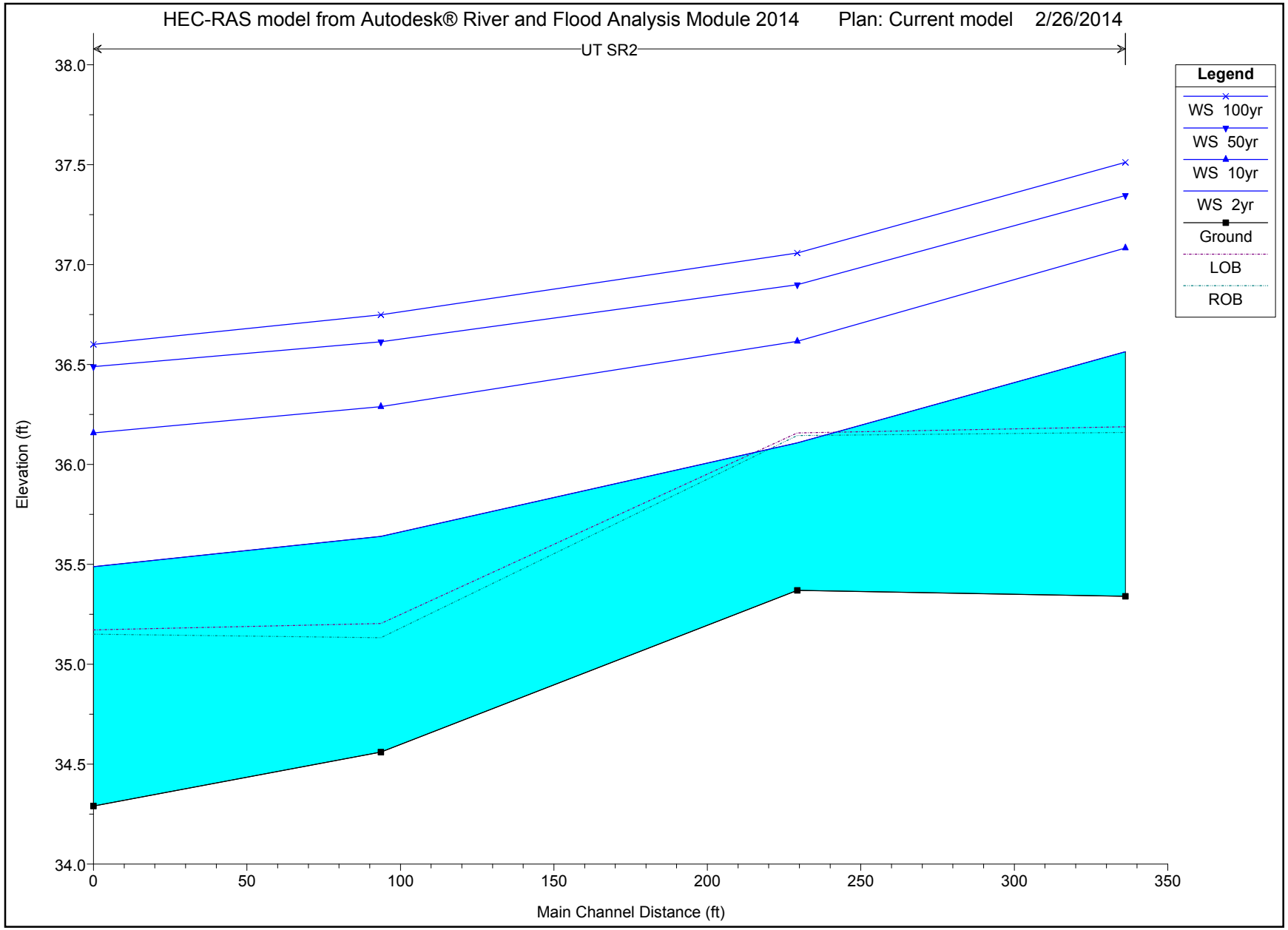


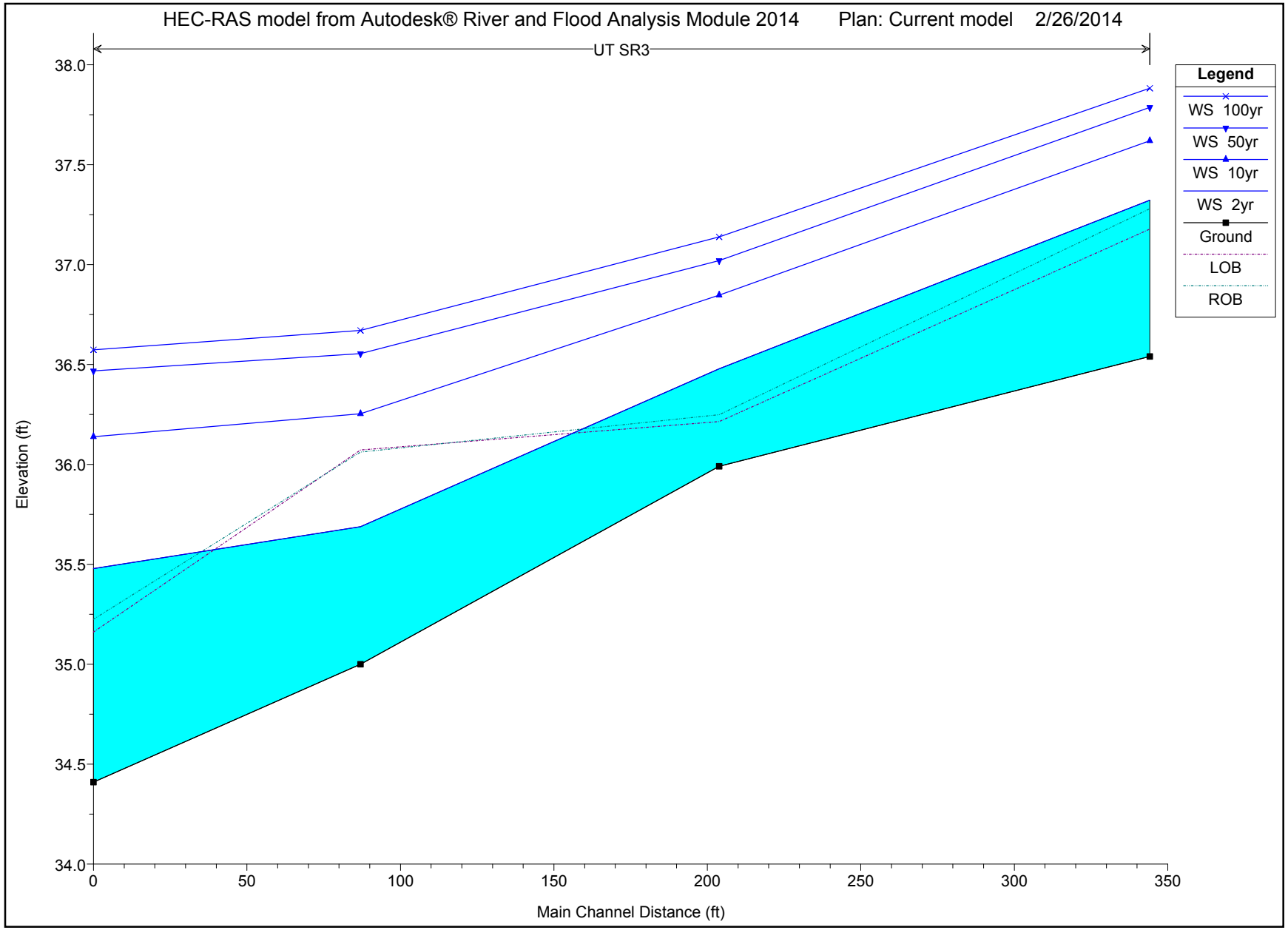
HEC-RAS model from Autodesk® River and Flood Analysis Module 2014 Plan: Current model 2/26/2014

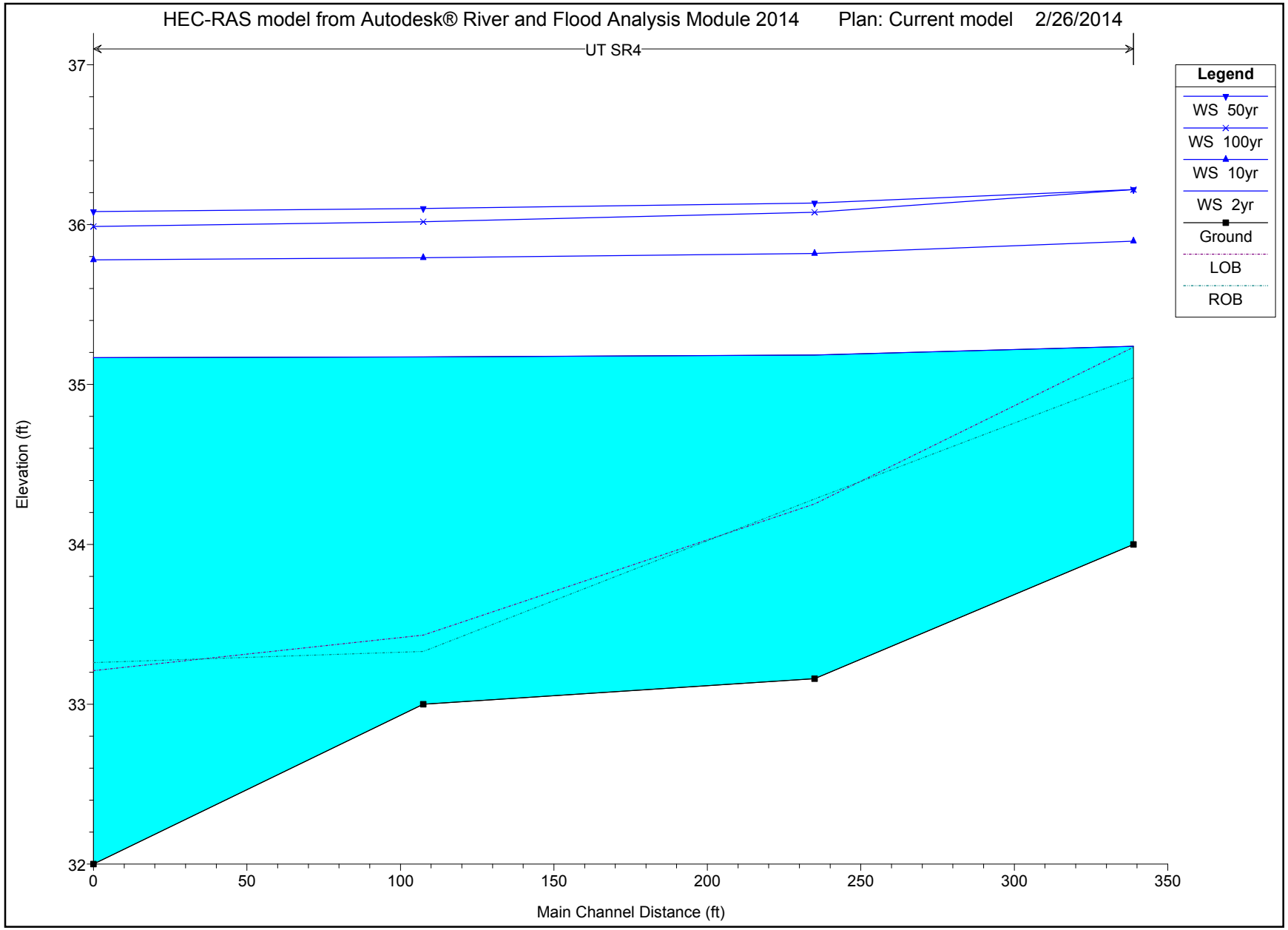


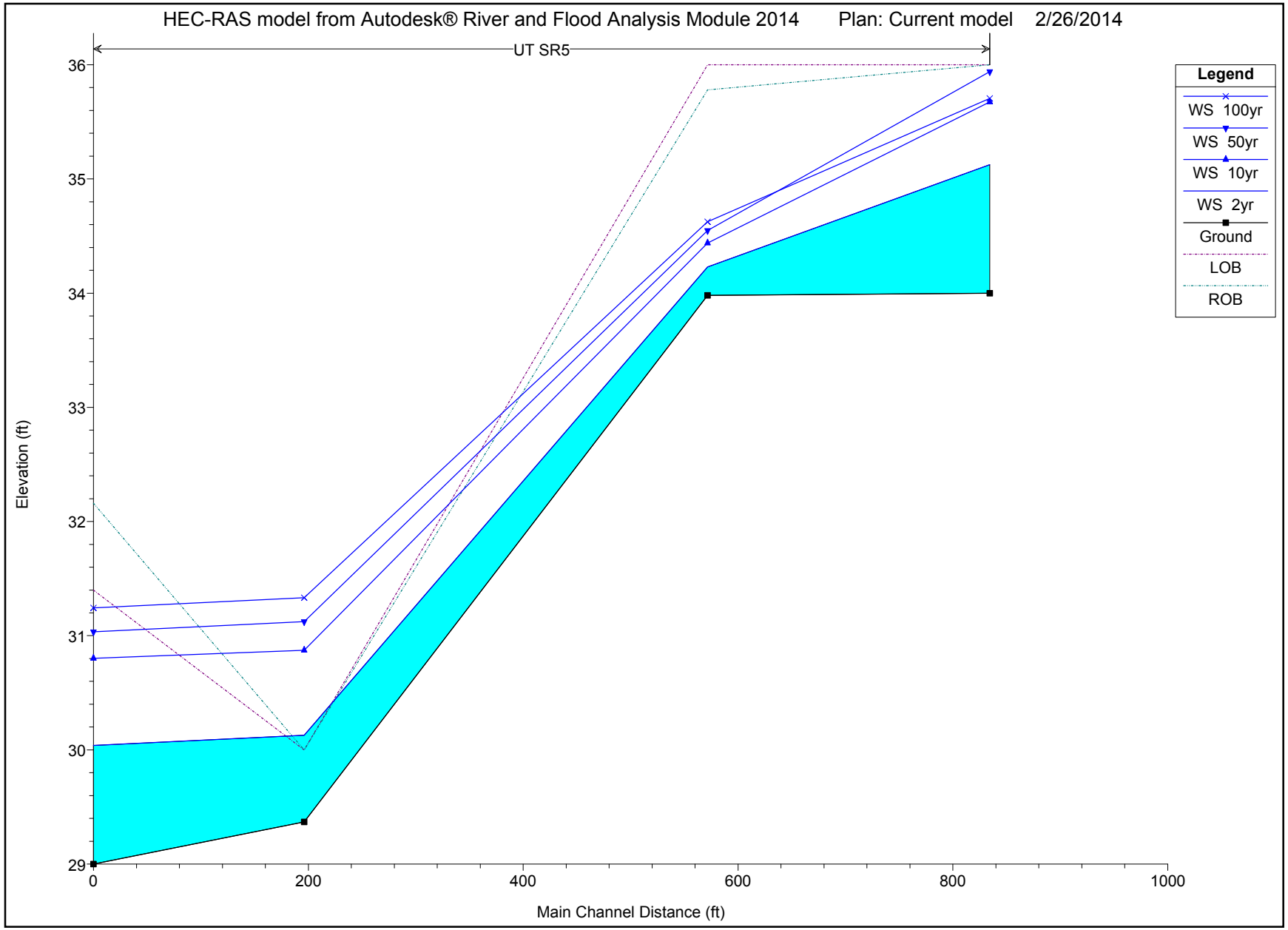

HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model 2/26/2014
Horse Branch Downstream
Horse Branch Upstream
Legend
WS 100yr
WS 50yr
WS 10yr
WS 2yr
Ground
LOB
ROB
Elevation (ft)
Main Channel Distance (ft)
34
32
30
28
26
24
22
0
500
1000
1500
2000
2500
3000
3500


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
UT SR1
Legend
WS 100yr
WS 50yr
WS 10yr
WS 2yr
Ground
LOB
ROB
Elevation (ft)
Main Channel Distance (ft)
41
40
39
38
37
36
35
0
100
200
300
400
500
600
700


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
UT SR2
Legend
WS 100yr
WS 50yr
WS 10yr
WS 2yr
Ground
LOB
ROB
Elevation (ft)
38.0
37.5
37.0
36.5
36.0
35.5
35.0
34.5
34.0
0
50
100
150
200
250
300
350
Main Channel Distance (ft)


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
UT SR3
Legend
WS 100yr
WS 50yr
WS 10yr
WS 2yr
Ground
LOB
ROB
Elevation (ft)
38.0
37.5
37.0
36.5
36.0
35.5
35.0
34.5
34.0
0
50
100
150
200
250
300
350
Main Channel Distance (ft)


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
UT SR4
Legend
WS 50yr
WS 100yr
WS 10yr
WS 2yr
Ground
LOB
ROB
Elevation (ft)
Main Channel Distance (ft)
37
36
35
34
33
32
0
50
100
150
200
250
300
350


HEC-RAS model from Autodesk® River and Flood Analysis Module 2014
Plan: Current model
2/26/2014
UT SR5
Legend
WS 100yr
WS 50yr
WS 10yr
WS 2yr
Ground
LOB
ROB
Elevation (ft)
36
35
34
33
32
31
30
29
0
200
400
600
800
1000
Main Channel Distance (ft)