

DRAFT FINAL MITIGATION PLAN
MUDDY RUN II STREAM AND WETLAND
RESTORATION PROJECT

DUPLIN COUNTY, NORTH CAROLINA, PROJECT # NC-95354

Cape Fear River Basin
HUC 03030007



Prepared for:



North Carolina Ecosystem Enhancement Program

North Carolina Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, NC 27699-1652

June 2013

**MUDDY RUN II STREAM AND WETLAND
RESTORATION PROJECT**

ADDENDUM #1

to the

FINAL MITIGATION PLAN

DUPLIN COUNTY, NORTH CAROLINA, PROJECT # NC-03-2012



Prepared for:



North Carolina Ecosystem Enhancement Program

North Carolina Department of Environment and Natural Resources
1652 Mail Service Center
Raleigh, NC 27699-1652

January 2014

**ADDENDUM to the FINAL MITIGATION PLAN
January 2014**

**Muddy Run II
Duplin County, North Carolina
EEP Project ID NC-03-2012**

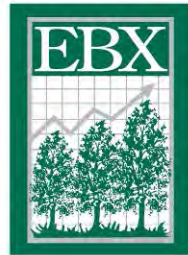
**Cape Fear River Basin
HUC 0030007060010**

Prepared for:



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

Prepared by:



**Environmental Banc & Exchange
909 Capability Drive, Suite 3100
Raleigh, NC 27606
919-829-9909**



WK Dickson & Co., Inc.
720 Corporate Center Drive
Raleigh, NC 27607
919-782-0495

This addendum modifies information in the following sections of the Muddy Run II Final Mitigation Plan submitted in January 2013:

- Page 3, Section 2.2.2 – Project Components and Structure (Table 2),
- Page 17, Section 3.1 – Site Protection Instrument Summary Information (Table 5),
- Page 38, Section 5 – Determination of Credits (Table 13),
- Pages 45-49, Section 7.2.1 – Stream Restoration Approach,
- Page 47, Figure 12a – Conceptual Design (East),
- Appendix A – Site Protection Instruments (Easement plat sheets 1, 12, and 13), and
- Appendix D – Project Plan Sheets (Index sheet and sheets 6, 11, 12, 35, 38, and 39).

The changes to the Mitigation Plan described herein are limited to the design of Reach 1 and Reach 3a-1. Reach 3a (3,440 LF) has been divided into two segments; Reach 3a-1 (730 LF) represents the portion of Reach 3a to which design changes were made, and Reach 3a-2 (2,710 LF) represents the unchanged portion of Reach 3a.

The design adjustments were necessitated by difficult landowner negotiations that resulted in a smaller allowable easement than previously agreed to on the Hatcher parcels. This was offset by increasing easement area on the Riley parcel. The design adjustments affect two percent of the original total project length, and still provide the originally intended functional uplifts through headwater valley restoration and stream restoration. These changes result in 105 SMUs less than the contract amount of 10,375 SMUs. The net total easement size increased by 0.03 acres (from 37.62 acres to 37.65 acres), and the total SMUs generated decreased by 216 SMUs (from 10,486 SMUs to 10,270 SMUs). The original project design included an excess of 111 SMUs. The proposed stream lengths, SMUs, and easement acreage by parcel are shown in **Tables 1 and 2**, and in **Figure 1** below. **Table 1** in this document replaces Table 2 and Table 13 in the Mitigation Plan. **Table 2** in this document replaces Table 5 in the Mitigation Plan. **Figure 1** in this document replaces Figure 12a in the Mitigation Plan.

p. 46, Section 7.2.1:

- **Reach 1 (STA 0+44 to STA 4+45)** – One of three headwater reaches within the project totaling approximately 401 linear feet of headwater valley restoration. This reach is flat with agricultural fields to the west and woods to the south and east. The reach begins at a gully feature just downstream of an existing headwater valley system. The proposed valley is located east of the existing ditch in disturbed hardwoods.
- **Reach 3a-1 (STA 0+00 to STA 8+31)** – Eastern most reach along the primary drainage feature totaling 730 linear feet of Priority 1 restoration. Both Reaches 1 and 2 outlet at the upstream end of the reach. Reach 3a-1 has a farm path along its entirety on the east bank, and flows through active agricultural fields and forested areas. This reach is constrained to a narrow meander pattern mostly within the existing ditch footprint. Restoration will include full buffer and floodplain connection.
- **Reach 3a-2 (STA 9+96 to STA 37+36)** – This portion of Reach 3a is unchanged from the initial design.

p. 49, Section 7.2.1:

Reach 1

Headwater valley restoration approach is proposed for Reach 1. The existing channel/ditch will be backfilled, and flow will be directed from its current position along the tree line back to the east through a mixed stand of low quality pines and disturbed hardwoods, down to the confluence with Reaches 2 and 3a-1. A 150-foot wide forested buffer will be planted throughout the reach. The upstream limit of Reach 1 will tie into an existing headwater valley system comprised of intermittent sections of single and multiple channels. This system will be used as a reference site for incorporating a small baseflow channel into the headwater valley restoration design. The existing vegetation will be enhanced with appropriate tree species. Individual high-quality specimen trees will be preserved when possible.

Reach 3a-1

Priority Level I restoration is proposed on Reach 3a-1. The restoration approach on this reach will include constructing a meandering channel within the footprint of the existing channel and raising the profile to allow frequent access to the floodplain. While the revised layout is significantly different from the previous layout, the design parameters of the revised layout fall within the range of parameters developed from the reference reach. Since the proposed cross-sectional area and overall slope did not change with the revised layout, no additional modeling was required.

One existing 36" CMP culvert crossing is located along this reach. The culvert will be removed and replaced in-line with the proposed stream to allow the landowners to access portions of their respective properties to the west of the project site. Priority Level I restoration is appropriate for this channel because it is the only mitigation approach that will address bed and bank instability, establish a forested riparian buffer, and significantly enhance aquatic habitat. Diffuse flow structures will be constructed where existing agricultural ditches enter the easement area.

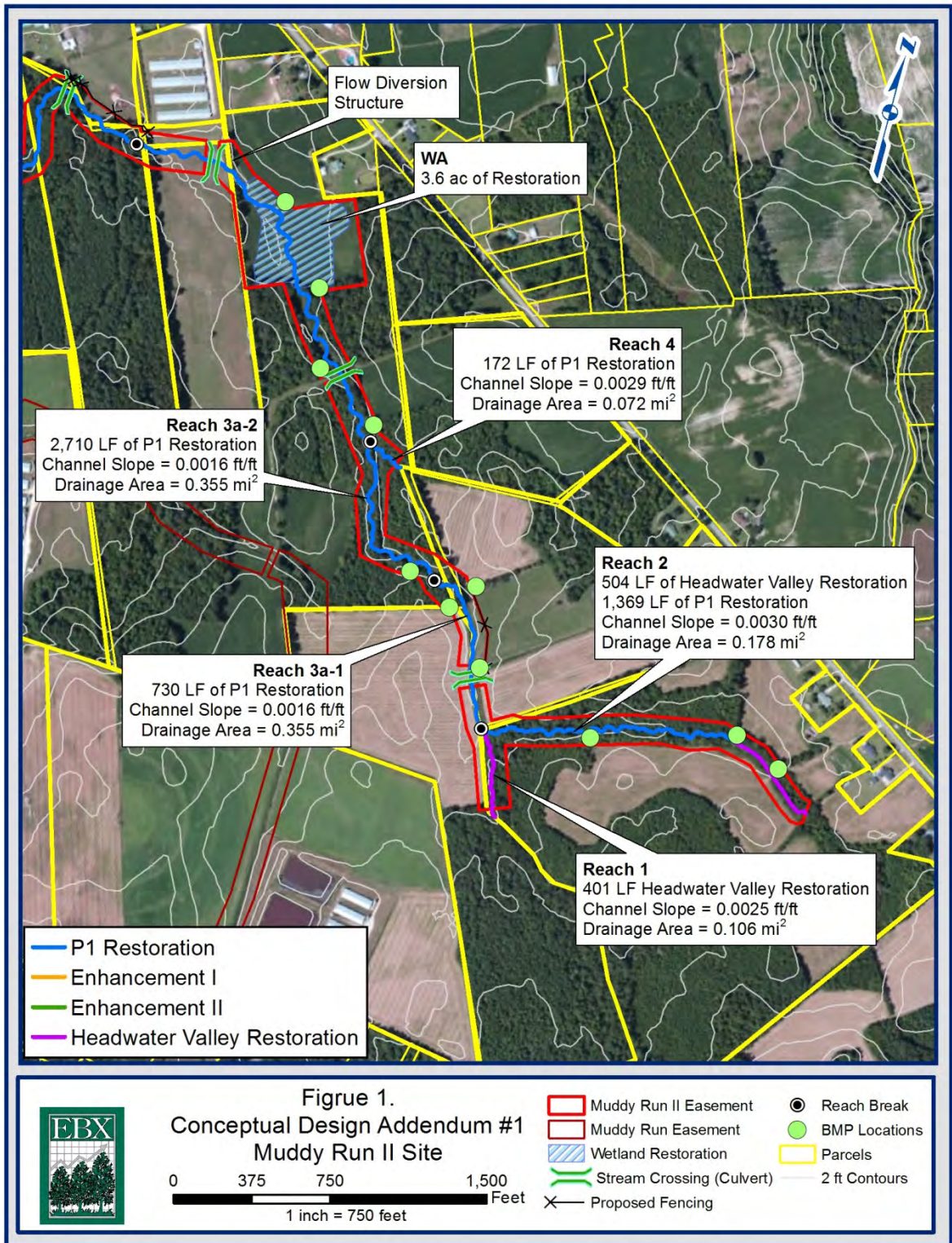
Table 1. Muddy Run II Project Components – Stream Mitigation.

Reach	Mitigation Type	Stationing	Existing Length (LF)	Proposed Length (LF)*	Mitigation Ratio	SMUs
Reach 1	Headwater Valley	0+44 to 4+45	438	401	1:1	401
Reach 2	Headwater Valley	0+00 to 5+04	504	504	1:1	504
Reach 2	P1 Restoration	5+00 to 17+31	1,223	1,369	1:1	1,369
Reach 3a-1	P1 Restoration	0+00 to 8+31	831	730	1:1	730
Reach 3a-2	P1 Restoration	9+96 to 37+36	2,470	2,710	1:1	2,710
Reach 3b	P1 Restoration	37+36 to 56+78	N/A	1,852	1:1	1,852
Reach 3c	Enhancement I	56+78 to 64+15	737	707	1:1.5	471
Reach 4	P1 Restoration	0+00 to 2+04	120	172	1:1	172
Reach 5a	P1 Restoration	0+00 to 18+04	1,602	1,774	1:1	1,774
Reach 5b	Enhancement II	18+04 to 22+05	401	401	1:2.5	160
Reach 6	Enhancement II	12+60 to 15+77	317	317	1:2.5	127
Total			8,643	10,937		10,270

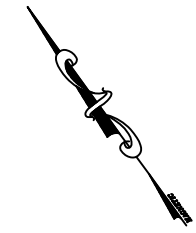
*The proposed lengths represent the total proposed channel length minus the length of the proposed channel associated with crossings (easement breaks).

Table 2. Project Parcel Landowner Information

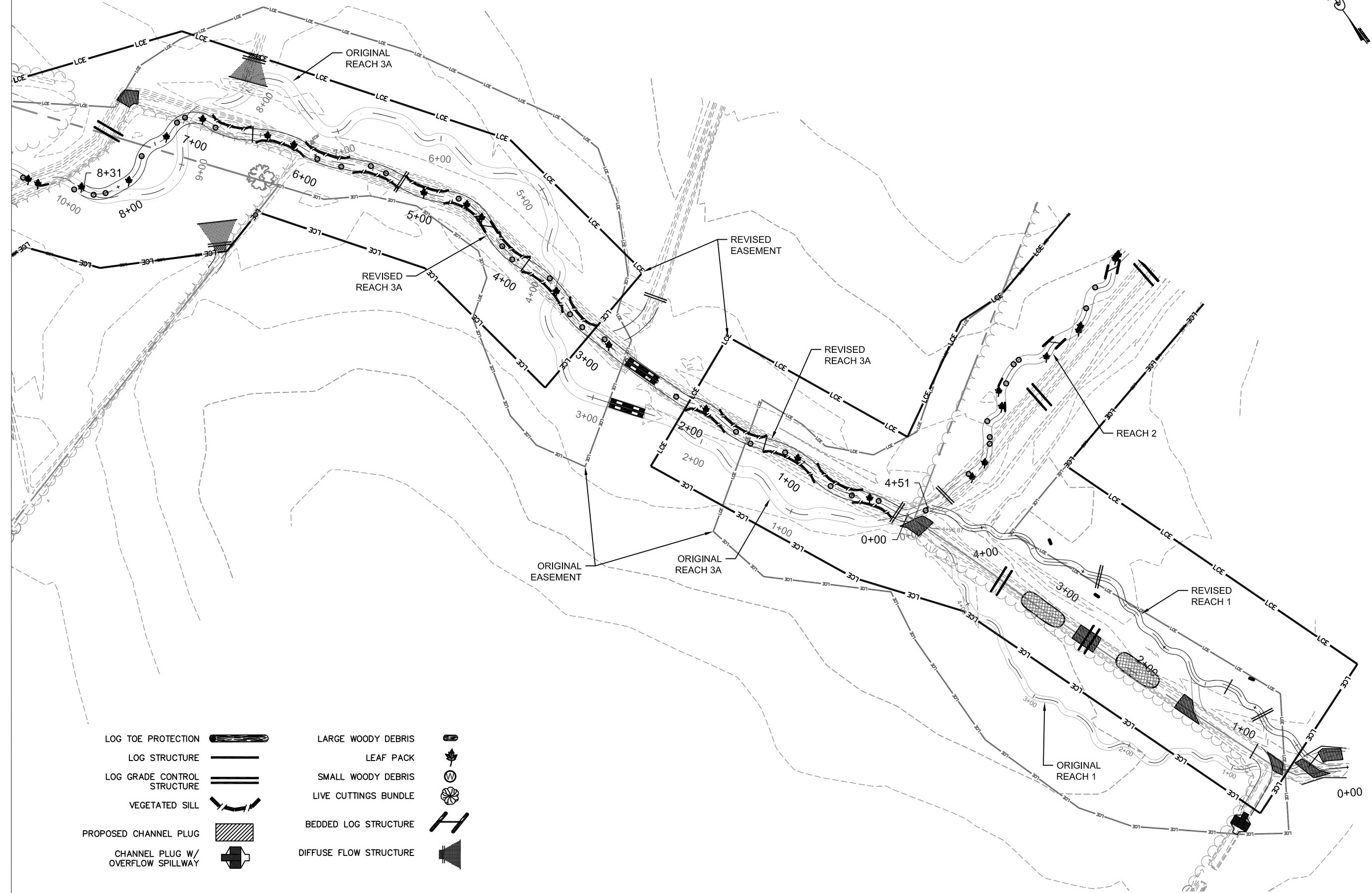
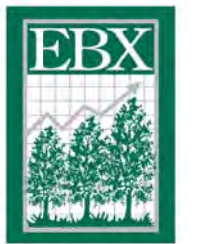
PIN	Landowner	County	Acreage
336900261466	EBX-NEUSE I, LLC	Duplin	1.99
336900266455	EBX-NEUSE I, LLC	Duplin	1.08
336900167209	EBX-NEUSE I, LLC	Duplin	2.28
335900966225	EBX-NEUSE I, LLC	Duplin	0.003
335900965215	EBX-NEUSE I, LLC	Duplin	0.55
336900352864	Futreal, Johnny Adrian	Duplin	12.11
336900445188	Hatcher, Danny Guy, et al.	Duplin	1.02
336900457397	Hatcher, Danny Guy, et al.	Duplin	1.37
336900161443	Holland, Thomas J. & Wife Kay D. Holland	Duplin	1.85
336900273089	Lanier, Michael Carlo	Duplin	0.31
336900548408	Riley, Patricia M	Duplin	5.80
336900053754	Smith, Auline L. & Worth L. Landen	Duplin	5.03
336900041738	Smith, Auline L. & Worth L. Landen	Duplin	3.02
335900953810	Smith, Jim	Duplin	0.79
336900178403	Wood, Jesse David And Wife Mary Ann Wood	Duplin	0.45
TOTAL			37.65



1" = 80'



WK DICKSON
 community infrastructure consultants
 720 Corporate Center Drive
 Raleigh, NC 27607
 (v) 919.782.0495
 (f) 919.782.9672
 WWW.WKDICKSON.COM
 NC LICENSE NO.
 F-0374



- | | | | |
|-----------------------------------|--|------------------------|--|
| LOG TOE PROTECTION | | LARGE WOODY DEBRIS | |
| LOG STRUCTURE | | LEAF PACK | |
| LOG GRADE CONTROL STRUCTURE | | SMALL WOODY DEBRIS | |
| VEGETATED SILL | | LIVE CUTTINGS BUNDLE | |
| PROPOSED CHANNEL PLUG | | BEDDED LOG STRUCTURE | |
| CHANNEL PLUG W/ OVERFLOW SPILLWAY | | DIFFUSE FLOW STRUCTURE | |

PRELIMINARY - NOT RELEASED FOR CONSTRUCTION

PROJECT NAME:
MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC

DRAWING TITLE:
REVISIONS TO REACHES 1 AND 3A

PROJ. MGR.:	DPI
DESIGN BY:	AFM
DRAWN BY:	AFM
PROJ. DATE:	12/17/13
DRAWING NUMBER:	1
WKD PROJ. NO.:	20120090.00.RA

FILE PATH: H:\Projects\EBX\2012\20090000RA - Muddy Run II Site\CADD\DWG\Design\Plan Set\20120090_C_CSD_Reach1_3A_Revised.dwg

Appendix A
Site Protection Instruments

Easement Plat Sheets 1, 12, and 13

**"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

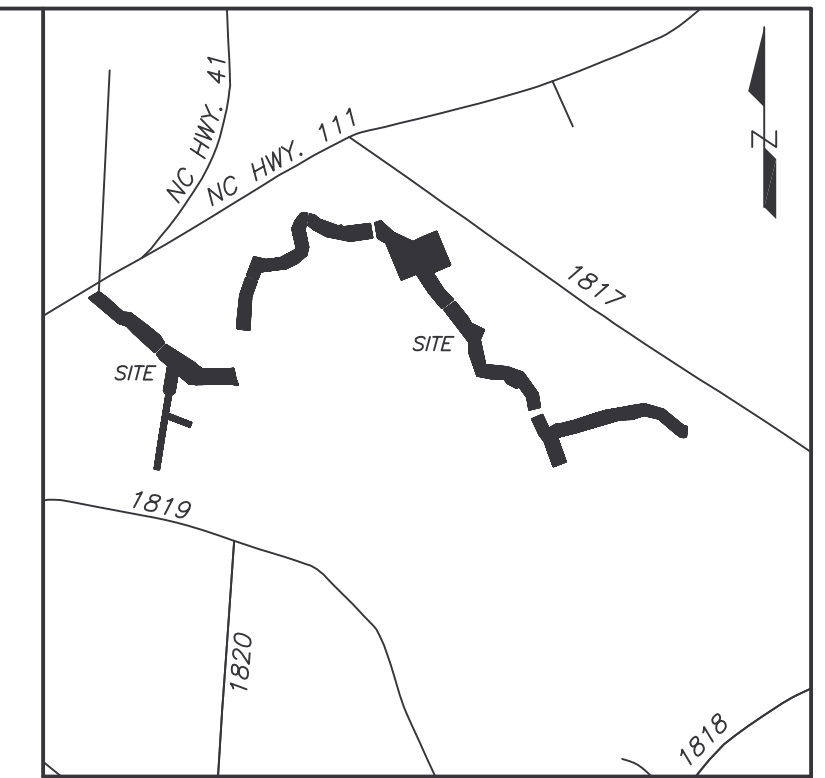
I, _____, REVIEW OFFICER OF
DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO
WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY
REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____

DATE _____

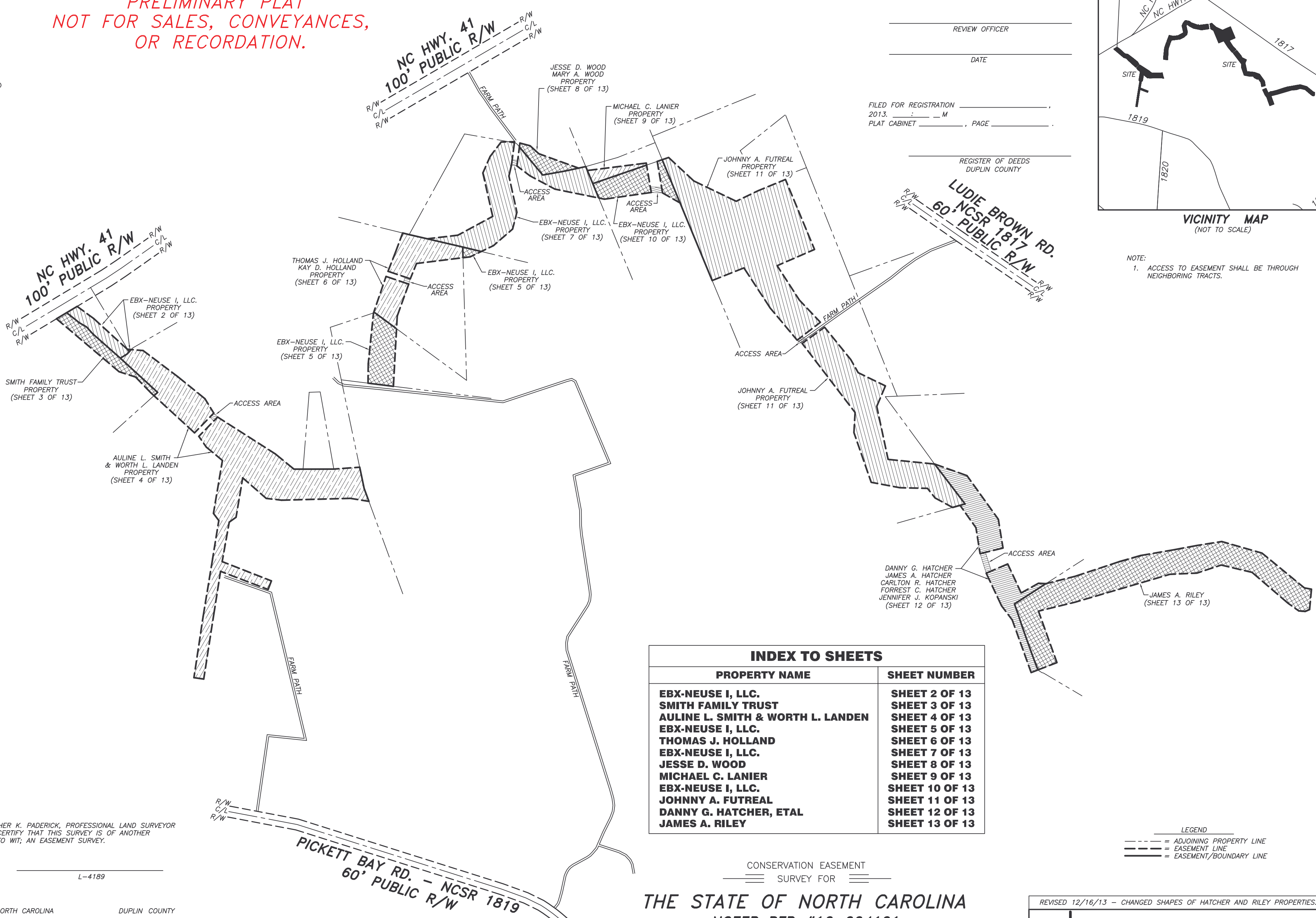
FILED FOR REGISTRATION _____
2013. ____ : ____ M
PLAT CABINET _____, PAGE _____

REGISTER OF DEEDS
DUPLIN COUNTY



VICINITY MAP
(NOT TO SCALE)

NOTE:
1. ACCESS TO EASEMENT SHALL BE THROUGH
NEIGHBORING TRACTS.



INDEX TO SHEETS	
PROPERTY NAME	SHEET NUMBER
EBX-NEUSE I, LLC.	SHEET 2 OF 13
SMITH FAMILY TRUST	SHEET 3 OF 13
AULINE L. SMITH & WORTH L. LANDEN	SHEET 4 OF 13
EBX-NEUSE I, LLC.	SHEET 5 OF 13
THOMAS J. HOLLAND	SHEET 6 OF 13
EBX-NEUSE I, LLC.	SHEET 7 OF 13
JESSE D. WOOD	SHEET 8 OF 13
MICHAEL C. LANIER	SHEET 9 OF 13
EBX-NEUSE I, LLC.	SHEET 10 OF 13
JOHNNY A. FUTREAL	SHEET 11 OF 13
DANNY G. HATCHER, ETAL	SHEET 12 OF 13
JAMES A. RILEY	SHEET 13 OF 13

LEGEND
 - - - - - ADJOINING PROPERTY LINE
 - - - - - EASEMENT LINE
 - - - - - EASEMENT/BOUNDARY LINE

I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR
NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER
CATEGORY: TO WIT; AN EASEMENT SURVEY.

L-4189

STATE OF NORTH CAROLINA DUPLIN COUNTY

I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS
PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL
SURVEY MADE UNDER MY SUPERVISION; (DEED DESCRIPTION
RECORDED IN MAP & DEED BOOKS NOTED); THAT THE
BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN
FROM INFORMATION REFERENCED HEREON; 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 17TH DAY OF MAY, A.D.,
2013.

L-4189

CONSERVATION EASEMENT
SURVEY FOR

THE STATE OF NORTH CAROLINA
NCEP RFP #16-004101
NCEP PROJECT #95354
NCEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP MAY 17, 2013
 DUPLIN COUNTY, NC 1" = 350'


350' 175' 0 350' 700'



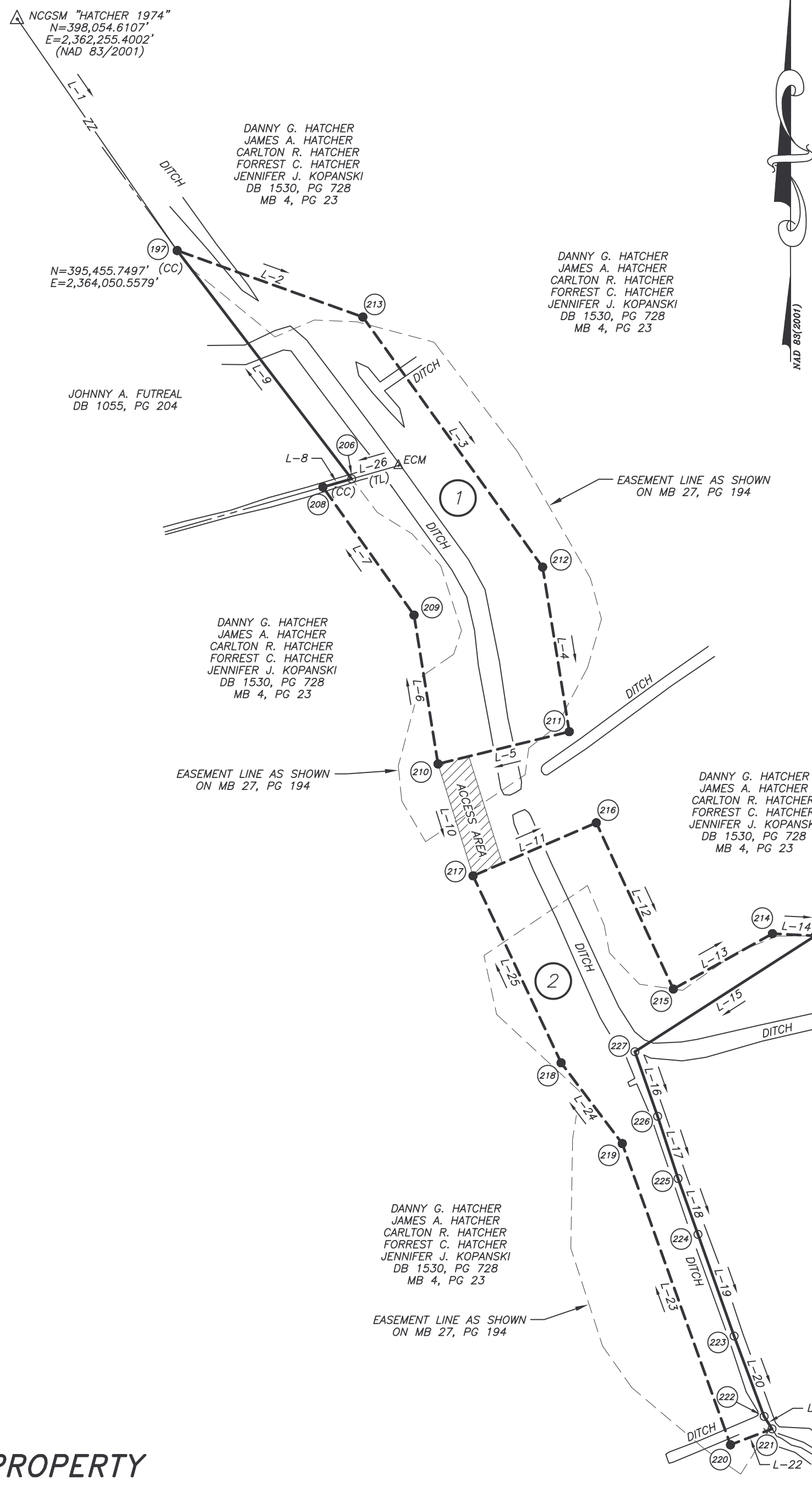
GRAPHIC SCALE

SHEET 1 OF 13

REVISED 12/16/13 - CHANGED SHAPES OF HATCHER AND RILEY PROPERTIES. (CKP)

 MATRIX EAST, PLLC PROFESSIONAL LAND SURVEYORS 906 N. QUEEN ST., SUITE A KINSTON, NC 28501 TEL: 252-522-2500 FAX: 252-522-4747	
FIRM LIC. # P-0221	EMAIL: surveyor@matriceast.net
DRAWN BY: CKP	PROJECT NO.: 20110047
SURVEYED BY: LDL/CCK	DATE: MAY 17, 2013
SCALE: 1" = 350'	DRAWING NAME: INDEX-MR2-REV

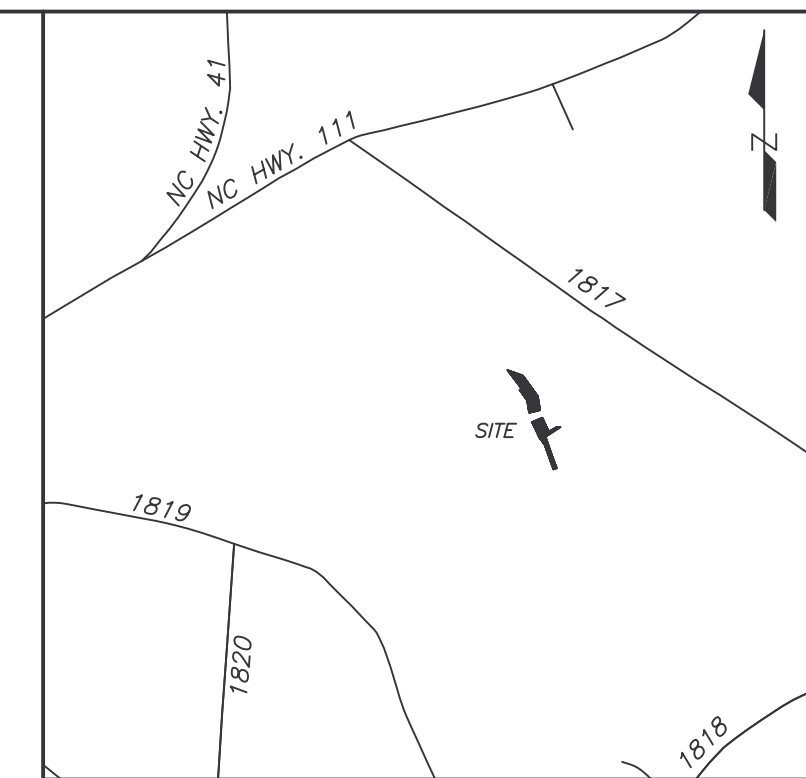
NC GEODETIC SURVEY MONUMENT REFERENCE TABLE	
FROM: "BROWN 1974"	TO: "HATCHER 1974"
N=395,131.0634' E=2,357,379.5569'	N=398,054.6107' E=2,362,255.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685.1541' (GRID) 5,685.86' (MEASURED)



I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA DUPLIN COUNTY

I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION; (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON; 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 20TH DAY OF MAY, A.D., 2013.



VICINITY MAP (NOT TO SCALE)

I, REVIEW OFFICER OF DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER

DATE

FILED FOR REGISTRATION _____, 2013. _____ M PLAT CABINET _____, PAGE _____.

REGISTER OF DEEDS DUPLIN COUNTY

FLOOD STATEMENT

THIS PROPERTY IS LOCATED IN ZONE "X" AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFIP RATE MAP DATED FEBRUARY 16, 2006. COMMUNITY PANEL NUMBER 370083-3368-J.

NOTES:

- COMBINED FACTOR IS 0.99989904.
- ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
- ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

LEGEND

- ECM = EXISTING CONCRETE MONUMENT
- = NEW IRON STAKE & CAP
- = NO POINT SET
- (TL) = TIE LINE
- (CC) = CONTROL CORNER
- NCGSM = NC GRID SURVEY MONUMENT
- Z— = NOT TO SCALE
- - - = ADJOINING PROPERTY LINE
- = EASEMENT LINE
- == = EASEMENT/BOUNDARY LINE

EASEMENT CORNER COORDINATE TABLE

#	NORTHING	EASTING
197	395,455.7497'	2,364,050.5579'
206	395,239.5160'	2,364,215.7929'
208	395,231.7795'	2,364,188.5423'
209	395,110.5688'	2,364,274.8129'
210	394,969.6375'	2,364,297.5219'
211	395,000.1609'	2,364,421.8207'
212	395,155.9839'	2,364,396.5326'
213	395,392.7713'	2,364,226.3360'
214	394,808.9354'	2,364,614.1453'
215	394,756.4598'	2,364,520.3314'
216	394,913.8830'	2,364,447.3800'
217	394,863.6863'	2,364,330.7231'
218	394,686.6317'	2,364,414.0793'
219	394,610.1773'	2,364,471.9750'
220	394,324.9383'	2,364,574.4648'
221	394,340.0618'	2,364,613.7912'
222	394,351.7992'	2,364,606.3066'
223	394,427.9130'	2,364,577.8997'
224	394,524.1927'	2,364,543.6522'
225	394,577.0681'	2,364,524.8221'
226	394,635.9758'	2,364,505.4296'
227	394,697.1250'	2,364,483.9813'
228	394,806.8899'	2,364,654.6969'

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "HATCHER 1974")

LINE TABLE

LINE	BEARING	LENGTH
L-1	S 34°38'05" E	3,158.59'
L-2	S 70°17'18" E	186.72'
L-3	S 35°42'27" E	291.61'
L-4	S 09°13'05" E	157.86'
L-5	S 76°12'11" W	127.99'
L-6	N 09°09'13" W	142.75'
L-7	N 35°26'28" W	148.78'
L-8	N 74°09'03" E	28.33'
L-9	N 37°23'07" W	272.14'
L-10	S 17°23'57" E	111.03'
L-11	N 66°43'05" E	127.00'
L-12	S 24°51'48" E	173.50'
L-13	N 60°46'45" E	107.49'
L-14	S 87°06'44" E	40.60'
L-15	S 57°15'37" W	202.96'
L-16	S 19°19'43" E	64.80'
L-17	S 18°13'18" E	62.02'
L-18	S 19°36'07" E	56.13'
L-19	S 19°34'51" E	102.19'
L-20	S 20°27'59" E	81.24'
L-21	S 32°31'28" E	13.92'
L-22	S 68°57'54" W	42.13'
L-23	N 19°45'50" W	303.09'
L-24	N 37°08'06" W	95.90'
L-25	N 25°12'39" W	195.70'
L-26	S 74°09'03" W	46.22'

CONSERVATION EASEMENT SURVEY OF

THE DANNY G. HATCHER, ETAL PROPERTY FOR THE STATE OF NORTH CAROLINA

S.P.O. FILE #31-W
NCEP RFP #16-004101
NCEP PROJECT #95354
NCEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP MAY 20, 2013
DUPLIN COUNTY, NC 1" = 100'



GRAPHIC SCALE

"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.

ACREAGE DATA (BY COMPUTER)

AREA 1 = 1.341 AC±
AREA 2 = 1.048 AC±
TOTAL = 2.389 AC±

SOURCE OF TITLE

DB 1530, PG 728
MB 4, PG 23

SHEET 12 OF 13

REVISED 12/16/13 - CHANGED EASEMENT AREAS, ACREAGE, NOTES, ETC. (CKP)



MATRIX EAST, PLLC PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221	EMAIL: surveyor@matriceast.net
DRAWN BY: CKP/INM	PROJECT NO.: 20110047
SURVEYED BY: LDL/CCK	DATE: MAY 20, 2013
SCALE: 1" = 100'	DRAWING NAME: HATCHER 2-REV

I, _____, REVIEW OFFICER OF
DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER

DATE

FILED FOR REGISTRATION _____,
2013. _____ M
PLAT CABINET _____, PAGE _____.

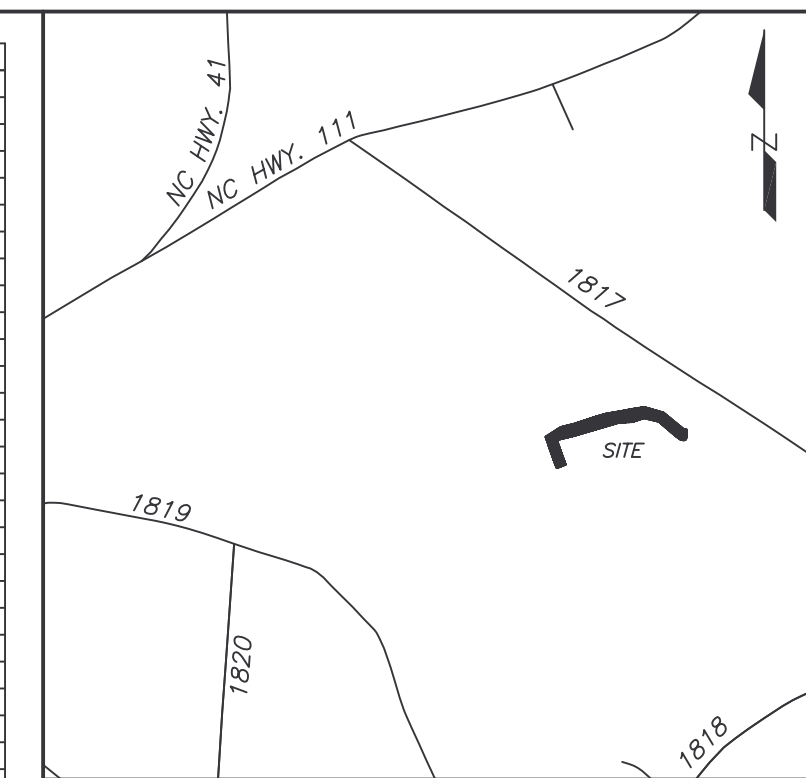
REGISTER OF DEEDS
DUPLIN COUNTY



#	NORTHING	EASTING
221	394,340.0618'	2,364,613.7912'
222	394,351.7992'	2,364,606.3066'
223	394,427.9130'	2,364,577.8997'
224	394,524.1927'	2,364,543.6522'
225	394,577.0681'	2,364,524.8221'
226	394,635.9758'	2,364,505.4296'
227	394,697.1250'	2,364,483.9813'
228	394,806.8899'	2,364,654.6969'
229	394,846.4730'	2,364,812.0609'
230	394,925.8650'	2,365,052.0960'
231	394,959.7234'	2,365,170.2686'
232	394,990.8893'	2,365,350.1470'
233	395,014.1600'	2,365,475.1900'
234	395,035.2655'	2,365,608.7842'
235	394,972.7540'	2,365,827.0739'
236	394,783.9777'	2,366,057.0272'
237	394,776.8493'	2,366,095.4955'
238	394,666.6186'	2,366,085.3789'
239	394,656.6093'	2,366,061.8378'
240	394,659.4871'	2,366,026.3789'
241	394,700.8227'	2,365,968.3543'
242	394,868.1092'	2,365,773.2036'
243	394,907.9794'	2,365,605.9140'
244	394,864.2082'	2,365,474.0669'
245	394,857.6575'	2,365,327.4333'
246	394,706.8868'	2,364,814.4695'
247	394,658.0822'	2,364,614.1512'
248	394,378.6715'	2,364,714.5468'

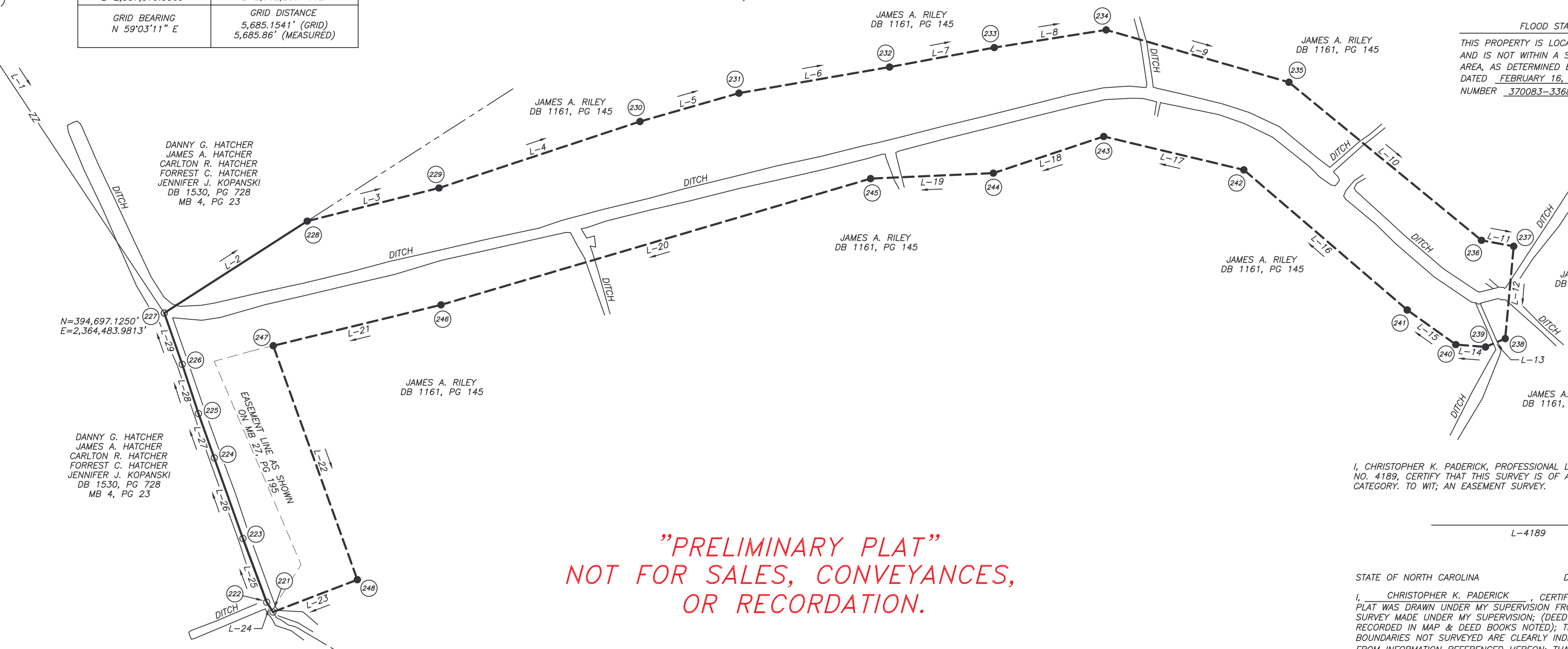
(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "HATCHER 1974")

LINE	BEARING	LENGTH
L-1	S 33°34'29" E	4,029.80'
L-2	N 57°15'37" E	202.96'
L-3	N 75°52'51" E	162.27'
L-4	N 71°41'54" E	252.82'
L-5	N 74°00'44" E	122.93'
L-6	N 80°10'14" E	182.56'
L-7	N 79°27'28" E	127.19'
L-8	N 81°01'21" E	135.25'
L-9	S 74°01'12" E	227.06'
L-10	S 50°36'59" E	297.51'
L-11	S 79°30'07" E	39.12'
L-12	S 05°14'37" W	110.69'
L-13	S 66°57'57" W	25.58'
L-14	N 85°21'37" W	35.58'
L-15	N 54°32'05" W	71.24'
L-16	N 49°23'46" W	257.04'
L-17	N 76°35'41" W	171.98'
L-18	S 71°38'05" W	138.92'
L-19	S 87°26'32" W	146.78'
L-20	S 73°37'15" W	534.66'
L-21	S 76°18'27" W	206.18'
L-22	S 19°45'50" E	296.90'
L-23	S 69°01'59" W	107.90'
L-24	N 32°31'28" W	13.92'
L-25	N 20°27'59" W	81.24'
L-26	N 19°34'51" W	102.19'
L-27	N 19°36'07" W	56.13'
L-28	N 18°13'18" W	62.02'
L-29	N 19°19'43" W	64.80'



NC GEODETIC SURVEY MONUMENT REFERENCE TABLE	
FROM: "BROWN 1974"	TO: "HATCHER 1974"
N=395,131.0634' E=2,357,379.5569'	N=398,054.6107' E=2,362,255.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685.1541' (GRID) 5,685.86' (MEASURED)

NCGSM "HATCHER 1974"
N=398,054.6107'
E=2,362,255.4002'
(NAD 83/2001)

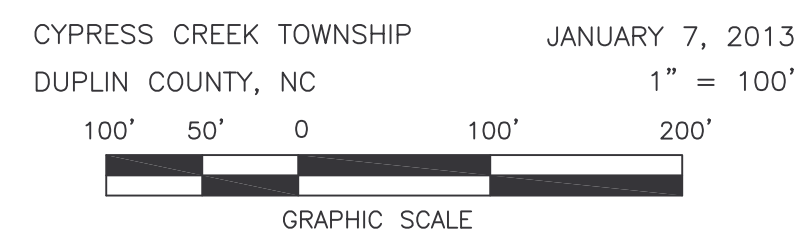


FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X"
AND IS NOT WITHIN A SPECIAL FLOOD HAZARD
AREA, AS DETERMINED BY NFIP RATE MAP
DATED FEBRUARY 16, 2006 : COMMUNITY PANEL
NUMBER 370083-3368-J.

I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR
NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER
CATEGORY, TO WIT; AN EASEMENT SURVEY.

**"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

CONSERVATION EASEMENT
SURVEY OF
**THE JAMES A. RILEY PROPERTY
FOR THE STATE OF NORTH CAROLINA**
S.P.O. FILE #31-X
NCEP RFP #16-004101
NCEP PROJECT #95354
NCEP PROJECT NAME: MUDDY RUN 2



- LEGEND
- = NEW IRON STAKE & CAP
 - = NO POINT SET
 - (TL) = TIE LINE
 - (CC) = CONTROL CORNER
 - NCGSM = NC GRID SURVEY MONUMENT
 - = NOT TO SCALE
 - = ADJOINING PROPERTY LINE
 - = EASEMENT LINE
 - = EASEMENT/BOUNDARY LINE

- NOTES:
1. COMBINED FACTOR IS 0.99989904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

STATE OF NORTH CAROLINA DUPLIN COUNTY
I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS
PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL
SURVEY MADE UNDER MY SUPERVISION; (DEED DESCRIPTION
RECORDED IN MAP & DEED BOOKS NOTED); THAT THE
BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN
FROM INFORMATION REFERENCED HEREON; 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 7TH DAY OF JANUARY, A.D.,
2013.

REVISED 12/16/13 - CHANGED EASEMENT AREA, ACREAGE, NOTES, ETC. (CKP)

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS
906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221	EMAIL: surveyor@matriceast.net
DRAWN BY: CKP/INM	PROJECT NO.: 20110047
SURVEYED BY: LDL/CCK	DATE: JANUARY 7, 2013
SCALE: 1" = 100'	DRAWING NAME: RILEY-REV

ACREAGE DATA
(BY COMPUTER)
5.797 AC±

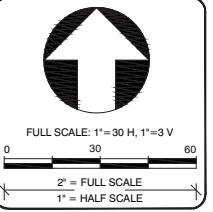
SOURCE OF TITLE
DB 1161, PG 145

SHEET 13 OF 13

Appendix D

Project Plan Sheets

Index Sheet and Sheets 6, 11, 12, 35, 38, and 39

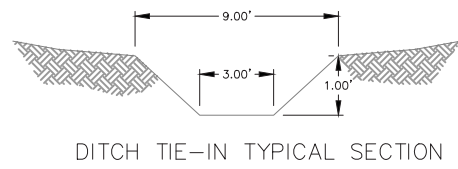
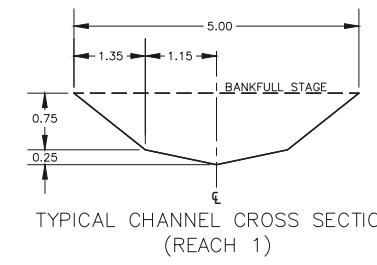
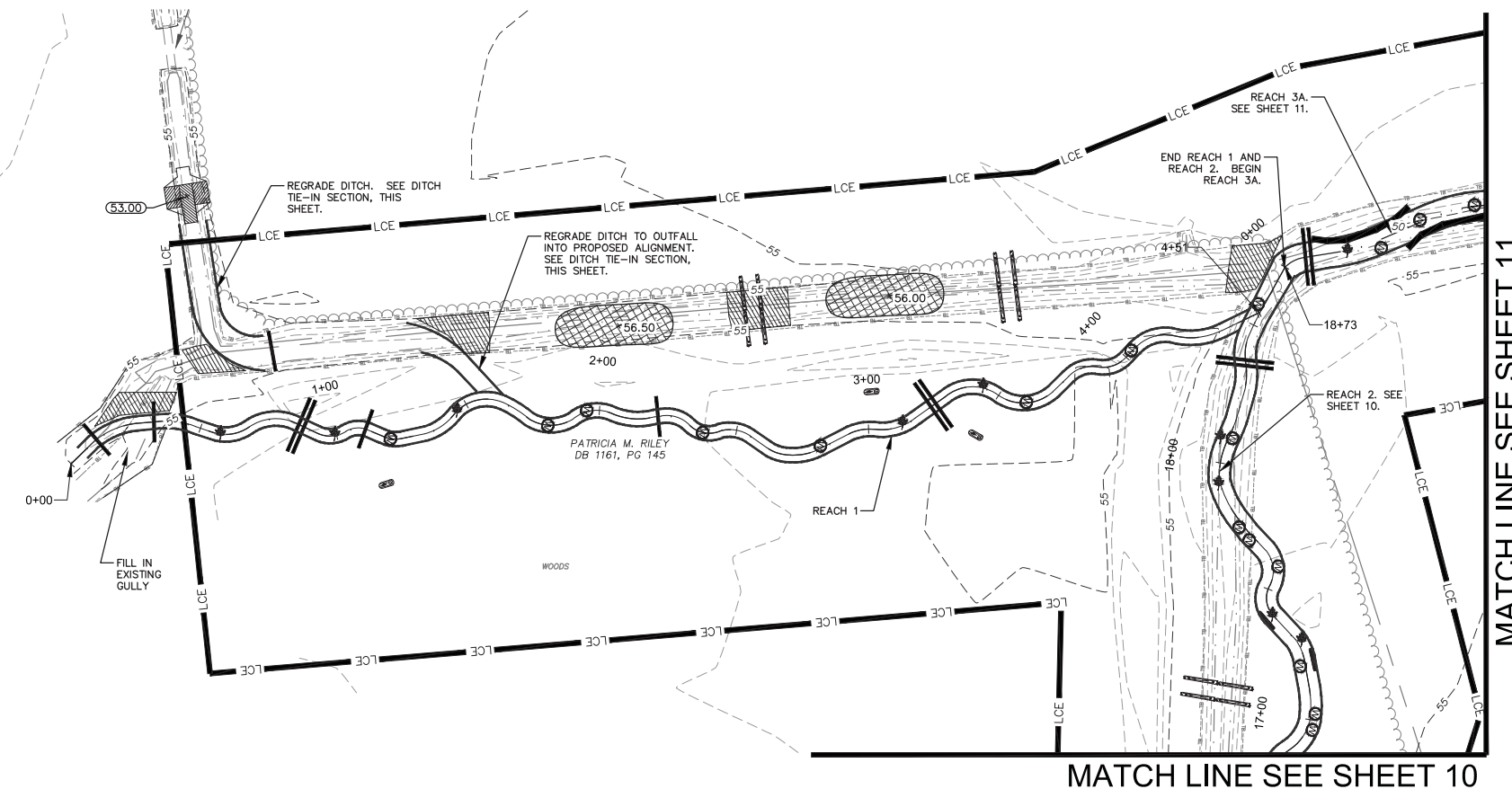


MARK	DATE	DESCRIPTION	REVISIONS FOR:	RELEASED FOR:	PLOT DATE:
					1/9/14

FINAL DESIGN - FOR CONSTRUCTION

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Plan And Profile - Reach 1
 OWNER: 24 HR CONTACT:
 ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: AUG 2013
 DRAWING NUMBER:
6
 PROJ. NO.: 20120090.00.RA



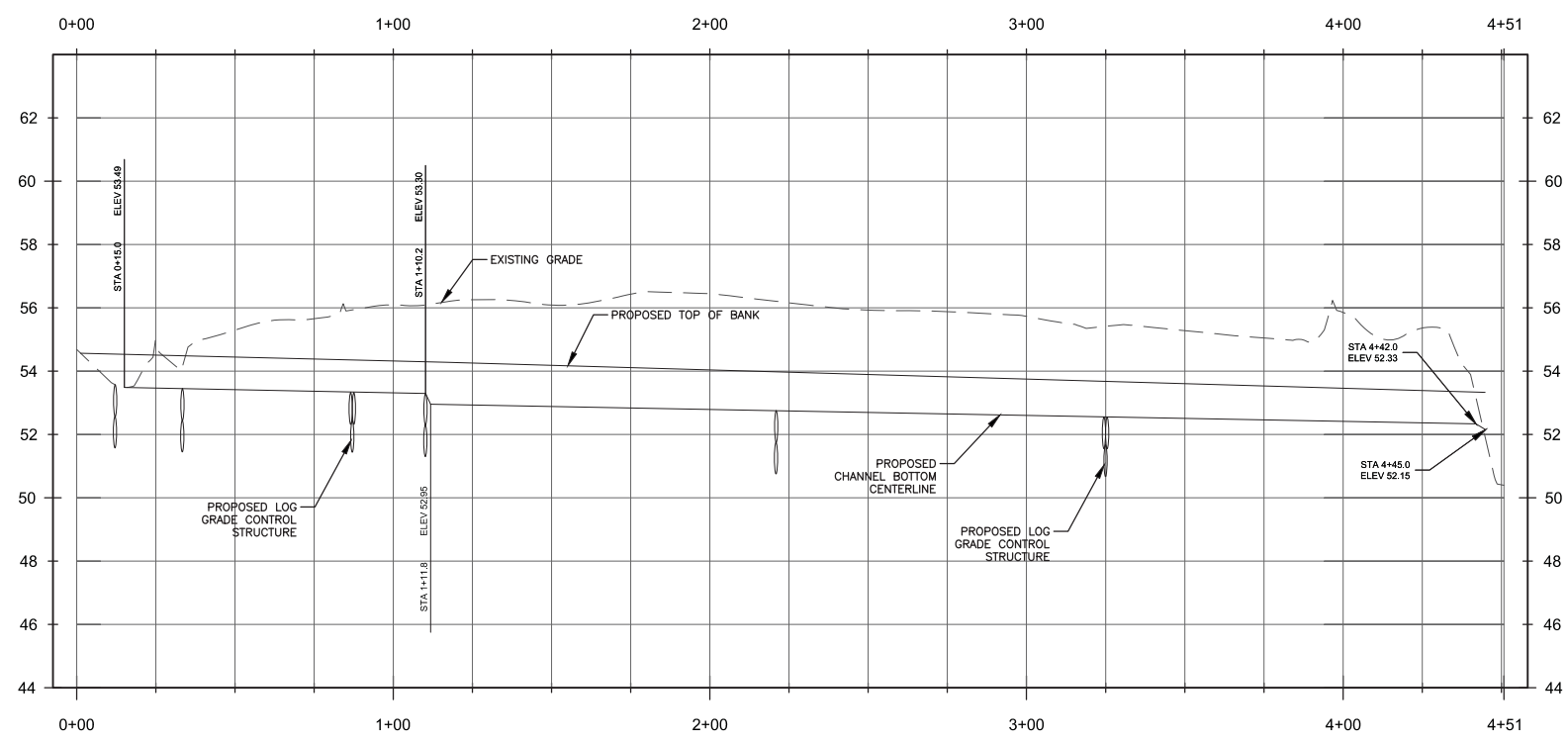
- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MAXIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 45 FOR DIMENSIONS.
 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 42 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

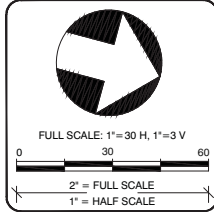
LEGEND

EXISTING CONTOUR MAJOR	-50-
EXISTING CONTOUR MINOR	-46-
PROPOSED CONTOUR MAJOR	50
PROPOSED CONTOUR MINOR	42
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	--- TB ---
EXISTING BOTTOM OF BANK	---
PROPOSED CENTERLINE OF CHANNEL	---
EXISTING FENCELINE	-x-x-x-x-
EXISTING TREELINE	~ ~ ~ ~ ~
PROPOSED CHANNEL BOTTOM	---
PROPOSED TOP OF BANK	---
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 42)	
LOG STRUCTURE (SEE DETAIL SHEET 44)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 42)	
VEGETATED SILL (SEE DETAIL SHEET 42)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 42)	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 45)	
LARGE WOODY DEBRIS (SEE DETAIL SHEET 44)	
LEAF PACK (SEE DETAIL SHEET 43)	
SMALL WOODY DEBRIS (SEE DETAIL SHEET 43)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 43)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 43)	
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 43)	
FLOODPLAIN SILL (SEE DETAIL SHEET 44)	
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 44)	
LOG GRADE CONTROL (PROFILE)	
LOG STRUCTURE (PROFILE)	
BEDDED LOG STRUCTURE (PROFILE)	

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG STRUCTURE	0+12	53.57	-----	-----	-----
LOG STRUCTURE	0+33	53.45	-----	-----	-----
LOG STRUCTURE	0+79	53.90	-----	-----	-----
LOG GRADE CONTROL	0+87	53.32	-----	-----	-----
LOG STRUCTURE	1+10	53.20	-----	-----	-----
LOG STRUCTURE	2+20	52.70	-----	-----	-----
LOG GRADE CONTROL	3+25	52.50	-----	-----	-----

*RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM





REVISIONS:

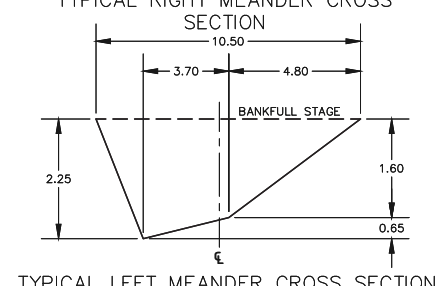
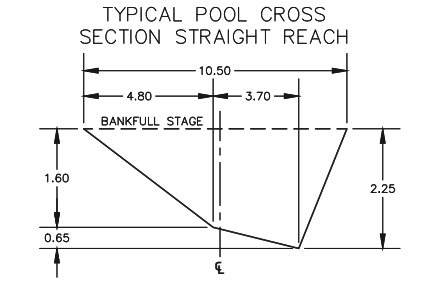
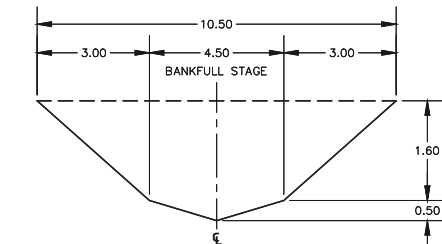
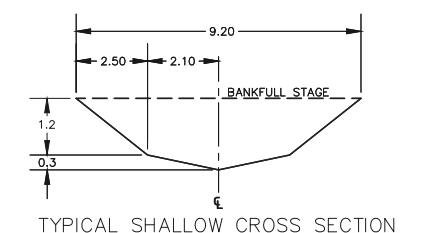
MARK	DATE	DESCRIPTION

RELEASED FOR: **FINAL DESIGN - FOR CONSTRUCTION**
PLOT DATE: 1/9/14

PROJECT NAME: **MUDDY RUN II STREAM MITIGATION PROJECT**
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: **Plan And Profile - Reach 3A**
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: AUG 2013
DRAWING NUMBER:
11
PROJ. NO.: 20120090.00.RA

- NOTES:
- IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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 - UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING FENCE TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 - FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 42 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

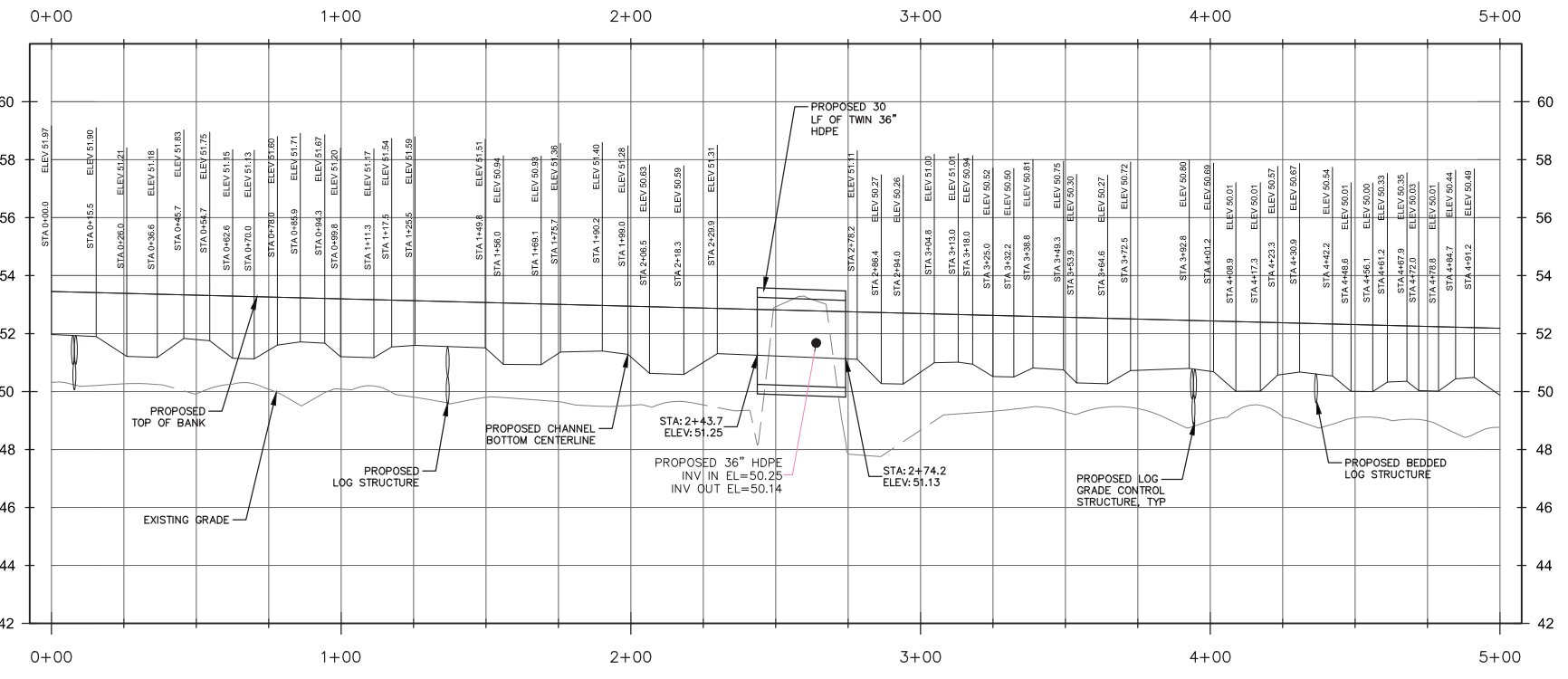
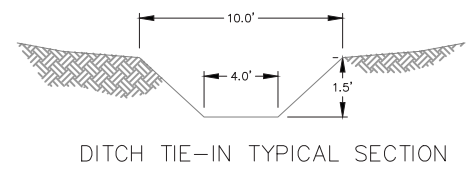
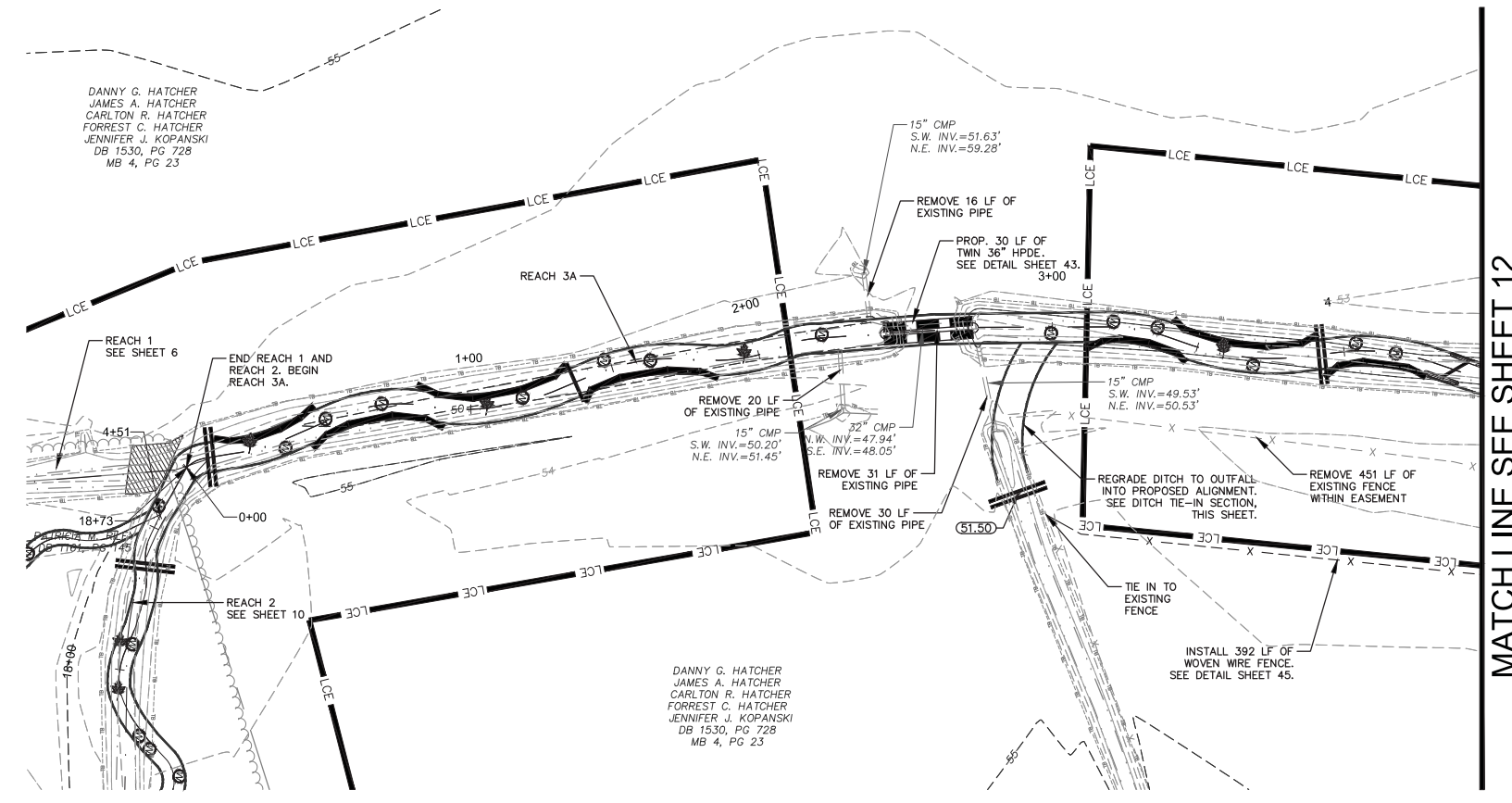


TYP. SECTIONS STA 00+00 TO 18+15 (REACH 3A)

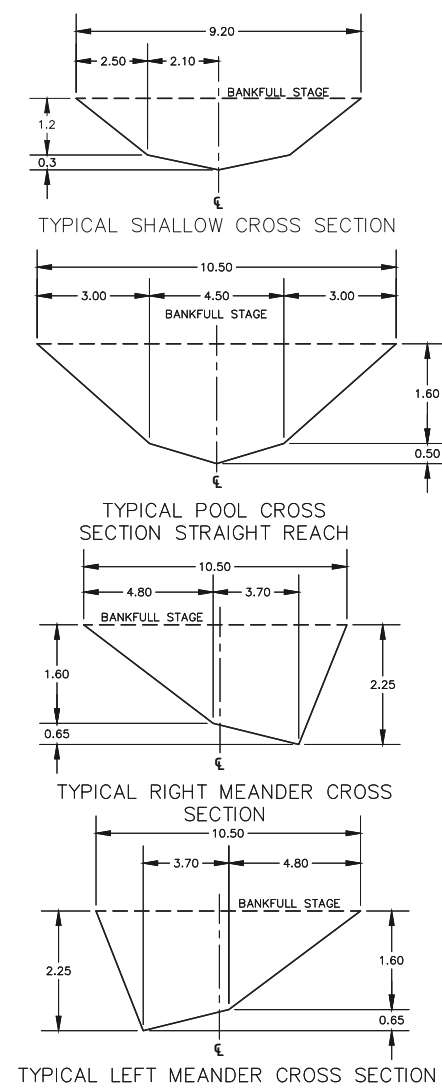
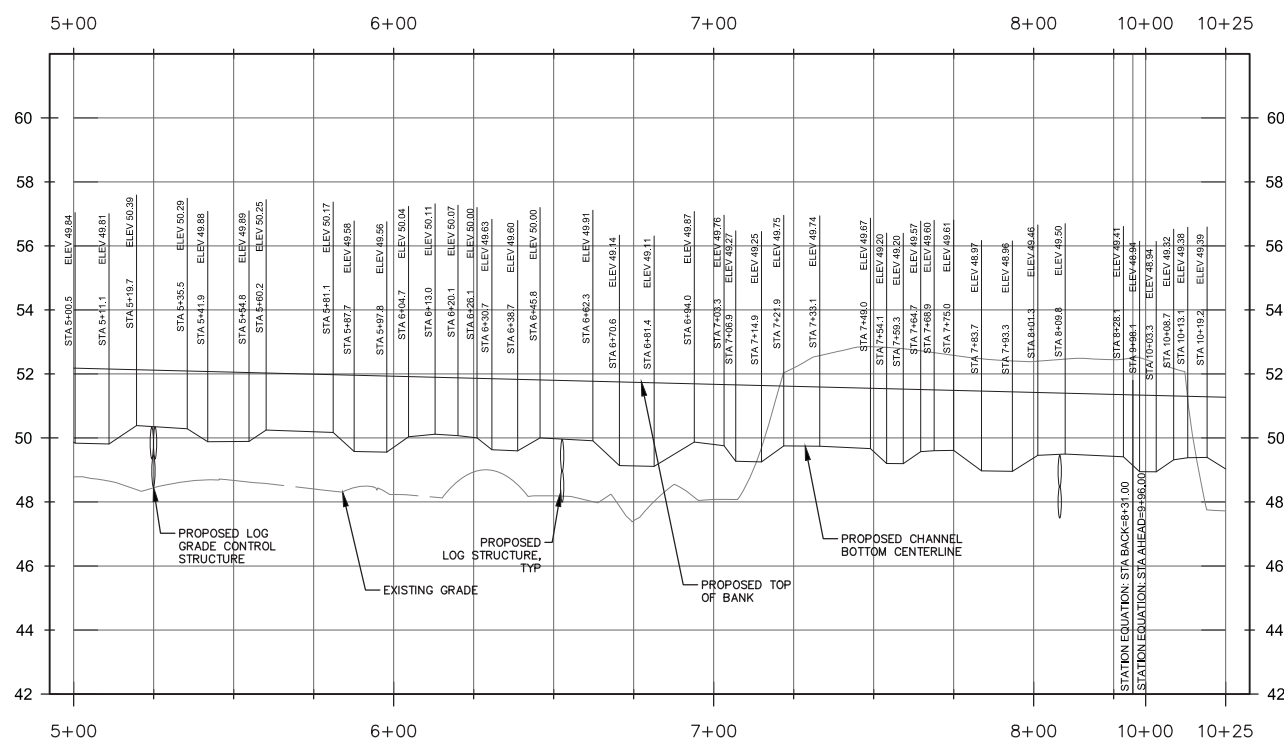
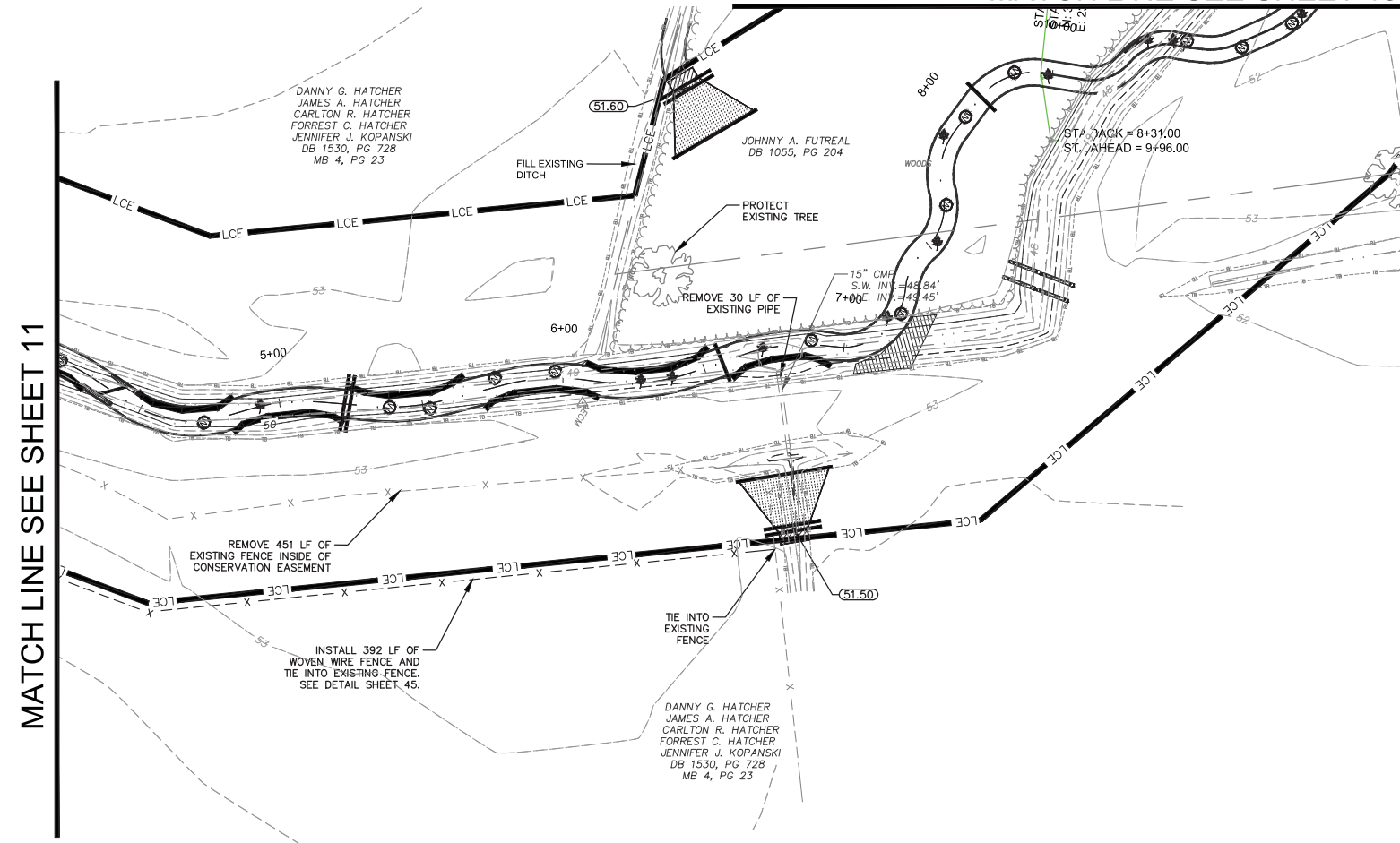
STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	0+09	51.80	-----	-----	-----
LOG STRUCTURE	1+37	51.50	-----	-----	-----
LOG GRADE CONTROL	2+92	51.50	-----	-----	R
LOG GRADE CONTROL	3+93	50.65	-----	-----	-----
BEDDED LOG STRUCTURE	4+38	50.59	-----	-----	-----

*RIGHT (R) AND LEFT (L) BANK LOCATIONS ARE REFERENCED LOOKING DOWNSTREAM

- LEGEND
- EXISTING CONTOUR MAJOR: -50-
 - EXISTING CONTOUR MINOR: -46-
 - PROPOSED CONTOUR MAJOR: (50)
 - PROPOSED CONTOUR MINOR: (42)
 - PROPOSED SPOT SHOT: x 49.32
 - EXISTING TOP OF BANK: TB
 - EXISTING BOTTOM OF BANK: ---
 - PROPOSED CENTERLINE OF CHANNEL: ---
 - EXISTING FENCELINE: ---
 - EXISTING TREELINE: ---
 - PROPOSED CHANNEL BOTTOM: ---
 - PROPOSED TOP OF BANK: ---
 - LIMITS OF PROPOSED CONSERVATION EASEMENT: LCE
 - LOG TOE PROTECTION (SEE DETAIL SHEET 42): [Symbol]
 - LOG STRUCTURE (SEE DETAIL SHEET 44): [Symbol]
 - LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 42): [Symbol]
 - VEGETATED SILL (SEE DETAIL SHEET 42): [Symbol]
 - WETLAND DEPRESSION: [Symbol]
 - PROPOSED FILL AREA: [Symbol]
 - PROPOSED WETLAND: [Symbol]
 - PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 42): [Symbol]
 - CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 45): [Symbol]
 - LARGE WOODY DEBRIS (SEE DETAIL SHEET 44): [Symbol]
 - LEAF PACK (SEE DETAIL SHEET 43): [Symbol]
 - SMALL WOODY DEBRIS (SEE DETAIL SHEET 43): [Symbol]
 - LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 43): [Symbol]
 - EXISTING TREE: [Symbol]
 - LOG OUTLET STRUCTURE (SEE DETAIL SHEET 43): [Symbol]
 - BEDDED LOG STRUCTURE (SEE DETAIL SHEET 43): [Symbol]
 - FLOODPLAIN SILL (SEE DETAIL SHEET 44): [Symbol]
 - DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 44): [Symbol]
 - LOG GRADE CONTROL (PROFILE): [Symbol]
 - LOG STRUCTURE (PROFILE): [Symbol]
 - BEDDED LOG STRUCTURE (PROFILE): [Symbol]



MATCH LINE SEE SHEET 13



TYP. SECTIONS STA 00+00 TO 18+15 (REACH 3A)

STRUCTURE	FROM		TO		BANK*
	STA	ELEV	STA	ELEV	
LOG GRADE CONTROL	5+24	50.25			
LOG STRUCTURE	6+57	49.90			
DIFFUSE FLOW STRUCTURE	6+78	51.50			R
DIFFUSE FLOW STRUCTURE	7+83	51.60			L
LOG STRUCTURE	8+08	49.45			

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 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 42 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR --- 50 ---
- EXISTING CONTOUR MINOR --- 46 ---
- PROPOSED CONTOUR MAJOR (50)
- PROPOSED CONTOUR MINOR (42)
- PROPOSED SPOT SHOT x 49.32
- EXISTING TOP OF BANK --- TB ---
- EXISTING BOTTOM OF BANK --- ---
- PROPOSED CENTERLINE OF CHANNEL --- ---
- EXISTING FENCELINE --- x-x-x-x ---
- EXISTING TREELINE --- ---
- PROPOSED CHANNEL BOTTOM --- ---
- PROPOSED TOP OF BANK --- ---
- LIMITS OF PROPOSED CONSERVATION EASEMENT --- LCE ---
- LOG TOE PROTECTION (SEE DETAIL SHEET 42) --- ---
- LOG STRUCTURE (SEE DETAIL SHEET 44) --- ---
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 42) --- ---
- VEGETATED SILL (SEE DETAIL SHEET 42) --- ---
- WETLAND DEPRESSION --- ---
- PROPOSED FILL AREA --- ---
- PROPOSED WETLAND --- ---
- PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 42) --- ---
- CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 45) --- ---
- LARGE WOODY DEBRIS (SEE DETAIL SHEET 44) --- ---
- LEAF PACK (SEE DETAIL SHEET 43) --- ---
- SMALL WOODY DEBRIS (SEE DETAIL SHEET 43) --- ---
- LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 43) --- ---
- EXISTING TREE --- ---
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 43) --- ---
- BEDDED LOG STRUCTURE (SEE DETAIL SHEET 43) --- ---
- FLOODPLAIN SILL (SEE DETAIL SHEET 44) --- ---
- DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 44) --- ---
- LOG GRADE CONTROL (PROFILE) --- ---
- LOG STRUCTURE (PROFILE) --- ---
- BEDDED LOG STRUCTURE (PROFILE) --- ---

WK DICKSON
community infrastructure consultants
Transportation + Water Resources
Urban Development + Geomatics
720 Corporate Drive
Raleigh, NC 27607
(919) 782-0495
(919) 782-9672
www.wkdickson.com
NC LICENSE NO. F-0374



FULL SCALE: 1"=30 H, 1"=3 V
2"= FULL SCALE
1"= HALF SCALE

MARK | DATE | DESCRIPTION
REVISIONS:
RELEASED FOR: FINAL DESIGN - FOR CONSTRUCTION
PLOT DATE: 1/9/14

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
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DRAWING TITLE: Plan And Profile - Reach 3A
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
O.C. DATE: FM
AUG 2013
DRAWING NUMBER:
12
PROJ. NO.: 20120090.00.RA

MATCH LINE
SEE SHEET 36

JOHNNY A. FUTREAL
DB 1055, PG 204

JOHNNY ADRAIN FUTREAL
TERRY ROSE FUTREAL
DB 1142, PG 501

REACH 4

JOHNNY A. FUTREAL
DB 1055, PG 204

REACH 3A

DANNY G. HATCHER
JAMES A. HATCHER
CARLTON R. HATCHER
FORREST C. HATCHER
JENNIFER J. KOPANSKI
DB 1530, PG 728
MB 4, PG 23

DANNY G. HATCHER
JAMES A. HATCHER
CARLTON R. HATCHER
FORREST C. HATCHER
JENNIFER J. KOPANSKI
DB 1530, PG 728
MB 4, PG 23

PATRICIA M. RILEY
DB 1161, PG 145

REACH 1

PROPOSED
PLANTING AREA
(SEE PLANTING
TABLE THIS SHEET)

PATRICIA M. RILEY
DB 1161, PG 145

REACH 2

MARION D. BROWN, JR.
VIVIAN E. BROWN
DB 1127, PG 96
MB 9, PG 20
MB 13, PG 37

PLANTING TABLE

Zone 1		
Common Name	Scientific Name	Percent Composition
River birch	<i>Betula nigra</i>	10%
Green ash	<i>Fraxinus pennsylvanica</i>	10%
Swamp tupelo	<i>Nyssa biflora</i>	5%
Laurel oak	<i>Quercus laurifolia</i>	20%
Overcup oak	<i>Quercus lyrata</i>	20%
Swamp chestnut oak	<i>Quercus michauxii</i>	10%
Water oak	<i>Quercus nigra</i>	5%
American sycamore	<i>Platanus occidentalis</i>	10%
Bald cypress	<i>Taxodium distichum</i>	10%

Zone 2		
Common Name	Scientific Name	Percent Composition
River birch	<i>Betula nigra</i>	15%
Green ash	<i>Fraxinus pennsylvanica</i>	20%
Swamp tupelo	<i>Nyssa biflora</i>	10%
Laurel oak	<i>Quercus laurifolia</i>	15%
Overcup oak	<i>Quercus lyrata</i>	20%
Bald cypress	<i>Taxodium distichum</i>	20%

Zone 3		
Common Name	Scientific Name	Percent Composition
Green ash	<i>Fraxinus pennsylvanica</i>	20%
Swamp tupelo	<i>Nyssa biflora</i>	20%
Laurel oak	<i>Quercus laurifolia</i>	20%
Overcup oak	<i>Quercus lyrata</i>	20%
Bald cypress	<i>Taxodium distichum</i>	20%

Permanent Riparian Seed Mix		
Common Name	Scientific Name	Percent Composition
Bushy Bluestem	<i>Andropogon glomeratus</i>	15%
Sedge, Fringed	<i>Carex crinita</i>	10%
Sedge, Tussock	<i>Carex stricta</i>	5%
Virginia Wildrye	<i>Elymus virginicus</i>	15%
Purple Lovegrass	<i>Eragrostis spectabilis</i>	10%
Switchgrass	<i>Panicum virgatum</i>	20%
Little Blue Stem	<i>Schizachyrium scoparium</i>	20%
Eastern Gamagrass	<i>Tripsacum dactyloides</i>	5%

Live Staking and Live Cuttings Bundle Tree Species		
Common Name	Scientific Name	Stakes/LF
Silky dogwood	<i>Cornus amomum</i>	1
Silky willow	<i>Salix sericea</i>	1
Black willow	<i>Salix nigra</i>	1


NOTES:


- Bare root planting is proposed for all areas within the easement not designated for live staking or live cuttings bundles.
- Bare root planting density is approximately 680 stems per acre.
- Live cuttings bundles are proposed along the outside of meander bends, adjacent to pools.
- Live cuttings bundle species shall include silky willows or black willows.
- Live stakes are proposed along both banks of straight reaches adjacent to pools.
- Permanent riparian seed mix shall be applied to all disturbed areas within the conservation easement at a rate of 25 lbs/acre.


PLANTING NOTES

- ALL PLANTING AREAS**
EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
- DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
 - ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
 - COIR FABRIC MATERIALS SHALL NOT BE CUT WITH PLANTING IMPLEMENTS. THE SMALLEST OPENING NECESSARY TO ACCOMMODATE EACH PLANT SHALL BE CUT INTO COIR FABRIC USING A SHARP KNIFE OR SHEARS. NO HOLES LARGER THAN 12 INCHES SHALL BE MADE.
 - SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
 - BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 45. LIVE CUTTING BUNDLES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 43. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 42.

PLANTING LEGEND


ZONE 1: RIPARIAN PLANTING 

ZONE 2: WETLAND 

ZONE 3: WETLAND DEPRESSION 

WK DICKSON
community infrastructure consultants
Transportation + Water Resources
Urban Development + Geomatics
720 Corporate Drive
Raleigh, NC 27607
(v) 919.782.0495
(f) 919.782.9672
www.wkdickson.com





FULL SCALE: 1" = 100 H, 1" = 3 V

0 100 200

2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	FINAL DESIGN - FOR CONSTRUCTION	PLOT DATE:
						1/9/14

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO., NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC

DRAWING TITLE: Planting Plan

OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: AUG 2013

DRAWING NUMBER:
35

PROJ. NO.:
20120090.00.RA



- LEGEND**
- LIMITS OF PROPOSED CONSERVATION EASEMENT LCE
 - EXISTING TREELINE
 - PLANTING ZONE 1: RIPARIAN PLANTING
 - PLANTING ZONE 2: WETLAND
 - PLANTING ZONE 3: WETLAND DEPRESSION
 - PROPOSED VEGETATION PLOT (AREA: 0.02 AC)
 - PROPOSED GROUNDWATER GAUGES

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 Urban Development + Geomatics
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 Raleigh, NC 27607
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 (f) 919.782.9672
 www.wkdickson.com
 N.C. LICENSE NO. F-0374



FULL SCALE: 1"=240 H, 1"=3 V
 0 240 480
 2" = FULL SCALE
 1" = HALF SCALE

MARK	DATE	DESCRIPTION

RELEASED FOR: **FINAL DESIGN - FOR CONSTRUCTION**
 PLOT DATE: 1/9/14

PROJECT NAME: **MUDDY RUN II STREAM MITIGATION PROJECT**
 DUPLIN CO., NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: **Monitoring Locations**
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 O.C.: FM
 O.C. DATE: AUG 2013
 DRAWING NUMBER:
38
 PROJ. NO.:
 20120090.00.RA



LEGEND

- LIMITS OF PROPOSED CONSERVATION EASEMENT ——— LCE ———
- TEMPORARY SILT FENCE ——— ■■■ ———
- EXISTING TREELINE ——— ~~~~~ ———
- EXISTING GRAVEL FARM PATH ——— - - - - - ———
- LIMITS OF DISTURBANCE ——— [Hatched Area] ———
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE ——— [Cross-hatched Area] ———

TOTAL AREA OF DISTURBANCE: 43.8 ACRES
 TOTAL AREA OF CONSERVATION EASEMENT: 37.6 ACRES

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 Urban Development + Geomatics
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↑
 FULL SCALE: 1"=240 H, 1"=3 V
 0 240 480
 2" = FULL SCALE
 1" = HALF SCALE

MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	FINAL DESIGN - FOR CONSTRUCTION	PLOT DATE:
						1/9/14

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO., NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Planting Plan
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: AUG 2013
 DRAWING NUMBER:
39
 PROJ. NO.:
 20120090.00.RA

**MITIGATION PLAN
June 2013**

**Muddy Run II
Duplin County, North Carolina
EEP Project ID NC-95354**

**Cape Fear River Basin
HUC 03030007**

Prepared for:



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

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DRAFT

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), and
- 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 Muddy Run II Stream Restoration Project is located within an agricultural watershed in Duplin County, North Carolina, approximately six miles south of Beulaville. The stream channels have been heavily impacted by channelization and agricultural practices. The project will involve the restoration and protection of streams in the Muddy Creek watershed. The purpose of this restoration project is to restore and enhance a stream/wetland complex located within the Cape Fear River Basin.

The project lies within USGS Hydrologic Unit Code 03030007060010 (USGS, 1998) and within the North Carolina Division of Water Quality (NCDWQ) Cape Fear River Subbasin 03-06-22 (NCDENR, 2002). The Muddy Run II project is located directly adjacent to the Muddy Run project currently in development. The Muddy Run II Mitigation Project will be located on stream reaches upstream of Muddy Run Reach 3 and downstream of Muddy Run Reach 1c.

The Muddy Run II project consists of six unnamed tributaries to Muddy Creek, but the project has been divided into nine distinct reaches for design purposes. Reach 1 is one of the upstream-most portions of the project; it begins on the edge of an existing agricultural field and extends to STA 04+97. Similarly, Reach 2 is one of the upper-most portions of the stream project. It begins in a disturbed forest corridor between several agricultural fields and extends to STA 18+73. Reach 3a starts at the confluence of Reaches 1 and 2 (STA 00+00) and flows north north-west through a disturbed hardwood buffer and several agricultural fields before being partially diverted to enter Reach 3b near STA 37+36. Reach 3b flows to the north and west where it flows into Reach 3c at STA 56+78. Reach 3c flows through a pine plantation to STA 64+15, where it flows into Reach 3 of the Muddy Run project. Reach 4 is a perennial channel that flows through a forested area from a ditch draining an agricultural field. Reach 4 flows into Reach 3A at STA 18+36. Reach 5a consists of the main stem beginning at STA 00+00 where it adjoins with Reach 1C of the Muddy Run project. Reach 5a flows north and flows into Reach 5b at STA 18+04. Reach 5b is the most downstream reach of the project, ending at the right-of-way for State Highway 41. Reach 6 begins in a forested area south of Reach 5 and flows in a northerly direction to the confluence with Reach 5a near STA 8+70. Two areas containing drained hydric soil were identified for restoration, located along Reach 3b and Reach 5a.

The site consists of farmland, concentrated animal feeding operations (CAFO), and wooded areas. The total easement area is 37.6 acres, 20.6 acres of which are wooded. The remaining area is agricultural or clear-cut. The wooded areas along the corridor designated for restoration are classified as disturbed deciduous forest, and invasive species are prevalent throughout. Several ditches exist throughout the project and flow into the main channel. Each ditch contributes to the overall design discharge of the channel. All existing channels are degraded to a point where they no longer access their floodplain, water quality is poor, and aquatic life is not supported. Little habitat is available to support aquatic life, and the channels are not maximizing their potential to filter nutrients because they are entrenched.

The objective for this restoration project is to restore wetland areas and design a natural waterway through a stream/wetland complex with appropriate cross-sectional dimension and slope that will provide function

and meet the appropriate success criteria for the existing streams. Accomplishing this objective entails the restoration of natural stream characteristics, such as stable cross sections, planform, and in-stream habitat. The floodplain areas will be hydrologically reconnected to the channel to provide natural exchange and storage during flooding events. The design will be based on reference conditions, USACE guidance (USACE, 2005), and criteria that are developed during this project to achieve success. Additional project objectives, such as restoring the riparian buffer with native vegetation, ensuring hydraulic stability, and eradicating invasive species, are listed in Section 1 along with several other project objectives.

The stream design approach for Muddy Run II is to combine the analog method of natural channel design with analytical methods to evaluate stream flows and hydraulic performance of the channel and floodplain. The analog method involves the use of a “template” stream adjacent to, nearby, or previously in the same location as the design reach. The template parameters of the analog reach are replicated to create the features of the design reach. The analog approach is useful when watershed and boundary conditions are similar between the design and analog reaches (Skidmore, et al., 2001). Hydraulic geometry was developed using analytical methods in an effort to identify the design discharge.

The headwater valley restoration approach is proposed along Reaches 1 and 2. The existing ditches/channels will be plugged and then backfilled to the extent possible such that cut and fill is balanced along the reach. Priority Level I restoration is proposed on Reaches 2, 3a, 3b, 4, and 5a. For the majority of the restoration reaches, the channel will be rerouted from its current location to adjacent natural valley features.

Enhancement Level I is proposed for Reach 3c. This will include grading a floodplain bench, bank stabilization treatment, and habitat improvements. Enhancement Level II is proposed for Reaches 5b and 6, where minor bank grading and habitat improvements are proposed.

Wetland restoration will occur adjacent to stream Reaches 3b and 5a. The approach is to reconnect the floodplain wetland to the stream, fill ditches, create shallow pool habitat, rough the floodplain surface, and plant appropriate small stream swamp vegetation. A water balance analysis indicates that sufficient hydrology should be present for four weeks at the beginning of the growing season.

After completion of all construction and planting activities, the site will be monitored on a regular basis, and a physical inspection of the site will be conducted a minimum of twice per year throughout the seven year post-construction monitoring period, or until performance standards are met. These site inspections will identify site components and features that require routine maintenance. Success criteria on the headwater valley reaches will include documented surface flow and vegetative success. The measure of stream restoration success will be documented bankfull flows and no change in stream channel classification. Sand bed channels are dynamic and minor adjustments to dimension and profile are expected. The hydrology success criterion for the site is to restore the water table at the site so that it will remain continuously within 12 inches of the soil surface for at least nine percent of the growing season (approximately 22 days) at each groundwater gauge location during normal rainfall years. The measure of vegetative success for the site will be the survival of at least 210 7-year old planted trees per acre at the end of year five of the monitoring period. Annual monitoring data will be reported using the EEP monitoring template.

Upon approval for closeout by the Interagency Review Team (IRT), the site will be transferred to the State of North Carolina (State). The State 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.

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Appendices

Appendix A. Site Protection Instruments
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1 RESTORATION PROJECT GOALS AND OBJECTIVES

The North Carolina Ecosystem Enhancement Program (EEP) develops River Basin Restoration Priorities (RBRP) 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 2009 Cape Fear River Basin Plan identified HUC 03030007060010 as a Targeted Local Watershed (http://portal.ncdenr.org/c/document_library/get_file?uuid=e16e9d5a-a385-41ec-8969-44c8e10369ba&groupId=60329). The watershed is characterized by 52 percent of agricultural land use area with Impaired for aquatic life because of a Fair benthic community rating. Aquatic habitat was good at the site, suggesting that the water quality is degraded. There are 98 animal operations and one NPDES wastewater discharge in the watershed that may be the source of the degraded water quality.

The 2009 Cape Fear RBRP identified water quality and animal operations as major stressors within this TLW. The Muddy Run II Stream and Wetland Restoration Project was identified as a Stream and Wetland opportunity to improve water quality, habitat, and hydrology within the TLW.

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

- Nutrient removal,
- Sediment removal,
- Reducing runoff from animal operations,
- Filtration of runoff, and
- Improved aquatic and terrestrial habitat.

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

- Establishing riparian buffer areas adjacent to CAFOs,
- Converting active farm field to forested buffers,
- Stabilization of eroding stream banks,
- Reduction in stream bank slope,
- Restoration of riparian buffer bottomland hardwood habitats, and
- Construction of instream structures designed to improve bedform diversity and trap detritus.

The proposed Muddy Run II stream mitigation project will provide numerous ecological and water quality benefits within the Cape Fear River Basin. While many of these benefits are limited to the project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. Expected improvements to water quality, hydrology, and habitat are outlined in **Table 1**.

. Many of the project design goals and objectives, including restoration of riparian buffers to decrease runoff from CAFOs and improve terrestrial habitat, and construction of instream structures to improve habitat diversity, will address the degraded water quality and nutrient input from animal operations that were identified as major watershed stressors in the 2009 Cape Fear RBRP.

Table 1. Design Goals and Objectives

Benefits Related to Water Quality	
Nutrient removal	Benefit will be achieved through filtering of runoff from adjacent CAFOs through buffer areas, the conversion of active farm fields to forested buffers, improved denitrification and nutrient uptake through buffer zones, and installation of diffuse flow structures where existing ditches enter the proposed conservation easement.
Sediment removal	Benefit will be achieved through the stabilization of eroding stream banks and reduction of sediment loss from field areas due to lack of vegetative cover. Channel velocities will also be decreased through a reduction in slope, therefore decreasing erosive forces.
Increase dissolved oxygen concentration	Benefit will be achieved through the construction of instream structures to increase turbulence and dissolved oxygen concentrations and lower water temperature to increase dissolved oxygen capacity.
Runoff filtration	Benefit will be achieved through the restoration of buffer areas that will receive and filter runoff, thereby reducing nutrients and sediment concentrations reaching water bodies downstream.
Benefits to Flood Attenuation	
Water storage	Benefit will be achieved through the restoration of buffer areas which will infiltrate more water during precipitation events than under current site conditions.
Improved groundwater recharge	Benefit will be achieved through the increased storage of precipitation in buffer areas, ephemeral depressions, and reconnection of existing floodplain. Greater storage of water will lead to improved infiltration and groundwater recharge.
Improved/restored hydrologic connections	Benefit will be achieved by restoring the stream to a natural meandering pattern with an appropriately sized channel, such that the channel's floodplain will be flooded more frequently at flows greater than the bankfull stage.
Benefits Related to Ecological Processes	
Restoration of habitats	Benefit will be achieved by restoring riparian buffer habitat to appropriate bottomland hardwood ecosystem.
Improved substrate and instream cover	Benefit will be achieved through the construction of instream structures designed to improve bedform diversity and to trap detritus. Stabilization of stream banks will provide an overall decrease in the amount fine materials deposited in the stream.
Addition of large woody debris	Benefit will be achieved through the addition of wood structures as part of the restoration design. Such structures may include log vanes, root wads, and log weirs.
Reduced temperature of water due to shading	Benefit will be achieved through the restoration of canopy tree species to the stream buffer areas.
Restoration of terrestrial habitat	Benefit will be achieved through the restoration of riparian buffer bottomland hardwood habitats.

2 SITE SELECTION

2.1 Directions to the Project Site

The Muddy Run II Stream and Wetland Site is located in Duplin County approximately 1.4 miles east of Chinquapin, NC (**Figure 1**). To access the Site from the town of Chinquapin, travel east on Highway 50, take the first left onto Pickett Bay Road (SR 1819), go 1.1 miles, then turn left onto Kenney Crawley Road. This private road is gravel and will split just past the residential house on the right. Keeping to the left will take you to the Reaches 3b, 3c, 5a, 5b, and 6. Going to the right at the split will take you to Reaches 1, 2, 3a, and 4.

2.2 Site Selection

2.2.1 USGS Hydrologic Unit Code and NC DWQ River Basin

The site is located in the Cape Fear River Basin within Cataloging Unit 03030007 (NCDWQ sub-basin 03-06-22). The project is located within the Cape Fear River Basin (8-digit USGS HUC 03030007, 14-digit USGS HUC 0303007060010) (USGS, 1998) and the NCDWQ Cape Fear 03-06-22 sub-basin (NCDWQ, 2002) (Table 2 and Table 3).

2.2.2 Project Components and Structure

Table 2. Muddy Run II Project Components - Stream Mitigation

Reach	Mitigation Type	Stationing	Existing Length (LF)	Proposed Length (LF)	Mitigation Ratio	SMUs
Reach 1	Headwater Valley	0+54 to 4+97	438	443	1:1	443
Reach 2	Headwater Valley	0+00 to 5+04	504	504	1:1	504
Reach 2	P1 Restoration	5+04 to 18+73	1,223	1,369	1:1	1,369
Reach 3a	P1 Restoration	0+00 to 37+36	3,301	3,581	1:1	3,581
Reach 3b	P1 Restoration	37+36 to 56+78	NA	1,852	1:1	1,852
Reach 3c	Enhancement I	56+78 to 64+15	737	707	1:1.5	471
Reach 4	P1 Restoration	0+00 to 2+04	120	204	1:1	204
Reach 5a	P1 Restoration	0+00 to 18+04	1,602	1,774	1:1	1,774
Reach 5b	Enhancement II	18+04 to 22+05	401	401	1:2.5	160
Reach 6	Enhancement II	12+60 to 15+77	317	317	1:2.5	127
			8,643	11,152		10,486

Table 3. Muddy Run II Project Components – Wetland Mitigation

Wetland	Mitigation Type	Mitigation Area (ac)	Mitigation Ratio	WMUs
WA	Restoration	3.60	1:1	3.60
WB	Restoration	1.32	1:1	1.32
Total		4.92		4.92

2.2.3 Historical Land Use and Development Trends

Aerial imagery and information provided by the property owners indicate that the subject site has been used extensively for agricultural purposes and that the location of the stream has not changed in over 50 years (Figure 4 and Figure 6; Table 4; additional historical aerial imagery is available in Appendix B). From 1949 to 1987, the land was primarily used for agriculture crop production. A network of drainage ditches made it possible to farm these flat, sandy fields. Between 1987 and 1993, two CAFOs (hog farms) were added to the Brown parcels. These hog operations consisted of four hog houses and one waste lagoon per site. The 1998 aerial photography shows that these CAFOs were expanded between 1993 and 1998. The western hog farm operation added four additional hog houses

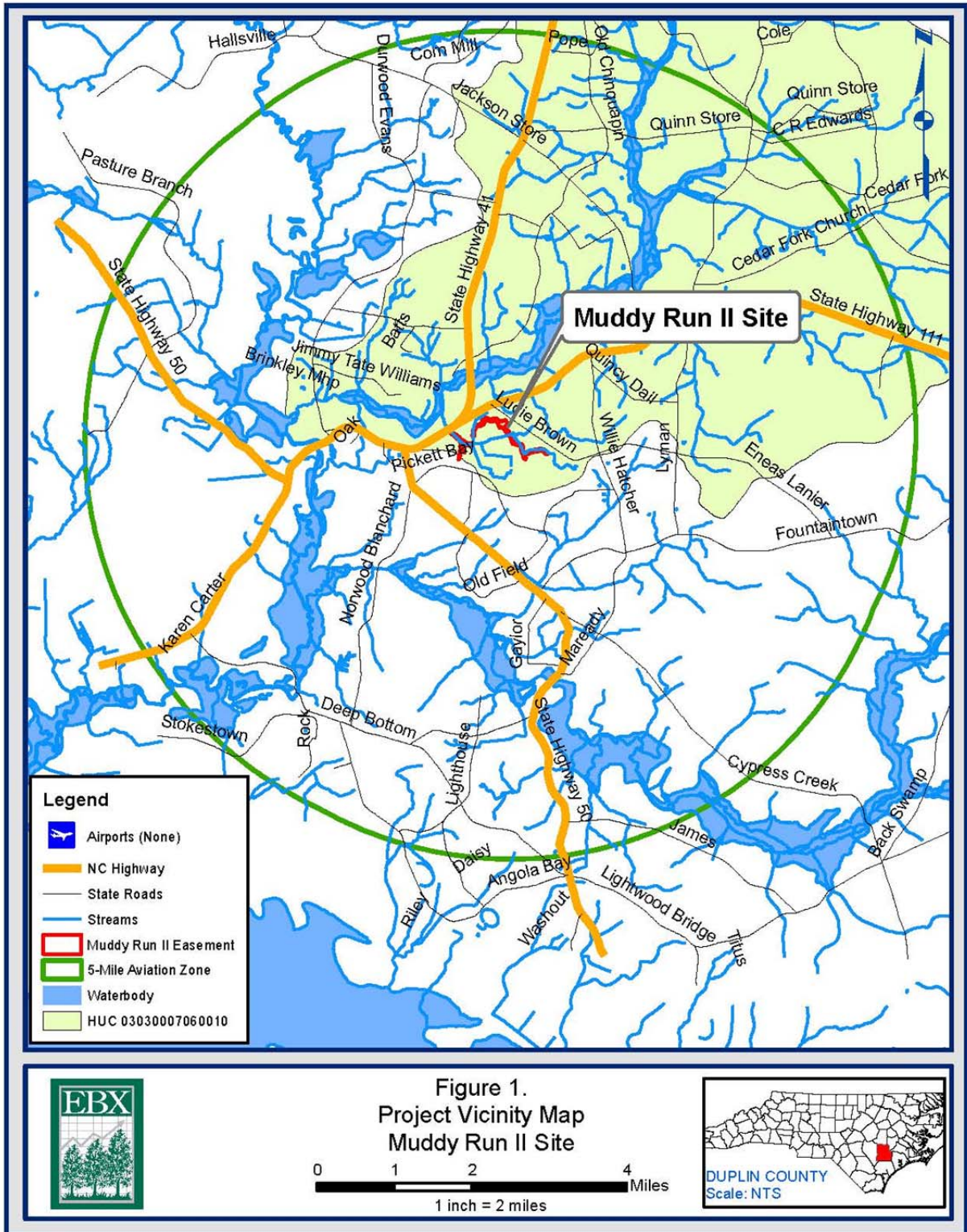
and one waste lagoon. The eastern hog farm had grown to a total of six hog houses and two waste lagoons. Little has changed since 1998 in regards to the development of the project site and nearby surrounding property. The area remains in an agricultural community with some neighboring property forested. Several watershed characteristics, such as groundwater, vegetation, surface drainage, and potentially soil parameters, have been modified. Soil structure and surface texture have been altered from intensive agricultural operations, and, although most of the soils characterized on the site are classified as poorly drained, the ditching system has caused these soils to be effectively drained.

Table 4. Historical Land Use and Development Trends

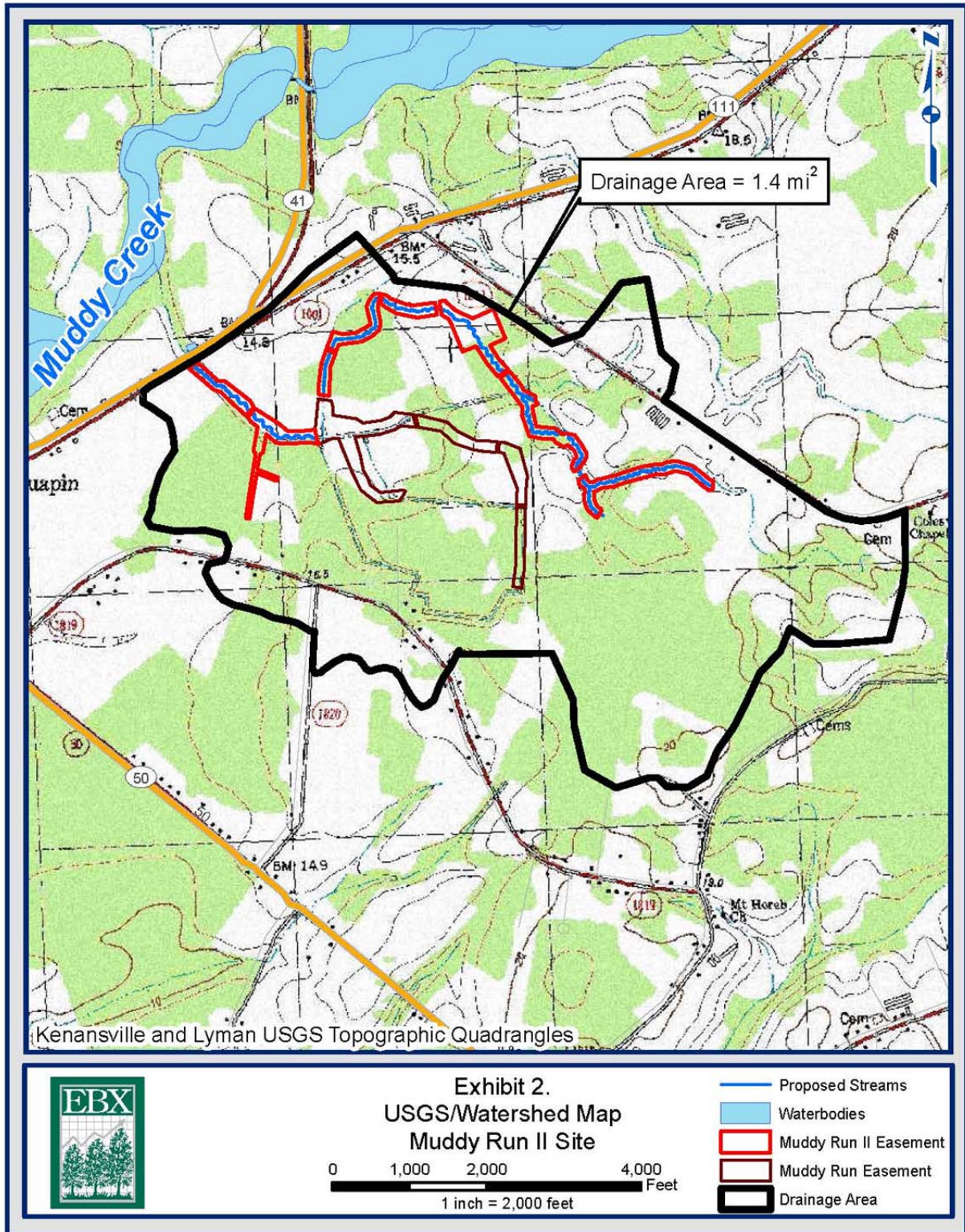
Date	Land Use and Development Observations*
1949	Conditions consist of ditched agricultural fields throughout the project area except where the confluence of Reaches 3c and 5a is proposed. This area is forested.
1965	Land use conditions have changed very little; however, there is a noticeable reduction in the drainage ditch network.
1987	The forested corridor where the confluence of Reaches 3c and 5a is proposed has been logged and converted into agricultural fields.
1993	Two CAFO (hog farm operations) have been added to the project vicinity. These operations consist of four houses and one waste lagoon per site.
1998	On the western hog farm operation, four additional hog houses and one waste lagoon have been added. The eastern hog farm operation has also added two hog houses and one additional waste lagoon.
2010	Depicts current site conditions.

* Observations based on aerial imagery and landowner communication

2.3 Vicinity Map



2.4 Watershed Map

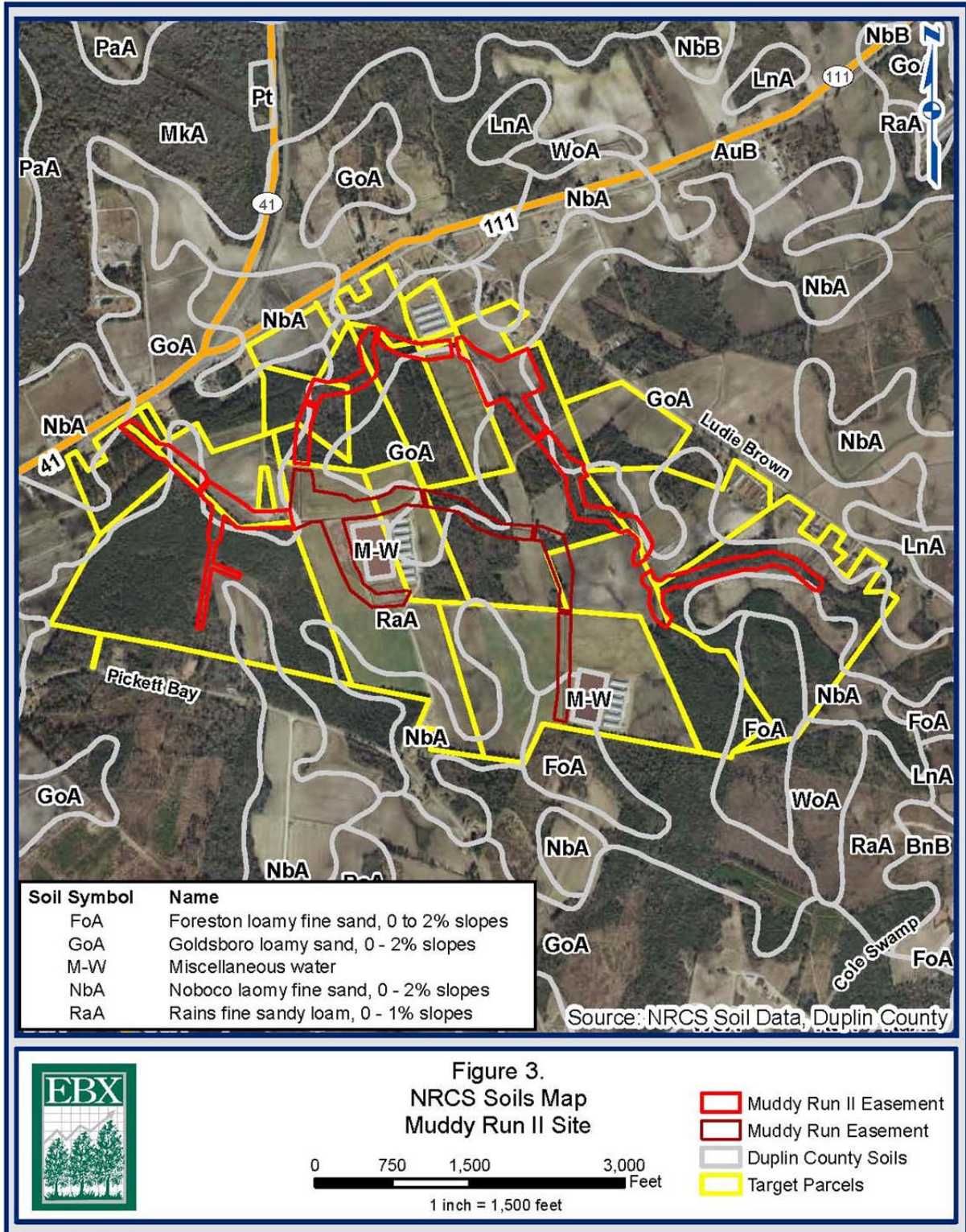


2.5 Soil Survey

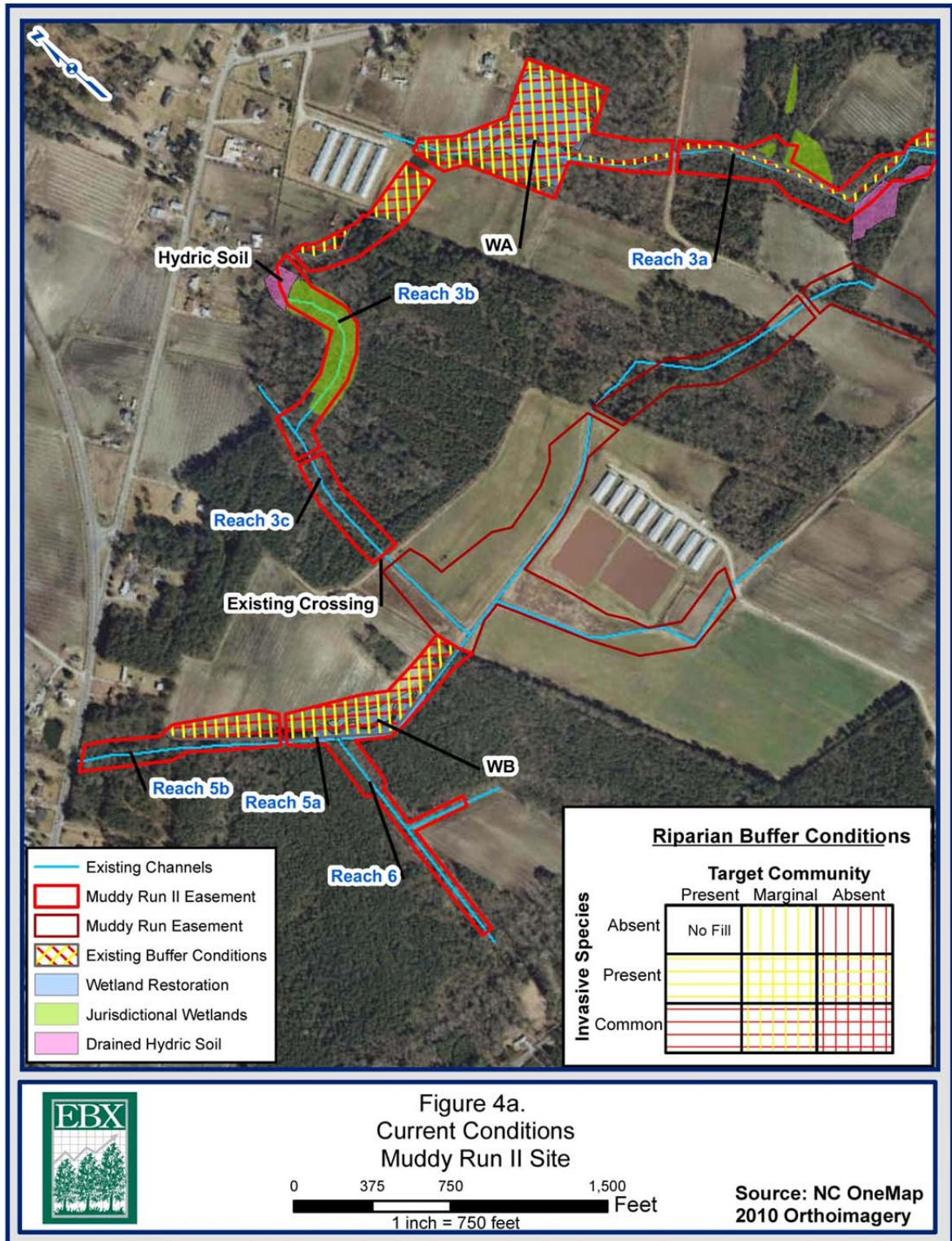
The Muddy Run II site is located in the Coastal Plain Physiographic Province. The watershed is underlain by the Castle Hayne aquifer. The Castle Hayne aquifer is composed of limestone, sandy limestone, and sand. It is the most productive aquifer in North Carolina. The topography of the area is generally flat with elevations ranging from 39 to 60 feet.

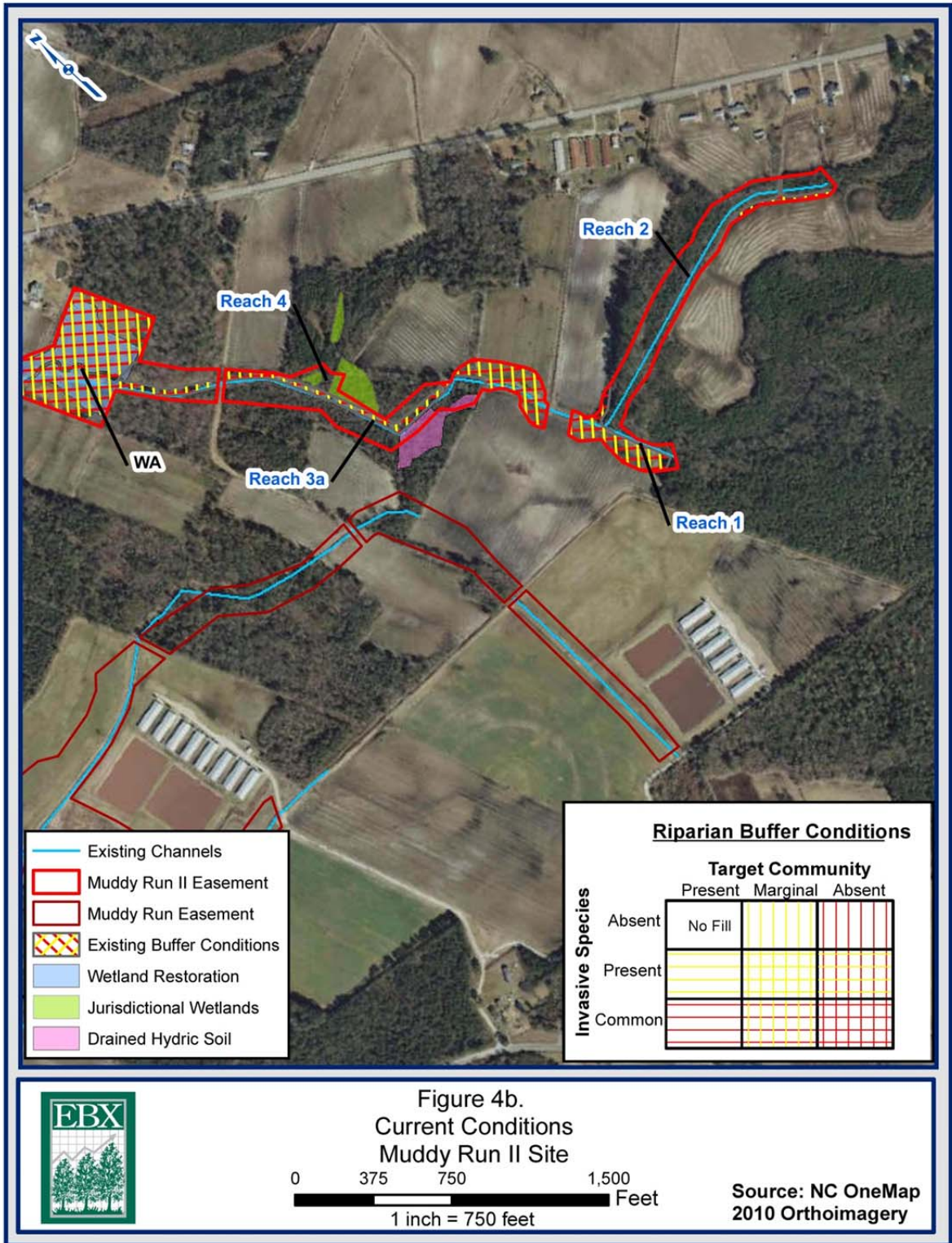
The Duplin County Soil Survey depicts a limited number of soil types as present within the project area (**Figure 3**). The four series present are Foreston loamy fine sand, 0 to 2 percent slopes, Goldsboro loamy sand, 0 to 2 percent slopes, Noboco loamy fine sand, 0 to 2 percent slopes, and Rains fine sandy loam, 0 to 1 percent slopes. Of the four mapped soil series that occur throughout the project, the majority consists of two series, Goldsboro loamy sand and Rains fine sandy loam. These soils formed in loamy and sandy marine deposits or fluvial sediments. The Foreston soils are moderately well drained and have moderate permeability. The seasonal high water table ranges from 24 to 42 inches. These soils are located on slight rises within broad, flat inter-stream divides. The Goldsboro soils are moderately well drained, and have moderate permeability. Runoff is negligible to medium. The seasonal high water table ranges from 24 to 36 inches. These soils are located on the hill slope summit and shoulder. This soil unit is typically cultivated. The Rains soils are poorly drained and have moderate permeability. Runoff is negligible. The seasonal high water table ranges from 0 to 12 inches. These soils occur across flats, depressions and Carolina bays. None of these soils are subject to ponding, and only Rains may experience flooding. The Natural Resource Conservation Service (NRCS) considers Rains soils to be hydric when undrained. The remaining soils mapped on the site contain small inclusions of hydric soil.

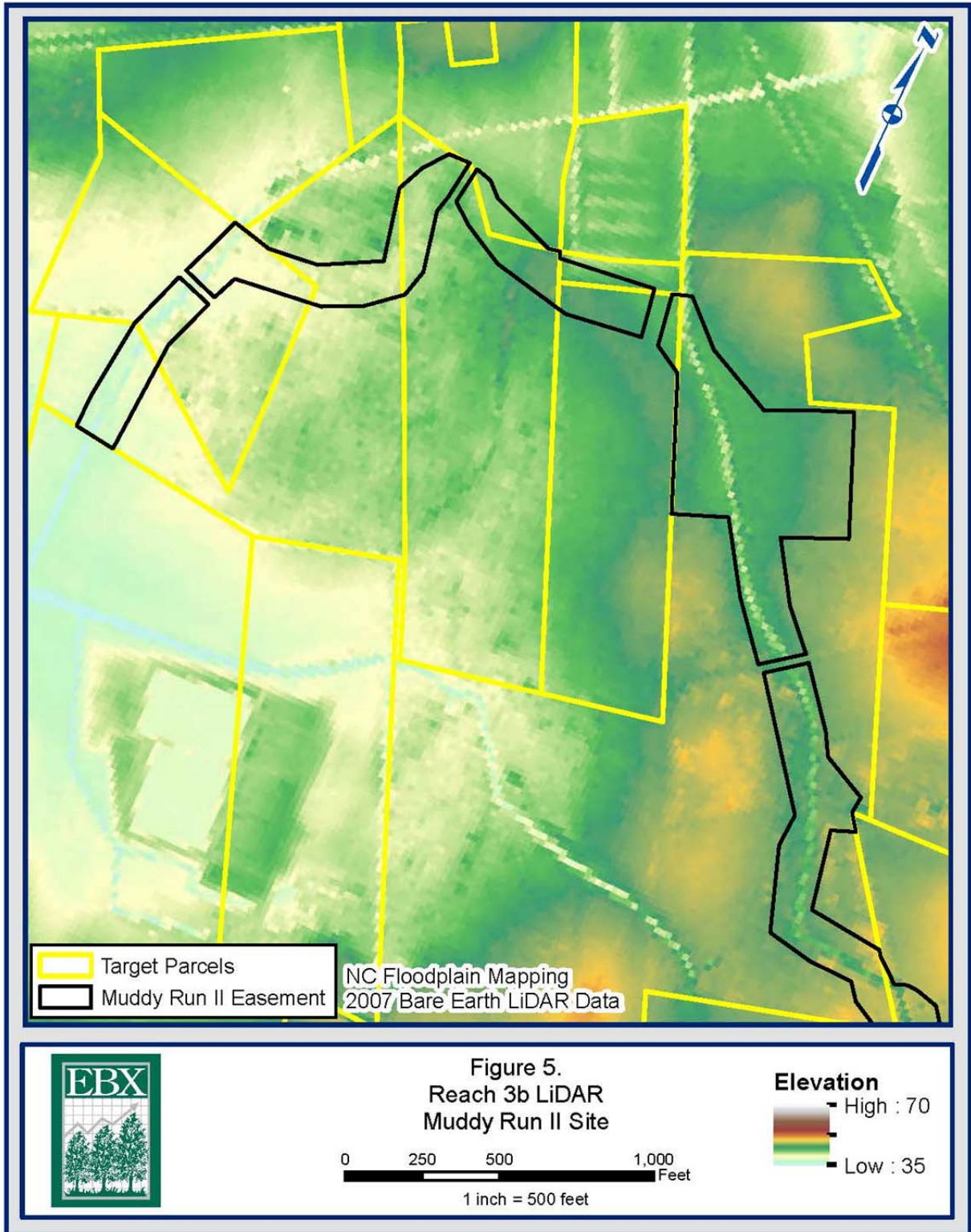
A detailed soil investigation of the site verified the existence of sandy soils similar to Rains throughout much of the project. The investigation also identified hydric soil indicators in areas having a lower elevation. The most common indicator is S5 – Stripped Matrix. Many areas within the cultivated fields appear to have fill or deposition present, and the resulting buried horizons would meet hydric indicator criteria. The fill in these areas appears to be spoil from excavated channel or ditch combined with slope deposition resulting from cultivation practices.



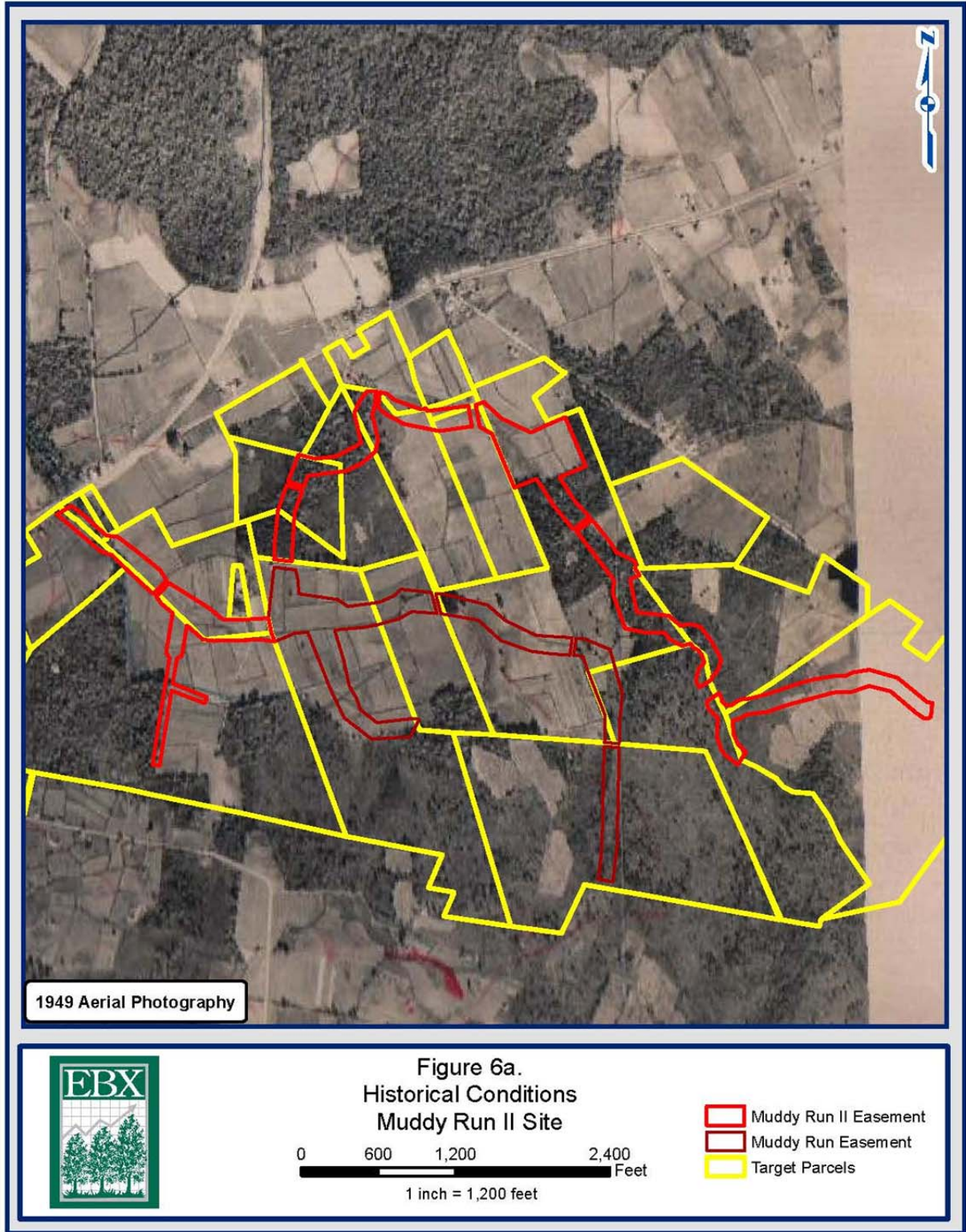
2.6 Current Conditions Plan View

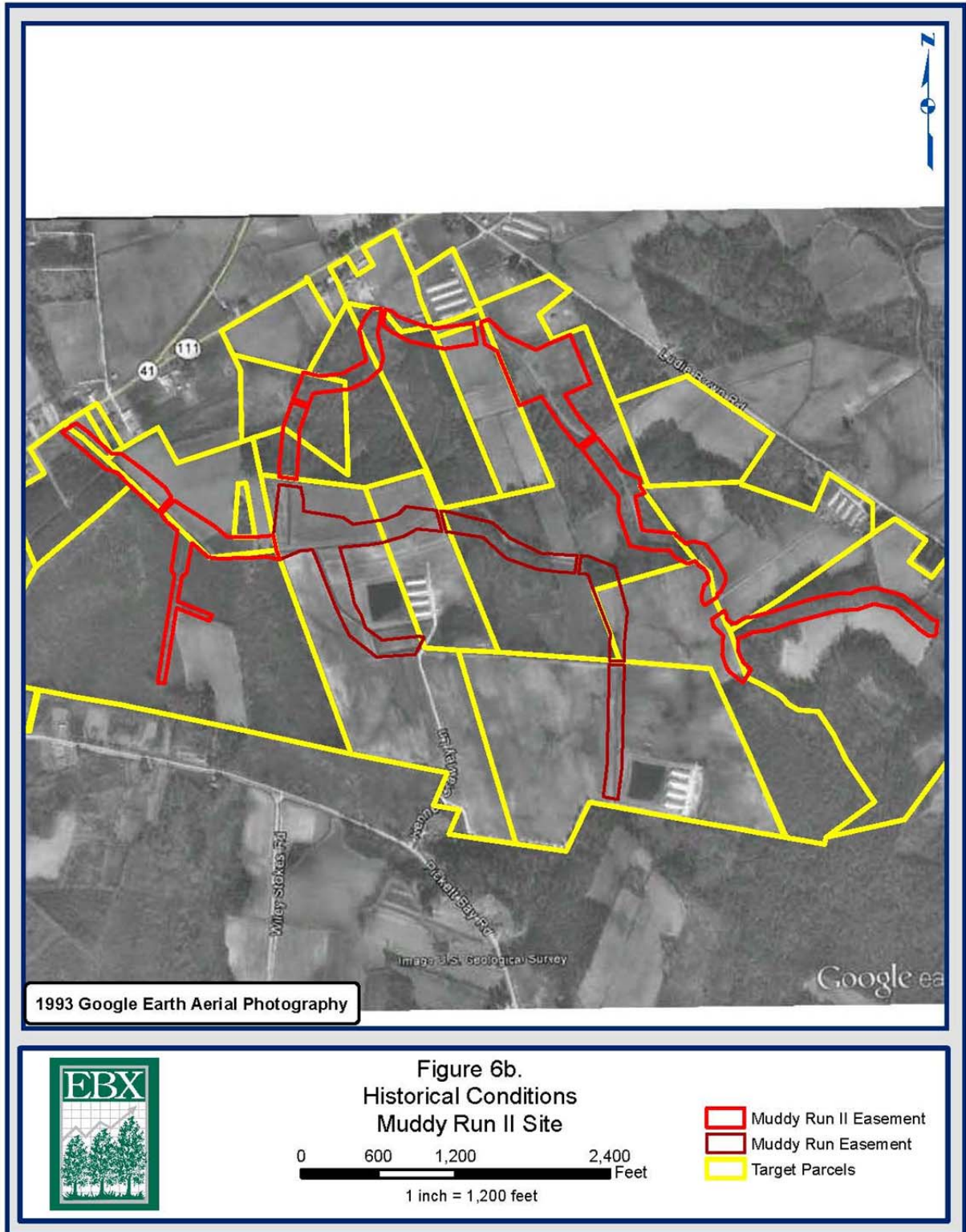


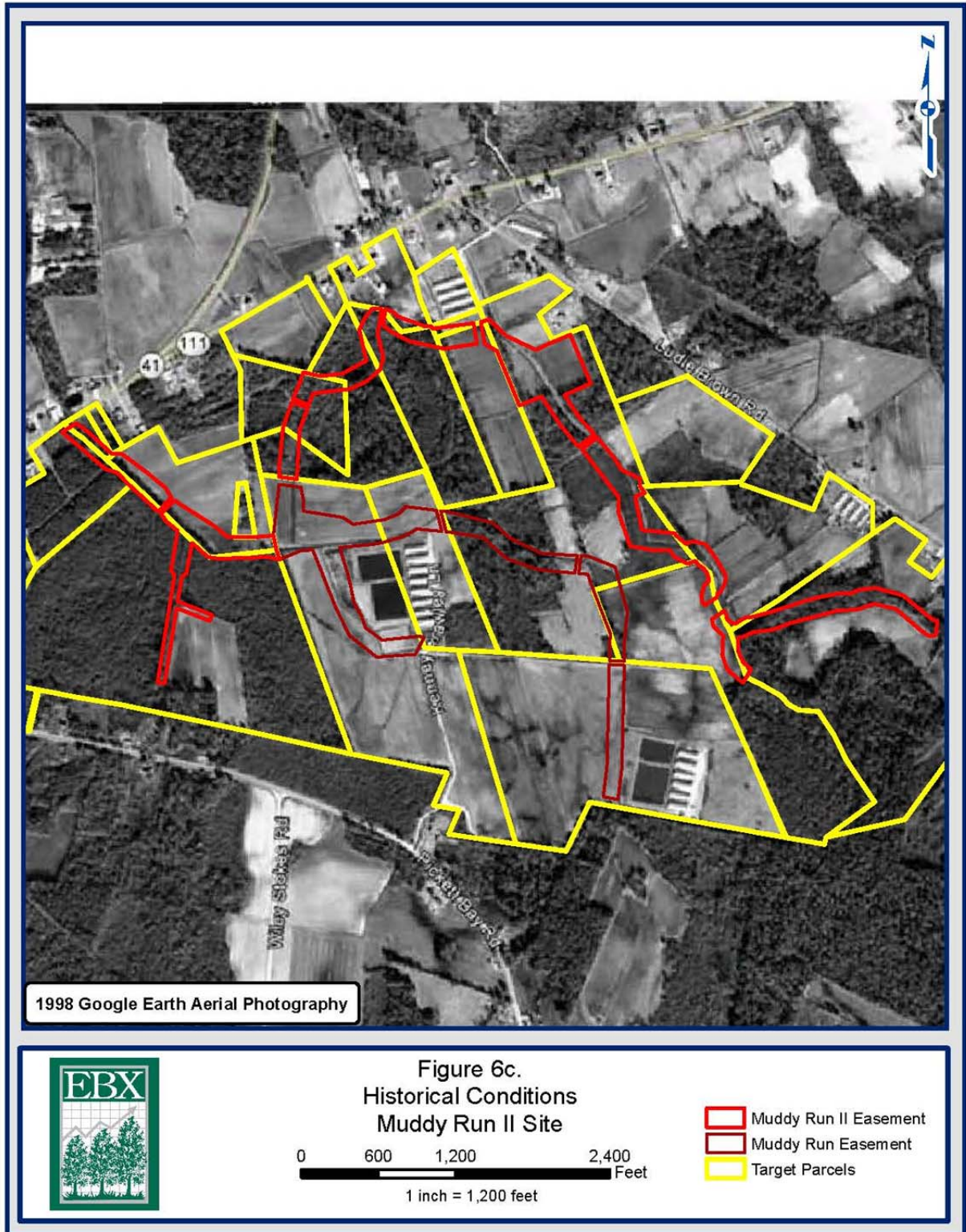




2.7 Historical Condition Plan View







2.8 Site Photographs



Facing upstream on headwater Reach 1.
6/25/2012



Facing upstream on Reach 2. 6/25/2012



Facing upstream on Reach 3a. 6/25/2012



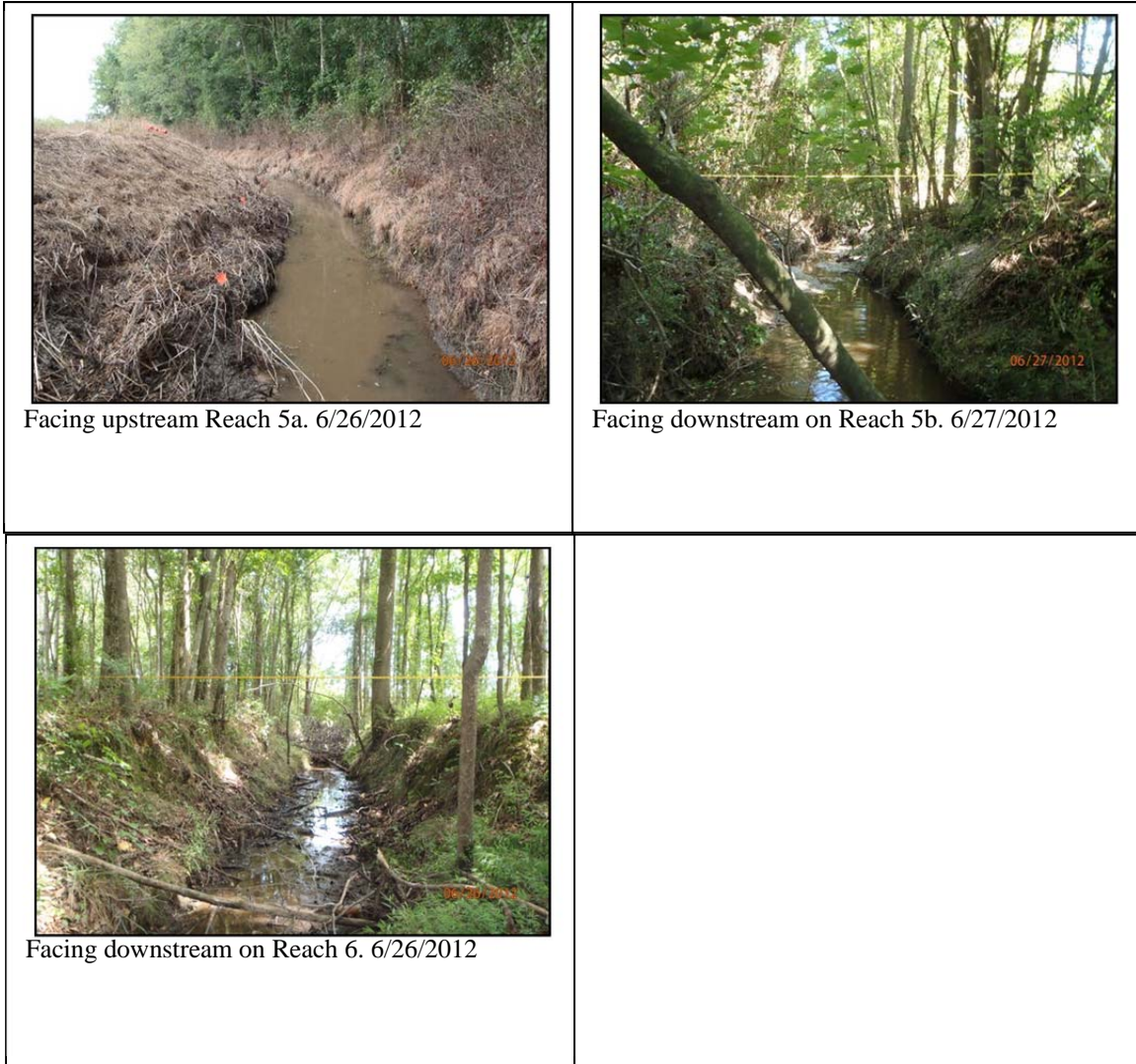
Facing upstream on Reach 3b. 9/03/2011



Facing downstream on headwater Reach 3c.
6/26/2012



Facing upstream on Reach 4. 6/26/2012



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 (**Table 5**). A copy of the land protection instrument(s) is included in **Appendix A**.

Table 5. Project Parcel and Landowner Information

PIN	Landowner	County	Acreage
336900261466	EBX-NEUSE I, LLC	Duplin	1.99
336900266455	EBX-NEUSE I, LLC	Duplin	1.08
336900167209	EBX-NEUSE I, LLC	Duplin	2.28
335900966225	EBX-NEUSE I, LLC	Duplin	0.003
335900965215	EBX-NEUSE I, LLC	Duplin	0.55
336900352864	Futreal, Johnny A.	Duplin	12.24
336900457397	Hatcher, Danny G., et al.	Duplin	1.46
336900445188	Hatcher, Danny Guy & et al.	Duplin	1.52
336900161443	Holland, Thomas J. & Kay D. Holland	Duplin	1.85
336900273089	Lanier, Michael C.	Duplin	0.31
336900548408	Riley, Patricia M	Duplin	5.05
336900053754	Smith, Auline L. & Worth L. Landen	Duplin	5.03
336900041738	Smith, Auline L. & Worth L. Landen	Duplin	3.02
335900953810	Smith, Jim	Duplin	0.79
336900178403	Wood, Jesse D. & Mary A. Wood	Duplin	0.45
	TOTAL		37.62

4 BASELINE INFORMATION

4.1 Watershed Summary Information

4.1.1 Drainage Area

The easement totals 37.6 acres and is broken into nine reaches. The land use in the project watershed is approximately 38 percent cultivated, 32 percent evergreen forest, 15 percent shrub/scrub, 6 percent bottomland forest/hardwood swamp, 5 percent mixed forest, 2 percent developed, and 2 percent managed herbaceous cover. Reach 1 has a drainage area of 68 acres; it begins at the start of the restoration project (STA 0+00) and extends west to STA 4+97. Reach 2 has a drainage area of 115 acres; it begins at STA 0+00 and extends to STA 18+73. Reach 3a (Sta. 0+00 to 37+36) begins at the confluence of Reaches 1 and 2 and has a drainage area of 227 acres. Currently, Reach 3a continues to flow north and away from the project site within a historically channelized canal excavated beneath Ludie Brown Road, a natural divide, and into Muddy Creek. Topographic survey, LiDAR, historic aerial photos, and landowner communication have confirmed that the natural flow pattern of Reach 3 was to the west and eventually flowed into the Muddy Run project (**Figure 5**). The proposed design will redirect flow in a westerly direction from Reach 3a to Reach 3b. The proposed alignment follows along a relic drainage feature that coincides with existing low topography to the west as exhibited by LiDAR (**Figure 5**).

Reach 3b has a proposed drainage area of 313 acres and flows west into Reach 3c. Reach 3c has an existing drainage area of 74 acres (proposed drainage area is 360 acres) extending north to south and flows into Reach 3 of the Muddy Run project. Reach 4 has a drainage area of 45 acres and flows from the east into Reach 3a. Reach 5a begins at the downstream limit of the Muddy Run project, flows into Reach 5b, and has an existing drainage area of 424 acres (proposed drainage area is 774 acres). Reach 5b has an existing drainage area of 583 acres (proposed drainage area is 889 acres) and terminates at NC HWY 41. Reach 6 has a drainage area of 77 acres and flows from the south into Reach 5a. (**Figure 2**).

The NC HWY 41 crossing was modeled to verify that the culvert would still function as designed given the increase in drainage due to restoring flow to the historic drainage path along Reach 3b. The NC Department of Transportation (NCDOT) design storm for the culvert is the 50-year flow, and model results show that the culvert capacity exceeds the proposed 100-year flows. The culvert analysis is provided in further detail within Section 6 below.

4.1.2 Surface Water Classification

The current State classification for the Muddy Run II restoration reaches is undefined. Reaches 5a and 5b are the main stem of the project, which runs directly into Muddy Creek. Muddy Creek is defined as Class C *Sw* (NCDWQ, 2005). Class C waters are suitable for aquatic life, secondary recreation, and agricultural usage. The *Sw* is a designation for swamp waters—waters that have low velocities and other natural characteristics that are different from adjacent streams.

4.1.3 Endangered/Threatened Species

Plants and animals with a federal classification of endangered or threatened are protected under provisions of Sections 7 and 9 of the Endangered Species Act of 1973, as amended. Rare and protected species listed for Duplin County, and any likely impacts to the species as a result of the project construction, are discussed in the following sections.

The US Fish and Wildlife Service (USFWS) database (updated 22 September 2010) lists one endangered species for Duplin County, North Carolina: red-cockaded woodpecker (*Picoides borealis*). The American alligator (*Alligator mississippiensis*) is listed as Threatened due to similarity of appearance, but is not protected. No protected species or potential habitat for protected species was observed during preliminary site evaluations.

In addition to the USFWS database, the NC Natural Heritage Program (NHP) GIS database was consulted to determine whether previously cataloged occurrences of protected species were mapped within one mile of the project site. Results from NHP indicate that there are no known occurrences within a one-mile radius of the project area. Based on initial site investigations, no impacts to federally protected species are anticipated as a result of the proposed project.

WK Dickson submitted a request to USFWS for review and comments on the proposed Muddy Run II Stream Restoration Project on June 7, 2012 in regards to any potential impacts to threatened and endangered species. No response was received within a 30-day period; therefore, it is assumed that the initial determination of no effect to endangered and threatened species will result from the proposed project.

The proposed project offers some potential to improve or create suitable habitat for several Federal Species of Concern. Habitat may be improved or created for species that require riverine habitat by improving water quality, in-stream and near-stream forage, and providing stable conditions not subject to regular maintenance. Improved stream habitat may benefit American eel (*Anguilla rostrata*) and broadtail madtom (*Noturus* sp. cf. *leptacanthus*).

4.1.4 Cultural Resources

Cultural resources include historic and archeological resources located in or near the project area. WK Dickson completed a preliminary survey of cultural resources to determine potential project impacts. No architectural structures or archeological artifacts have been observed or noted during surveys of the site for restoration purposes. In addition, the majority of the site has historically been disturbed due to agricultural practices and channel modifications.

WK Dickson submitted a request to the NC State Historic Preservation Office (SHPO) to search records to determine the presence of any areas of architectural, historic, or archaeological significance that may be affected by the Muddy Run II Stream Restoration Project on June 7, 2012. In a letter dated July 3, 2012 (**Appendix 3**), the SHPO stated that they had “conducted a review of the project and are aware of no historic resources which would be affected by the project.”

4.2 Reach Summary Information

The project area is comprised of two easement areas separated by the previously awarded Muddy Run easement. The upper drainage originates in headwater valleys (Reach 1 and Reach 2) that confluence to form Reach 3a. An intact reference headwater valley is located upstream of the proposed Reach 1 restoration and will serve as a reference system. Reach 3a flows generally to the north and Reach 4 flows into Reach 3a from the east. Reach 3a was historically channelized and conveyed beneath Ludie Brown Road and into Muddy Creek. Topographic survey, historic aerial photos, and landowner communication have confirmed that the natural flow pattern of Reach 3a was to the west and eventually into the previously awarded Muddy Run project. The proposed mitigation will reconnect Reach 3a to the historic drainage way. All Muddy Run II stream channels are unnamed tributaries to Muddy Creek and ultimately the Northeast Cape Fear River (**Figure 2**). The Muddy Run II Mitigation Site is not located in a FEMA mapped floodzone (**Figure 10**). NCDWQ Stream Classification Forms and USACE Stream Quality Assessment Worksheets were completed at representative locations throughout the project area and are included in **Appendix B**. Results of the preliminary data collection are presented in **Figure 4**, and the Existing Conditions Summary Table and the Stream Morphology Table are in **Appendix B**.

Reach 1 is currently an incised excavated intermittent ditch with moderately unstable banks and severely oversized channel. Reach 1 lacks a forested buffer and banks. The bed appears to be aggrading. LiDAR mapping (**Figure 5**) and historic aerial photography (**Figure 6**) document the presence of a valley feature.

Reach 2 is a greatly oversized intermittent channel located in a disturbed, forested corridor. Spoil piles are present along either side of the channel, indicating past dredging. LiDAR mapping (**Figure 5**) and historic aerial photography (**Figure 6**) document the presence of a valley feature.

Reach 3a is an incised, excavated, perennial channel with a disturbed hardwood buffer. The banks are moderately unstable and lack mature hardwood vegetation.

Reach 3b was diverted from its historic flow pattern to promote drainage for agricultural production. The reach currently flows from Reach 3a to the north and east, away from the project site. The existing perennial channel is deeply incised and has unstable banks. The buffer lacks mature hardwoods due to logging and agricultural activities. Reach 3b will be rerouted to the west along a shallow historic drainage feature through a forested area consisting of pines and hardwoods. LiDAR mapping (**Figure 5**) documents the presence of a valley feature to the west of existing Reach 3a/3b.

Reach 3c is an incised but stable channel through a pine plantation with a mature hardwood component on the channel banks and top of bank. The channel is stable and exhibits some meandering within its banks.

Reach 4 is a small, stable, perennial channel. The channel was likely dredged and straightened historically, but is stable and slightly oversized. The buffer and channel banks include mature hardwood vegetation.

Reach 5a is an oversized perennial channel. Banks are moderately unstable and bedform diversity is low. Bank vegetation includes some hardwoods and invasive species along the left bank and active agricultural fields along the right bank.

Reach 5b is the downstream-most reach on Muddy Run II and also conveys all flow from the Muddy Run Stream Mitigation Project. This perennial channel is incised, has moderately unstable banks, and a forested buffer. The active channel is meandering within the oversized, dredged channel.

Reach 6 is a greatly oversized intermittent channel located in a forested corridor. Large spoil piles are present adjacent to the channel, indicating past dredging. LiDAR mapping and historic aerial photography documents the presence of a valley feature.

In general, the streams do not typically function to their full potential. Having been channelized in the past and ditched to drain nearby field for row crops, the streams do not access their floodplains as often as they naturally would have prior to the farm operations. In some cases, the streams are hydraulically unstable, causing erosion and undercutting of the banks. Habitat along the majority of the restoration reaches is poor in that there is little woody debris or overhanging vegetation for fish cover or protection for other aquatic species. Vegetative diversity and habitat diversity is poor along the reaches, as well, and offers little benefit to the wildlife in the area. Site photographs and morphological parameters are located in **Appendix B**.

4.2.1 Channel Classification

The streams have been classified as intermittent and perennial streams using the NCDWQ Stream Identification Form version 4.11 (**Appendix B**) and are predominantly G5c or F5 stream types as classified using the Rosgen stream classification system (Rosgen, 1994). The design reaches have been separated into nine distinct sections that are described in **Section 4.2.3**. Channel characteristics are summarized in **Table 6**.

4.2.2 Discharge

Estimating flows (discharge) for Muddy Run II is difficult due to the existing network of ditches and low, depressional areas located throughout the site. Several models, regression equations, and the Coastal Plain regional curves were used to develop existing discharges. Land use and slope were considered when the discharge calculations were developed. All hydraulic and hydrologic analyses are discussed in Section 7.3.1. Data and analysis of the hydrologic and hydraulic models are included as **Appendix C**.

4.2.3 Channel Morphology

4.2.3.1 Reach 1

Reach 1 has a drainage area of 0.11 square miles (68 acres), and flows in a northerly direction adjacent to a cultivated field. The planform of this G-type channel is generally straight and is entrenched throughout. The current cross sectional area is 41.9 square feet with approximate dimensions of 14.7 feet wide and 2.9 feet deep. The existing length of Reach 1 is 438 linear feet, and the dominant bed material is fine sand. The gradient of the reach is approximately 0.0043 ft/ft. The reach is severely oversized and exhibits moderately



Upstream view of Headwater Reach 1.

unstable banks. The riparian buffer is forested along the east bank and a sparse along the west. The channel scored 24.75 points on the NCDWQ Stream Identification Form (Version 4.11).

4.2.3.2 Reach 2

Reach 2 is a greatly oversized intermittent channel located in a disturbed, forested corridor. Reach 2 is approximately 1,727 linear feet, and flows west to its confluence with Reach 1. It has a drainage area of 0.18 square miles (114 acres). Reach 2, an F-type channel, is typically 16.2 feet wide and 2.5 feet deep. Spoil piles are located adjacent to the channel, a result of past dredging. This indicates that during channelization, the stream was dug exceedingly deep to aid in draining the adjacent fields. The average cross sectional area is approximately 41.2 square feet. The existing slope of Reach 2 is 0.0021 ft/ft, and the dominant bed material is fine sand. The channel scored 24.75 points on the NCDWQ Stream Identification Form (Version 4.11).

4.2.3.3 Reach 3a

Reach 3a begins at the confluence of Reaches 1 and 2 and flows northwest and ends at approximate STA 33+75. Reach 3a has a drainage area of 0.36 square miles (227 acres) and has a width and depth of 15.4 feet and 1.4 feet, respectively. The existing cross-sectional area is approximately 22.2 square feet. The existing slope is 0.0016 ft/ft and has little to no buffer on either side of the channel. This reach is classified as a F5 stream type and has an existing length of 3,301 linear feet. Reach 3a is an incised, excavated, perennial channel with a disturbed hardwood buffer. The banks are moderately unstable and lack mature hardwood vegetation. The channel scored 36.5 points on the NCDWQ Stream Identification Form (Version 4.11).

4.2.3.4 Reach 3b

Reach 3b was diverted from its historic flow pattern to promote drainage for agricultural production. The reach currently flows to the north and east across a natural divide (Ludie Brown Road) and into an unnamed tributary of Muddy Creek. LiDAR mapping, historic aerial photography, landowner interviews, and on-site survey confirm the historic flow pattern was to the west and eventually flowed into the Muddy Run project.

The proposed alignment for Reach 3b begins behind a CAFO (existing STA 33+75), and flows southwest where it follows along a relic flow path to Reach 3c (STA 47+78). Reach 3b has a proposed drainage area of 0.52 square miles (333 acres), and the relic channel features exhibit a width and depth of 5.6 feet and 0.7 feet, respectively. The existing cross-sectional area is approximately 2.5 square feet with a slope of 0.0023 ft/ft. The riparian buffer is well-established with a mix of pines and hardwoods. This reach is classified as a C5 stream type and has an existing length of 464 linear feet.

4.2.3.5 Reach 3c

Reach 3c is an incised but stable channel through a pine plantation with a mature hardwood component on the channel banks and top of bank. The channel is stable and mending within its banks. Reach 3c is approximately 737 linear feet, and flows south to the Muddy Run Site. It has a drainage area of 0.58 square miles (370 acres). Reach 3c, an F-type channel, is typically 16.7 feet wide and 2.2 feet deep. The average cross sectional area is approximately 36.5 square feet. The existing slope of Reach 3c is 0.0022 ft/ft, and the dominant bed material is fine sand. The channel scored 40.5 points on the NCDWQ Stream Identification Form (Version 4.11).

4.2.3.6 Reach 4

Reach 4 is a small, stable, perennial channel. The channel was likely dredged and straightened historically, but is stable and slightly oversized. The buffer and channel banks include mature

hardwood vegetation. Reach 4 is approximately 120 linear feet, and flows southwest to Reach 3a. It has a drainage area of 0.07 square miles (46 acres). Reach 4, a G-type channel, is typically 11.0 feet wide and 1.6 feet deep. The average cross sectional area is approximately 17.0 square feet. The existing slope of Reach 4 is 0.0034 ft/ft, and the dominant bed material is fine sand. The channel scored 32.0 points on the NCDWQ Stream Identification Form (Version 4.11).

4.2.3.7 Reach 5a

Reach 5a is an oversized perennial channel. Banks are moderately unstable and bedform diversity is low. Bank vegetation to the south includes some hardwoods and invasive species, while the buffer to the north is an active agricultural field. Reach 5a is approximately 1,602 linear feet, and flows northwest to Reach 5b. It has a drainage area of 1.21 square miles (774 acres). Reach 5a, a G-type channel, is typically 18.4 feet wide and 2.6 feet deep. The average cross sectional area is approximately 47.8 square feet. The existing slope of Reach 5a is 0.0024 ft/ft, and the dominant bed material is fine sand. The channel scored 35.5 points on the NCDWQ Stream Identification Form (Version 4.11).



Upstream view of Reach 5a.

4.2.3.8 Reach 5b

Reach 5b is the downstream-most reach on Muddy Run II, and also conveys all flow from the Muddy Run project. This perennial channel is incised, and has moderately unstable banks. The active channel is meandering within the oversized, dredged channel. Reach 5b is approximately 401 linear feet, and flows northwest to Highway 41. It has a drainage area of 1.42 square miles (908 acres). Reach 5b, a G-type channel, is typically 17.0 feet wide and 2.9 feet deep. The average cross sectional area is approximately 49.3 square feet. The existing slope of Reach 5b is 0.0015 ft/ft, and the dominant bed material is fine sand. The channel scored 37.5 points on the NCDWQ Stream Identification Form (Version 4.11).

4.2.3.9 Reach 6

Reach 6 is a greatly oversized intermittent channel located within a forested corridor. Reach 6 is approximately 317 linear feet, flows north to its confluence with Reach 5a, and has a drainage area of 0.12 square miles (77 acres). Reach 6, a G-type channel, is typically 13.0 feet wide and 3.2 feet deep. Spoil piles are located adjacent to the channel along both banks, a result of past dredging. This indicates that during channelization, the stream was dug exceedingly deep to aid in draining the adjacent agricultural land. The average cross sectional area is approximately 42.3 square feet. The existing slope of Reach 6 is 0.0024 ft/ft, and the dominant bed material is fine sand. The channel scored 20.75 points on the NCDWQ Stream Identification Form (Version 4.11).

Table 6. Summary of Existing Channel Characteristics

Reach	Drainage Area (Ac)	CSA ¹ (ft ²)	Width (ft)	Mean Depth (ft)	Width:Depth Ratio	Sinuosity	Slope (ft/ft)
1	68	41.9	14.7	2.9	5.2	1.0	0.0043
2	114	41.2	16.2	2.5	6.4	1.0	0.0021
3a	227	22.2	15.4	1.4	10.7	1.0	0.0016
3b	27	2.5	5.6	0.4	14.8	1.0	0.0023
3c	74	36.5	16.7	2.2	7.6	1.0	0.0022
4	46	17.0	11.0	1.6	7.1	1.0	0.0034
5a	424	47.8	18.4	2.6	7.1	1.0	0.0024
5b	583	49.3	17.0	2.9	5.7	1.0	0.0015
6	77	42.3	13.0	3.2	4.8	1.0	0.0024

¹CSA= cross-sectional area (measured from top of bank)

4.2.4 Channel Stability Assessment

A modified version of the channel stability assessment method (CSA) provided in “Assessing Stream Channel Stability at Bridges in Physiographic Regions” by Johnson (2006) was used to assess channel stability for the Muddy Run II existing channels and reference reach. This method may be rapidly applied on a variety of stream types in different physiographic regions having a range of bed and bank materials.

The original CSA method was designed to evaluate thirteen stability indicators in the field. These parameters are: watershed characteristics, flow habit, channel pattern, entrenchment/channel confinement, bed material, bar development, presence of obstructions/debris jams, bank soil texture and coherence, average bank angle, bank vegetation/protection, bank cutting, mass wasting/bank failure, and upstream distance to bridge. As this method was initially developed to assess stability at bridges, a few minor adjustments were made to remove indicators that contradict stability characteristics of natural channels in favor of providing hydraulic efficiency at bridges. First, the “channel pattern” indicator was altered such that naturally meandering channels scored low as opposed to straightened/engineered channels that are favorable for stability near bridges. Secondly, the last indicator, “upstream distance to bridge,” was removed from the assessment as bridges are not a focus of channel stability for this project. Lastly, the “bed material” indicator was removed since all project streams are sand bed channels and would subsequently score high (poorly), as this indicator focuses on coarse substrate. The eleven indicators were then scored in the field, and a rating of excellent, good, fair, or poor was assigned to each project reach based on the total score. See **Appendix B** for the CSA field form.

The CSA results (scores and ratings) for the Muddy Run II project and reference reaches are provided in **Table 7**. Project Reaches 1, 2, 3a, 5a, 5b, and 6 all received “Fair” ratings, while Reaches 3c and 4 received a “Good” rating. Overall, the existing project streams appear to be physically stable as there is little active erosion present; however, all channels have been straightened and entrenched, and some are actively maintained. These characteristics are reflected in the poor CSA scores for channel pattern and bank vegetation/protection. Each reach also scored poorly for watershed characteristics since the surrounding land use is dominated by agriculture activities or recent clear cutting up to top of bank (**Figure 8**).

Table 7. Channel Stability Assessment Results

	Reach 1	Reach 2	Reach 3a	Reach 3c	Reach 4	Reach 5a	Reach 5b	Reach 6	Reference Reach	
1 Watershed characteristics	6	8	7	4	6	9	8	9	4	
2 Flow habit	9	9	10	4	5	6	5	10	1	
3 Channel pattern	9	11	11	5	7	11	8	7	2	
4 Entrenchment/channel confinement	10	11	11	8	6	11	10	11	1	
5 Bed material	NA	NA	NA	NA	NA	NA	NA	NA	NA	
6 Bar development	10	10	10	7	7	10	7	7	1	
7 Obstructions/debris jams	4	3	1	5	5	2	3	4	5	
8 Bank soil texture and coherence	9	9	9	11	10	11	10	9	3	
9 Average bank angle	7	9	7	11	7	11	8	11	4	
10 Bank vegetation/protection	8	3	10	3	3	8	5	7	4	
11 Bank cutting	7	2	3	3	4	7	4	6	2	
12 Mass wasting/bank failure	7	1	3	3	4	6	2	5	3	
13 Upstream distance to bridge	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Score	86	76	82	64	64	92	70	95	30
	Rating*	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Excellent

* Excellent (0 < Score <= 33), Good (33 < Score <= 66), Fair (66 < Score <= 99), Poor (99 < Score <= 132)

4.2.5 Bankfull Verification

Bankfull is difficult and often times impossible to accurately identify on actively maintained channels and agricultural ditches. The usual and preferred indicators rarely exist, and other factors may be taken into consideration in order to approximate a bankfull stage. Other factors that may be used are wrack lines, vegetation lines, scour lines, or top of a bankfull bench; however, complete confidence should not be placed on these indicators. Throughout the entire project, the channel is generally entrenched and actively maintained, which means bankfull indicators were very limited or non-existent. Therefore, bankfull stage was estimated by using Coastal Plain Regional Curves and other hydrologic analyses, existing cross-sections, and in-house spreadsheets to estimate bankfull area and bankfull discharge.

4.2.6 Vegetation

Current land use around the project is primarily agriculture and forestry. Land use immediately surrounding the project consists of concentrated animal feeding operations (CAFO), row crop production, animal waste spray area, and forestry. The CAFOs consist of 14 active hog houses and eight active poultry houses. There are four lagoons storing waste that is sprayed on fields adjacent to proposed restoration reaches. The remaining channels are adjacent to cultivated fields or disturbed forested areas. The landscape has been contoured to increase surface runoff and eliminate surface ponding to enhance production and increase mechanized access. Natural channels and valleys have been excavated to promote further drainage. Ditches have been constructed to remove surface water.

The cultivated fields are alternated annually between corn and soybeans. The actively managed hay fields appear to be Bermuda or similar perennial warm season grass over-seeded with a cool season

grass. The forested community is young, mixed pine hardwood forest and is influenced by local elevation changes. The upper reaches of the project have the most cross-sectional elevation differences, ranging up to 3 feet at the edges of the easement. The higher elevations areas are typically dominated by loblolly pine (*Pinus taeda*) and have a dense understory. Elevation changes are low within the cultivated field along Reach 3b. Forested areas in these lower and wetter landscapes have a mix of loblolly pine and hardwoods or are predominately hardwoods. The hardwood species include willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), tulip poplar (*Liriodendron tulipifera*) and sweet gum (*Liquidambar styraciflua*). A mid-story layer is comprised of water oak (*Quercus nigra*), tulip poplar, red maple (*Acer rubrum*), and swamp chestnut oak (*Quercus michauxii*). Shrubs and woody vines are locally dense and include sweet bay (*Magnolia virginiana*), redbay (*Persea borbonia*), American holly (*Ilex opaca*), large gallberry (*Ilex coriacea*), wax myrtle (*Morella cerifera*), and swamp greenbriar (*Smilax laurifolia*). Some exotics were noted, including Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera sempervirens*). The only common herbaceous plant observed is giant cane (*Arundinaria gigantea*). All naturally vegetated areas were classified by their community type, and their boundaries were approximately located on field maps (**Figure 9**). Detailed observations of vegetation species, soils, and hydrology were recorded in each community type. Table 7 describes each natural community. **Table 8** describes each natural community.

Table 8. Natural Community Summary

Existing Community	Percent of Study Area	Natural Community (Schafale and Weakley Community)
Agriculture – Pasture/Hayfields	18	NA
Agriculture – Row Crops	21	NA
Bottomland Hardwood Forest	13	NA
Concentrated Animal Feeding Operation	5	NA
Clear-Cut	3	NA
Mixed Pines/Hardwoods	22	Mesic Mixed Hardwood Forest-Coastal Plain
Pine Plantation	13	NA
Residential	5	NA

4.2.7 Quantitative Habitat Assessment

A quantitative habitat assessment was performed in November 2011 on the reference reach and in June 2012 for existing Muddy Run II Reaches 3a, 5a, and 5b to measure the volume of woody debris and fish cover. These data were used to establish a baseline for measuring functional uplift and as a tool to determine the placement and volume of woody debris in the design reaches. The total available woody debris (not buried) in the design reaches exceeds the reference reach on a per linear foot basis. In addition, surveys conducted pre- and post-construction in the restoration reach will enable EBX to quantify habitat deficiencies and habitat gains over time.

The length of each sample reach was thirty to forty times the base-flow wetted width of the channel with a minimum reach size of 150 feet. The sample reach was divided into ten transects spaced evenly over the entire reach. Transect length was five feet upstream and five feet downstream of the transect midpoint, and extend the full width of the channel. Parameters measured at each transect were small woody debris (SWD), fish cover, substrate material, and riparian composition. At each transect, the channel bed form was noted and an average width and depth recorded. The following is an analysis of the habitat assessment data.

4.2.7.1 Small Woody Debris Methods and Results

Small woody debris was measured at the reference reach in order to design SWD habitat structures similar to those found in the reference reach (**Appendix B**). SWD greater than 0.2 inches in diameter were measured in each reference reach transect. Large woody debris was eliminated from analysis since these are analogous to structures such as log vanes and log toes currently applied to most restoration designs.

Transects were identified as either shallow or pool bed form types resulting in three pools and ten shallows measured at the reference reach. Measurements of SWD were summed for each bed form type and divided by the number of corresponding transects to get the average volume of SWD per pool or shallow. The average volume was then divided by the average transect area to get the volume of SWD per square foot. The average design reach bed form area was calculated by assuming a length of ten feet (based on reference transects) and multiplying that by the average bottom cross section width. The average volume was multiplied by the ratio of average reference reach transect area to the average area in the design reach to obtain the volume of SWD to be installed at each fixed pool and at select locations along the design shallows.

WK Dickson currently uses wattles, dead brush, and woody debris bundles in the design of restoration channels. Based on the reference reach SWD analysis, these SWD structures will be concentrated in pool habitats and throughout shallows in volumes and size classes similar to those found in the reference reach. Wattles are woody branch structures tied together and embedded into the bank so that the free ends stick out into the wetted channel. Dead brush structures are shrub or tree tops that are anchored to the bottom of the channel. Woody debris bundles are bundles of sticks one to four inches in diameter and one to four feet long that are anchored to the streambed. Although root wads serve as bank stability structures, they also provide a significant amount of SWD volume to the restoration reach. The average volume of each SWD structure is presented in **Table 9**. A combination of structures listed in **Table 9** will be used in the design to attempt to achieve the calculated average volume per bed form type listed in **Table 10**.

Table 9. Average volume (cubic inches) of SWD structures used in the design reach

SWD	Average Volume
Woody Debris Bundle	509
Dead Brush	589
Wattle	42
Root Wad	562
Leaf Pack	120

Table 10. Small Woody Debris calculations for the reference and design reach

Channel bed form	Total volume (in ³)	Average volume in reference reach (in ³)	Percent of WD	Average volume to be applied to design Reach 3a (U/S) per 10 LF of channel (in ³)	Average volume to be applied to design Reach 3a (D/S) per 10 LF of channel (in ³)	Average volume to be applied to design Reach 3a (D/S) per 10 LF of channel (in ³)
Shallow	3219	460	39%	679	938	1132
Pool	5115	1705	61%	1705	2273	2766
Total	8334	2165	100%	2384	3212	3898

In addition to the habitat assessment conducted at the reference site, Reaches 3a and 5a of the project site were assessed in order to measure representative habitat gains over time post-construction. Based

on these assessments, there is a large disparity of SWD volume between the reference reach and the design reaches (**Chart 1**).

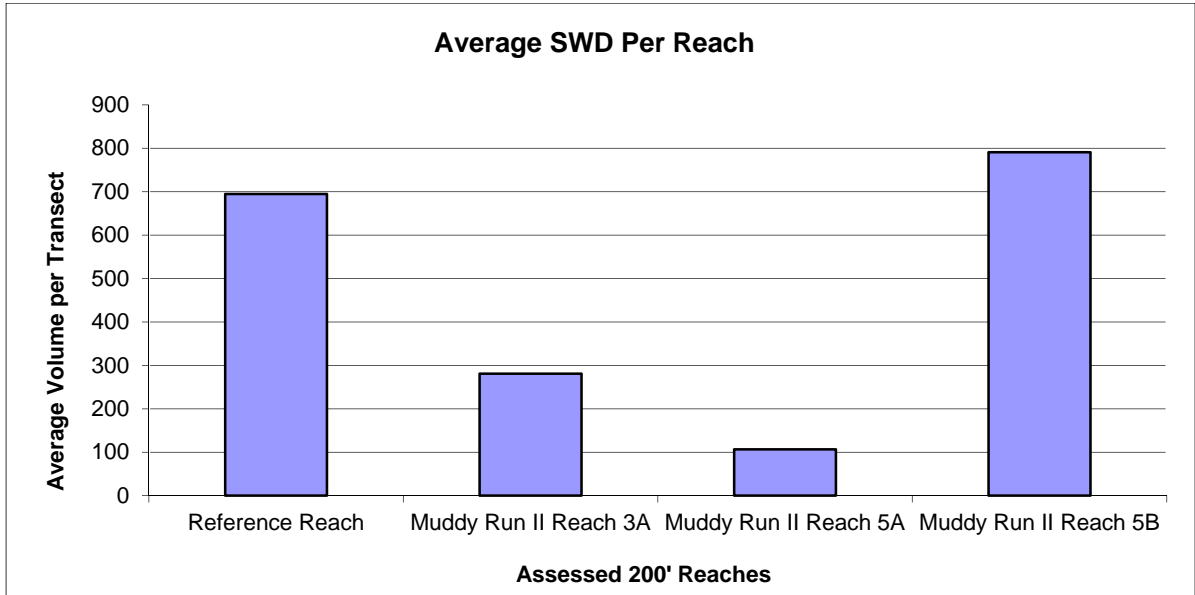


Chart 1. Average volume (cubic inches) of SWD per assessed reach. This chart represents existing conditions in all assessed reaches.

Woody debris collected in streams provides habitat for macroinvertebrates, fish, and amphibians, and increases stream productivity by retaining carbon in the channel. While it would be difficult to replicate the volume and spatial distribution of SWD found in the reference channel, this quantitative habitat assessment provides guidance for improving habitat conditions through specifically placed and sized SWD structures, and provides a means for assessing functional gains over time. WKD has included these structures in the design plans (**Appendix D**).

4.2.7.2 Fish Cover Methods and Results

Fish cover measurements were taken at each transect along the reference reach and Muddy Run II Reaches 3a, 5a, and 5b. Fish cover area was visually calculated within the ten-foot transect length. Fish cover types include small woody debris and brush, aquatic macrophytes, overhanging vegetation, undercut banks, and boulders. For each transect a percentage of total fish cover and individual cover type areas were calculated (**Chart 2**). Location and general habitat data was recorded for each fish cover measurement to assess spatial distribution.

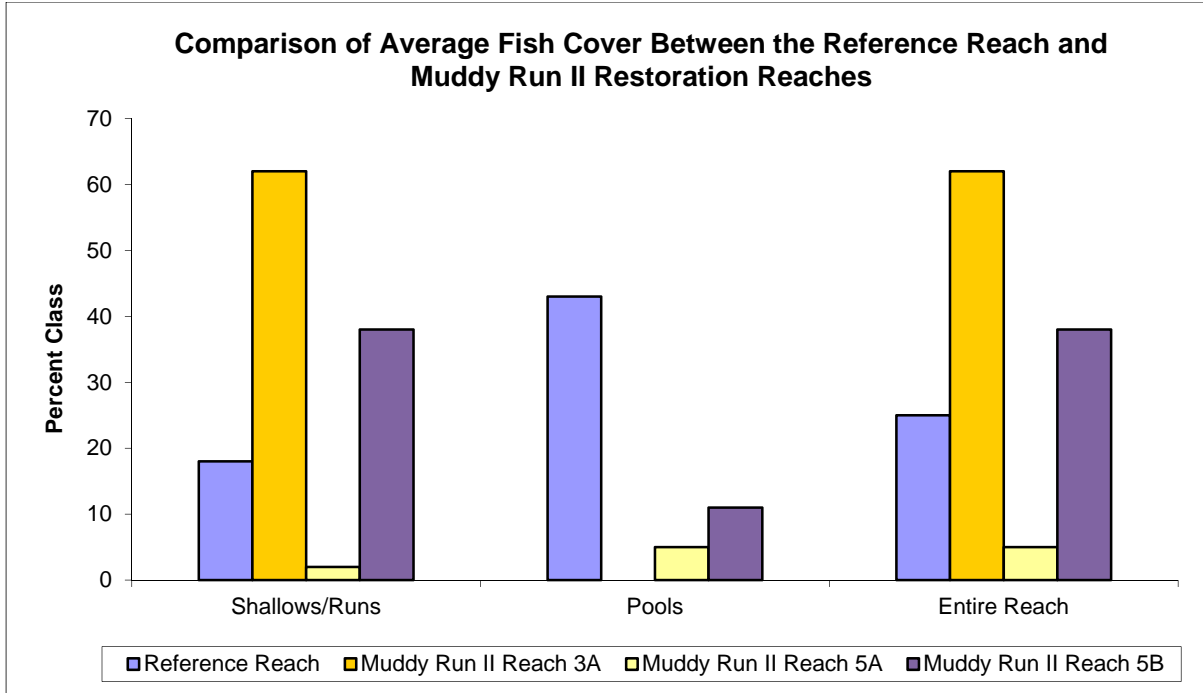


Chart 2. Average percent of fish cover per channel bed form type in the reference reach

The fish cover analysis revealed that the average area of fish cover is nearly three times as high in Muddy Run II Reach 3a as in the reference reach. This is because the streambed along the assessed portion of Reach 3a was mostly covered by macrophytic vegetation and was devoid of any significant woody debris or undercut banks. As Muddy Run II Reach 5b is located in a heavily forested area, this reach exhibited a larger area of fish cover, primarily in the form of undercut banks and woody debris. Muddy Run II Reach 5a presented very little fish cover habitat that can be attributed to a poor buffer along the north bank and active channel maintenance. Fish cover from low growing brush will increase in the restoration reaches after the riparian planting occurs. Woody debris structures will also provide additional fish cover habitat and resting areas for fish swimming upstream.

4.2.7.3 Substrate Composition

Substrates were divided into eight classes as follows: coarse/fine particulate organic matter, silt/clay/muck, fine sand, coarse sand, gravel, cobble, boulder, and bedrock (**Chart 3**). Channel width and water depth were measured at each transect in four equally spaced intervals from bank to bank. Substrate coverage was visually determined between widths measured at each major change in substrate type.

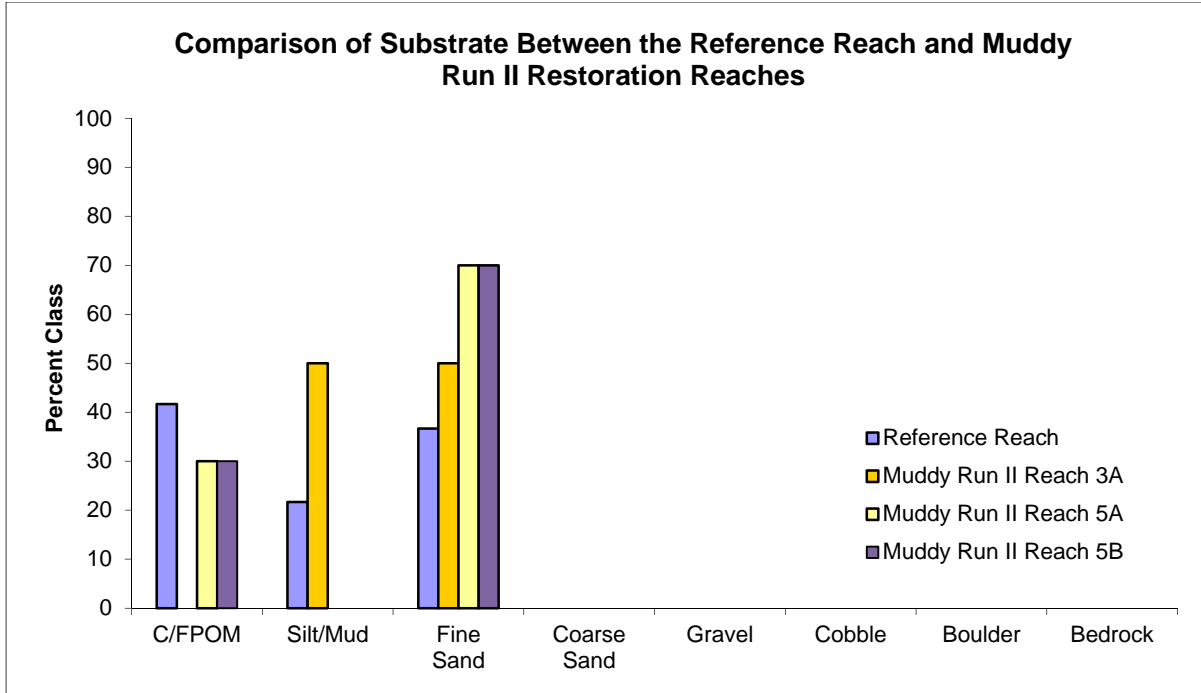


Chart 3. Comparison of substrate composition between the reference reach and the restoration reaches.

The substrate composition analysis revealed that the reference reach has slightly more organic matter substrate (C/FPOM) than Reaches 5a and 5b, and significantly more than Reach 3a. These differences may be attributed to a couple of factors including the maturity and close proximity of riparian plants to the reference reach and Reaches 5a and 5b, and channelization of Reach 3a which typically results in flushing of organic matter and a lack of carbon retention. Macroinvertebrate abundance and diversity has been tied to the ability of a channel to retain carbon. Several design structures and vegetation plantings can be used to increase organic substrate composition. Constructed leaf packs will be installed in select locations for immediate macroinvertebrate colonization. SWD bundles will serve to collect organic matter flowing downstream increasing carbon retention. By adding sinuosity and creating a better floodplain connection, adding SWD in select locations, and creating pool habitats, substrate composition will more closely resemble reference reach conditions.

4.3 Wetland Summary Information

4.3.1 Existing Wetlands

The US Fish and Wildlife Service National Wetland Inventory Map (NWI) does not depict any wetlands within the project site (**Figure 7**). A wetland delineation was performed in June 2012. Wetland boundaries were delineated using current methodology outlined in the 1987 Army Corps of Engineers Wetland Delineation Manual (DOA 1987) and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0) (U.S. Army Corps of Engineers 2010). Soils were characterized and classified using the Field Indicators of Hydric Soils in the United States, Version 7.0 (USDA-NRCS 2010). Wetland boundaries were marked with sequentially numbered wetland survey tape (pink/black striped). Flag locations were surveyed under the direction of a Professional Licensed Surveyor (PLS) with GPS and conventional survey (**Figure 4**).

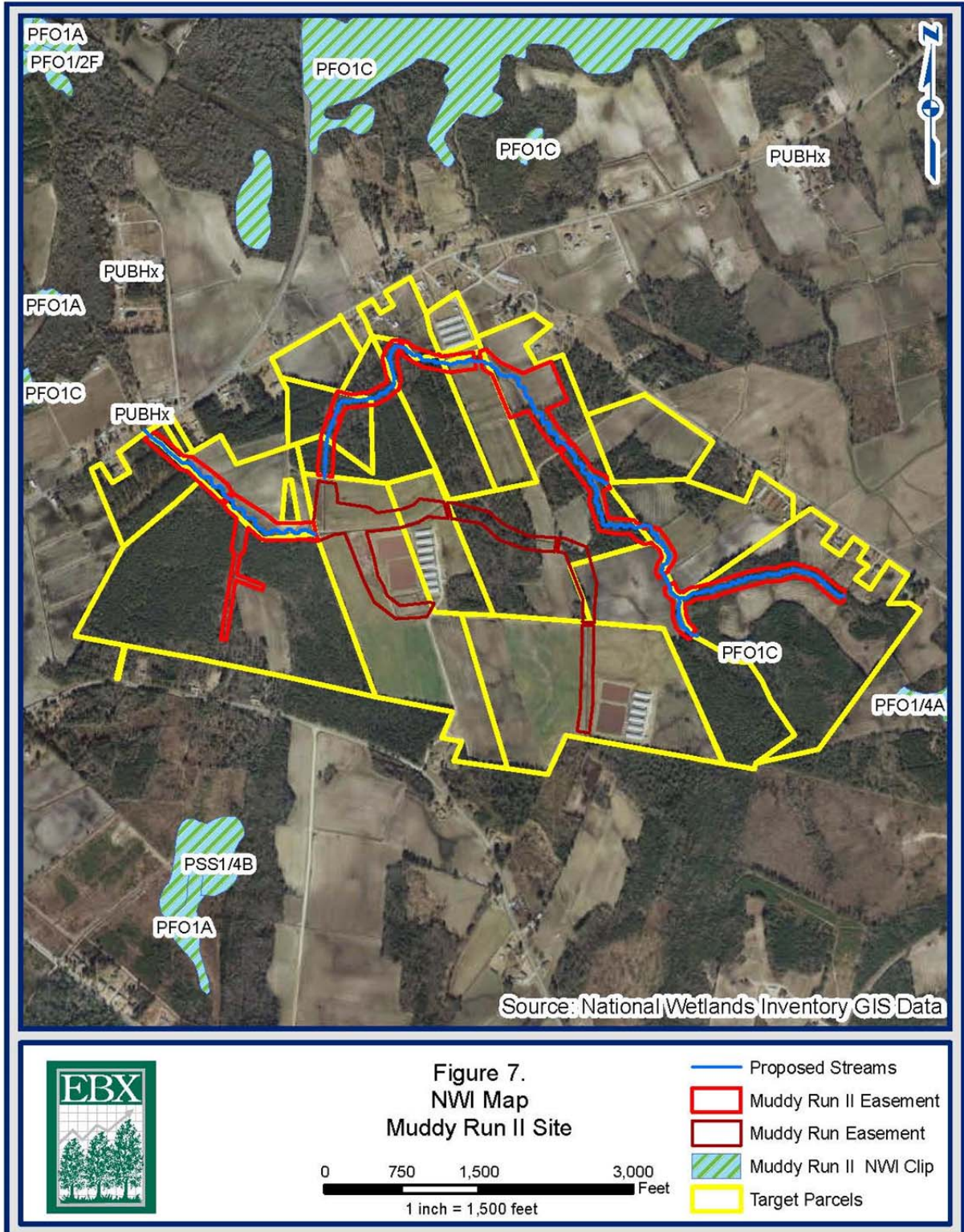


Table 11. Existing Wetlands Parameter and Characteristics

Parameters	Wetland 1	Wetland 2
Size of Wetland within Easement (Acres)	0.29	2.23
Wetland Type	Riparian Riverine	Riparian Riverine
Mapped Soil Series	Goldsboro	Rains
Drainage Class	Moderately well	Poorly
Hydric Soil Status	Yes	Yes
Source of Hydrology	Runoff	Runoff
Hydrological Impairment	Ditched / Incised channel / Berm	Diverted Channel Flow
Native Vegetation Community	Forested	Forested
Percent composition of exotic/invasive species	5%	<1%

4.3.1.1 Wetland 1

This wetland is located along Reach 3a on the right bank. The current land use is forested along the dredged channel just downstream of Reach 4, which divides this wetland. This wetland is seasonally saturated. Hydrology is primarily runoff that collects within a shallow depression and restricted by berms along the dredged channels. This wetland is 0.29 acres.

4.3.1.2 Wetland 2

This wetland is located along Reach 3b on both sides of the channel. The current land use is mature forest. The stream through this wetland is diverted from its historic flow pattern to promote drainage for agricultural production. This wetland is seasonally saturated. Hydrology is currently due to its lower landscape position collecting runoff. Large flood events likely inundate this wetland on a limited basis. This area may also experience limited groundwater discharge. This wetland is 2.23 acres.

A jurisdictional determination of the wetlands has not been made by the US Army Corps of Engineers (USACE), but the USACE has visited the restoration site. Wetland forms are included in **Appendix B**. Onsite wetlands include riparian wetlands along Reach 3a/Reach 4 and along both sides of Reach 2C (**Figure 4**).

4.3.2 Existing Hydric Soil

In addition to the two jurisdictional wetland areas, four areas containing hydric soil are located within the proposed project easement (**Figure 4**). Two areas are forested and may be hydrologically restored or enhanced by the restoration, but are not proposed for credit. The remaining two areas are located within the cultivated fields and are proposed to be restored. Soils and hydric indicators are similar within each land use type. The typical hydric soils are sandy textured and underlain by a clayey subsoil. The most common hydric indicator is Sandy Redox (S5). Some areas were observed to meet Depleted Matrix (F3), Depleted Below Dark Surface (A11) or Dark Surface (S7). In the lower landscape positions a clayey subsoil is found.

The Muddy Run II Mitigation Site offers a total ecosystem restoration opportunity. As such, the wetland restoration is closely tied to the stream restoration. The proposed wetland restoration is located on the floodplains adjacent to the proposed stream restoration of Muddy Run II. All proposed wetlands are near deeply incised and dredged stream channels. Some wetland areas also have adjacent ditching that further lowers the water table.

The Goldsboro soils are moderately well drained, and have moderate permeability. Runoff is negligible to medium. The seasonal high water table ranges from 24 to 36 inches. These soils are located on the hill slope summit and shoulder. This soil unit is typically cultivated. The Rains soils are poorly drained and have moderate permeability. Runoff is negligible. The seasonal high water table ranges from 0 to 12 inches. These soils occur across flats, depressions and Carolina bays. The Natural Resources Conservation Service (NRCS) considers Rains soils to be hydric when undrained. Soil series descriptions are discussed in Section 2.5. Soil profiles are listed on the wetland forms (**Appendix B**). Soils found in the wetland areas can be described as Goldsboro and Rains soils.

Within the project, the majority of the soil map units are Rains, with some areas mapped as Goldsboro or Foreston. Hydric soils within the proposed wetland restoration areas were verified through auger borings by a licensed soil scientist (**Appendix B**). Hydric soils are located in Rains or Goldsboro map units. Based on vegetation, soil, and hydrology indicators, it appears that these areas are inundated or saturated for most of the growing season in a typical year. The wetlands are depressional or topographic low areas. They are impacted by the spoil material along the channel and the access path, creating an artificial barrier between the wetland and channel. Field indicators of wetland hydrology include water stained leaves, saturated soil within one foot of the surface, crayfish burrows, and mapped hydric soils. An extensive ditch network and agricultural surface modifications have significantly affected wetland hydrology. **Table 12** summarizes the sizes of the two proposed wetland restoration areas.

Table 12. Proposed Hydric Soils Parameter and Characteristics

Parameters	Wetland A	Wetland B
Size of Wetland within Easement (Acres)	3.60	1.32
Proposed Wetland Type	Riparian Riverine	Riparian Riverine
Mapped Soil Series	Goldsboro	Rains
Drainage Class	Moderately well	Poorly
Hydric Soil Status	Yes	Yes
Source of Hydrology	Runoff / overbank flows	Runoff / overbank flows
Hydrological Impairment	Ditched/Incised channel	Ditched/Incised channel
Native Vegetation Community	Cultivated	Cultivated
Percent composition of exotic/invasive species	N/A	N/A

Two areas of hydric soil are proposed for wetland restoration for a total of 4.92 acres. The existing areas for proposed wetland restoration have been historically disturbed and lack the typical vegetation of hardwood wetlands. Disturbance includes clearing and grubbing, cultivation, ditching, and crowning. The wetlands are cultivated row crop and are effectively drained.

Areas of wetland restoration are determined by areas having available hydric soil that are located within areas negotiated with land owner. Acreages are limited due to design parameters and limiting acres to where restoration of wetland hydrology is expected to occur within 12 inches of soil surface.

4.3.2.1 Proposed Wetland WA

This wetland is located along the downstream portion of Reach 3a. The current land use is row crop production along the dredged channel. The adjacent stream channel is deeply dredged with a farm road constructed between the cultivated wetland and the channel.

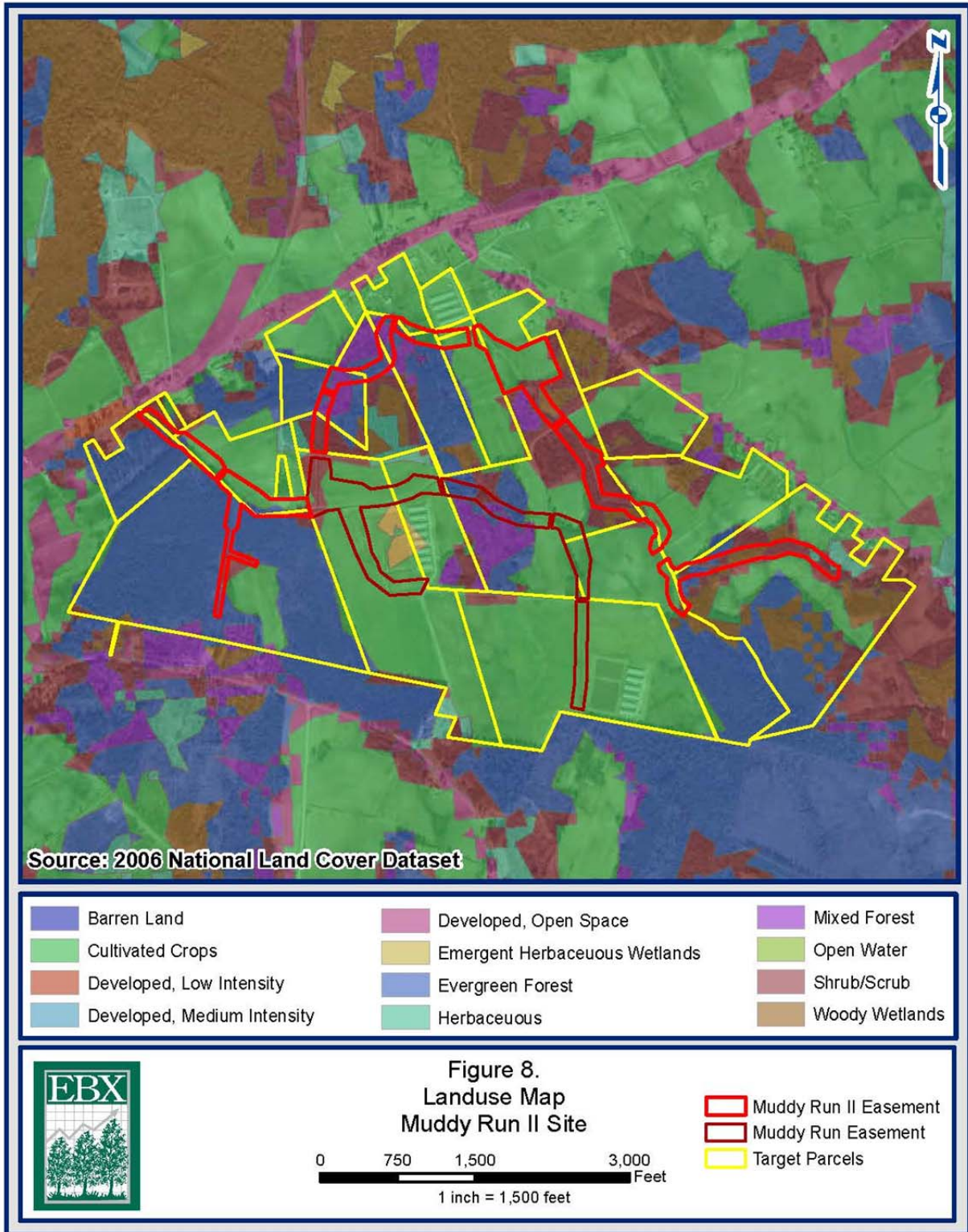
4.3.2.2 Proposed Wetland WB

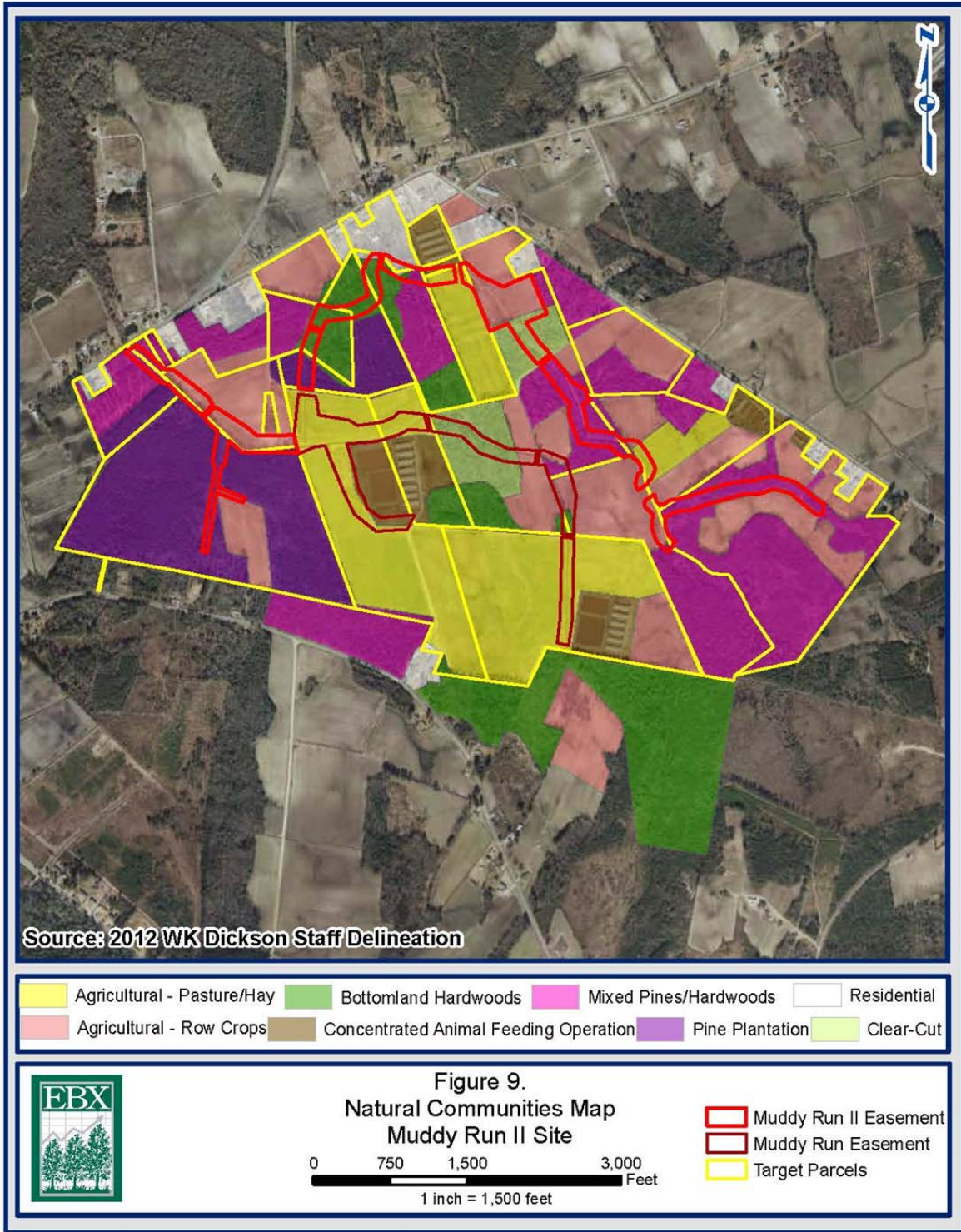
This wetland is located along the downstream portion of Reach 5a, below the downstream end of the Muddy Run project. The current land use is row crop production along the right bank of the dredged channel. A pine plantation is present along the left bank. Ditches are present and the adjacent stream channel is deeply dredged with a farm road constructed between the cultivated wetland and the channel.

4.4 Regulatory Considerations and Potential Constraints

4.4.1 Property Ownership, Boundary, and Utilities

There are no constraints to increasing stream bed elevations at the Muddy Run II Mitigation Site. Several crossings will be upgraded or constructed to provide full landowner access to isolated properties. One existing crossing will be removed entirely. Existing poultry houses will slightly confine the proposed buffer restoration on the northern end of the project. The channel will be restored such that a full 50-foot riparian buffer is restored on both banks. The Muddy Run II site is not located within five miles an air transport facility.



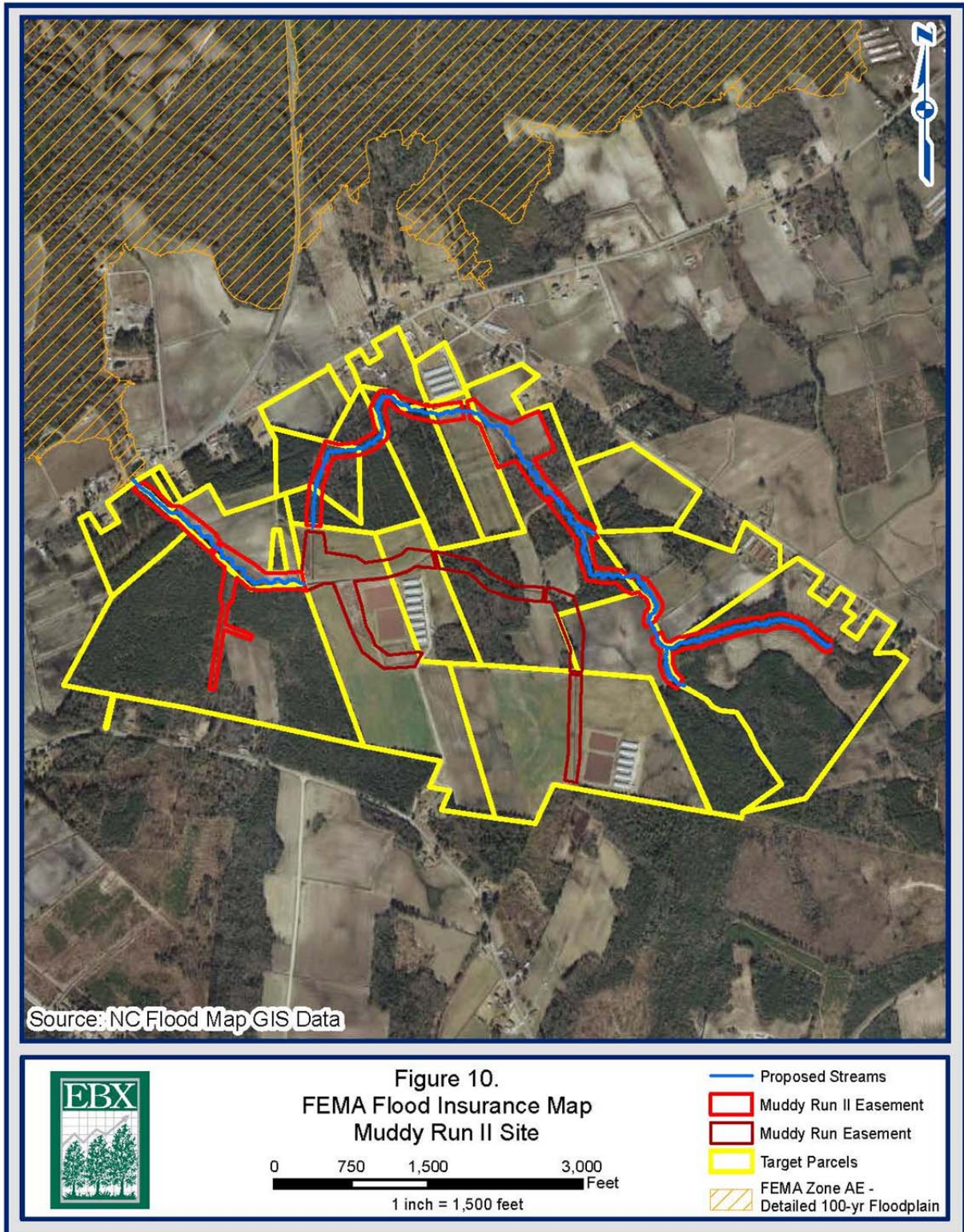


4.4.2 Site Access

There are no access constraints to the Muddy Run II site. To access the Site from the town of Chinquapin, travel east on Highway 50. Take the first left onto Pickett Bay Road and go 1.1 miles. Turn left onto Kenney Crawley Road. This road is gravel and will split just past the residential house on the right. Keeping to the left will take you to the Reaches 3b, 3c, 5a, 5b, and 6. Going to the right at the split will take you to Reaches 1, 2, 3a, and 4. The site protection instrument can be found in **Appendix A**.

4.4.3 FEMA/ Hydrologic Trespass

Hydrologic trespass is a not a major concern for this project. The Muddy Run II Restoration Site is outside of any FEMA floodway area (**Figure 10**). The Site is mapped as Zone X, which indicates that there is 0.2 percent annual chance of flooding. While designing the Muddy Run II project, appropriate measures were taken to reduce the chances of hydrologic trespass of the adjacent agricultural fields and animal operations. The adjacent land use will not be affected by the proposed design, and the property owners have been notified of any potential impacts from hydrologic trespass within existing ditches. No detrimental impacts are expected beyond the easement limits. Landowner communication indicates Reach 5 is subject to flooding due to backwater from the downstream Muddy Creek.



5 DETERMINATION OF CREDITS

Table 13. Muddy Run II Project Components – Stream Mitigation

Reach	Mitigation Type	Stationing	Existing Length (LF)	Proposed Length (LF)	Mitigation Ratio	SMUs
Reach 1	Headwater Valley	0+54 to 4+97	438	443	1:1	443
Reach 2	Headwater Valley	0+00 to 5+04	504	504	1:1	504
Reach 2	P1 Restoration	5+04 to 18+73	1,223	1,369	1:1	1,369
Reach 3a	P1 Restoration	0+00 to 37+36	3,301	3,581	1:1	3,581
Reach 3b	P1 Restoration	37+36 to 56+78	NA	1,852	1:1	1,852
Reach 3c	Enhancement I	56+78 to 64+15	737	707	1:1.5	471
Reach 4	P1 Restoration	0+00 to 2+04	120	204	1:1	204
Reach 5a	P1 Restoration	0+00 to 18+04	1,602	1,774	1:1	1,774
Reach 5b	Enhancement II	18+04 to 22+05	401	401	1:2.5	160
Reach 6	Enhancement II	12+60 to 15+77	317	317	1:2.5	127
			8,643	11,152		10,486

Table 14. Muddy Run II Project Components – Wetland Mitigation

Wetland	Mitigation Type	Mitigation Area (ac)	Mitigation Ratio	WMUs
WA	Restoration	3.60	1:1	3.60
WB	Restoration	1.32	1:1	1.32
Total		4.92		4.92

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 as follows:

Table 15. Forested Wetlands 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%
3	Third year monitoring report demonstrates performance standards are being met.	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met.	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; Provided that all performance standards are met, the IRT may allow the NCEEP to discontinue hydrologic monitoring after the fifth year, but vegetation monitoring must continue for an additional two years after the fifth year for a total of seven years.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met.	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval.	10%	100%

Table 16. 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% (65%*)
3	Third year monitoring report demonstrates performance standards are being met.	10%	60% (75%*)
4	Fourth year monitoring report demonstrates performance standards are being met.	10%	70% (85%*)
5	Fifth year monitoring report demonstrates performance standards are being met, and project has received close-out approval.	15%	100%

*additional 15% credit release following second bankfull event in separate years

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 15% 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 and Wetland Types

7.1.1 Reference Stream Studies

7.1.1.1 Target Reference Conditions

The restoration site is characterized by agricultural and forestry practices. Several ditches and underdrains exist in the watershed and contribute to the project site. Physical parameters of the site were used, as well as other reference materials, to determine the target stream type. An iterative process was used to develop the final information for the site design.

To develop the target reference conditions, physical site parameters were reviewed. This included the drainage area, land use, soils mapping units from the Duplin County Soil Survey for the watershed and site, typical woody debris and habitat available and for the area, as well as general topography. The "Classification of the Natural Communities of North Carolina" was also used to narrow the potential community types that would have existed at the site (Shafale and Weakley, 2003).

Targeted reference conditions included the following:

- Located within the Physiographic Region – Outer Coastal Plain,
- Similar drainage area,
- Similar land use onsite and in the watershed,
- Similar watershed soil types,
- Similar site soil types,
- Ideal, undisturbed habitat – several types of woody debris present,
- Similar topography,
- Similar slope,
- Pattern common among coastal plain streams, and
- Minimal presence of invasive species.

7.1.1.2 Reference Site Search Methodology

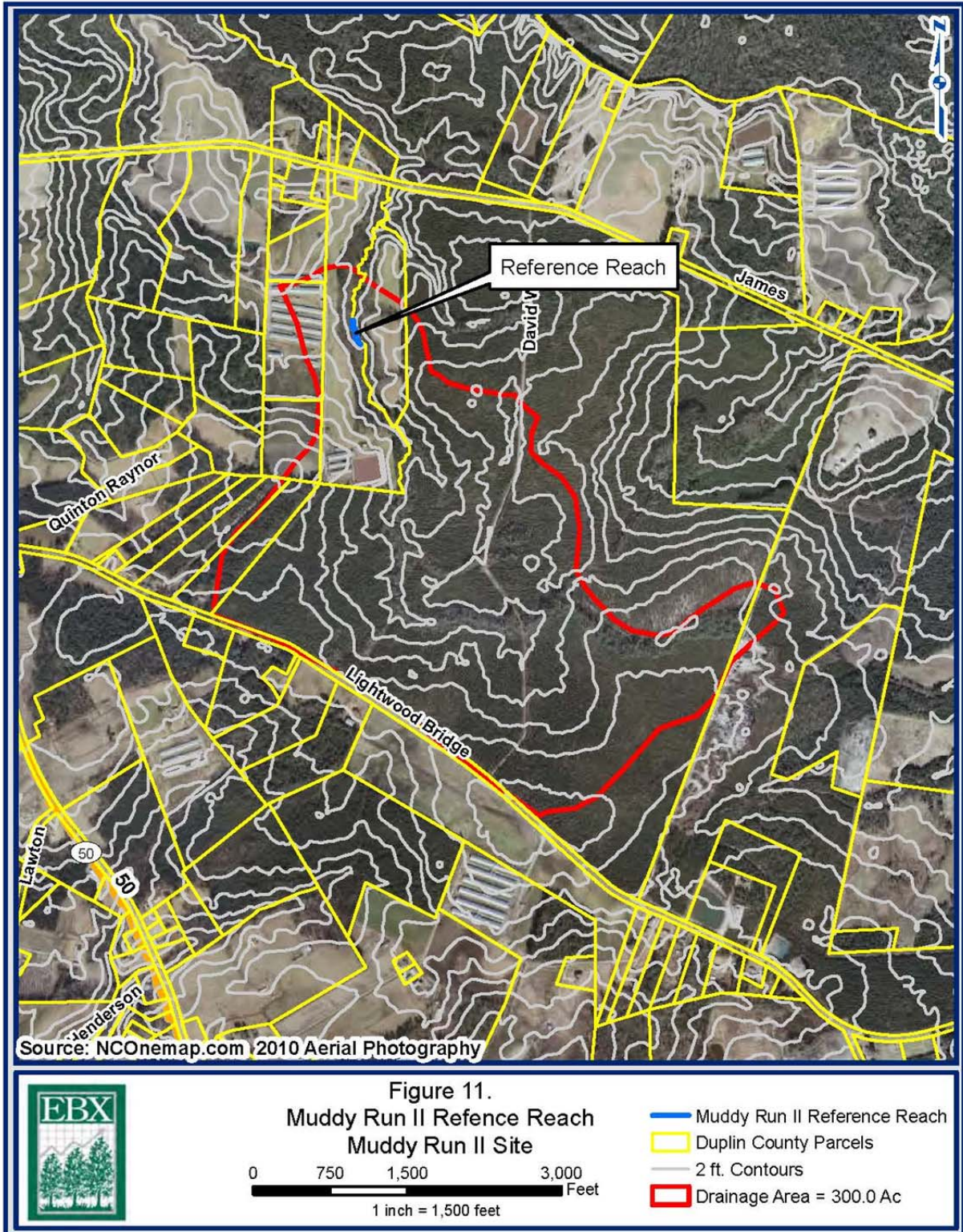
All the parameters used in Section 4.1 were used to find appropriate reference stream sites. Obtaining property owner information and owner authorization for access was another factor in locating suitable reference sites for the project. For this project, there was no predetermined amount of reference sites needed as long as the site was suitable and met nearly all the parameters. Eight potential reference sites were visited, and their characteristics were noted. It is difficult to find reference sites on the coastal plain because many have been disturbed by farming or urban development. Most streams tend to be modified ditches and may have some of the characteristics that are sought in a reference, but too few to make it an ideal reference for the project site. One reference stream site that proves to be ideal in both geomorphology and habitat is located approximately six miles southeast of the restoration site in a wooded corridor.

A GIS-based search was initially conducted for the identification of reference stream sites in the outer coastal plain. The GIS process was based on a search through quadrangle maps, aerial photography, and topography. Drainage areas for each reference site were delineated. Soils and land use were considered for each site, as well as accessibility and location in comparison to the restoration reach. Once sites were identified, all eight sites were visited and assessed. Many of the references were affected by farming practices, dense invasive species, and disturbed or altered floodplains along the streams. This was the case for a few of the sites visited, and, therefore, the sites were not considered. One site was identified for use as a reference site.

7.1.1.3 Reference Watershed Characterization

The reference stream flows northwest and drains into Cypress Creek (**Figure 11**). The reach that was surveyed and analyzed is approximately 300 feet long. The drainage area for the unnamed tributary to Cypress Creek (UT) is 0.47 square miles (300 acres). The land use in the watershed is characterized by mostly southern yellow pine (86 percent), bottomland hardwood forest/hardwood swamps (6 percent), broadleaf evergreen forest (3 percent), managed herbaceous cover (3 percent), and cultivation (2 percent). Site photographs of the reference stream are located in **Appendix B**.

The current State classification for the UT to Cypress Creek is undefined. However, Cypress Creek is defined as Class C *Sw* (NCDWQ, 2005). Class C waters are suitable for aquatic life, secondary recreation, and agricultural usage. The *Sw* is a designation for swamp waters—waters that have low velocities and other natural characteristics that are different from adjacent streams. Using Rosgen stream classification, the stream is classified as a E5 stream type.



7.1.1.4 Reference Soils Characterization

The soils found in and around the reference reach are mapped as Muckalee, Blanton, and Murville, all of which are hydric soils. Muckalee is a Hydric B, loam soil, typically found on slopes ranging from 0 to 1 percent slopes. Blanton is a Hydric B sandy soil, found on flats, marines, and terraces with slopes from 1 to 6 percent. Murville soils are mucky fine sand generally found in depressions with slopes of 0 to 2 percent. The soils immediately adjacent to the reference reach have similar characteristics and properties to the soils found at the Muddy Run II Restoration Site.

7.1.1.5 Reference Discharge

Several hydrologic models/methods were used to develop a bankfull discharge for the reference site. Existing drainage area, land use, slope, roughness, and cross-sectional area were all factors considered when performing the calculations. Using a combination of Coastal Plain Regional Curves, in-house spreadsheet tools, and a project specific regional flood frequency analysis, the existing discharge was found to be around 12 cubic feet per second (ft³/s). See **Section 7.3** for a more detailed description of the hydrologic analyses performed for this project.

7.1.1.6 Reference Channel Morphology

In comparison to the restoration reaches, the reference reach is smaller when comparing pattern, dimension and profile, which is the reason for using a scaling factor for the design. The scaling factor is based on the smaller bankfull area of the reference channel. Since the reference stream was smaller, it was necessary to scale up the analog reach in order to use it for design. The new reach would then have the necessary dimensions of that of a bigger stream similar in size to the existing channel that would correspond to the larger drainage area. The stream was typically five to eight feet wide and one to two feet deep. The cross sectional area was typically around 6.7 square feet with a width to depth ratio around 9.0.

7.1.1.7 Reference Channel Stability Assessment

The reference reach was stable and showed no evidence of incision or erosion in the portion that was surveyed and analyzed. The stream appeared to maintain its slope and had sufficient amounts of vegetation to secure its banks. Riparian buffer widths exceeded fifty feet on each side. The CSA results (scores and ratings) for the reference reach is provided above in **Table 7** (Section 4.2.4). The reference reach received an “Excellent” rating as the channel demonstrates a stable meandering pattern and a well vegetated riparian buffer.

7.1.1.8 Reference Bankfull Verification

Typical indicators of bankfull include vegetation at the bankfull elevation, scour lines, wrack lines, vegetation lines, benches/inner berm, and point bars. Throughout the entire length of the reference reach, bankfull is located at the top of bank elevation. The accuracy of this bankfull stage is verified by the Coastal Plain Regional Curves using existing cross sections to calculate area and discharge. Evidence that can further support the location of bankfull is the lack of any bench or berm features within the channel, and wrack lines present within the floodplain.

7.1.1.9 Reference Vegetation

The reference reach riparian community is characteristic of a coastal plain small stream swamp community. This community is approximately 15 to 20 years old, as evidenced by the representative diameter at breast height (DBH) measurements. This community was determined to have had past disturbance altering the species composition. Most of the canopy species recorded are high dispersal species and have been observed to occur near the restoration site. The following table lists the

coverage estimates and species encountered. The right bank is denoted as RB and the left bank is denoted as LB.

Table 17. Tree Communities at the Reference Reach for Muddy Run II

Transect	Location	Percent Coverage	Percent Evergreen	Percent Deciduous	Representative DBH (")	Species
1	LB	80	15	85	8	<i>Nyssa biflora</i> , <i>Magnolia virginiana</i> , <i>Ilex opaca</i> , <i>Acer rubrum</i> , <i>Liriodendron tulipifera</i>
	RB	90	15	85	12.5	<i>Liriodendron tulipifera</i> , <i>Liquidambar styraciflua</i> , <i>Nyssa biflora</i> , <i>Ilex opaca</i> ,
2	LB	65	10	90	9	<i>Liriodendron tulipifera</i> , <i>Ilex opaca</i> , <i>Liquidambar styraciflua</i>
	RB	80	10	90	15	<i>Liquidambar styraciflua</i> , <i>Nyssa biflora</i> , <i>Liriodendron tulipifera</i>
3	LB	90	10	90	10	<i>Nyssa biflora</i> , <i>Acer rubrum</i> , <i>Liriodendron tulipifera</i> , <i>Ilex opaca</i> , <i>Magnolia virginiana</i>
	RB	60	30	70	7	<i>Ilex opaca</i> , <i>Magnolia virginiana</i> , <i>Nyssa biflora</i> , <i>Liquidambar styraciflua</i>
4	LB	85	10	90	10	<i>Liquidambar styraciflua</i> , <i>Liriodendron tulipifera</i> , <i>Ilex opaca</i>
	RB	35	50	50	3	<i>Ilex opaca</i> , <i>Magnolia virginiana</i> , <i>Liquidambar styraciflua</i>
5	LB	90	10	90	8	<i>Liriodendron tulipifera</i> , <i>Magnolia virginiana</i> , <i>Acer rubrum</i> , <i>Fagus grandifolia</i> , <i>Nyssa biflora</i> , <i>Liquidambar styraciflua</i>
	RB	60	25	75	9	<i>Nyssa biflora</i> , <i>Liquidambar styraciflua</i> , <i>Ilex opaca</i> , <i>Liriodendron tulipifera</i>
6	LB	90	10	90	8	<i>Liriodendron tulipifera</i> , <i>Magnolia virginiana</i> , <i>Acer rubrum</i> , <i>Fagus grandifolia</i> , <i>Nyssa biflora</i> , <i>Liquidambar styraciflua</i>
	RB	70	50	50	6	<i>Magnolia virginiana</i> , <i>Ilex opaca</i> , <i>Nyssa biflora</i>
7	LB	75	10	90	10	<i>Liriodendron tulipifera</i> , <i>Acer rubrum</i> , <i>Ilex opaca</i> , <i>Q. michauxii</i>
	RB	60	40	60	8	<i>Ilex opaca</i> , <i>Liriodendron tulipifera</i> , <i>Liquidambar styraciflua</i>
8	LB	55	20	80	7	<i>Liriodendron tulipifera</i> , <i>Acer rubrum</i> , <i>Pinus taeda</i> , <i>Ilex opaca</i> , <i>Ligustrum japonicum</i>
	RB	80	40	60	6	<i>Quercus nigra</i> , <i>Liriodendron tulipifera</i> , <i>Ilex opac</i> , <i>Acer rubrum</i>
9	LB	70	25	75	10	<i>Nyssa biflora</i> , <i>Ilex opaca</i> , <i>Liriodendron tulipifera</i> , <i>Pinus taeda</i>
	RB	80	20	80	6	<i>Liriodendron tulipifera</i> , <i>Ilex opaca</i> , <i>Quercus nigra</i> , <i>Acer rubrum</i>
10	LB	60	25	75	11.5	<i>Nyssa biflora</i> , <i>Ilex opaca</i> , <i>Liriodendron tulipifera</i> , <i>Pinus taeda</i>
	RB	80	15	85	11	<i>Pinus taeda</i> , <i>Quercus michauxii</i> , <i>Ilex opaca</i> , <i>Acer rubrum</i> , <i>Liquidambar styraciflua</i> , <i>Liriodendron tulipifera</i> , <i>Ligustrum japonicum</i>

It is anticipated that a local seed source for these high dispersal species is present and will disperse across much of the mitigation site. These species are often found in early successional communities and quickly fill disturbance gaps. Because many of these high dispersal species often become aggressive in these sites, they are not included in the Restoration Planting List (**Section 7.2.3**). Hardwood species typical of the target community was observed in adjacent and nearby communities, and were judged to be more appropriate for this site.

7.1.1.10 Habitat Assessment – Woody Debris

The habitat assessment for the reference stream channel is included in the quantitative habitat assessment discussion for Muddy Run II within Section 4.2.7.

7.1.2 Reference Wetland Studies

Reference wetlands were not studied for similar hydrology or habitat. A reference wetland site adjacent to the stream evaluated for habitat was evaluated for species composition, but was determined to be impacted by timber management and was not a suitable community to reference. A reference wetland will be determined before construction is complete so groundwater monitoring can begin before or at the same time as wetland restoration monitoring.

7.2 Design Parameters

7.2.1 Stream Restoration Approach

Stream restoration efforts along the tributaries to Muddy Creek will be accomplished through a combination of analytical and analog and/or reference reach-based design methods. The result will be a combination of Priority Level I stream restoration and headwater valley restoration. The cross-section geometry, planform, and profile will be modified to restore appropriate capacity and sinuosity to the channelized, sand bed streams. The Priority Level I stream restoration will incorporate the design of a single-thread meandering channel, with parameters based on data taken from NC Coastal Plains Regional Curve tables and from reference sites described herein. Approximately 8,780 LF of stream channel will be reconstructed. An additional 947 LF of headwater valley restoration will bring the total restoration SMUs to 9,727. Enhancement Levels I and II will be applied to an additional 1,425 linear feet of channel that are relatively stable and forested.

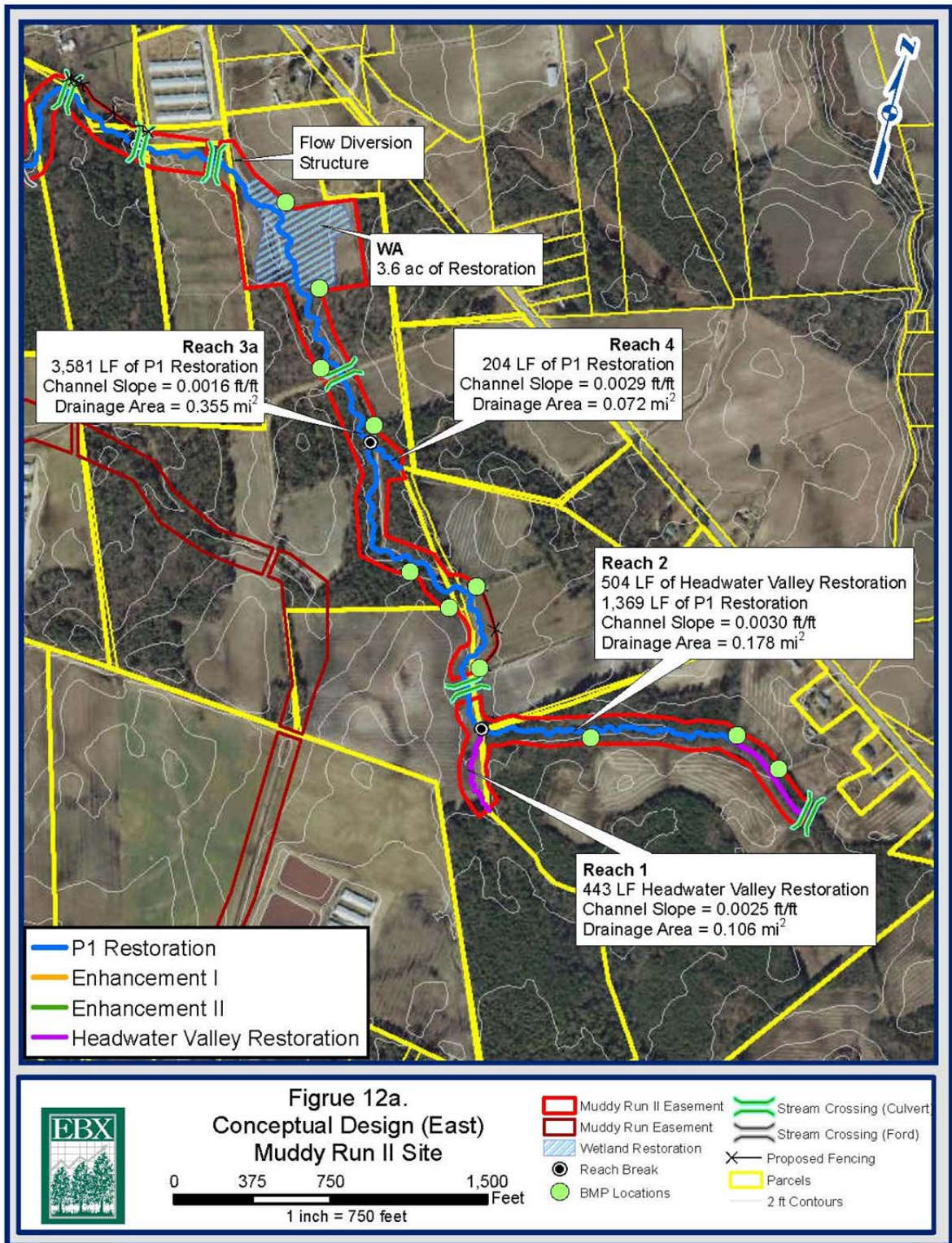
Stream buffers throughout the project site will be restored and protected in perpetuity. Proposed mitigation for the Muddy Run site involves headwater valley restoration and Priority Level I stream restoration. The proposed mitigation design divides the site into three distinct drainage features consisting of six design reaches (**Figure 12**). Priority Level I restoration is proposed on five reaches and headwater valley restoration is proposed on two reaches.

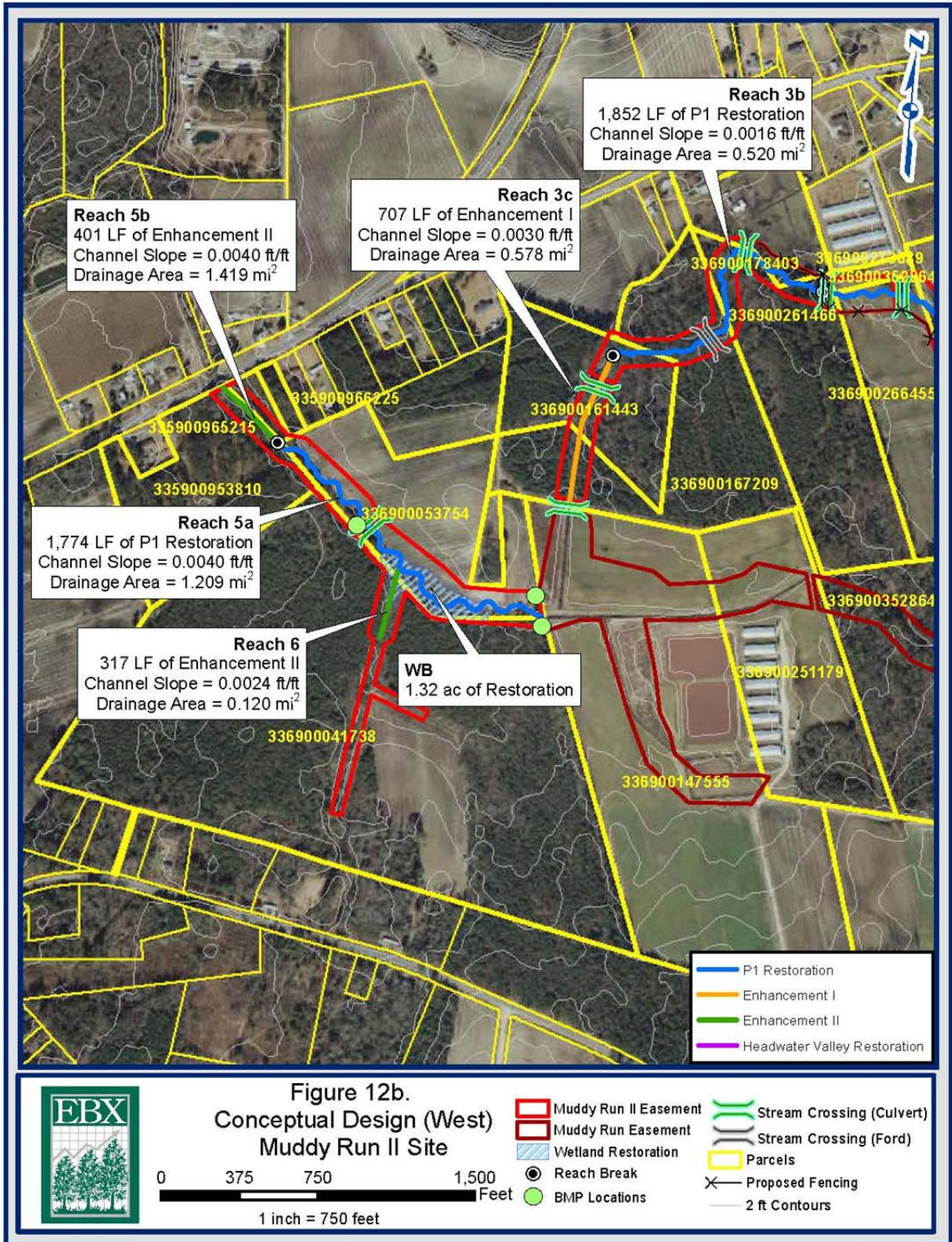
Priority I restoration reaches will typically include a meandering stream pattern constructed to mimic the natural planform of low-gradient, sand bed channels. The proposed sinuosity is 1.1, which is based on local reference reach conditions, existing site constraints, and hydraulic modeling. As a result of the restoration of planform and dimension, frequent overbank flows and a restored riparian buffer will provide the appropriate hydrology and sediment transport throughout this coastal plain watershed.

Headwater valley restoration will follow current regulatory guidance and published research. This restoration approach will result in a fully vegetated valley bottom following natural existing contours. Any ditches or channels present will be backfilled and stabilized. Vegetation will be restored across the entire headwater valley.

Muddy Run II has been broken into the following design reaches:

- **Reach 1 (STA 0+54 to STA 4+97)** – One of three headwater reaches within the project totaling approximately 443 linear feet of headwater valley restoration. This reach is flat with agricultural fields to the west and woods to the south and east. The reach begins at a gully feature just downstream of an existing headwater valley system.
- **Reach 2 (STA 0+00 to STA 18+73)** – Eastern most reach of the project totaling approximately 504 linear feet of headwater valley restoration and 1,369 linear feet of Priority 1 restoration. Agricultural fields are located to the north and south of the reach, outside of a forested buffer.
- **Reach 3a (STA 0+00 to STA 37+36)** – Eastern most reach along the primary drainage feature totaling approximately 3,581 linear feet of Priority 1 restoration. Both Reaches 1 and 2 outlet at the upstream end of the reach. Reach 3a has a farm path along its entirety on the east bank and flows through active agricultural fields and forested areas. Reach 4 flows into this reach near STA 19+50.
- **Reach 3b (STA 37+36 to STA 56+78)** – Middle reach along the primary drainage feature totaling approximately 1,852 linear feet of Priority 1 restoration. The upper section of Reach 3b adjacent to turkey houses and pastures before entering a forested area to the west.
- **Reach 3c (STA 56+78 to STA 64+15)** – Western-most reach totaling approximately 707 linear feet of Enhancement Level I. This reach is flat, is surrounded by forest comprised of a mix of pines and hardwoods, and flows into Reach 3 of the Muddy Run project.
- **Reach 4 (STA 0+00 to STA 2+04)** – Short reach totaling approximately 204 linear feet of Priority 1 restoration. This reach flows through a forested buffer down to Reach 3a.
- **Reach 5a (STA 0+00 to STA 18+04)** – Western reach beginning at the downstream end of the Muddy Run project totaling approximately 1,774 linear feet of Priority 1 restoration. This reach is flat with agricultural fields to the north and woods to the south.
- **Reach 5b (STA 18+04 to STA 22+05)** – Western-most reach totaling approximately 401 linear feet of Enhancement Level II. This reach is flat and has a forested buffer along both banks.
- **Reach 6 (STA 12+60 to STA 15+77)** – One of three headwater reaches within the project totaling approximately 317 linear feet of Enhancement Level II. This reach is flat with agricultural fields to the east and woods to the south and west.





Reach 1

Headwater valley restoration approach is proposed for Reach 1. The existing channel/ditch will be backfilled, and flow will be directed from its current position along the tree line back to within the historic valley location down to the confluence with Reaches 2 and 3a. A 100 foot wide forested buffer will be planted throughout the reach. The upstream limit of Reach 1 will tie into an existing headwater valley system comprised of intermittent sections of single and multiple channels. This system will be used as a reference site for incorporating a small baseflow channel into the headwater valley restoration design.

Reach 2

Similar to Reach 1, headwater valley restoration is proposed for the upper section of Reach 2. The existing channel will be backfilled with existing spoil material located along adjacent to the channel, a result of previous dredging activities. Areas within the 100 foot buffer that are disturbed or lack riparian vegetation will be planted. Grade control structures will be installed along three ditches that enter Reach 2 at the upstream end of the project. These structures will raise the upstream channel bed elevations slightly to tie in existing ditches to the project reach. An existing CMP culvert located along the upstream section will be removed and replaced outside the easement (upstream) to continue to allow the landowner access to all areas of his property. Priority 1 restoration is proposed for the majority of Reach 2. Restoration activities will involve relocating the channel to the north through an existing wooded area consisting primarily of pines a few hardwoods. Existing spoil piles located along the channel banks will be removed and used to fill the existing ditch. Diffuse flow structures will be installed along several ditches that outlet to the reach from both the north and south. The structures will attenuate and disperse flows as the existing ditches enter the proposed easement.

Reach 3a

Priority Level I restoration is proposed on Reach 3a. The restoration approach on this reach will include relocating the channel on either side of its current location to follow the natural valley and removing the adjacent roadbed to allow continuous access to the floodplain. Two existing 36" CMP culvert crossings are located along this reach. Each culvert will be removed and replaced in-line with the proposed stream to allow the landowners to access portions of their respective properties to the west of the project site. Reach 3a will flow in a northwesterly direction until it reaches a property line. At this point, the existing ditch that continues to flow in a northerly direction will be plugged and a diversion structure installed. The structure is designed to pass 100 percent of baseflow and small storms through the project, and divert up to 70 percent of storms larger than the 25-yr storm to the existing ditch and offsite. See Section 7.3.1.1 (Stream Hydrologic Analysis) for hydraulic analysis details.

Just downstream of the diversion structure, the channel will be relocated just south of several turkey houses, and will flow in a westerly direction as Reach 3b. The network of ditches surrounding the turkey houses appear to cross a small ridge, directing flow away from the project area. An additional culvert crossing is proposed where flow will be diverted to the west at the turkey houses. Priority I restoration is appropriate for this channel because it is the only mitigation approach that will address bed and bank instability, establish a forested riparian buffer, and significantly enhance aquatic habitat. Diffuse flow structures will be constructed where existing agricultural ditches enter the easement area.

The diversion structure is proposed at the downstream end of Reach 3a to alleviate and prevent flooding caused by rerouting flow and increased drainage areas, to provide continued flow through the existing ditch for storms larger than bankfull (design) events, and to reduce impacts from proposed grading activities. Per discussions with Mr. Lanier (owner of parcel northwest of proposed structure), larger storm events overtop the existing ditch flowing to the north. This flooding may be

attributed to inefficiencies with existing structures and ditch alignments in conjunction with low gradients. The culvert associated with the gravel access road that leads from Ludie Brown Road to the turkey houses outlets perpendicular to the receiving ditch that flows to the northeast and under Ludie Brown Road. This ditch continues to the northeast and crosses Route 111, where it flows to the north into Muddy Creek. By diverting up to 70 percent of higher flows through the existing ditch and offsite, existing flooding issues will be reduced adjacent to the turkey houses. This diversion also decreases potential flooding impacts that would occur if 100 percent of storm events were passed through the proposed channel, Reach 3b. There are several residential parcels within zero to 200 feet of the proposed easement along Reach 3b. Because the topography is very flat through this area, the flooding associated with the majority of storm events greater than bankfull would negatively impact these parcels.

Finally, by diverting a percentage of the proposed higher flows, flooding impacts will also be reduced along Reaches 5a and 5b and at the existing HWY 41 culvert at the downstream end of the project. Currently, agricultural fields are present along the north side of Reach 5a. By reducing high flows, the flooding extent and duration will be reduced; thus, preventing adverse impacts to crops. If 100 percent of higher storm events were allowed to pass through the project, significant grading would be required to cut floodplain terraces/benches to relieve flooding of the adjacent agricultural fields.

Reach 3b

Priority Level I restoration is proposed on Reach 3b. The restoration approach on this reach will include relocating the channel in a westerly direction through an open pasture. The pasture area has been extensively modified and substantial grading will be required. The proposed design then moves the channel to a historic drainage way as observed on LiDAR and historical aerial photographs (**Figures 5 and 6**). The flow path will then be connected to a small relic channel identified in the forested area west of the pasture. Subsequent topographic survey confirmed positive drainage along the relic channel which follows a low lying feature observed on LiDAR. The restoration approach will include some minor grading to enlarge the existing channel and to create a diverse bed habitat by constructing pools. Log grade control structures will be installed at the confluence with Reach 3c and at the connection to the relic channel. Small, mechanical equipment and hand tools will be used to minimize damage to the existing forested buffer. A livestock protected culvert crossing is proposed near the existing pasture along an existing farm path to allow the landowner uninterrupted access to his property.

Reach 3c

Enhancement I is proposed on Reach 3c as it flows through a forested area downstream from Reach 3b to Reach 3 of the Muddy Run Stream Mitigation Project. A grade control structure will be installed at the upstream end to stabilize the transition from an existing agricultural ditch to the stable channel. A crossing is proposed along the upper section to allow the landowner access to both sides of his property. Enhancement activities will include removing portions of existing spoil piles located along top of banks, cutting floodplain benches and laying back banks, and installing woody debris habitat structures. Diffuse flow structures will also be constructed at the downstream limit where existing agricultural ditches enter the easement area. Invasive species management will be performed throughout the buffer, and any bare or disturbed areas will be planted with native riparian vegetation.

Reach 4

Priority 1 restoration is proposed on the downstream end of Reach 4 as it flows through a forested area below a ditch draining an agricultural field. A grade control structure will be installed at the upstream end to transition from the existing ditch to a stable channel. The lower section of the reach will be constructed into an E-type channel before its confluence with Reach 3a. Invasive species

management will be performed throughout the buffer, and any bare or disturbed areas will be planted with native riparian vegetation.

Reach 5a

Priority Level I restoration is proposed on Reach 5a. The channel will be relocated north of its current location into the adjacent agricultural field. The existing ditch will be backfilled and plugged at any locations that may cross the proposed channel. The upstream end of the reach will tie into Reach 1C of the Muddy Run Stream Mitigation Project. The proposed single-thread channel will flow through proposed wetland WB beginning approximately 300 feet downstream of the Muddy Run project. A CMP culvert crossing will be installed in-line with the proposed design near the middle of the reach to allow the landowners access to the adjacent parcels. Priority I restoration is appropriate for this channel because it is the only mitigation approach that will address bed and bank instability, establish a forested riparian buffer, and significantly enhance aquatic habitat.

Reach 5b

Enhancement Level II is proposed on Reach 5b. Several log grade controls and woody debris structures will be installed along the bed to increase aquatic habitat and bed diversity. The right bank along the reach will be laid back and spoil piles along the tops of banks will be removed using small equipment to minimize impacts to the existing buffer. Additionally, invasive species management will be performed throughout the buffer, and any bare or disturbed areas will be planted with native riparian vegetation.

Reach 6

Enhancement Level II is proposed for the downstream section of Reach 6 (STA 12+60 to STA 15+77). The right and left banks will be laid back, and the channel will be backfilled using spoil located adjacent to the channel such that positive drainage is maintained throughout the reach down to the confluence with Reach 5a. Invasive species management will be performed throughout the buffer where enhancement is proposed, and any bare or disturbed areas will be planted with native riparian vegetation. A 50 foot wide buffer will be provided along the upper section of Reach 6 (STA 3+64 to STA 12+60); however, no enhancement activities are proposed through this section other filling portions of the channel. This additional easement is being provided to account for any hydrologic impacts that may occur as a result of the proposed enhancement activities.

7.2.1.1 Design Discharge

Based upon the hydrologic analysis described in Section 7.3.1.1 below, design discharges were selected that fall on the low end of flows between the results of the 1.1 and 1.5-year flood frequency analysis for each reach. The selected flows are 7ft³/s, 15ft³/s, 10ft³/s, 5ft³/s, and 44ft³/s for Reaches 2, 3a, 3b, 4, and 5a, respectively. These discharges will provide frequent inundation of the adjacent floodplain.

The design discharges were selected based on the following rationale:

- The calculated bankfull discharge for the analog/reference reach closely matches the results of the 1.1-year flood frequency analysis,
- The results of the Hydraflow Hydrographs for the 1-year storm fell between the results of the 1.1 and 1.5-year flood frequency analysis,
- The results of the 1.1-year flood frequency analysis matched well with the NC regional curve (Doll et al., 2003), and
- Selecting design discharges between the 1.1 and 1.5-year storm events allows frequent inundation of the floodplain, while also preventing adjacent active agriculture land from flooding at a high frequency.

7.2.1.2 Design Methods

There are three primary methods that have demonstrated success in stream restoration: analog, empirical, and analytical. All three methods have advantages and limitations, and it is often best to utilize more than one method to address site-specific conditions or to verify the applicability of design elements. Combinations of analytical and analog methods were used to develop the stream designs for Muddy Run II.

Analytical Approach

Analytical design is based on principles and processes considered universal to all streams, and can entail many traditional engineering techniques. The analytical approach utilizes continuity, roughness equations, hydrologic and hydraulic models, and sediment transport functions to derive equilibrium conditions. Since the project is located within a rural watershed, restoration designs are based on hydrologic and hydraulic analyses, including rainfall-runoff models to determine design discharges coupled with reference reach techniques.

Analog Approach

The analog method of natural channel design involves the use of a “template” or reference stream located near the design reach, and is particularly useful when watershed and boundary conditions are similar between the design and analog reaches (Skidmore et al., 2001). In an analog approach, the planform pattern, cross-sectional shape, longitudinal profile, and frequency and locations of woody debris along the analog reaches are mimicked when developing the design parameters for the subject stream. A scaling factor was calculated from the survey data in order to correctly size the planform design parameters for the project site. The scaling factors for each design reach were derived from the design cross-sectional area and topwidth of each reach as follows:

1. The appropriate bankfull cross-sectional area (A_{BKF}) of each design reach was calculated using an in-house spreadsheet based on Manning’s Equation. The input parameters included the design discharge as determined by the hydrologic analysis described above, and proposed slope based on site conditions and the sinuosity measured for the analog reach.
2. The cross-sectional shape was adjusted within the spreadsheet to replicate the width-depth ratios and side slopes surveyed along the analog reach, while also maintaining the A_{BKF} necessary to convey the design discharge.
3. The scaling factor is determined from the ratio of the design topwidth to the analog topwidth (**Table 18**). For this project, several sections and planform geometry were obtained at the analog site, resulting in an average width of 7.8 feet.
4. Pool cross-sectional areas were calculated using the analog approach. Design A_{BKF} areas were determined using the measured analog ratios of shallow A_{BKF} to pool A_{BKF} as applied to the design A_{BKF} s. The pool cross-sectional shape was adjusted within the in-house spreadsheet as described above in step 2.

Table 18. Scaling Factors for Sizing Planform Design Parameters

Reach	Drainage Area (ac)	Proposed Bankfull A_{BKF} (ft ²)	Design Topwidth (ft)	Analog Reach Topwidth (ft)	Scaling Factor
2	114	5.9	7.6	7.8	1.0
3a (U/S)	209	8.7	9.2	7.8	1.2
3a (D/S)	254	15.7	12.4	7.8	1.6
3b	333	8.3	9	7.8	1.2
4	46	3.3	5.6	7.8	0.7
5a	730	22.7	15.0	7.8	1.9

7.2.1.3 Typical Design Sections

Typical cross sections for shallows and pools are shown on the design plan sheets in **Appendix D**. The cross-section dimensions were developed for the three design reaches by using an in-house spreadsheet described above. The cross-sections were altered slightly to facilitate constructability; however, the cross-sectional area, width to depth ratio, and side slopes were preserved. Typical pool sections include pools located on straight reaches and pools on meander bends.

7.2.1.4 Typical Meander Pattern

The design plans showing the proposed channel alignment are provided in **Appendix B**. The meander pattern was derived directly from the analog reach and sized using the scaling factors described in **Table 18**. The analog meander pattern was altered in some locations to provide variability in pattern, to avoid onsite constraints, to follow the valley pattern, and to make the channel more constructible. The morphologic parameters summarized in **Table 18** and **Appendix D** was applied wherever these deviations occurred.

7.2.1.5 Longitudinal Profiles

The design profiles are presented in **Appendix D**. These profiles extend throughout the entire project for the proposed channel alignment. The profiles were designed using the analog reach bed features that were sized with the scaling factors. The bed slopes and bankfull energy gradients were determined for each design reach based on the existing valley slope and the sinuosity of the design reach. Log structures will be utilized in the design to control grade, divert flows, and provide additional habitat diversity and stability.



Sod mats blanket the top of bank of this stream in Bertie County.

7.2.1.6 In-Stream Structures

Structures will be incorporated into the channel design to provide additional stability and improve aquatic habitat. Native materials and vegetation will be used for revetments and grade control structures where applicable. Additionally, woody debris will be placed throughout the channel at locations and at a frequency that is similar to those mapped in the analog reaches. The analog reach has woody debris throughout the length of the channel, providing grade control for shallows and forcing scour pools. Woody habitat features installed will include leaf packs, dead brush, woody debris bundles, root wads, and wattles. Sod mats harvested onsite will be installed along stream banks during construction if and when feasible. Sod mats will only be harvested and used if comprised of

appropriate vegetation. The use of sod mats that include aggressive turf grasses will be not be used. Sod mats (see photo above) are natural sections of vegetation taken from existing banks and adjacent areas during construction, and generally range between 0.75 to 1.0 feet in thickness. Before installation, proposed banks are graded lower than specified to accommodate the thickness of the mat. The mats are placed on top of the bank to act as a natural stabilizer of native species, and they grow much faster than the combination of coir fiber matting and seeding (see detail **Appendix D**). Other bank stability measures include the installation of cuttings bundles at three to five foot intervals along the tops of banks, live staking, root wads, and log toes. Typical details for proposed in-stream structures and revetments are in **Appendix D**.

7.2.2 Wetland Restoration Approach

The Muddy Run II Mitigation Site offers a total ecosystem restoration opportunity. As such, the wetland restoration is closely tied to the stream restoration. The proposed wetland restoration is located on the floodplains adjacent to the proposed stream restoration of Muddy Run II and Muddy Run. There are two sites adjacent to Muddy Run II. All proposed wetlands are near deeply incised and dredged stream channels. Some wetland areas also have adjacent ditching that further lowers the water table.

7.2.2.1 Wetland Restoration Summary

Wetland restoration activities will include plugging existing ditches, restoring microtopographic features (less than 6 inches depth) by surface roughing, creating macrotopographic features (wetland depressions), planting wetland species, and removal of an existing farm road. This roadbed interrupts surface flow to and from the channel. Grading and surface roughing will include adding micro- and macro-topography on the floodplain to create hydrologic retention and encourage species diversification. The surface depressions will be generally linear and approximately parallel the channel. Many of the surface depressions will be irregular to increase edge habitat. Combined with the proposed stream restoration these actions will result in a sufficiently high water table and flood frequency to support hydrophytic vegetation and wetland hydrology, resulting in restored riverine wetlands.

The primary restoration activities will include constructing a stream channel that floods the adjacent wetlands frequently (as described above) and construction of ditch plugs. A typical ditch plug will be 15 feet wide and extend above the ditch bank elevation approximately six inches. Plugs are to be constructed of compacted fill (clay or sandy clay) in 12 inch lifts with the upper 18 inches minimally compacted to facilitate plant growth. Plugs are spaced such that successive plugs are no more than 12 inches in elevation below the next plug up gradient. Where plugs may impact adjacent ditches (outside of the proposed conservation easement) the top of plug elevation will be equal to the existing ditch invert outside of the easement to prevent hydrologic trespass. The existing stream channel will be partially filled. The unfilled areas will provide deeper pools for increased storage and create diverse habitat. The farm road adjacent to the existing stream will be removed, graded to match surrounding contours, disced, and planted.

7.2.2.2 Proposed Wetland Hydrology

The Muddy Run II Stream and Wetland Mitigation site was once a Coastal Plain small stream swamp subject to prolonged inundation as indicated by soils mapping, historical aerial photography, and personal communication with landowners. Both proposed wetland restoration areas were historically cleared and the streams channelized prior to 1958 based upon the historical NRCS aerial photography. Based upon similar landscape position the project site was likely a Coastal Plain small stream swamp.

The restoration plan for the Muddy Run II wetlands consists of reconstructing the stream channel with a higher bed elevation and plugging existing drainage ditches. The ditch plugs will lengthen wetland hydroperiods by halting artificial subsurface drainage and preventing rapid surface drainage. The stream design parameters will reconnect the stream to the floodplain and provide seasonal overbank flows. These periodic flows will provide surface and subsurface hydrology support to the newly created Coastal Plain small stream swamp system. This periodic flooding is vital to sustain plants and wildlife characteristic of riverine wetlands (Ainslie, 2002).

The drainage area for the upstream portion of the project for Wetland A is approximately 0.90 square miles and for Wetland B 1.90 square miles. The restored wetlands will have a variable flooding regime due to the small size of the drainage area. Modeling of the stream design indicates that a 2.8 inch six-hour rainfall event will produce an out-of-bank flow. Analysis of daily rainfall totals indicates that a 2.29 inch or greater daily rainfall total occurs on average two times per year. **Chart 4** presents a chart of the historic rainfall data and corresponding number of out of bank events expected with current design parameters. The wetland restoration areas should experience seasonal out of bank flooding on average 1.17 times per year. The anticipated flood events range from zero to four events per year. This periodic flooding is vital to sustain plants and wildlife characteristic of riverine wetlands (Ainslie, 2002). In the absence of inundation, groundwater levels should remain near the surface due to reduced artificial drainage, increased infiltration, and elevated stream bed elevation.

The use of historic rainfall and stream modeling to estimate flood events demonstrates that the wetland restoration area will be subject to inundation and function as a riverine wetland system. However, limitations with the rainfall data set did not allow for statistically rigorous analysis of flooding depth or return interval. Supplemental to the above discussion a conventional water balance was performed.

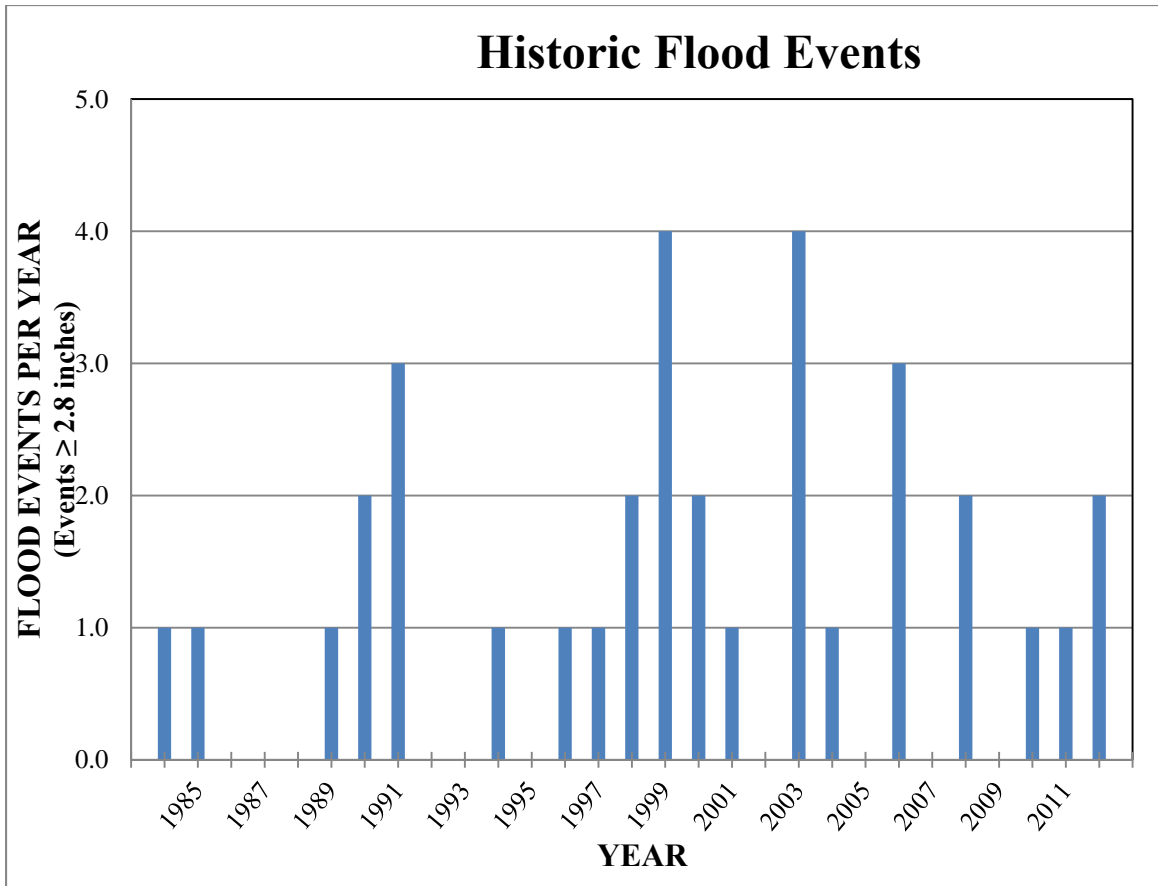


Chart 4. Historic rainfall events sufficient to produce overbank flow in restored stream

7.2.2.3 Soils

Hydric soils within the proposed wetlands were verified through auger borings by a licensed soil scientist (**Appendix B**). The majority of the soil map units are Rains with two mapped as Goldsboro. The stream channel bed will be raised, reconnecting the floodplain with seasonal out-of-bank flows. Raising the stream bed will also lessen the “dry shoulder” effect near the stream channel. BMPs will treat stormwater flows from offsite ditches prior to entering the wetlands. A preliminary assessment of hydrologic trespass was performed on the site. It appears that the adjacent agricultural fields are topographically elevated sufficient to provide drainage onto the floodplain without impacting existing drainage. Restoration activities will include:

- Reconnecting low lying areas of hydric soil with the floodplain through stream restoration;
- Plugging/filling agricultural drainage ditches to raise the seasonal groundwater elevations;
- Planting native tree and shrub species commonly found in small stream swamp ecosystems;
- and
- Creating a rough soil surface to aid in infiltration and storage by ripping and discing.

These hydrology restoration activities will result in an elevated seasonal high water table, increased flood frequency and duration, and increased precipitation infiltration across all of the restored wetlands.

It is estimated that riverine wetland restoration will be 4.92 acres. Minor grading along the restored channels is proposed to remove fill excavated from channel dredging. No fill is proposed beyond plugging previously excavated channels and ditches. Soils in the wetland restoration area will be tested for fertility, and soil amendments may be specified as needed. These wetlands expand habitat along the easement and provide habitat diversity. Once constructed, these wetlands will be monitored to document the success of hydrologic and vegetative restoration.

Wetland WA

Hydrology will be restored by removing dredge material along the channel and ditch, plugging the ditch, and raising the streambed elevation to bring the water table closer to the ground surface.

Wetland WB

Hydrology will be restored by removing dredge material along the channel and raising the streambed elevation, bringing the water table closer to the ground surface.

7.2.3 Natural Plant Community Restoration

7.2.3.1 Plant Community Restoration

The restoration of the plant communities is an important aspect to the restoration of the site. The selection of plants is based on what was observed at the reference reach, species present in the forest surrounding the restoration site, and what is typically native to the area. Several sources of information were used to determine the most appropriate species for the restoration project. The reference stream is located within a disturbed Coastal Plain Small Stream Swamp – Blackwater subtype. Dominant species included sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), swamp tupelo (*Nyssa biflora*), and red maple (*Acer rubrum*) in the canopy. Shrubs included sweetbay (*Magnolia virginiana*), American holly (*Ilex opaca*). The absence of bald cypress (*Taxodium distichum*) likely indicates past logging with poor regeneration at the site. The reference site was chosen due to the stability of the channel, the physical structure of the forest community, and to evaluate stream habitat. The species present are indicative of early successional species that have high dispersal rates. The mitigation site also supports many species typical of this community type due to its past disturbance history. Timber management is likely responsible for the absence of cypress. Typically, a Coastal Plain Small Stream Swamp would be located along the stream banks and adjacent floodplain of the proposed restoration site.

The restoration site has a relatively uniform topography. Based on observations of the reference community and the communities surrounding the mitigation site, a single riparian and wetland community is appropriate. Three planting zones will be utilized. The zones vary slightly in species composition and percentage to ensure appropriate species are planted for the expected hydrologic regime. The variation more closely mimics the natural range seen in this community type. Therefore, Coastal Plain Small Stream Swamp will be the target community type and will be used for all areas within the project, as well as for buffer around the site. The plant species list has been developed and can be found in **Table 19**. The high dispersal species include red maple, tulip poplar, and sweetgum. Species with high dispersal rates are not included because of local occurrence and the high potential for natural regeneration. It is anticipated that a local seed source for these species is present and they will disperse across much of the mitigation site. Because many of these high dispersal species often become aggressive in these sites, they are not included in the planting list.

The restoration of plant communities along Muddy Run II will provide stabilization and diversity. For rapid stabilization of the stream banks (primarily outside meanders), silky dogwood, silky willow,

and black willow were chosen for live stakes along the restored channel because of their rapid growth patterns and high success rates. Willows will also be quicker to contribute organic matter to the channel. Willows grow at a faster rate than the species planted around them and stabilize the stream banks. When the other species are bigger, the black willow and silky willows will slowly stop growing or die out because the other species would outgrow them and create shade that the willows do not tolerate. The live stake species will be planted along the outside of the meander bends three feet from the top of bank, creating a three-foot section along the top of bank. The live stakes will be spaced one per linear foot with alternate spacing vertically. See **Appendix D** for a detailed planting plan. A second planting zone will utilize species common in wetter conditions will be specified in the shallow pools and wettest portions of the wetland and in the Headwater Wetlands. The Headwater Wetlands will be approximately 15 feet wide and trees will be planted on an alternating diamond grid.

Table 19. Proposed Plant List

Bare Root Planting Tree Species - Riparian Areas			
Common Name	Scientific Name	Wetland Indicator*	Percent Composition
River birch	<i>Betula nigra</i>	FACW	10%
Green ash	<i>Fraxinus pennsylvanica</i>	FACW	10%
Swamp tupelo	<i>Nyssa biflora</i>	OBL	5%
Laurel oak	<i>Quercus laurifolia</i>	FACW	20%
Overcup oak	<i>Quercus lyrata</i>	OBL	20%
Swamp chestnut oak	<i>Quercus michauxii</i>	FACW	10%
Water oak	<i>Quercus nigra</i>	FAC	5%
American sycamore	<i>Platanus occidentalis</i>	FACW	10%
Bald cypress	<i>Taxodium distichum</i>	OBL	10%

Bare Root Planting Tree Species - Wetland Areas			
Common Name	Scientific Name	Wetland Indicator*	Percent Composition
River birch	<i>Betula nigra</i>	FACW	15%
Green ash	<i>Fraxinus pennsylvanica</i>	FACW	20%
Swamp tupelo	<i>Nyssa biflora</i>	OBL	10%
Laurel oak	<i>Quercus laurifolia</i>	FACW	15%
Overcup oak	<i>Quercus lyrata</i>	OBL	20%
Bald cypress	<i>Taxodium distichum</i>	OBL	20%

Bare Root Planting Tree Species - Wetland Depressions			
Common Name	Scientific Name	Wetland Indicator*	Percent Composition
Green ash	<i>Fraxinus pennsylvanica</i>	FACW	20%
Swamp tupelo	<i>Nyssa biflora</i>	OBL	20%
Laurel oak	<i>Quercus laurifolia</i>	FACW	20%
Overcup oak	<i>Quercus lyrata</i>	OBL	20%
Bald cypress	<i>Taxodium distichum</i>	OBL	20%

Planting density approximately 680 bare root stems per acre.

Planted on a diamond grid to limit preferential linear flow.

Live Staking and Live Cuttings Bundle Tree Species			
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Common Name	Scientific Name	Wetland Indicator*	Percent Composition
Silky dogwood	<i>Cornus amomum</i>	FACW	45%
Silky willow	<i>Salix sericea</i>	OBL	45%
Black willow	<i>Salix nigra</i>	OBL	10%

*National Wetland Indicator Status from Draft Rating 2012-Atlantic Gulf Coastal Plain.

7.2.3.2 On-Site Invasive Species Management

Some invasive species have been noted on the site. They include Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera sempervirens*). These invasive species are common but not limited to any confined location. The movement of topsoil will also stir up weed seeds, but most will be inhibited by the raising of the water table on the site. It will be important during monitoring site visits to check for any significant encroachment of invasive species and to develop a plan of action to control any such problem.

7.2.4 Best Management Practices

Due to the rural nature of this project, individual stormwater best management practices (BMPs) will not be required. However, diffuse flow structures will be applied at locations where ditches or other forms of concentrated flow enter the conservation easement. Under existing conditions, concentrated runoff (untreated) from adjacent sprayfields enters the project channels through a network of ditches. By diffusing flow through the buffer, the runoff will be treated by proposed buffer vegetation. These structures will consist of a pool (forebay) located just outside the conservation easement that will attenuate runoff combined with grading and stabilization techniques that will diffuse flow upon entering the buffer. All diffuse flow structures will be installed within the conservation easement so that landowners will not have access to the structures. Failure or maintenance of the structures is not anticipated as these structures will be installed in low-gradient areas, and the areas proposed to diffuse flow will be well vegetated and matted.

Stormwater management issues resulting from future development of adjacent properties will be governed by the applicable state and local ordinances and regulation. It is recommended that any future stormwater entering the site maintain pre-development peak flow. Any future stormwater diverted into the project should be done in a manner as to prevent erosion, adverse conditions, or degradation of the project in any way.

7.2.5 Soil Restoration

After construction activities, the subsoil will be scarified and any compaction will be deep tilled before the topsoil is placed back over the site. Any topsoil that is removed during construction will be stockpiled and placed over the site during final soil preparation. This process should provide favorable soil conditions for plant growth.

7.3 Data Analysis

7.3.1 Stream Data Analysis

7.3.1.1 Stream Hydrologic Analysis

Hydrologic evaluations were performed for the design reaches using multiple methods to determine and validate the design bankfull discharge and channel geometry required to provide regular floodplain inundation. The use of various methods allows for comparison of results and eliminates

reliance on a single model. Peak flows (**Table 20**) and corresponding channel cross-sectional areas were determined for comparison to design parameters using the following methods:

- Regional Flood Frequency Analysis,
- Intellisolve's Hydraflow Express Hydrographs,
- NC and VA/MD Regional Curves for the Coastal Plain, and
- USGS regional regression equations for rural conditions in the Coastal Plain, and

Regional Flood Frequency Analysis

A flood frequency analysis was completed for the study region using historic gauge data on all nearby USGS gauges with drainage areas less than 6,400 acres (10 mi²) which passed the Dalrymple homogeneity test (Dalrymple, 1960). This is a subset of gauges used for USGS regression equations. Regional flood frequency equations were developed for the 1.1-, 1.5-, and 2-year peak discharges based on the gauge data. Discharges were then computed for the design reach. These discharges were compared to those predicted by the discharge regional curve and USGS regional regression 2-year discharge equations.

Intellisolve's Hydraflow Express Hydrographs

Hydraflow Express was used to simulate the rainfall-runoff process and establish peak flows for the watersheds. This model was chosen over the U.S. Army Corps of Engineers model HEC-1 because it allows the user to adjust the peak shape factor for the Coastal Plain conditions. Using a standard Type III distribution in HEC-1, the model will use a 284 peak shape factor, which is the outdated standard for a coastal environment. This results in conservatively high peak flows that may not be appropriate for a stream restoration design. NRCS staff has recommended using peak shape factors between 60 and 100 for the Coastal Plain. Hydraflow Express allows the user to make this adjustment to the peak shape factor.

Regional Curve Regression Equations

The North Carolina Coastal Plain regional curves by Doll et al (2003) and Sweet and Geratz (2003) and the Virginia/Maryland (Krstolic et al., 2007) Coastal Plain regional curves for discharge were used to predict the bankfull discharge for the site. The NC regional curves predicted flows that are similar to those predicted by the 1.1-year flood frequency, while the VA/MD curves are comparable to flows predicted by the 1.5-year flood frequency equation. The regional curve equations for NC discharges by Doll et al. (2003) (1) and Sweet and Geratz (2003) (2) and VA/MD (3) discharges are:

- | | | |
|-----|----------------------------------|--------------------------|
| (1) | $Q_{bkf}=16.56*(DA)^{0.72}$ | (Doll et al., 2003) |
| (2) | $Q_{bkf}=8.49*(DA)^{0.76}$ | (Sweet and Geratz, 2003) |
| (3) | $Q_{bkf}=28.3076*(DA)^{0.59834}$ | (Krstolic et al., 2007) |

Where Q_{bkf} =bankfull discharge (ft³/s) and DA=drainage area (mi²).

USGS Regional Regression Equations

USGS regression equations estimate the magnitude and frequency of flood-peak discharges (Gotvald, et al., 2009). The regression equations were developed from gauge data in different physiographic regions of the Southeastern United States. For this analysis, there was only concern for the 2-year return interval. The equation for the rural Coastal Plain (Hydrologic Region 4) is:

- | | |
|-----|-------------------------|
| (4) | $Q_2=60.3*(DA)^{0.649}$ |
|-----|-------------------------|

Table 20. Peak Flow Comparison

Reach	Drainage Area (Ac)	Hydraflow Hydrographs Q ₁	FFQ Q _{1.1}	FFQ Q _{1.5}	NC Regional Curve Q (1)	NC Regional Curve Q (2)	VA/MD Regional Curve Q (3)	Regional Regression Eqns. Q ₂	Design/Calculated Q
Analog	285	---	11	23	9	5	18	36	13
1	68	---	3	7	3	2	7	14	3
2	114	7	4	11	5	2	10	20	7
3a	227	14	9	20	8	4	17	26	15
3b	333	20	12	25	10	5	18	38	10*
3c	370	25	14	18	11	6	20	42	NA
4	46	3	2	5	2	1	6	11	5
5a	730	54	28	48	18	10	31	66	44
5b	908	65	33	56	21	11	34	75	NA
6	77	3	3	8	4	2	8	15	NA

* Design discharge is based on the installation of a split flow structure at the downstream end of Reach 3a as analyzed with EPA SWMM.

The fact that the regional curves predict flows similar to the 1.1-year flood frequency analysis indicates that the bankfull flows occur in the region with a frequency of approximately once a year. The developers of the NC Coastal Plain regional curves report an average recurrence interval of 1.12 years for the gauged streams included in their study.

7.3.1.2 Channel Stability and Sediment Transport Analysis

An erosion and sedimentation analysis was performed to confirm that the restoration design creates a stable sand bed channel that neither aggrades nor degrades over time. Typically, sediment transport is assessed to determine a stream's ability to move a specific grain size at specified flows. Various sediment transport equations may be easily applied when estimating entrainment for gravel bed streams; however, these equations are not as effectively applied to sand bed channels where the entire bed becomes mobile during geomorphically significant flows. Therefore, more sophisticated modeling techniques were used to analyze the stream design for this project. The following methods and functions were utilized during the sediment transport analysis:

- Stable Channel Design Function – Copeland Method (HEC-RAS),
- Shear Stress, and
- Velocity.

Stable Channel Design

Design cross-section dimensions as determined from the analog approach were evaluated using the stable channel design functions within HEC-RAS. These functions are based upon the methods presented in the SAM Hydraulic Design Package for Channels developed by the USACE Waterways Experiment Station. The Copeland Method was developed specifically for sand bed channels (median grain size restriction of 0.0625 mm to 2 mm) and was selected for application at Muddy Run II. The method sizes stable dimensions as a function of slope, discharge, roughness, side slope, bed material gradation, and the inflowing sediment discharge. Results are presented as a range of widths and

slopes, and their unique solution for depth, making it easy to adjust channel dimensions to achieve stable channel configurations. The stable design output parameters are listed in **Table 21**. The results are acceptable and match closely with the design reach parameters.

Table 21. Stable Channel Design Output

Reach	Q (ft/s ³)	Bottom Width (ft)	Depth (ft)	Energy Slope (ft/ft)	Composite n value	Velocity (ft/s)	Shear Stress (lbs/ft ²)
2	7	3	1	0.0017	0.041	1.22	0.12
3a (U/S)	14	4	1.2	0.0026	0.039	1.66	0.17
3a (D/S)	16	5	1.6	0.0005	0.039	0.95	0.05
3b	10	4	1.2	0.0014	0.041	1.24	0.11
4	5	3	0.8	0.005	0.035	1.78	0.18
5a	44	6	1.9	0.0013	0.040	1.87	0.20

Shear Stress Approach

Shear stress is a commonly used tool for assessing channel stability. Allowable channel shear stresses are a function of bed slope, channel shape, flows, bed material (shape, size, and gradation), cohesiveness of bank materials, and vegetative cover. The shear stress approach compares calculated shear stresses to those found in the literature. Shear stress is the force exerted on a boundary during the resistance of motion as calculated using the following formula:

(1) $\tau = \gamma RS$
 τ = shear stress (lb/ft²)
 γ = specific gravity of water (62.4 lb/ft³)
 R = hydraulic radius (ft)
 S = average channel slope (ft/ft)

Table 22. Comparison of Allowable and Proposed Shear Stresses

Reach	Proposed Shear Stress at Bankfull Stage (lbs/ft ²)	Critical Shear Stress (lbs/ft ²)	Allowable Shear Stress ¹	
			Sand/Silt/Clay (lbs/ft ²)	Vegetation (lbs/ft ²)
2	0.07	>0.003	0.03 to 0.26	0.2 to 0.95
3a (U/S)	0.15	>0.003	0.03 to 0.26	0.2 to 0.95
3a (D/S)	0.04	>0.003	0.03 to 0.26	0.2 to 0.95
3b	0.08	>0.003	0.03 to 0.26	0.2 to 0.95
4	0.15	>0.003	0.03 to 0.26	0.2 to 0.95
5a	0.08	>0.003	0.03 to 0.26	0.2 to 0.95

¹(Fischenich, 2001)

Review of the above table shows that the proposed shear stresses for the Muddy Run II design reaches fall between the critical shear stress (shear stress required to initiate motion) and the allowable limits. Therefore, the proposed channel should remain stable.

Velocity Approach

Published data are readily available that provide entrainment velocities for different bed and bank materials. A comparison of calculated velocities to these permissible velocities is a simple method to aid in the verification of channel stability. **Table 22** compares the proposed velocities calculated

using Manning’s equation with the permissible velocities presented in the Stream Restoration Design Handbook (NRCS, 2007).

Table 22. Comparison of Allowable and Proposed Velocities

Reach	Manning’s “n” value	Design Velocity (ft/s)	Allowable Velocity ¹ (ft/s)	
			Fine Sand	Coarse Sand
2	0.045	1.2	2.0	4.0
3a (U/S)	0.045	1.7	2.0	4.0
3a (D/S)	0.045	0.9	2.0	4.0
3b	0.045	1.3	2.0	4.0
4	0.045	1.6	2.0	4.0
5a	0.045	1.4	2.0	4.0

¹(NRCS, 2007)

Sediment Supply

In addition to the stability assessment, a qualitative analysis of sediment supply was performed by characterizing watershed conditions. A combination of field reconnaissance and windshield surveys, existing land use data, and historical aerial photography were analyzed to assess existing and past watershed conditions and to determine if any changes occurred that would significantly impact sediment supply. As discussed in Section 2.2.3, the land use throughout the site and watershed has changed little since 1949; and current land use is composed of approximately 47% forest cover, 38% cultivated land, 6% residential and 15% a mix of clear cut, CAFOs and pasture. Since 1949, there have been two significant land disturbing events. One occurred between 1965 and 1987, when forested areas near Reaches 3c and 5a were cleared and converted to agricultural land. The other event occurred after 2010 when the forested area adjacent to Reach 3a and Wetland 1 was clear cut. Overall, the project watershed is stable, is largely forested and all developed areas are located along the edges of the watershed boundary. Land use has remained relatively constant within this rural watershed, and significant land disturbing activities are not anticipated for the future.

A large percentage of the cultivated areas are located in the middle and lower portions of the project watershed, adjacent to Reaches 3a and 5a. Observations and assessments of these reaches show no signs of aggradation or degradation and that the streams are physically stable. Much of the headwaters (Reaches 1 and 2) of the project area are a mix of forest and cultivation, where most of the forested areas are found adjacent to and/or upstream of these reaches. These headwater reaches along with Reaches 3c, 5b, and 6 also show no signs of aggradation or degradation. All of the existing streams appear to be physically stable and show little to no signs of deposition, indicating that the reaches are able to effectively transport the sediment supplied by their respective watersheds. It is anticipated that sediment supply will decrease as buffers are enhanced and widened, and flow from existing agricultural ditches will be diffused before entering the proposed channel. Since sand bed streams are mobile and therefore more sensitive to changes in flow and sediment regimes, a design approach has been used where the proposed channel is designed to maintain geometry and handle stresses slightly greater than what will be applied under the design conditions. Additionally, grade controls have been integrated throughout the design to provide vertical stability.

7.3.1.3 Hydraulic Analyses

Hydraulic evaluations were performed for the design reaches, the NC HWY 41 culvert, and the proposed diversion structure on Reach 3a. These analyses were performed to confirm that the restoration designs will convey the design discharge, provide more frequent overbank flooding, and that significant structures will perform as designed.

HEC-RAS Analysis

A hydraulic analysis was performed to confirm that the restoration design results in a channel that will convey the design discharge and provide for frequent flooding of the adjacent riparian floodplain and wetlands. Channel characteristics including cross-sectional dimension, slope, and roughness, were used to analyze and adjust design parameters calculated by the analog/reference reach approach.

HEC-RAS was used to perform the hydraulic analysis. This model is a hydraulic model developed by the US Army Corps of Engineers’ Hydrologic Engineering Center to perform one-dimensional (1-D) steady and unsteady flow calculations. The model uses representative geometric data (cross-sections) and hydraulic computation routines.

Design cross-sectional dimensions determined through the analog/reference reach approach were evaluated using the 1-D steady flow analysis component and the channel design functions within the HEC-RAS Model (Version 4.0.0). The cross-sectional dimensions for reaches 2, 3a, 3b, and 5a were iteratively adjusted based on the model results to produce a channel design that will regularly flood the adjacent riparian areas. Model results are presented in **Appendix C**. The results are organized by reach, discharge, and STA number and include water surface elevation, velocity, flow area, stream power, and shear stress.

Flow Diversion Structure

EPA SWMM was used to analyze flows and to model a diversion structure to be installed at the break between Reaches 3a and 3b. EPA SWMM is a model that simulates the rainfall-runoff process and evaluates the hydraulic capacity of storm water and river systems. It was selected due to its ability to model a system of open channels, to model in-stream structures, and to account for routing effects of the channel and overbank storage areas.

The proposed structure will convey 100 percent of baseflow and small storms to Reach 3b and to subsequent downstream project reaches. Higher flows, approximately 70 percent of flows greater than the 10-year storm event, will be diverted to the north and away from the project along the existing flowpath of Reach 3a. See **Table 23** for model results of the split flow analysis. Details of the flow diversion structure are provided in **Appendix D**.

Table 24. Split Flow Analysis Results

Flow Path	2-yr Flow (cfs)	10-yr Flow (cfs)	25-yr Flow Goldsboro (cfs)	100-yr Flow (cfs)
North (overflow)	16	76	120	253
West (Reach 3b)	14	37	54	78
West (% of total Flow)	47%	33%	31%	24%

NC HWY 41 Culvert

The NC HWY 41 crossing was modeled to verify that the culvert would function as designed given the increase in drainage due to restoring flow to the historic drainage path along Reach 3b, an increase from 583 (0.9 sqmi) acres to 889 acres (1.4 sqmi). HY-8, a hydraulic culvert analysis and design model distributed by the FHWA, was used to analyze and model proposed flows at the NC HWY 41 crossing.

The NC HWY 41 culvert hydraulic design report/analysis was obtained from the NCDOT Sampson/Duplin County Bridge Maintenance group. Analysis of the report shows that a drainage area of 1.4 mi² was used to design the culvert. This drainage area matches the total proposed drainage area

for the Muddy Run II project as delineated on the Chinquapin, NC USGS 7.5-minute quadrangle; therefore, the existing culvert appears to be sized to handle flows from the proposed project.

To confirm that the existing culvert will be able to handle project flows, HY-8 was used to model the proposed flows generated from USGS regional regression equations for the rural Coastal Plain. The NCDOT design storm for primary roads is the 50-year flow. Model results show that the culvert capacity exceeds the USGS regional regression 50-year flow of 446 cfs, and the proposed 100-year flow (accounts for high flows leaving system at proposed diversion structure) does not overtop NC HWY 41. The NC HWY 41 culvert hydraulic design report and results from the culvert analysis and are provided in **Appendix C**.

7.3.2 Wetland Data Analysis

7.3.2.1 Wetland Hydrologic Analysis

In general, hydrology of a small stream swamp wetland system is derived from seasonal or temporary overbank flooding of the adjacent stream channel and seasonal high water table elevation controlled by the stream water surface elevation. Many resources describe the duration and frequency of flooding as highly inconsistent. As described by Schafale and Weakley (1990), small stream swamp systems have highly variable flow regimes with floods of short duration and periods of very low flow; however, smaller watersheds lead to a more variable flooding regime. Additionally, the influence of channel overbank flow may vary seasonally to yearly in magnitude, duration, and frequency (WRP Technical Note HY-EV-2.1, 1993). It may be anticipated that the majority of flooding of riverine wetlands occurs during the winter months and the early portions of the growing season. Surface water of riverine wetlands may be present for extended periods during the growing season and usually greater than 14 consecutive days, but is typically absent by the end of the growing season in most typical years (EPA, 2006). Field indicators of surface inundation include water-stained leaves, drift lines and water marks on trees (EPA, 2006). In the absence of surface water, the water table is often near the ground elevation.

Due to the direct relationship between stream flow and riverine wetland hydrology, the proposed stream was designed to provide periodic overbank flow within the bounds of the proposed wetland. Because of the expected inconsistent frequency of flooding, an analysis of hydrologic input was performed to determine the ability of the smaller local watershed to sustain a positive water balance at the proposed wetland restoration sites.

7.3.2.2 Wetland Water Balance

Runoff from the local watershed will also provide hydrologic input and will provide the opportunity for nutrient and pollutant removal in these wetlands. The proposed wetland restoration consists of two sites; one is located adjacent to the restoration Reach 3b, and the other is located adjacent to Reach 5. To determine the general input to each proposed wetland from their local watershed in terms of providing significant hydrology that is needed to sustain saturated conditions, a general water balance analysis was performed.

In order to determine suitable hydrology for the proposed Wetland Creation/Enhancement Coastal Plain Small Stream Swamp, existing hydrologic conditions were evaluated through a water balance analysis. This water balance is a model for water depths and potential drawdown for the proposed wetland construction and is used to determine the net hydrologic input to each proposed wetland. A watershed approach was applied, and the methods outlined in *Planning hydrology for constructed wetlands* (Pierce, 1993) were followed.

The water balance presented in this report was determined from the following equation:

$$S = P + R - ET - I.$$

Where S is storage, P is precipitation, R is runoff, ET is evapotranspiration, and I is infiltration (Pierce, 1993). All values were calculated in acre inches per month. A positive storage indicates the groundwater is expected to be within 12 inches of the surface. It is expected that regular occurrences of overbank flooding will provide significant hydrologic input into these wetlands that is not shown in these water balance calculations. The design allows for areas of ponding and inundation, but stream elevations and site drainage prevent the ponding from being greater than 12 inches. The maximum storage is limited because of the drainage, and the equation does not account for these losses, nor allow monthly carryover of storage because it starts over each month. This type of water balance estimates the months where a positive storage supports the proposed wetland hydrology. Each component of the water balance was determined by the following criteria.

Precipitation

Daily precipitation data and temperature data from the Warsaw (COOP) weather station has been compiled for a 28-year period of record from January 1, 1984 through September 31, 2012 (The North Carolina State Climatologist <http://www.nc-climate.ncsu.edu/>; Attachment A). The Warsaw Station was used, as it is the closest station to the site with a large portion of the records available. Data was unavailable for a total of 18 months throughout the 330 months of record, primarily before 1996. Average monthly precipitation values were then calculated from these data and applied to the water balance calculations.

Precipitation only calculates runoff from the small local watershed to the wetland restoration. The larger drainage area encompassed by the adjacent channel is not evaluated, but will contribute overbank flows to provide additional input to wetland hydrology.

Evapotranspiration

A long-term record of weather data for the area is missing or not collected. Daily precipitation and temperature data from the Warsaw (COOP) weather station has been compiled for a 28-year period of record from January 1, 1984 through September 31, 2012 (The North Carolina State Climatologist <http://www.nc-climate.ncsu.edu/>). An alternative estimate for Evapotranspiration was calculated based on daily temperatures using a method defined by Richard Allen, et al. (2006).

$$ET_o = 0.0023(T_{mean} + 17.8) (T_{max} - T_{min})^{0.5} R_a$$

Where;

ET_o	reference crop evapotranspiration [mm day-1]
T_{mean}	daily mean air temperature [°C]
T_{max}	daily maximum air temperature [°C]
T_{min}	daily minimum air temperature [°C]
R_a	extraterrestrial radiation [MJ m ⁻² day ⁻¹]

Values of R_a for different latitudes are given in a table provided by the authors, where values “deviate from values that are averaged over each day of the month by less than one percent for all latitudes during non-frozen periods ...”

Runoff Calculations

Runoff onto the wetland creation/enhancement site was determined using the TR-55 Curve Number Method as described by Pierce 1993. This was done by first determining the amount of rainfall

required over a 24-hour period to produce runoff (Q) for the drainage area. Q is measured in inches of rainfall. The drainage area was delineated using 7.5 Minute USGS topographic quadrangle for Drake, North Carolina (**Figure 2**).

The value of Q for the drainage area was then subtracted from daily precipitation values over the period of record. Those days that returned positive values (i.e. runoff occurred) were then summed to return the total amount of runoff (R) produced within the watershed area. The equation for calculating runoff is as follows:

$$Q = \frac{(P_{24} - 0.2S)^2}{(P_{24} + 0.8S)}$$
$$S = \left(\frac{1000}{CN}\right) - 10$$

Where P_{24} is the maximum rainfall occurring in a 24-hour period (over the period of record), CN is the composite curve number, and S is the storage capacity of the soil. A composite curve was calculated by subdividing the watershed with respect to soil hydrologic group and land use, then determining the appropriate curve number for each subdivision using tables published by the USDA (1986). The area and curve number were multiplied, summed and divided by the total watershed area to calculate the composite curve number as described below.

$$CN = \frac{\sum(CN * SubdividedArea)}{(WatershedArea)}$$

By this method, the composite curve number for the proposed wetland creation/enhancement site was 81.1.

P_{24}

A 24-hour rainfall record was determined using precipitation data. The maximum climatological-day precipitation over the 27-year period of record, excluding tropical storms, occurred on June 6, 1994, with 6.6 inches of rainfall. No rainfall was recorded on June 5 or June 7, 1994 and therefore the maximum adjacent-climatological-day precipitation is 6.6 inches.

$$P_{24} = (max. climatological-day P) + .5(max. adjacent-climatological-day P)$$

$$P_{24} = (6.6 in) + 0.5(0.0 in)$$

$$P_{24} = 6.6 in$$

Runoff

$$Q = \frac{(P_{24} - 0.2S)^2}{(P_{24} + 0.8S)}$$

$$S = \left(\frac{1000}{CN}\right) - 10$$

$$Q = \frac{\left[P_{24} - 0.2 \left(\left(\frac{1000}{CN} \right) - 10 \right) \right]^2}{\left[P_{24} + 0.8 \left(\left(\frac{1000}{CN} \right) - 10 \right) \right]}$$

$$Q = \frac{\left[6.6in - 0.2 \left(\left(\frac{1000}{81.1} \right) - 10 \right) \right]^2}{\left[6.6in + 0.8 \left(\left(\frac{1000}{81.1} \right) - 10 \right) \right]}$$

Q = 2.33

Using this value, the runoff produced by each rain event was calculated by subtracting the *minimum 24-hour rainfall amount needed to produce runoff (Q)* from the amount of *precipitation (P)* on each day. Those events that return positive values (i.e. runoff occurred) are then summed to return the amount of *runoff (R)* produced by each acre in the watershed. These values are then averaged by month for the entire period to give the average monthly runoff for the watershed. Once runoff values were calculated for the drainage area, it was necessary to adjust these values to reflect the amount of water seen on the site as follows:

$$R = (\text{Watershed Runoff}) * (\text{Watershed Area}) / (\text{Site Area})$$

Runoff for each wetland is summarized in **Appendix C**.

Infiltration

The proposed wetland creation/enhancement area is mapped as Rains and Goldsboro soil. Soil boring in these areas indicates the soil is closer to Rains. The Rains mapping unit is poorly drained and has loamy surface underlain by clayey subsoil found in lower landscape positions. The Goldsboro mapping unit is moderately well drained and has loamy surface underlain by clayey subsoil found in higher landscape positions.

Infiltration into the soil on the site was based upon the permeability range (0.0 to 0.05 in/hr) indicated for hydrologic soil group D soils (USDA 1986). During months where the seasonal high water table is above 12 inches, the infiltration was assumed to be negligible and was set to zero. The Rains soil typically has a seasonal high water table from December through April ranging from zero to 12 inches in depth. Infiltration is calculated by converting permeability from centimeters per second (cm/sec) to inches per month (in/mo). Infiltration is expected to be low or near zero during these months, and was set at zero for the water balance Calculation.

Hydrograph

The calculated data has been compiled and a hydrograph has been plotted illustrating the monthly average flow of water in and out of the proposed wetland construction area (Chart 5). These values are represented in acre-inches. Results of this analysis indicate that there is a period of drawdown during the months of April until November. These results also indicate that runoff and direct precipitation will, in average years, provide adequate wetland hydrology during the early part of the growing season in the wetland restoration area.

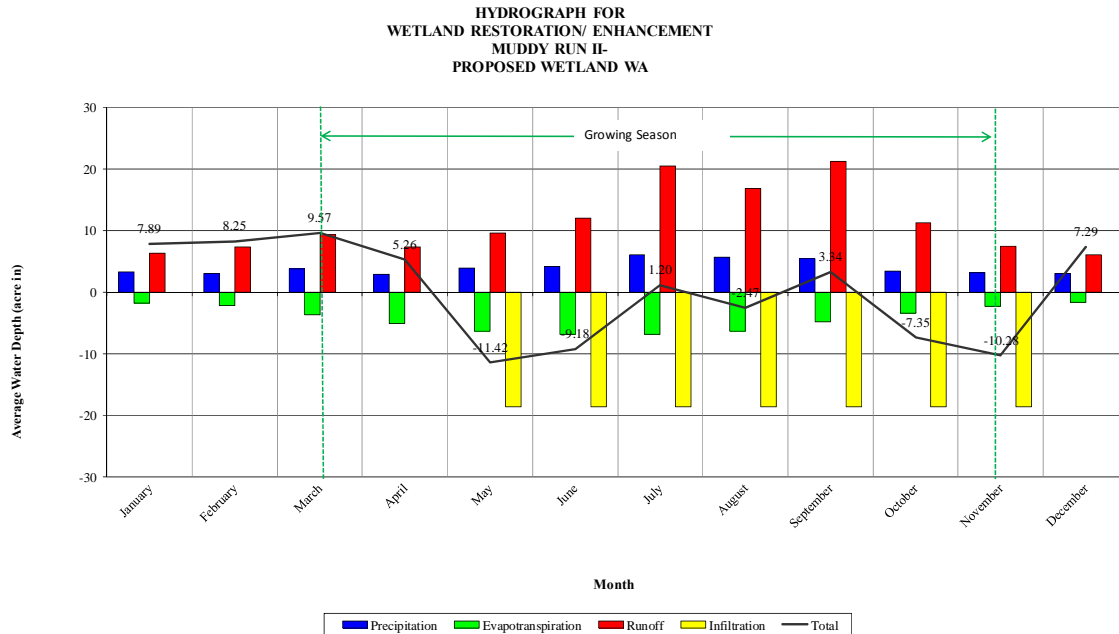


Chart 5. Wetland restoration hydrograph

Conclusions

This water balance analysis was conducted to evaluate the existing hydrology of the proposed wetland restoration area and to determine if the proposed wetland design is appropriate for this site. The modeling presented in this report indicates that there is sufficient hydrology at appropriate times of the year to support wetland vegetation.

Field observations indicate that existing conditions of the proposed wetland restoration area include hydric soils and proximity to the floodplain. These observations suggest that overbank flows from the restored stream channel will play a significant role in overall site hydrology. However, without more detailed data with regards to the fluctuating groundwater table, this information is unreliable and also unpredictable. Therefore, conducting a water balance analysis assures a minimum water source to the site. Based upon the channel design, it is expected that regular occurrences of overbank flooding will provide significant hydrologic input into these wetlands that is not shown in these water balance calculations.

7.4 Mitigation Summary

Natural channel design techniques have been used to develop the restoration designs described in this document. The combination of the analog and analytical design methods was determined to be appropriate for this project because the watershed is rural, the causes of disturbance are known and have been abated, and there are minimal infrastructure constraints. The original design parameters were developed from the measured analog/reference reach data and applied to the subject stream. The parameters were then analyzed and adjusted through an iterative process using analytical tools and numerical simulations of fluvial processes. The designs presented in this report provide for the restoration of natural Coastal Plain sand-bed channel features and stream bed diversity to improve benthic habitat. The proposed design will allow flows that exceed the design bankfull stage to spread out over the floodplain, restoring a portion of the hydrology for the existing wetlands.

A large portion of the existing stream will be filled using material excavated from the restoration channel and from the farm path built adjacent to the channel. However, many segments will be left

partially filled to provide habitat diversity and flood storage. Native woody material will be installed throughout the restored reach to reduce bank stress, provide grade control, and increase habitat diversity.

Forested riparian buffers of at least fifty feet on both sides of the channel will be established along the project reach. An appropriate riparian plant community, a Coastal Plain Small Stream Swamp – Blackwater subtype community, will be established to include a diverse mix of species. Three zones will be used depending upon expected hydrologic conditions. Replanting of native species will occur where the existing buffer is impacted during construction.

Reductions in nutrients and other pollutants will be achieved with the buffer restoration work, providing substantial benefits to the watershed. The proposed Muddy Run II Mitigation Site is an expansion of the ongoing Muddy Run mitigation project. This proposed restoration is hydrologically connected. Wetlands WA and WB are proposed adjacent to the stream restoration of the Muddy Run II Mitigation Site. A water balance analysis indicates that adequate hydrology will be present.

8 MAINTENANCE PLAN

EBX 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 chinking of in-stream structures to prevent piping, 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.
Wetland	Routine wetland maintenance and repair activities may include securing of loose coir matting and supplemental installations of live stakes and other target vegetation within the wetland. Areas where stormwater and floodplain flows intercept the wetland may also require maintenance to prevent scour.
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.
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.

9 PERFORMANCE STANDARDS

The success criteria for the Muddy Run II Site stream restoration will follow accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines and subsequent NCEEP and agency guidance. Specific success criteria components are presented below.

9.1 Stream Restoration Success Criteria

9.1.1 Bankfull Events

Two bankfull flow events must be documented within the seven-year monitoring period. The two bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years.

9.1.2 Cross Sections

There should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion), or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross-sections shall be classified using the Rosgen stream classification method, and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

9.1.2.1 Digital Image Stations

Digital images will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

9.2 Wetland Success Criteria

The NRCS does not have a current WETs table for Duplin County upon which to base a normal rainfall amount and average growing season. The closest comparable data was determined to be from Sampson County. The growing season for Sampson County is 242 days long, extending from March 17 to November 14, and is based on a daily minimum temperature greater than 28 degrees Fahrenheit occurring in five of ten years.

Because of the surface roughing and shallow depressions, a range of hydroperiods are expected. The water balance indicates that the site will have a positive water balance in the early part of the growing season for four to five weeks, on average. The hydrology success criterion for the site is to restore the water table at the site so that it will remain continuously within 12 inches of the soil surface for at least nine percent of the growing season (approximately 22 days) at each groundwater gauge location during normal rainfall years. Overbank flooding events will provide additional inputs that may extend the hydroperiod in some years.

Gauge data will be compared to reference wetland well data in growing seasons with less than normal rainfall. In periods of low rainfall, if a restoration gauge hydroperiod exceeds the reference gauge hydroperiod, and both exceed five percent of the growing season, then the gauge will be deemed

successful. If a gauge location fails to meet these success criteria in the five year monitoring period, then monitoring may be extended, remedial actions may be undertaken, or the limits of wetland restoration will be determined.

9.3 Vegetation Success Criteria

Specific and measurable success criteria for plant density within the riparian buffers on the site will follow NCEEP Guidance. Vegetation monitoring plots will be a minimum of 0.02 acres in size, and cover a minimum of two percent of the planted area. Vegetation monitoring will occur annually in the fall of each year. The interim measures of vegetative success for the site will be the survival of at least 320 three-year old trees per acre at the end of Year 3, 260 five-year old trees at the end of Year 5, and the final vegetative success criteria will be 210 trees per acre at the end of Year 7.

9.4 Scheduling/Reporting

A mitigation plan and as-built drawings documenting stream restoration activities will be developed within 60 days of the planting completion on the mitigation site. The report will include all information required by NCEEP mitigation plan guidelines, including elevations, photographs and sampling plot locations, gauge locations, and a description of initial species composition by community type. The report will also include a list of the species planted and the associated densities. Baseline vegetation monitoring will follow CVS-NCEEP Protocol for Recording Vegetation Version 4.0. Level 1 and Level 2 monitoring will be conducted. The baseline report will follow Baseline Monitoring Report Template and Guidance version 2.0 (10/14/10).

The monitoring program will be implemented to document system development and progress toward achieving the success criteria. The restored stream morphology will be assessed to determine the success of the mitigation. The monitoring program will be undertaken for five years or until the final success criteria are achieved, whichever is longer.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCEEP. The monitoring reports will include all information, and be in the format required by NCEEP in Version 2.0 of the NCEEP Monitoring Report Template.

10 MONITORING REQUIREMENTS

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. The success criteria for the Muddy Run II Site stream mitigation will follow current accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines, NCEEP requirements, and subsequent agency guidance. Specific success criteria components are presented in **Table 25**. Monitoring reports will be prepared annually and submitted to EEP.

Table 25. Monitoring Requirements

Required	Parameter	Quantity	Frequency	Notes
	Pattern	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline	Additional surveys will be performed if monitoring indicates instability or significant channel migration
	Dimension	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline, Years 1,2,3,5, and 7	Surveyed cross sections and bank pins
	Profile	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Baseline	Additional surveys will be performed if monitoring indicates instability
	Surface Water Hydrology	As per April 2003 USACE Wilmington District Stream Mitigation Guidelines	Annual	Crest Gauges and/or Pressure Transducers will be installed on site; the devices will be inspected on a quarterly/semi-annual basis to document the occurrence of bankfull events on the project
	Groundwater Hydrology		Annual	Groundwater monitoring gauges with data recording devices will be installed on site; the data will be downloaded on a quarterly basis during the growing season
	Vegetation		Annual	Vegetation will be monitored using the Carolina Vegetation Survey (CVS) protocols
	Exotic and Nuisance Vegetation		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
	Stream Visual		Annual	Semi-annual visual assessments
	Wetland Visual		Annual	Semi-annual visual assessments

10.1 As-Built Survey

An as-built survey will be conducted following construction to document channel size, condition, and location. The survey will include a complete profile of Thalweg, water surface, bankfull, and top of bank to compare with future geomorphic data. Longitudinal profiles will not be required in annual monitoring reports unless requested by NCEP or USACE. Stream channel stationing will be marked with stakes placed near the top of bank every 100 feet.

10.2 Visual Monitoring

Visual monitoring of all mitigation areas will be conducted a minimum of twice per monitoring year by qualified individuals. The visual assessments will include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of stream stability will include a complete streamwalk and structure inspection. Digital images will be taken at fixed representative locations to record each monitoring event as well as any noted problem areas or areas of concern. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. Photographs will be used to subjectively evaluate channel aggradation or

degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos should indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the banks over time. A series of photos over time should indicate successional maturation of riparian vegetation.

10.3 Cross Sections

Permanent cross-sections will be installed at a minimum of one per 20 bankfull widths with half in pools and half in shallows. All cross-section measurements will include bank height ratio and entrenchment ratio. Cross-sections will be monitored annually. There should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent movement toward a less stable condition (for example down-cutting or erosion), or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Bank height ratio shall not exceed 1.2, and the entrenchment ratio shall be no less than 2.2 within restored reaches. Channel stability should be demonstrated through a minimum of two bankfull events documented in the seven-year monitoring period.

10.4 Bank Pin Arrays

Bank pin arrays will be used as a supplemental method to monitor erosion on selected meander bends where there is not a cross section. Bank pin arrays will be installed along the outer bend and upstream third and downstream third of the meander. Bank pins will be installed just above the water surface and every two feet above the lowest pin. Bank pin exposure will be recorded at each monitoring event, and the exposed pin will be driven flush with the bank.

10.5 Surface Flow

Headwater valley restoration areas will be monitored to document intermittent or seasonal surface flow. This will be accomplished through direct observation, photo documentation of dye tests, and surface flow gauges.

10.6 Wetland Hydrology

Wetland hydrology will be monitored to document hydric conditions in the wetland restoration areas. This will be accomplished with automatic recording pressure transducer gauges installed in representative locations across the restoration areas and reference wetland. The gauges will be downloaded quarterly and wetland hydroperiods will be calculated during the growing season. Gauge installation will follow current regulatory and EEP guidance. Visual observations of primary and secondary wetland hydrology indicators will also be recorded during quarterly site visits.

10.7 Vegetative Success Criteria

Vegetative monitoring success criteria for plant density within the riparian buffers on the site will follow NCEEP Guidance dated 7 November 2011. Vegetation monitoring plots will be a minimum of 0.02 acres in size, and cover a minimum of two percent of the planted area. The following data will be recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. Monitoring will occur each year during the monitoring period. The interim measures of vegetative success for the site will be the survival of at least 320 3-year old trees per acre at the end of Year 3 and 260 5-year old trees per acre at the end of Year 5. The final vegetative success criteria will be the survival of 210 trees per acre at the end of Year 7 of the monitoring period.

Invasive and noxious species will be monitored and controlled so that none become dominant or alter the desired community structure of the site. If necessary, EBX will develop a species-specific control plan.

10.8 Remedial Actions

The Mitigation Plan will include a detailed adaptive management plan that will address how potential problems are resolved. In the event that the site, or a specific component of the site, fails to achieve the defined success criteria, EBX will develop necessary adaptive management plans and/or implement appropriate remedial actions for the site in coordination with NCEEP and the review agencies. Remedial action required will be designed to achieve the success criteria specified previously, and will include identification of the causes of failure, remedial design approach, work schedule, and monitoring criteria that will take into account physical and climatic conditions.

11 LONG-TERM MANAGEMENT PLAN

Upon approval for closeout by the Interagency Review Team (IRT), the site will be transferred to the State of North Carolina (State). The State 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.

The NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program currently houses EEP stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statute GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

12 ADAPTIVE MANAGEMENT PLAN

Upon completion of site construction, EEP 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 that 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.

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APPENDIX A

Site Protection Instrument

Conservation Easement Deeds
Draft Plats

wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-150

Being all of that certain parcel of land containing approximately 1/4 acre and being conveyed to Grantor by deed as recorded in **Deed Book 1738 at Page 701** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions therein.

Tract 2: Tax Parcel Map Identification Number: 08-149

Being all of that certain parcel of land containing approximately 22-6/10 acres and being conveyed to Grantor by deed as recorded in **Deed Book 1738 at Page 701** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions contained therein.

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

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

**STATE OF NORTH CAROLINA
DUPLIN COUNTY**

SPO File Number: 31-P

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 ___ day of 2013, by EBX-NEUSE I, LLC, a Maryland Limited Liability Company who has a PLACE OF BUSINESS at 518 Plaza Blvd., Kinston, NC 28501 ("**Grantor**"), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606,** and the North Carolina Department of Environment and Natural Resources, to provide stream,

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 **Muddy Run, NCEEP Project # 95354**.

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:

AREA 1: being 2.163 acres, more or less.
AREA 2: being 0.944 acres, more or less.

AND BEING that same area of land containing 3.107 acres, more or less, consisting of **Area 1, being 2.163 acres, more or less, and Area 2, being 0.944 acres, more or less**, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX NEUSE PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #95354, NCEEP RFP #16-004101, NCEEP PROJECT #31-P, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**.

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, 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 ACTIVITIES

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 subterranean 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, Grantor has caused this instrument to be signed by its Manager by all authority given, the day and year first set out above.

EBX-NEUSE I, LLC

BY: _____
Ely J. Perry, III, Manager

NORTH CAROLINA

COUNTY OF

I, _____, a Notary Public for said County and State, do hereby certify that _____ personally appeared before me this day and acknowledged that he is _____ of EBX-Neuse I, LLC, a Maryland Limited Liability Company, and that by authority duly given, he signed the forgoing instrument in its name and its behalf as its act and deed.

Witness my hand and official seal, this the ____ day of _____, 2012.

Notary Public

My Commission Expires: _____

EXHIBIT A

TO CONSERVATION EASEMENT DEED BETWEEN EBX-NEUSE I, LLC Grantor, AND the STATE OF NORTH CAROLINA, Grantee, dated _____, 20____.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING at an iron stake designated as Easement Corner #138 on the below referenced plat, from that point of beginning N 83 deg. 15' 07" E 166.99 feet to an iron stake designated as Easement Corner #141 on said plat; thence N 61 deg. 35' 16" E 210.84 feet to an iron stake designated as Easement Corner #142 on said plat; thence N 12 deg. 28' 29" W 238.66 feet to an iron stake designated as Easement Corner #143 on said plat; thence N 23 deg. 41' 42" E 102.73 feet to an iron stake designated as Easement Corner #144 on said plat; thence N 37 deg. 25' 51" E 98.24 feet to an iron stake designated as Easement Corner #150 on said plat; thence N 88 deg. 45' 31" E 45.73 feet to a point designated as Easement Corner #151 on said plat; thence S 80 deg. 04' 37" E 26.58 feet to a corner designated as Easement Corner #152 on said plat; thence S 07 deg. 27' 39" E 165.44 feet to an iron stake designated as Easement Corner #149 on said plat; thence S 25 deg. 37' 33" W 18.73 feet to an iron stake designated as Easement Corner #148 on said plat; thence S 12 deg. 21' 25" E 201.48 feet to an iron stake designated as Easement Corner #147 on said plat; thence S 14 deg. 23' 01" W 93.94 feet to an iron stake designated as Easement Corner #146 on said plat; thence S 49 deg. 14' 23" W 137.25 feet to an iron stake designated as Easement Corner #145 on said plat; thence S 64 deg. 13' 58" W 73.56 feet to a control corner designated as Easement Corner #140 on said plat; thence N 76 deg. 34' 12" W 103.65 feet to an existing concrete monument and control corner designated as Easement Corner #139 on said plat; thence N 76 deg. 53' 41" W 197.11 feet to an iron stake designated as Easement Corner #138 on said plat, being the same point of beginning, and consisting of 2.163 acres, more or less, and being the same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX NEUSE PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING at a corner designated as Easement Corner #159 on the below referenced plat, said corner being S 80 deg. 04' 37" E 5.26 feet; thence S 49' 50" E 10.77 feet; thence S 41 deg. 37' 17" E 8.02 feet; and thence S 39 deg. 36' 32" E 12.62 feet from Easement Corner #152, being the same Easement Corner #152 in the description of Area 1 above, from that point of beginning along the ditch S 39 deg. 36' 32" E 197.85 feet to a corner designated as Easement Corner #160 on said plat; thence continuing along the ditch N 79 deg. 54' 13" E 123.37 feet to a point designated as Easement Corner #161 on said plat; thence N 77 deg. 55' 29" E 75.60 feet to an iron stake designated as Easement Corner #165 on said plat; thence N 77 deg. 55' 29" E 39.15

feet to an existing iron stake and control corner designated as Easement Corner #166 on said plat; thence along the property line of Michael C. Lanier S 22 deg. 31' 04" E 100.02 feet to an existing iron stake designated as Easement Corner #154 on said plat; thence along the property line of Colie S. Jenkins S 22 deg. 31' 16" E 84.35 feet to a corner designated as Easement Corner #155 on said plat; thence N 78 deg. 34' 15" W 242.62 feet to an iron stake designated as Easement Corner #156 on said plat; thence N 61 deg. 56' 31" 154.08 feet to an iron stake designated as Easement Corner #157 on said plat; thence N 52 deg. 46' 45" 88.11 feet to an iron stake designated as Easement Corner #158 on said plat; thence N 07 deg. 27' 39" E 104.14 feet to a corner designated as Easement Corner #159 on said plat, being the same point of beginning, and consisting of 0.944 acres, more or less, and being the same Area 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX NEUSE PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Padertick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

**STATE OF NORTH CAROLINA
DUPLIN COUNTY**

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

SPO File Number:

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 ____ day of _____, 2013, by **JOHNNY ADRAIN FUTREAL**, also known as, Johnny A. Futreal, and wife, **TERRY ROSE FUTREAL**, also known as Terry R. Futreal, of P.O. Box 91, Harkers Island, NC 28531 ("**Grantor**"), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606**, 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 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-647

Being all of that certain parcel of land containing approximately 60.270 acres and being conveyed to Grantor by deed as recorded in **Deed Book 1055 at Page 204** of the Duplin County Registry, North Carolina. Property description contained in the above referenced deed is herein incorporated by reference.

Tract 2: Tax Parcel Map Identification Number: 08-646

Being all of that certain parcel of land containing approximately 19.150 acres and being conveyed to Grantor by deed as recorded in **Deed Book 1142 at Page 501** of the Duplin County Registry, North Carolina. Property description contained in the above referenced deed is herein incorporated by reference.

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 **Muddy Run, NCEEP Project # _____**.

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:

That area of land containing **11.018 acres**, more or less, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE FUTREAL PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE # 31-N, NCEEP RF#16-004101, NCEEP PROJECT # _____, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book _____, Page _____. Reference to said map is hereby made for a more perfect and accurate description.

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, 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 ACTIVITIES

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 subterranean 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 any 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 Grantor's hand and seal, the day and year first above written.

Johnny Adrain Futreal (SEAL)

Terry Rose Futreal (SEAL)

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that **JOHNNY ADRAIN FUTREAL** and wife, **TERRY ROSE FUTREAL**, 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 _____ day of _____, 2013.

Notary Public

My commission expires: _____

EXHIBIT A
TO CONSERVATION EASEMENT DEED BETWEEN JOHNNY ADRAIN
FUTREAL and wife, TERRY ROSE FUTREAL, Grantor, AND THE STATE OF NORTH
CAROLINA, Grantee, dated the ___ day of _____, 2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING along a ditch at an iron stake in a southwestern corner designated as Easement Corner #197 on the below referenced plat, from that point of beginning N 39°57'32" W 201.55 feet to an iron stake designated as Easement Corner #198 on said plat; thence N 33°16'39" W 232.75 feet to an iron stake designated as Easement Corner #199 on said plat; thence N 32°06'16" W 53.46 feet to an iron stake designated as Easement Corner #200 on said plat; thence S 68°20'11" W 185.34 feet to an iron stake designated as Easement Corner #201 on said plat; thence N 22°29'45" W 709.16 feet to an existing iron stake designated as Easement Corner #175 on said plat; thence N 70°07'25" E 36.73 feet to an iron stake designated as Easement Corner #176 on said plat; thence S 47°00'04" E 166.76 feet to an iron stake designated as Easement Corner #177 on said plat; thence S 89°20'17" E 56.11 feet to a control corner designated as Easement Corner #178 on said plat; thence S 63°29'37" E 166.50 to an iron stake designated as Easement Corner #179 on said plat; thence S 39°10'08" E 63.30 feet to an iron stake designated as Easement Corner #180 on said plat; thence N 83°40'03" E 57.41 feet to an iron stake designated as Easement Corner #181 on said plat; thence N 67°14'56" E 38.46 feet to an iron stake designated as Easement Corner #182 on said plat; thence N 61°51'55" E 58.96 feet to an iron stake designated as Easement Corner #183 on said plat; thence N 78°09'42" E 79.71 feet to an iron stake designated as Easement Corner #184 on said plat; thence S 47°50'03" E 25.28 feet to an iron stake designated as Easement Corner #185 on said plat; thence S 30°50'33" E 55.46 feet to an iron stake designated as Easement Corner #186 on said plat; thence S 17°49'55" W 51.61 feet to an iron stake designated as Easement Corner #187 on said plat; thence S 38°53'07" W 39.18 feet to an iron stake designated as Easement Corner #188 on said plat; thence S 47°10'47" W 63.86 feet to an iron stake designated as Easement Corner #189 on said plat; thence S 03°56'43" E 95.81 feet to an iron stake designated as Easement Corner #190 on said plat; thence S 39°56'59" E 50.57 feet to an iron stake designated as Easement Corner #191 on said plat; thence S 35°24'04" E 67.09 feet to an iron stake designated as Easement Corner #192 on said plat; thence S 45°28'50" W 54.79 feet to an iron stake designated as Easement Corner #193 on said plat; thence S 34°40'21" E 124.30 feet to an iron stake designated as Easement Corner #194 on said plat; thence S 31°10'44" E 98.69 feet to an iron stake designated as Easement Corner #195 on said plat; thence S 43°25'16" E 165.32 feet to an iron stake designated as Easement Corner #196 on said plat; thence S 52°25'34" W 163.02 feet from an iron point designated as Easement Corner #197, being the same point of beginning, containing 6.616 acres, more or less, and being that same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JOHNNY A. FUTREAL PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE # 31-N, NCEEP RFP#16-004101, NCEEP PROJECT # _____, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013,

NCEEP PROJECT # _____, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book _____, Page _____. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING along a ditch at an iron stake designated as Easement Corner #211 on the below referenced plat, said corner being S 43°17'32" E 35.5 feet from iron stake designated as Easement Corner #196 on said plat and being the same Easement Corner #196 in the description of Area 1 above, from that point of beginning S 36°47'25" E 111.41 feet to an iron stake designated as Easement Corner #212 on said plat; thence S 41°39'00" E 111.13 feet to an iron stake designated as Easement Corner #213 on said plat; thence S 33°11'39" E 106.44 feet to an iron stake designated as Easement Corner #214 on said plat; thence S 69°15'48" E 46.22 feet to an iron stake designated as Easement Corner #215 on said plat; thence S 64°21'17" E 100.51 feet to an iron stake designated as Easement Corner #216 on said plat; thence S 04°52'02" W 56.75 feet to an iron stake designated as Easement Corner #217 on said plat; thence S 36°19'25" E 63.69 feet to an iron stake designated as Easement Corner #218 on said plat; thence S 69°11'10" W 78.99 feet to an iron stake designated as Easement Corner #219 on said plat; thence S 08°14'37" E 31.35 feet to an iron stake designated as Easement Corner #220 on said plat; thence S 12°32'10" E 211.33 feet to an iron stake designated as Easement Corner #221 on said plat; thence S 22°58'44" E 26.39 feet to an iron stake designated as Easement Corner #222 on said plat; thence S 86°02'27" E 125.93 feet to an iron stake designated as Easement Corner #223 on said plat; thence S 87°55'45" E 108.97 feet to a point designated as Easement Corner #227 on said plat; thence S 35°55'43" E 11.04 feet to a point designated as Easement Corner #226 on said plat; thence S 37°23'07" E 275.43 feet to a control corner designated as Easement Corner #225 on said plat; thence S 74°09'03" W 61.22 feet to a point designated as Easement Corner #224 on said plat; thence N 46°48'56" W 14.56 feet to an iron stake designated as Easement Corner #202 on said plat; thence N 37°52'39" W 113.27 feet to an iron stake designated as Easement Corner #203 on said plat; thence N 88°37'58" W 214.56 feet to an iron stake designated as Easement Corner #204 on said plat; thence N 80°14'22" W 159.57 feet to an iron stake designated as Easement Corner #205 on said plat; thence N 19°27'29" W 178.64 feet to an iron stake designated as Easement Corner #206 on said plat; thence N 18°14'17" W 115.15 feet to an iron stake designated as Easement Corner #207 on said plat; thence N 01°58'46" W 111.21 feet to an iron stake designated as Easement Corner #208 on said plat; thence N 35°18'21" W 191.34 feet to an iron stake designated as Easement Corner #209 on said plat; thence N 34°31'27" W 122.57 feet to an iron stake designated as Easement Corner #210 on said plat; thence N 40°30'35" W 144.12 feet to an iron stake designated as Easement Corner #211, being the same point of beginning, consisting of 4.402 acres, more or less, and being the same Area 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE FUTREAL PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE # 31-N, NCEEP RFP#16-004101, NCEEP PROJECT # _____, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013,

by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book ____, Page _____. Reference to said map is hereby made for a more perfect and accurate description.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT

SPO File Number: 31-S
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 ____ day of 2013, by THOMAS J. HOLLAND, also known as, TOM HOLLAND, and wife, KAY D. HOLLAND, also known as, KAY DAIL HOLLAND, of P.O. Box 174, Chinquapin, NC 28521 (“**Grantor**”), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606**, 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 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-1882

Being all of that certain parcel of land containing approximately 11.05 acres and being conveyed to Grantor by deed as recorded in **Deed Book 960 at Page 757** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions contained therein.

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 **Muddy Run, NCEEP Project # 95354**.

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:

AREA 1: Being 0.559 acres, more or less.

AREA 2: Being 1.273 acres, more or less.

That area of land containing **1.832 acres, more or less, consisting of AREA 1, being 0.559 acres, more or less, and AREA 2, being 1.273 acres, more or less, being the same Areas 1 and 2** as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE HOLLAND PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-S; NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**.

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, 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 ACTIVITIES

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 Grantor. 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-transferable.

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 subterranean 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 uncorrected 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 Grantor's hand and seal, the day and year first above written.

Thomas J. Holland
(SEAL)

Kay D. Holland
(SEAL)

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that THOMAS J. HOLLAND, also known as TOM HOLLAND, and wife, KAY D. HOLLAND, also known as KAY DAIL HOLLAND, 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 _____ day of _____, 20____.

Notary Public

My commission expires:

EXHIBIT A

TO CONSERVATION EASEMENT DEED BETWEEN THOMAS J. HOLLAND and wife, KAY D. HOLLAND, Grantor, AND THE STATE OF NORTH CAROLINA, Grantee, dated _____, 20_____.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING at a southern point designated as Easement Corner #123 on the below referenced plat, from that point of beginning N 53 deg. 37' 25" W 141.61 feet to an existing iron pipe and control corner designated as Easement Corner #122 on said plat; thence S 71 deg. 37' 20" W 2.96 feet to a corner designated as Easement Corner #121 on said plat; thence N 04 deg. 49' 36" E 111.01 feet to an iron stake designated as Easement Corner #124 on said plat; thence N 19 deg. 48' 53" E 155.41 feet to an iron stake designated as Easement Corner #125 on said plat; thence S 76 deg. 20' 09" E 124.40 feet to an iron stake designated as Easement Corner #128 on said plat; thence S 21 deg. 03' 03" W 49.50 feet to an iron stake designated as Easement Corner #127 on said plat; thence S 14 deg. 20' 49" W 150.83 feet to an iron stake designated as Easement Corner #126 on said plat; thence S 07 deg. 42' 38" W 18.70 feet to a corner designated as Easement Corner #123 on said plat, being the same point of beginning, and consisting of 0.559 acres, more or less, and being the same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE HOLLAND PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-S, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING at an iron stake designated as Easement Corner #133 on the below referenced plat, said corner being N 19 deg. 48' 53" E 30.17 feet from Easement Corner #125, being the same Easement Corner #125 in the description of Area 1 above, from that point of beginning N 19 deg. 48' 53" E 21.57 feet to an iron stake designated as Easement Corner #301 on said plat; thence N 18 deg. 48' 02 E 116.31 feet to an iron stake designated as Easement Corner #134 on said plat; thence N 21 deg. 34' 09" E 117.58 feet to an iron stake designated as Easement Corner #135 on said plat; thence S 76 deg. 36' 16" 49.16 feet to an iron stake designated as Easement Corner #136 on said plat; thence N 11 deg. 42' 11" E 7.58 feet to an iron stake designated as Easement Corner #137 on said plat; thence S 76 deg. 53' 41" E 286.84 feet to an existing concrete monument designated as Easement Corner #139 on said plat; thence S 01 deg. 40' 32" E 57.79 feet to a corner designated as Easement Corner #130 on said plat; thence S 83 deg. 01' 24" W 255.17 feet to an iron stake designated as Easement Corner #131 on said plat; thence S 21 deg. 22' 07" W 119.76 feet to an iron stake designated as Easement Corner #132 on said plat; thence N 76 deg. 20' 09" W 125.06 feet to an iron stake designated as Easement Corner #133 on said plat, being the same point of beginning, and consisting of 1.273 acres, more or less, and being the same Area 2 designated as (2) as shown on plat

of survey entitled "CONSERVATION EASEMENT SURVEY OF THE HOLLAND PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-S, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-1890

Being all of that certain parcel of land containing approximately 13.5 acres and being conveyed to Grantor by deed as recorded in **Deed Book 1738 at Page 704** of the Duplin County Registry, North Carolina, corrected in Deed of Correction registered in Book 1740, Page 0088, Duplin County Registry. Property description contained in the above referenced deeds is herein incorporated by reference.

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 **Muddy Run, NCEEP Project # 95354**.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

**STATE OF NORTH CAROLINA
DUPLIN COUNTY**

SPO File Number: 31-P
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 ___ day of 2013, by EBX-NEUSE I, LLC, a Maryland Limited Liability Company who has a place of business at 518 Plaza Blvd., Kinston, NC 28501 ("**Grantor**"), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606,** and the North Carolina Department of Environment and Natural Resources, to provide stream,

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:

AREA 1: 0.824 acres, more or less.
AREA 2: 0.252 acres, more or less.

AND BEING that area of land containing **1.076 acres, more or less, consisting of Area 1, being 0.824 acres, more or less, and Area 2, consisting of 0.252 acres, more or less,** as shown on the plats of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JENKINS PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

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, 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 Grantor against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

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 Grantor. 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-transferable.

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 subterranean 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 uncorrected 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.

Remainder of Page Intentionally Left Blank

IN TESTIMONY WHEREOF, Grantor has caused this instrument to be signed by its Manager by all authority given, the day and year first set out above.

EBX-NEUSE I, LLC

BY: _____
Ely J. Perry, III, Manager

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public for said County and State, do hereby certify that _____ personally appeared before me this day and acknowledged that he is _____ of EBX-Neuse I, LLC, a Maryland Limited Liability Company, and that by authority duly given, he signed the foregoing instrument in its name and its behalf as its act and deed.

Witness my hand and official seal, this the ____ day of _____, 2013.

Notary Public

My Commission Expires: _____

EXHIBIT A

TO CONSERVATION EASEMENT DEED BETWEEN EBX-NEUSE I, LLC Grantor, AND the STATE OF NORTH CAROLINA, Grantee, dated _____, 20____.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING at a point along the boundary line of Edith B. Hill and husband Rommie O. Hill, being a western point designated as Easement Corner #155 on the below referenced plat, from that point of beginning along the Hill boundary line N 22 deg. 31' 16" W 84.35 feet to an existing iron stake and control corner designated as Easement Corner #154 on said plat; thence N 70 deg. 58' 59" E 308.92 feet to a corner designated as Easement Corner #169 on said plat; thence S 09 deg. 36' 16" E 150.61 feet to an iron stake designated as Easement Corner #170 on said plat; thence S 81 deg. 51' 28" W 256.52 feet to an iron stake designated as Easement Corner #171 on said plat; thence N 78 deg. 34' 15" W 31.57 feet to a corner designated as Easement Corner #155, being the same point of beginning, and consisting of 0.824 acres, more or less, and being the same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JENKINS PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING at an iron stake designated as Easement Corner #172 on the below referenced plat, said corner being N 70 deg. 58' 59" E 308.92 feet from Easement Corner #169, being the same Easement Corner #169 in the description of Area 1 above, from that point of beginning N 70 deg. 58' 59" E 28.50 feet to an iron stake designated as Easement Corner #175 on said plat; thence S 22 deg. 29' 45" E 253.80 feet to an iron stake designated as Easement Corner #174 on said plat; thence N 60 deg. 15' 30" W 109.62 feet to an iron stake designated as Easement Corner #173 on said plat; thence N 09 deg. 35' 35" W 173.24 feet to an iron stake designated as Easement Corner #172 on said plat, and being the same point of beginning and consisting of 0.252 acres, more or less, and being the same Area 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JENKINS PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-147

Being all of that certain parcel of land designate on map registered in Map Book 26, Page 221, Duplin County Registry and being conveyed to Grantor by deed as recorded in **Deed Book 1725 at Page 307** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions therein.

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 **Muddy Run, NCEEP Project # 95354**.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

**STATE OF NORTH CAROLINA
DUPLIN COUNTY**

SPO File Number: 31-P
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 ___ day of 2013, by EBX-NEUSE I, LLC, a Maryland Limited Liability Company who has a place of business at 518 Plaza Blvd., Kinston, NC 28501 ("**Grantor**"), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606**, and the North Carolina Department of Environment and Natural Resources, to provide stream,

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:

AREA 1: Being 1.014 acres, more or less.
AREA 2: Being 0.076 acres, more or less.

AND BEING that area of land containing **1.090 acres, more or less, consisting of Area 1, being 1.014 acres, more or less, and Area 2, being 0.076 acres, more or less**, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX NEUSE PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**.

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, 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 ACTIVITIES

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-transferable.

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 subterranean 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 uncorrected 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, Grantor has caused this instrument to be signed by its Manager by all authority given, the day and year first set out above.

EBX-NEUSE I, LLC

BY: _____
Ely J. Perry, III, Manager

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public for said County and State, do hereby certify that _____ personally appeared before me this day and acknowledged that he is _____ of EBX-Neuse I, LLC, a Maryland Limited Liability Company, and that by authority duly given, he signed the foregoing instrument in its name and its behalf as its act and deed.

Witness my hand and official seal, this the ____ day of _____, 2013.

Notary Public

My Commission Expires: _____

EXHIBIT A

TO CONSERVATION EASEMENT DEED BETWEEN EBX-NEUSE I, LLC Grantor,
AND the STATE OF NORTH CAROLINA, Grantee, dated _____, 2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING at an existing iron pipe and control corner designated as Easement Corner #122 on the below referenced plat, from that point of beginning S 53 deg. 37' 25" E 71.41 feet to a corner designated as Easement Corner #123 on said plat; thence S 07 deg. 42' 38" 59.15 feet to an iron stake designated as Easement Corner #120 on said plat; thence S 03 deg. 53' 17" W 119.78 feet to an iron stake designated as Easement Corner #119 on said plat; thence S 02 deg. 23' 26" W 136.65 feet to an iron stake designated as Easement Corner #118 on said plat; thence N 82 deg. 56' 04" W 128.47 feet to an iron stake designated as Easement Corner #115 on said plat; thence N 01 deg. 31' 18" E 105.23 feet to an iron stake designated as Easement Corner #116 on said plat; thence N 06 deg. 33' 26" E 206.91 feet to an iron stake designated as Easement Corner #117 on said plat; thence N 04 deg. 49' 36" E 71.41 feet to a point designated as Easement Corner #121 on said plat; thence N 71 deg. 37' 20" E 2.96 feet to an existing iron pipe and control corner designated as Easement Corner #122, being the same point of beginning, and consisting of 1.014 acres, more or less, and being the same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX NEUSE PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING at an Easement Corner designated as Easement Corner #130 on the below referenced plat, said corner being S 53 deg. 37' 25" E 428.08 feet to an existing concrete monument and thence N 01 deg. 40' 32" W 665.42 feet from that corner designated as Easement Corner #123 in description of Area 1 above, thence from that point of beginning N 01 deg. 40' 32" W 57.79 feet to an existing concrete monument and control corner designated as Easement Corner #139 on said plat; thence S 76 deg. 34' 12" 103.65 feet to a corner designated as Easement Corner #140 on said plat; thence S 64 deg. 13' 58" 66.43 feet to an iron stake designated as Easement Corner #129 on said plat; thence S 83 deg. 01' 24" W 39.59 feet to a corner designated as Easement Corner #130 on said plat, being the same point of beginning, and consisting of 0.076 acres, more or less, and being the same Area 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX-NEUSE I, LLC PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____**

_____, Page _____. Reference to said map is hereby made for a more perfect and accurate description.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT

SPO File Number: 31-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 ____ day of 2013, MICHAEL C. LANIER and wife, GINA MICHELE EDWARDS LANIER, of 280 S NC HWY 111, Chinquapin, NC 28521 (“**Grantor**”), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606**, 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 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-1891

Being all of that certain parcel of land containing approximately 0.87 acres and being conveyed to Grantor by deed as recorded in **Deed Book** ___ at **Page** ___ of the Duplin County Registry, North Carolina. Property description contained in the above referenced deed is herein incorporated by reference.

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 **Muddy Run, NCEEP Project #** _____.

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:

That area of land containing **0.313 acres** as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JENKINS PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O FILE #31-U, NCEEP RFP #16-004101, NCEEP PROJECT #93554, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book Page** _____. Reference to said map in hereby made for a more perfect and accurate description.

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, 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 ACTIVITIES

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 subterranean 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 uncorrected 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.

IN TESTIMONY WHEREOF, Grantor has signed this instrument the day and year first set out above.

Michael C. Lanier
(SEAL)

Gina Michele Edwards Lanier
(SEAL)

STATE OF NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public of said County and State, do hereby certify that MICHAEL C. LANIER and wife, GINA MICHELE EDWARDS LANIER, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and notarial seal this ____ day of _____, 2012.

Notary Public

My Commission Expires: _____

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.

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EXHIBIT A

TO CONSERVATION EASEMENT DEED BETWEEN EBX-NEUSE I, LLC, Grantor,
AND the STATE OF NORTH CAROLINA, Grantee, dated _____, 2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

BEGINNING at an existing iron stake in a southwestern corner designated as Easement Corner #154 on the below referenced plat, from that point of beginning N 22° 31' 04" W 76.99 feet to a control corner designated as Easement Corner #167 on said plat; thence N 82° 47' 19" E 322.24 feet to a control corner designated as Easement Corner #168 on said plat; thence S 09° 36' 16" E 11.06 feet to a point designated as Easement Corner #169 on said plat; thence S 70° 58' 59" W 308.92 feet to a corner designated as Easement Corner #154, being the same point of beginning, and consisting of 0.313 acres, more or less, as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JENKINS PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O FILE #31-U, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book** _____, **Page** _____. Reference to said map in hereby made for a more perfect and accurate description.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT

SPO File Number: 31-Q
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 ____ day of _____, 2013, by JAMES A. RILEY, of 326 Ludie Brown Road, Chimquapin, North Carolina, 2852, acting as individual beneficiary and Executor under the will of Patricia Maready Riley ("Grantor"), 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 EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606, 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 003981 and dated June 27, 2011.

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 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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-1449

Being all of that certain parcel of land containing approximately 69-5/10 acres and being conveyed to Grantor through the will of Patricia Maready Riley, filed in Estate File No 13 E _____ in the office of the Duplin County Clerk of Court. Said property conveyed to Patricia Maready Riley via deed as recorded in **Deed Book 994, Page 62, Deed Book 1161, Page 158, and Deed Book 1218, Page 500, and said deeds being corrected in Deed Book _____, Page _____, Deed Book _____, and Deed Book _____, Page _____**, all of the Duplin County Registry, North Carolina. Property description in said deeds is hereby incorporated by reference.

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 **Muddy Run, NCEEP Project # _____**.

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:

Being the same Easement consisting of **5.210 acres**, more or less, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE PATRICIA M. RILEY PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-X, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2", and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

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, 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 ACTIVITIES

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-transferable.

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 subterranean 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 uncorrected 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 Grantor's hand and seal, the day and year first above written.

Patricia F. Maready Riley
(SEAL)

James A. Riley
(SEAL)

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that, JAMES A. RILEY, Grantor, as individual beneficiary as well as Executor under the will of Patricia Maready Riley, 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 _____ day of _____, 2013.

Notary Public

My commission expires:

EXHIBIT A
TO CONSERVATION EASEMENT DEED BETWEEN JAMES A RILEY, Grantor,
AND the STATE OF NORTH CAROLINA, Grantee, dated the ____ day of _____, 2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

BEGINNING at a southern point designated as Easement Corner #266 on the below referenced plat, from that point of beginning N 59 deg. 28' 24" W 16.83 feet to a point designated as Easement Corner #265 on said plat; thence N 75 deg. 05' 18" W 9.42 feet to a point designated as Easement Corner #264 on said plat; thence N 55 deg. 34' 22" W 11.32 feet to a point designated as Easement Corner #263 on said plat; thence N 66 deg. 18' 08" W 5.24 feet to a point designated as Easement Corner #262 on said plat; thence N 31 deg. 10' 52" W 5.95 feet to a point designated as Easement Corner #261 on said plat; thence N 32 deg. 31' 28" W 16.05 feet to a point designated as Easement Corner #260 on said plat; thence N 20 deg. 27' 59" W 81.24 feet to a point designated as Easement Corner #259 on said plat; thence N 19 deg. 34' 51" W 102.19 feet to a point designated as Easement Corner #258 on said plat; thence N 19 deg. 36' 07" W 56.13 feet to a point designated as Easement Corner #257 on said plat; thence N 18 deg. 13' 18" W 62.02 feet to a point designated as Easement Corner #256 on said plat; thence N 19 deg. 19' 43" W 64.80 feet to a control corner designated as Easement Corner #255 on said plat; thence N 57 deg. 15' 37" E 217.28 feet to a control corner designated as Easement Corner #254 on said plat; thence N 66 deg. 34' 36" E 65.74 feet to an iron stake designated as Easement Corner #300 on said plat; thence N 75 deg. 50' 15" E 100.74 feet to an iron stake designated as Easement Corner #299 on said plat; thence N 76 deg. 15' 03" E 156.59 feet to an iron stake designated as Easement Corner #298 on said plat; thence N 72 deg. 13' 02" E 181.25 feet to an iron stake designated as Easement Corner #297 on said plat; thence N 85 deg. 31' 58" E 76.84 feet to an iron stake designated as Easement Corner #296 on said plat; thence N 76 deg. 14' 26" E 124.69 feet to an iron stake designated as Easement Corner #295 on said plat; thence S 85 deg. 51' 28" E 77.56 feet to an iron stake designated as Easement Corner #294 on said plat; thence N 62 deg. 43' 19" E 57.02 feet to an iron stake designated as Easement Corner #293 on said plat; thence N 81 deg. 01' 21" E 142.87 feet to an iron stake designated as Easement Corner #292 on said plat; thence S 73 deg. 30' 03" E 150.49 feet to an iron stake designated as Easement Corner #291 on said plat; thence S 69 deg. 30' 44" E 84.17 feet to an iron stake designated as Easement Corner #290 on said plat; thence S 51 deg. 03' 12" E 88.83 feet to an iron stake designated as Easement Corner #289 on said plat; thence S 50 deg. 02' 06" E 193.73 feet to an iron stake designated as Easement Corner #288; thence S 79 deg. 30' 07" E 39.12 feet to an iron stake designated as Easement Corner #287 on said plat; thence S 05 deg. 14' 37" W 110.69 feet to an iron stake designated as Easement Corner #286 on said plat; thence S 66 deg. 57' 57" W 25.58 feet to an iron stake designated as Easement Corner #285 on said plat; thence N 85 deg. 21' 37" W 35.58 feet to an iron stake designated as Easement Corner #284 on said plat; thence N 54 deg. 11' 18" W 25.13 feet to an iron stake designated as Easement Corner #283 on said plat; thence N 54 deg. 43' 24" W 46.12

feet to an iron stake designated as Easement Corner #282 on said plat; thence N 49 deg. 23' 46" W 257.04 feet to an iron stake designated as Easement Corner #281 on said plat; thence N 76 deg. 35' 41" W 171.98 feet to an iron stake designated as Easement Corner #280 on said plat; thence S 71 deg. 38' 05" W 138.92 feet to an iron stake designated as Easement Corner #279 on said plat; thence S 89 deg. 34' 28" W 90.82 feet to an iron stake designated as Easement Corner #278 on said plat; thence S 79 deg. 41' 58" W 135.72 feet to an iron stake designated as Easement Corner #277 on said plat; thence S 73 deg. 55' 51" W 118.64 feet to an iron stake designated as Easement Corner #276 on said plat; thence S 74 deg. 45' 58" W 266.35 feet to an iron stake designated as Easement Corner #275 on said plat; thence S 76 deg. 40' 25" W 212.21 feet to an iron stake designated as Easement Corner #274 on said plat; thence S 66 deg. 45' 52" W 113.89 feet to an iron stake designated as Easement Corner #273 on said plat; thence S 88 deg. 56' 05" W 20.74 feet to an iron stake designated as Easement Corner #272 on said plat; thence S 01 deg. 32' 38" E 105.44 feet to an iron stake designated as Easement Corner #271 on said plat; thence S 22 deg. 51' 43" E 88.67 feet to an iron stake designated as Easement Corner #270 on said plat; thence S 45 deg. 34' 34" E 75.62 feet to an iron stake designated as Easement Corner #269 on said plat; thence S 70 deg. 28' 08" E 34.98 feet to an iron stake designated as Easement Corner #268 on said plat; thence S 49 deg. 09' 59" E 29.77 feet to an iron stake designated as Easement Corner #267 on said plat; thence S 33 deg. 27' 10" W 68.69 feet to a point designated as Easement Corner #266; being the same point of beginning, and consisting of 5.210 acres, more or less, and being that same 5.210 acres, more or less, as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE PATRICIA M. RILEY PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-X, NCEEP REP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-E052

Being all of that certain parcel of land designated as Lot No 1 on map registered in Map Book 10, Page 21, Duplin County Registry and being conveyed to Grantor by deed as recorded in **Deed Book 1737** at **Page 683** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions therein.

Tract 2: Tax Parcel Map Identification Number: 08-E053

Being all of that certain parcel of land designated as Lot No 2 on map registered in Map Book 10, Page 21, Duplin County Registry and being conveyed to Grantor by deed as recorded in **Deed Book 1737** at **Page 683** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions contained therein.

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

**STATE OF NORTH CAROLINA
DUPLIN COUNTY**

SPO File Number: 31-P

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 ___ day of 2013, by EBX-NEUSE I, LLC, a Maryland Limited Liability Company who has a place of business at 518 Plaza Blvd., Kinston, NC 28501 ("**Grantor**"), 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 **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606,** and the North Carolina Department of Environment and Natural Resources, to provide stream,

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 **Muddy Run, NCEEP Project # 95354**.

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:

AREA 1: Being 0.549 acres, more or less.
AREA 2: Being 0.003 acres, more or less.

AND BEING that area of land containing **0.552 acres, more or less, consisting of Area 1, being 0.549 acres, more or less, and Area 2, being 0.003 acres, more or less**, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX-NEUSE I, LLC PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**.

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, 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 ACTIVITIES

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 subterranean 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, Grantor has caused this instrument to be signed by its Manager by all authority given, the day and year first set out above.

EBX-NEUSE I, LLC

BY: _____
Ely J. Perry, III, Manager

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public for said County and State, do hereby certify that _____ personally appeared before me this day and acknowledged that he is _____ of EBX-Neuse I, LLC, a Maryland Limited Liability Company, and that by authority duly given, he signed the foregoing instrument in its name and its behalf as its act and deed.

Witness my hand and official seal, this the ____ day of _____, 2013.

Notary Public

My Commission Expires: _____

EXHIBIT A

TO CONSERVATION EASEMENT DEED BETWEEN EBX-NEUSE I, LLC Grantor, AND the STATE OF NORTH CAROLINA, Grantee, dated _____, 2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING at a northwestern point designated as Easement Corner #79 on the below referenced plat, from that point of beginning N 59 deg. 00' 12" E 66.13 feet to an iron stake designated as Easement Corner #75 on said plat; thence S 53 deg. 50' 33" E, 111.46 feet to an iron stake designated as Easement Corner #76 on said plat; thence S 47 deg. 34' 13" E 246.76 feet to an iron stake designated as Easement Corner #77 on said plat; thence S 85 deg. 07' 03" E 1.73 feet to a corner designated as Easement Corner #78; thence N 31 deg. 00' 23" W 16.48 feet to an existing iron pipe designated as Easement Corner #85 on said plat; thence S 42 deg. 48' 14" W 15.69 feet to an existing iron pipe designated as Easement Corner #84 on said plat; thence S 58 deg. 14' 06" W 43.80 feet to an existing iron stake designated as Easement Corner #83 on said plat; thence N 48 deg. 31' 23" W 198.40 feet to a point designated as Easement Corner #82 on said plat; thence N 41 deg. 53' 51" W 51.52 feet to a point designated as Easement Corner #81 on said plat; thence N 60 deg. 26' 01" W 44.45 feet to a point designated as Easement Corner #80 on said plat; thence N 51 deg. 26' 07" W 88.77 feet to a corner designated as Easement Corner #79 on said plat, being the same point of beginning, and consisting of 0.549 acres, more or less, and being the same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX-NEUSE I, LLC PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC; Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING at a point designated as Easement Corner #78 on said plat, being the same Easement Corner #78 referenced in description of Area 1 above, from that point of beginning S 85 deg. 07' 03" E 20.06 feet to a control corner designated as Easement Corner #86 on said plat; thence N 42 deg. 48' 14" W 16.92 feet to an existing iron pipe designated as Easement Corner #85 on said plat; thence N 31 deg. 00' 23" W 16.48 feet to a corner designated as Easement Corner #78 on said plat, being the same point of beginning, and consisting of 0.003 acres, more or less, and being the same Area 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE EBX-NEUSE I, LLC PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-P, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC; Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between **EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606**, 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 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-1880

Being all of that certain parcel of land containing approximately 14 acres and being conveyed to Grantor through deed as recorded in **Deed Book _____, Page _____** of the Duplin County Registry and the will of James M Smith, also known as Jim Smith, filed in file No. 05 E 190, Duplin County Office of the Clerk of Court. Property description in the above referenced deed is herein incorporated by reference.

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

**CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT**

**STATE OF NORTH CAROLINA
DUPLIN COUNTY**

SPO File Number: 31-Q

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 _____ day of _____ 2013, by AULINE LANIER SMITH, *Widow*, presently of 4645 S NC 50 HWY, Chinquapin, NC 28521, Beneficiary under Article VI of the will of James M Smith, also known as Jim Smith, filed in file No. 05 E 190, Duplin County Office of the Clerk of Court, and KENT L. SMITH and JAMES BRIAN SMITH, Trustees of the Smith Family Trust under Article VI of the will of James M. Smith filed, also known as Jim Smith, in file No. 05 E 190, Duplin County Office of the Clerk of Court, (**Grantor**"), 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

Grantee is willing to accept such Conservation Easement. This Conservation Easement shall be for the protection and benefit of **Muddy Run, NCEEP Project # 31-Q**.

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:

That area of land containing **0.766 acres**, more or less, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JIM SMITH PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O FILE #31-Q, NCEEP REP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book _____, Page _____. Reference to said map in hereby made for a more perfect and accurate description.

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, 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 ACTIVITIES

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-transferable.

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 subterranean 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 uncorrected 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.

Remainder of Page Intentionally Left Blank

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

Auline Lanier Smith _____ (SEAL)

Kent L. Smith, Trustee of the Smith Family Trust under the will of James M. Smith, also known as Jim Smith, Estate File No 05 E 190, Duplin County Office of the Clerk of Court

James Brian Smith, Trustee of the Smith Family Trust under the will of James M. Smith, also known as Jim Smith, Estate File No 05 E 190, Duplin County Office of the Clerk of Court

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that AULINE LANIER SMITH, Widowed, 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 _____ day of _____, 20____.

Notary Public _____

My commission expires: _____

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that KENT L. SMITH personally appeared before me this day and acknowledged the execution of the foregoing instrument as Trustee of the Smith Family Trust under the will of James M. Smith, also known as Jim Smith, Estate File No 05 E 190, Duplin County Office of the Clerk of Court.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the _____ day of _____, 20____.

Notary Public _____

My commission expires: _____

NORTH CAROLINA
COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that JAMES BRIAN SMITH personally appeared before me this day and acknowledged the execution of the foregoing instrument as Trustee of the Smith Family Trust under the will of James M. Smith, also known as Jim Smith, Estate File No 05 E 190, Duplin County Office of the Clerk of Court.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the _____ day of _____, 20____.

Notary Public _____

My commission expires: _____

EXHIBIT A
TO CONSERVATION EASEMENT DEED BETWEEN AULINE LANIER SMITH and
KENT L. SMITH and JAMES BRIAN SMITH, Trustees of the Smith Family Trust,
Grantor, AND the STATE OF NORTH CAROLINA, Grantee, dated _____,
2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

BEGINNING at a point in a southwestern corner designated as Easement Corner #94 on the below referenced plat, from that point of beginning N 49°04'52" W 22.82 feet to an iron stake designated as Easement Corner #93 on said plat; thence N 44°07'34" W 119.68 feet to an iron stake designated as Easement Corner #92 on said plat; thence N 70°27'23" W 95.36 feet to an iron stake designated as Easement Corner #91 on said plat; thence N 54°40'06" W 26.05 feet to an iron stake designated as Easement Corner #90 on said plat; thence N 48°27'27" W 86.20 feet to an iron stake designated as Easement Corner #89 on said plat; thence N 48°58'55" W 106.34 feet to an iron stake designated as Easement Corner #88 on said plat; thence N 50°40'18" W 223.68 feet to an iron stake designated as Easement Corner #87 on said plat; thence N 59°00'30" E 64.48 feet to a point designated as Easement Corner #79 on said plat; thence S 1°26'07" E 88.78 feet to a point designated as Easement Corner #80 on said plat; thence S 60°26'01" E 44.45 feet to a point designated as Easement Corner #81 on said plat; thence S 41°53'51" E 51.52 feet to a point designated as Easement Corner #82 on said plat; thence S 48°31'23" E 198.40 feet to a control corner and existing iron stake designated as Easement Corner #83 on said plat; thence S 47°33'00" E 274.43 feet to a control corner designated as Easement Corner #95 on said plat; thence S 48°01'00" W 26.14 feet to a point designated as Easement Corner #94, being the same point of beginning, consisting of 0.766 acres, more or less, as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE JIM SMITH PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O FILE #31-Q, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book _____, Page _____. Reference to said map in hereby made for a more perfect and accurate description.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT

SPO File Number: 31-R
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 ____ day of _____ 2013, by AULINE LANIER SMITH, *Widow*, presently of 4645 S NC 50 HWY, Chinquapin, NC28521, WILLIAM F. LANDEN, JR., and wife, HOLLY P. LANDEN, presently of _____, and GREGORY M. LANDEN, *Divorced*, presently of _____, ("**Grantor**"), 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

EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606, 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 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-1156

Being all of that certain parcel of land containing approximately 72 acres and being conveyed to Grantor by deed as recorded in **Deed Book 656 at Page 471** of the Duplin County Registry, North Carolina, and **Estate File 07 E 000124** of the Duplin County Estates Division. Property Description contained in the above referenced deed is herein incorporated by reference.

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 **Muddy Run, NCEEP Project # 95354**.

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:

AREA ONE: being 1.843 acres, more or less.

AREA TWO: being 3.950 acres, more or less.

AND BEING that area of land containing of **5.793 acres, more or less, consisting of Area 1, being 1.843 acres, more or less, and Area 2, being 3.950 acres, more or less**, as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE AULINE SMITH AND WORTH L. LANDEN PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-R, NCEEP RHP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book _____, Page _____. Reference to said map is hereby made for a more perfect and accurate description.

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, 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 ACTIVITIES

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-transferable.

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 subterranean 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 uncorrected 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 Grantor's hand and seal, the day and year first above written.

(SEAL)
Auline Lanier Smith

(SEAL)
William F. Landen

(SEAL)
Holly P. Landen

(SEAL)
Gregory M. Landen

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that **AULINE LANIER SMITH**, Widowed, 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 _____ day of _____, 20____.

Notary Public

My commission expires: _____

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public in and for the County and State
aforesaid, do hereby certify that WILLIAM F. LANDEN and wife, HOLLY P.
LANDEN, 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
_____ day of _____, 20____.

Notary Public

My commission expires:

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public in and for the County and State
aforesaid, do hereby certify that GREGORY M. LANDEN, Divorced, 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
_____ day of _____, 20____.

Notary Public

My commission expires:

EXHIBIT A

**TO CONSERVATION EASEMENT DEED BETWEEN AULINE LANIER SMITH,
WILLIAM F. LANDEN and wife, HOLLY P. LANDEN, and GREGORY M. LANDEN,
Grantor, AND the STATE OF NORTH CAROLINA, Grantee, dated _____,
2013.**

Located in Cypress Creek Township, Duplin County, North Carolina and being more
particularly described as follows:

AREA 1: BEGINNING at an iron stake designated as Easement Corner #100 on the
below referenced plat, from that point of beginning N 45°52'18" W 156.82 feet to an iron
stake designated as Easement Corner #101 on said plat; thence N 49°04'52" W 141.51
feet to a point designated as Easement Corner #94 on said plat; thence N 48°01'00" E
26.14 feet to a point designated as Easement Corner #95 on said plat; thence N 47°33'00"
W 274.43 feet to an existing iron stake designated as Easement Corner #83 on said plat;
thence N 58°14'06" E 43.80 feet to an existing iron pipe designated as Easement Corner
#84 on said plat; thence N 42°48'14" E 15.69 feet to an existing iron pipe designated as
Easement Corner #85 on said plat; thence N 42°48'14" E 16.92 feet to a control corner
designated as Easement Corner #86 on said plat; thence S 85°07'03" E 64.44 feet to an
iron stake designated as Easement Corner #96 on said plat; thence S 53°03'44" E 235.65
feet to an iron stake designated as Easement Corner #97 on said plat; thence S 50°54'26"
E 189.59 feet to an iron stake designated as Easement Corner #98 on said plat; thence S
31°34'33" E 91.53 feet to an iron stake designated as Easement Corner #99 on said plat;
thence S 44°19'49" W 149.50 feet to an iron stake designated as Easement Corner #100,
being the same point of beginning, consisting of 1.843 acres, more or less, and being the
same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION
EASEMENT SURVEY OF THE AULINE SMITH AND WORTH L. LANDEN
PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE # 31-R, NCEEP
RFP#16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY
RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS
Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at
Plat Book _____, Page _____. Reference to said map is hereby made for a more perfect
and accurate description.

AREA 2: BEGINNING at an iron stake designated as Easement Corner #108 on the
below referenced plat, said corner being N 50°40'03" W 30.31 feet to Easement Corner
#100, being the same Easement Corner #100 referenced in the description of Area 1
above, from that point of beginning N 44°15'12" E 146.13 feet to an iron stake
designated as Easement Corner #109 on said plat; thence S 56°49'33" E 99.71 feet to an
iron stake designated at Easement Corner #110 on said plat; thence S 57°41'42" E 271.39
feet to an iron stake designated as Easement Corner #111 on said plat; thence S
50°42'30" E 133.32 feet to an iron stake designated as Easement Corner #112 on said
plat; thence N 87°47'17" E 47.51 feet to an iron stake designated as Easement Corner
#113 on said plat; thence N 90°00'00" E 167 feet to an iron stake designated as Easement
Corner #114 on said plat; thence N 85°51'21" E 140.51 feet to an iron stake designated as
Easement Corner #25 on said plat; thence S 11°54'00" E 116.94 feet to a point

designated as Easement Corner #24 on said plat; thence S 20°09'56" E 75.47 feet to an iron stake designated as Easement Corner #23 on said plat; thence N 80°22'58" W 88.74 feet to an iron stake designated as Easement Corner #102 on said plat; thence S 89°21'11" W 252.49 feet to an iron stake designated as Easement Corner #103 on said plat; thence S 86°37'47" W 160.57 feet to an iron stake designated as Easement Corner #104 on said plat; thence N 76°23'20" W 58.41 feet to an iron stake designated as Easement Corner #105 on said plat; thence N 48°56'11" W 259.73 feet to an iron stake designated as Easement Corner #106 on said plat; thence N 50°14'14" W 168.36 feet to an iron stake designated as Easement Corner #107 on said plat; thence N 34°52'27" W 70.77 feet to an iron stake designated as Easement Corner #108 and being the same point of beginning, and consisting of 3.950 acres, more or less, and being that AREA 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE AULINE SMITH AND WORTH L. LANDEN PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-R, NCEEP RFP #16-004101, NCEEP PROJECT #, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at Plat Book _____, Page _____. Reference to said map is hereby made for a more perfect and accurate description.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

CONSERVATION EASEMENT
PROVIDED PURSUANT TO
FULL DELIVERY
MITIGATION CONTRACT

SPO File Number: 31-T
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 ____ day of _____, 2013, by JESSE DAVID WOOD, SR, Divorced, of 188 S. NC 111 Hwy, Chinquapin, NC 28521 ("Grantor"), 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 EBX-NEUSE I, LLC, 909 Capability Drive, Suite 3100 Raleigh NC 27606, 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 003981 and dated June 27, 2011.

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 Cypress Creek Township, Duplin County, North Carolina (the "**Property**"), and being more particularly described as:

Tract 1: Tax Parcel Map Identification Number: 08-2507

Being all of that certain parcel of land containing approximately 6.31 acres and being conveyed to Grantor by deed as recorded in **Deed Book 1688 at Page 436** of the Duplin County Registry, North Carolina and subject to the same conditions and exceptions contained therein.

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 **Muddy Run, NCEEP Project # 95354**.

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.

AREA 1: being 0.002 acres, more or less.
AREA 2: being 0.448 acres, more or less.

AND BEING that area of land containing **0.450 acres, more or less, consisting of Area 1, being 0.002 acres, more or less, and Area 2, being 0.448 acres, more or less**, and being the same Areas 1 and 2 as shown on the plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE WOOD PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-T, NCEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**.

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, 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 ACTIVITIES

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 subterranean 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 uncorrected 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.

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

(SEAL)
JESSE DAVID WOOD, SR.

(SEAL)
MARY ANN WOOD

NORTH CAROLINA

COUNTY OF _____

I, _____, a Notary Public in and for the County and State aforesaid, do hereby certify that JESSE DAVID WOOD, SR, and wife, MARY ANN WOOD, 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 _____ day of _____, 2012.

Notary Public

My commission expires:

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.

Remainder of Page Intentionally Left Blank

EXHIBIT A

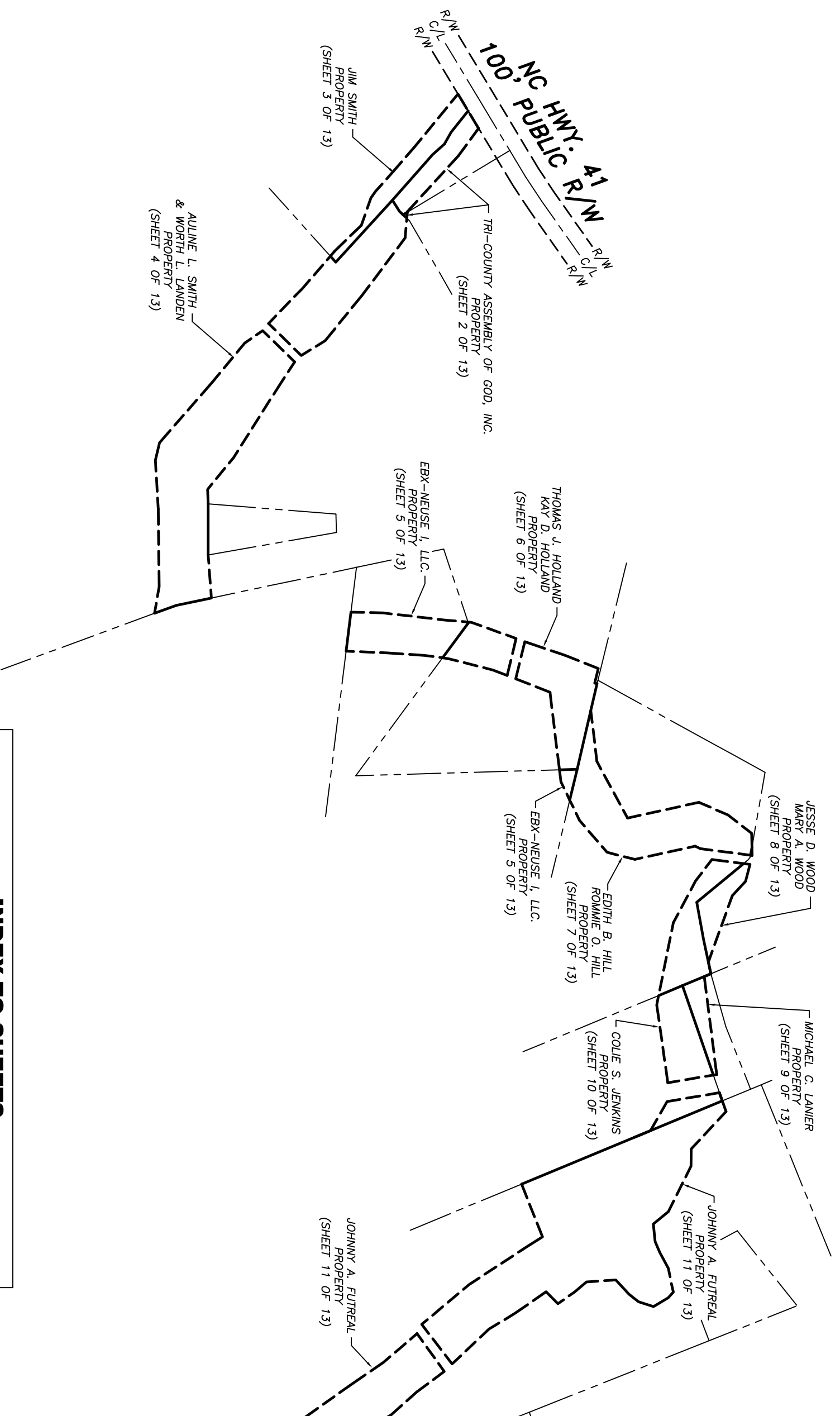
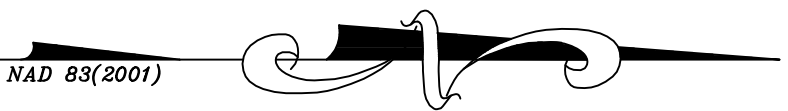
TO CONSERVATION EASEMENT DEED BETWEEN JESSE DAVID WOOD, SR., and wife, MARY ANN WOOD, Grantor, AND the STATE OF NORTH CAROLINA, Grantee, dated the ____ day of _____, 2013.

Located in Cypress Creek Township, Duplin County, North Carolina and being more particularly described as follows:

AREA 1: BEGINNING at an eastern point along a ditch, said point being designated as Easement Corner #151 on the below referenced plat, from that point of beginning N 88 deg. 45' 31" E 26.86 feet to an iron stake designated as Easement Corner #153 on said plat; thence S 07 deg. 27' 39" W 5.21 feet to a corner designated as Easement Corner #152 on said plat; thence N 80 deg. 04' 37" W 26.58 feet to a corner designated as Easement Corner #151 on said plat and being the same point of beginning, and consisting of 0.002 acres, more or less, and being the same Area 1 designated as (1) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE WOOD PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-T, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**. Reference to said map is hereby made for a more perfect and accurate description.

AREA 2: BEGINNING at a corner designated as Easement Corner #159 on the below referenced plat, said corner being S 80 deg. 04' 37" E 5.26 feet; thence S 53 deg. 49' 50" E 10.77 feet; thence S 41 deg. 37' 17" E 8.02 feet; and thence S 39 deg. 36' 32" E 12.62 feet from Easement Corner #152, being the same Easement Corner #152 in the description of Area 1 above, from that point of beginning along the ditch N 07 deg. 27' 39" E 21.08 feet to an iron stake and control corner designated as Easement Corner #162 on said plat; thence continuing along the ditch S 75 deg. 12' 22" E 57.15 feet to an iron stake designated as Easement Corner #163 on said plat; thence S 47 deg. 26' 26" E 63.67 feet to an iron stake designated as Easement Corner #164 on said plat; thence S 70 deg. 08' 40" E 230.33 feet to an iron stake designated as Easement Corner #165 on said plat; thence along the property line of Edith B. Hill S 77 deg. 55' 29" W 75.60 feet to a point designated as Easement Corner #161 on said plat; thence continuing along the property line of Edith B. Hill S 79 deg. 54' 13" 123.37 feet to a corner designated as Easement Corner #160 on said plat; thence continuing along the property of Edith B. Hill N 39 deg. 36' 32" W 197.85 feet to a corner designated as Easement Corner #159 on said plat, being the same point of beginning, and consisting of 0.448 acres, more or less, and being the same Area 2 designated as (2) as shown on plat of survey entitled "CONSERVATION EASEMENT SURVEY OF THE WOOD PROPERTY FOR THE STATE OF NORTH CAROLINA, S.P.O. FILE #31-T, NCEEEP RFP #16-004101, NCEEP PROJECT #95354, NCEEP PROJECT NAME: MUDDY RUN 2" and dated January 7th, 2013, by Matrix East, PLLC, Christopher K. Paderick, PLS Number 4189 and recorded in the Duplin County, North Carolina Register of Deeds at **Plat Book _____, Page _____**.

**"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**



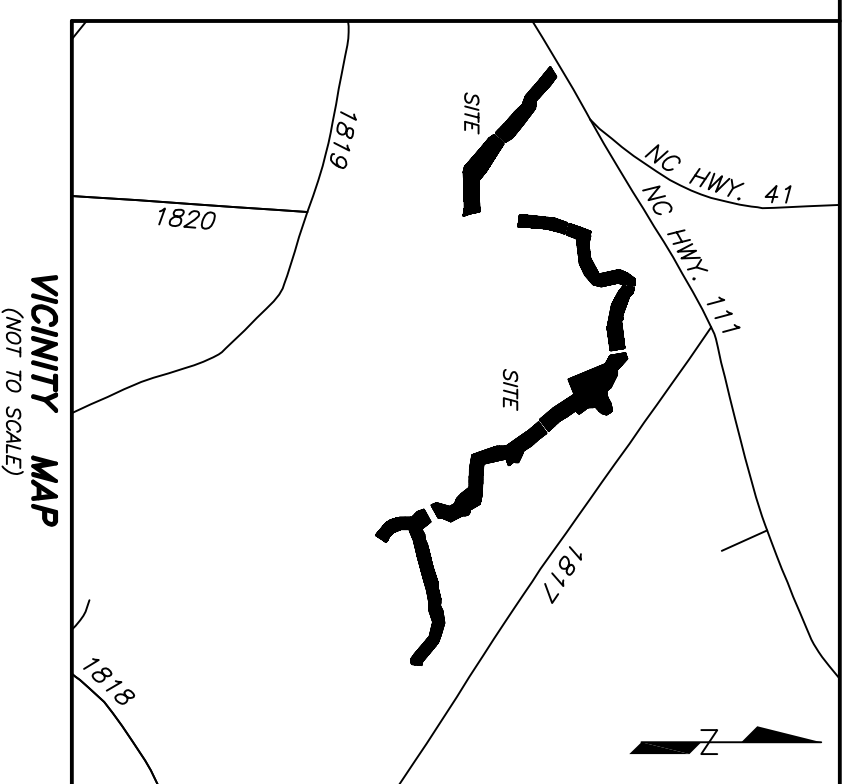
INDEX TO SHEETS	
PROPERTY NAME	SHEET NUMBER
TRI-COUNTY ASSEMBLY OF GOD, INC.	SHEET 2 OF 13
JIM SMITH	SHEET 3 OF 13
AULINE L. SMITH & WORTH L. LANDEN	SHEET 4 OF 13
EBX-NEUSE I, LLC.	SHEET 5 OF 13
THOMAS J. HOLLAND	SHEET 6 OF 13
EDITH B. HILL	SHEET 7 OF 13
JESSE D. WOOD	SHEET 8 OF 13
MICHAEL C. LANIER	SHEET 9 OF 13
COLIE S. JENKINS	SHEET 10 OF 13
JOHNNY A. FUTREAL	SHEET 11 OF 13
DANNY G. HATCHER, ETAL	SHEET 12 OF 13
PATRICIA M. RILEY	SHEET 13 OF 13

1. REVIEW OFFICER OF
DURHAM COUNTY CERTIFY THAT THE PLAT
WHICH THIS CERTIFICATION IS APPLIED MEETS ALL STATUTORY
REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____
DATE _____

FILED FOR REGISTRATION _____
2013 _____ M _____ PAGE _____
PLAT CABINET _____

REGISTER OF DEEDS
DURHAM COUNTY



NOTE:
1. ACCESS TO EASEMENT SHALL BE THROUGH
NEIGHBORING TRACTS.

I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR
NO. 14988, CERTIFY THAT THIS SURVEY IS A SURVEY OF ANOTHER
CATEGORY TO WIT: AN EASEMENT SURVEY.

L-4189

STATE OF NORTH CAROLINA
DURHAM COUNTY

I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS
PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL
SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION
RECORDED IN MAP & DEED BOOKS NOTED); THAT THE
BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN
FROM INFORMATION REFERENCED HEREON; 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 21TH DAY OF JANUARY, A.D.,
2013.

THE STATE OF NORTH CAROLINA

NCEEP RFP #16-004101
NCEEP PROJECT #XXXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CONSERVATION EASEMENT
SURVEY FOR

CYPRESS CREEK TOWNSHIP
DURHAM COUNTY, NC
JANUARY 7, 2013
1" = 350'



LEGEND
--- ADJOINING PROPERTY LINE
--- EASEMENT LINE
--- EASEMENT/BOUNDARY LINE

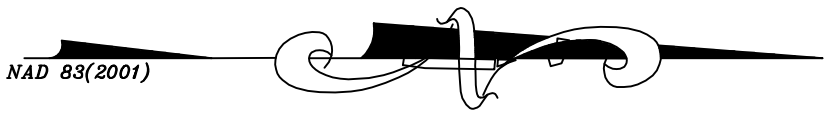
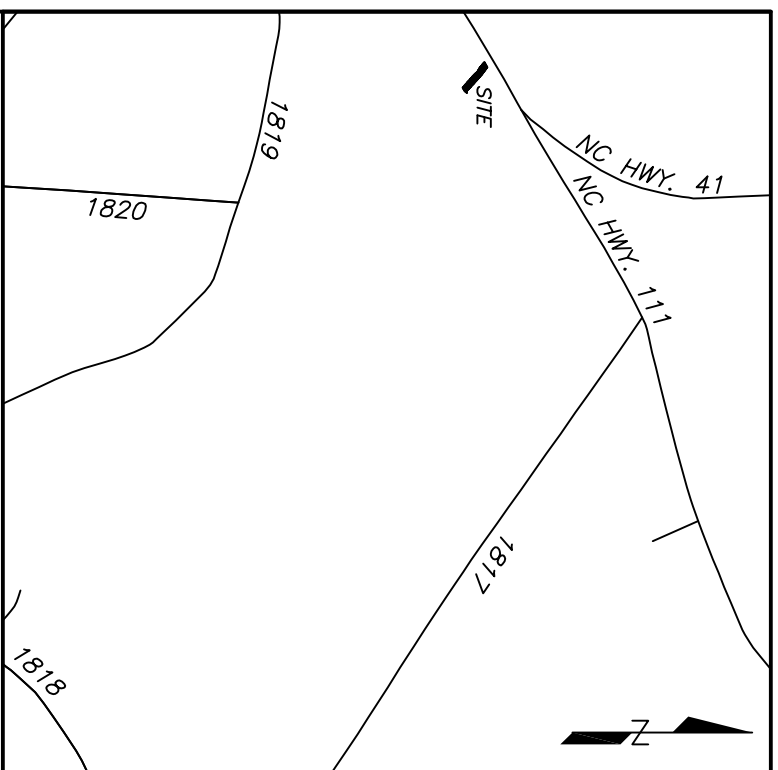
SHEET 1 OF 13

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221
DRAWN BY: CKP
SURVEYED BY: LDJ/CKK

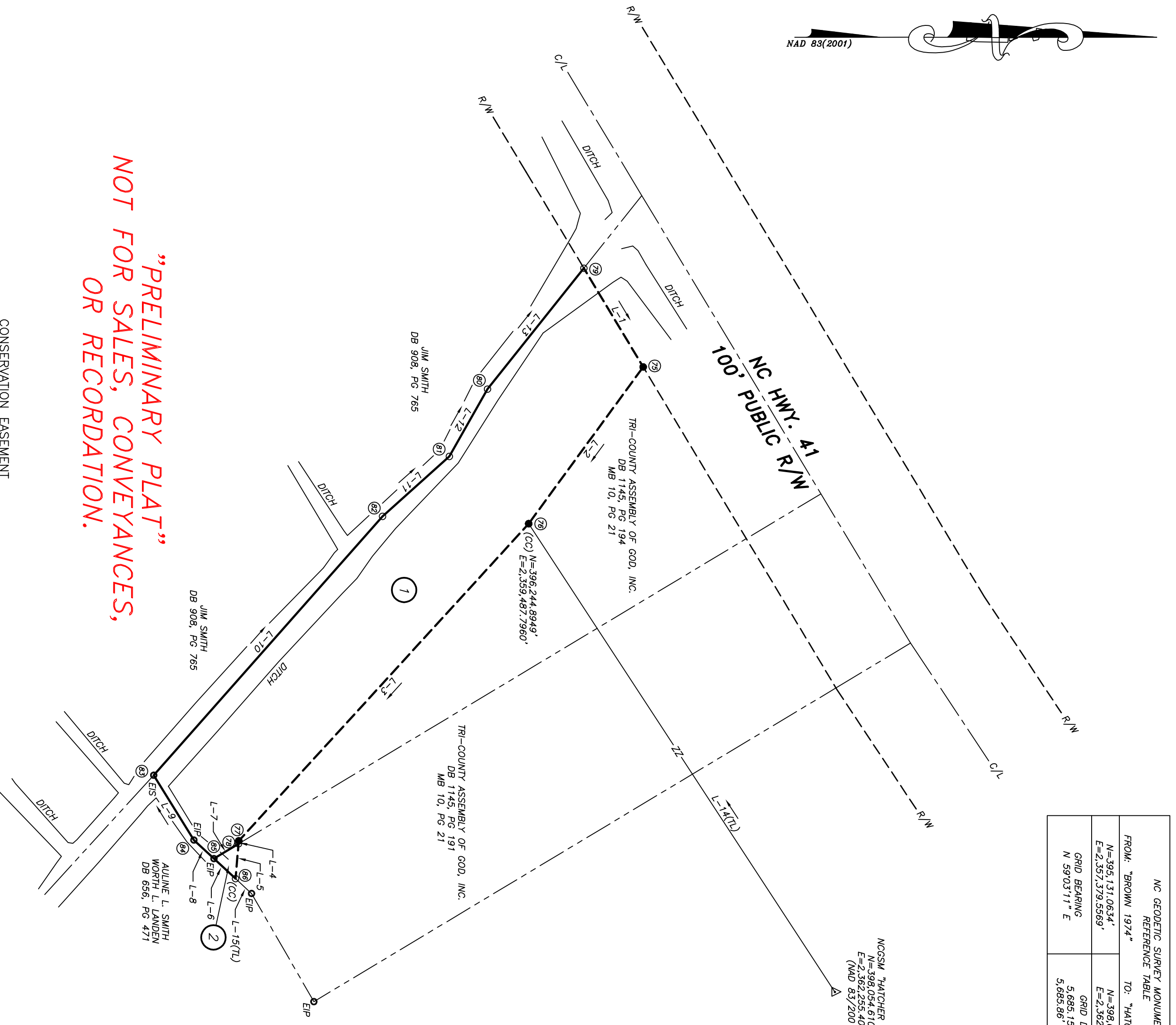
EMAIL: surveyor@matrixeast.net
PROJECT NO.: 20110047
DATE: 1/7/2013
DRAWING NAME: INDEX-MR2



LINE	BEARING	LENGTH
L-1	N 89.0012° E	66.13'
L-2	S 53.9033° E	171.46'
L-3	S 47.3413° E	246.76'
L-4	S 85.0703° E	1.73'
L-5	S 85.0703° E	20.06'
L-6	S 42.4814° W	16.92'
L-7	N 31.0023° W	16.48'
L-8	S 42.4814° W	15.69'
L-9	S 58.1406° W	43.60'
L-10	N 48.3123° W	198.40'
L-11	N 41.5351° W	51.52'
L-12	N 60.2601° W	44.45'
L-13	N 51.2607° W	88.77'
L-14	S 56.4911° W	3.306.77'
L-15	S 42.4814° W	12.53'

#	NORTHING	EASTING
75	396,310.6546	2,359,397.8065
76	396,244.8949	2,359,487.7960
77	396,078.4068	2,359,669.9331
78	396,078.2598	2,359,671.6544
79	396,276.5977	2,359,341.1185
80	396,221.2587	2,359,410.5283
81	396,199.3252	2,359,449.1910
82	396,160.9778	2,359,483.5951
83	396,029.5716	2,359,632.2435
84	396,052.6282	2,359,669.4808
85	396,064.1389	2,359,680.1412
86	396,076.5528	2,359,691.6381

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "HATCHER 1974")



NC GEODETIC SURVEY MONUMENT	
FROM: "BROWN 1924"	TO: "HATCHER 1974"
N=395,131.0634'	N=398,054.6107'
E=2,357,379.5569'	E=2,362,255.4002'
GRID BEARING N 59.0311° E	GRID DISTANCE 5,695.1941' (GRID) 5,695.86' (MEASURED)

"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.

THE TRI-COUNTY ASSEMBLY OF GOD, INC., PROPERTY
FOR THE STATE OF NORTH CAROLINA

S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CONSERVATION EASEMENT
 SURVEY OF
 CYPRESS CREEK TOWNSHIP
 DUPLIN COUNTY, NC
 JANUARY 7, 2013
 1" = 50'
 GRAPHIC SCALE

ACREAGE DATA	
(BY COMPUTER)	
AREA 1 = 0.549 AC±	
AREA 2 = 0.003 AC±	
TOTAL = 0.552 AC±	

SOURCE OF TITLE
 DB 1145, PG 194
 DB 1145, PG 191
 MB 10, PG 21

SHEET 2 OF 13

REVIEW OFFICER OF
 DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO
 WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY
 REQUIREMENTS FOR RECORDING.
 REVIEW OFFICER
 DATE

REGISTER OF DEEDS
 DUPLIN COUNTY

FILED FOR REGISTRATION
 2013
 PLAT CABINET _____, PAGE _____

- LEGEND**
- EIS = EXISTING IRON STAKE
 - EIP = EXISTING IRON PIPE
 - (T) = TIE LINE/ TIE SET
 - (C) = CONTROL CORNER
 - (CO) = NC GRID SURVEY MONUMENT
 - NCGSM = NC GRID SURVEY MONUMENT
 - Z± = NOT TO SCALE
 - ADJOINING PROPERTY LINE
 - EASEMENT LINE
 - EASEMENT/BOUNDARY LINE

FLOOD STATEMENT

THIS PROPERTY IS LOCATED IN ZONE "X".
 AND IS NOT WITHIN A SPECIAL FLOOD HAZARD
 AREA, AS DETERMINED BY NFP RATE MAP
 DATED FEBRUARY 16, 2006. : COMMUNITY PANEL
 NUMBER 370083-3348-L.

- NOTES:**
1. COMBINED FACTOR IS 0.999999904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

MATRIX EAST, PLLC
 PROFESSIONAL LAND SURVEYORS
 906 N. QUEEN ST., SUITE A KINSTON, NC 28501
 TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221
 DRAWN BY: CKP/JNM
 SURVEYED BY: LDJ/CCK
 DATE: JANUARY 7, 2013
 DRAWING NAME: TRI-COUNTY

EMAIL: surveyor@matrixeast.net
 PROJECT NO.: 20110047

STATE OF NORTH CAROLINA
 DUPLIN COUNTY

I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR AND CERTIFIED SURVEYOR OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

L-4189

I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON; 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 7TH DAY OF JANUARY, A.D., 2013.

L-4189

1. DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____
DATE _____

FILED FOR REGISTRATION _____
2013 _____ M _____ PAGE _____
PLAT CABINET _____

REGISTER OF DEEDS
DUPLIN COUNTY

- LEGEND
- EIS = EXISTING IRON STAKE
 - EIP = EXISTING IRON PIPE
 - = NO POINT SET
 - = NEW IRON STAKE & CAP
 - (TL) = THE LINE
 - (CO) = CONTROL CORNER
 - NCGSM = NC GRID SURVEY MONUMENT
 - NOT TO SCALE
 - ADJOINING PROPERTY LINE
 - EASEMENT LINE
 - EASEMENT/BOUNDARY LINE

FLOOD STATEMENT

THIS PROPERTY IS LOCATED IN ZONE "X" AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFIP RATE MAP DATED FEBRUARY 16, 2008. COMMUNITY PANEL NUMBER 370083-3348-L.

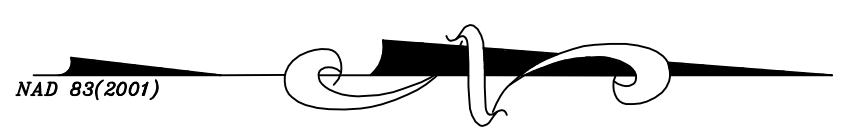
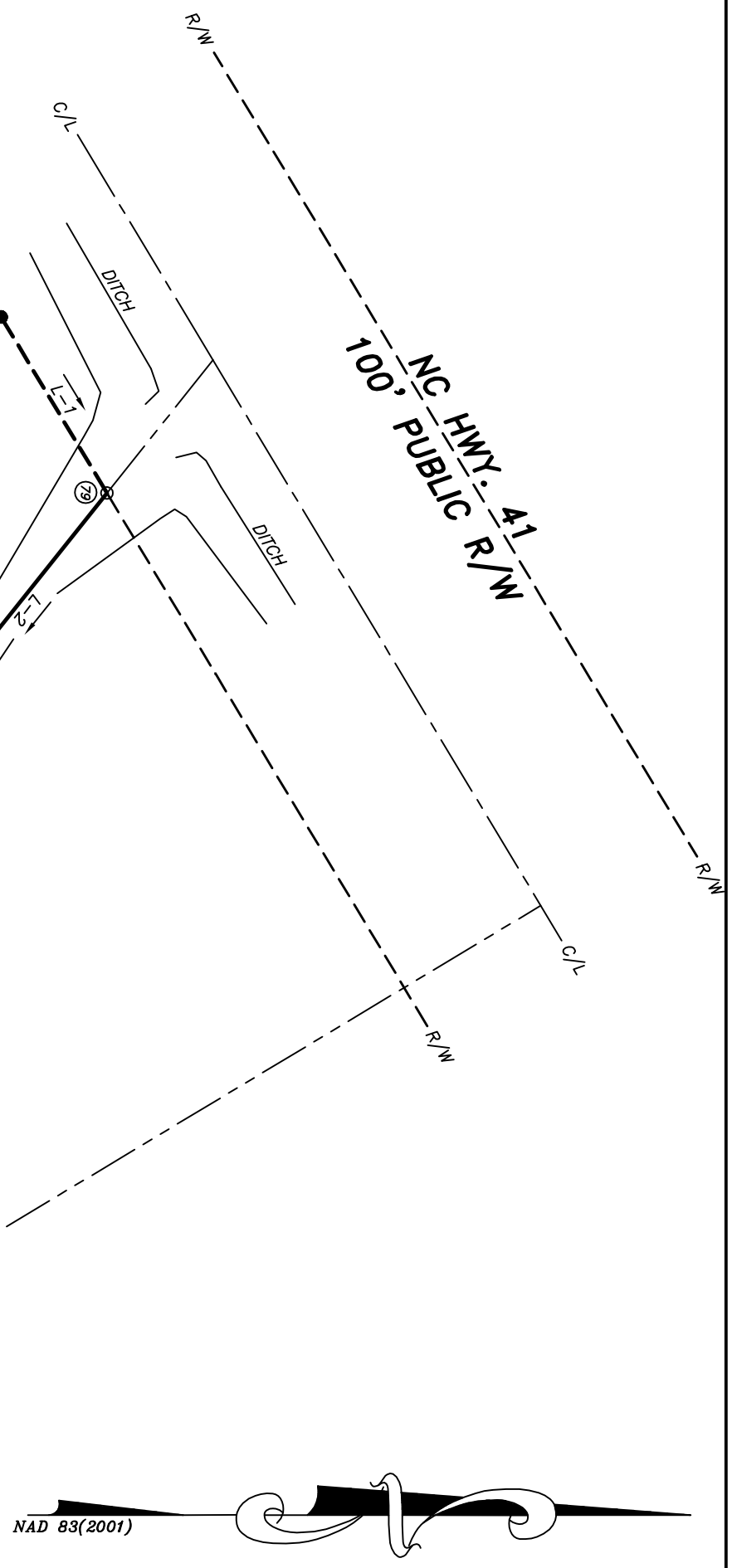
LINE	BEARING	LENGTH
L-1	N 59°00'30" E	64.48'
L-2	S 51°28'07" E	88.78'
L-3	S 60°28'01" E	44.45'
L-4	S 41°53'51" E	51.52'
L-5	S 48°31'23" E	198.40'
L-6	S 47°33'00" E	274.43'
L-7	S 48°01'00" W	26.14'
L-8	N 49°04'52" W	22.82'
L-9	N 44°07'34" W	119.68'
L-10	N 20°27'23" W	95.36'
L-11	N 54°40'06" W	26.05'
L-12	N 48°27'22" W	86.20'
L-13	N 48°59'55" W	106.34'
L-14	N 50°40'18" W	223.88'
L-15	S 47°38'08" W	327.39'
L-16	S 38°14'08" W	43.80'

1. CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR AND CERTIFIED SURVEYOR OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

L-4189

STATE OF NORTH CAROLINA
DUPLIN COUNTY

1. CHRISTOPHER K. PADERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION, FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON; 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 7TH DAY OF JANUARY, A.D., 2013.



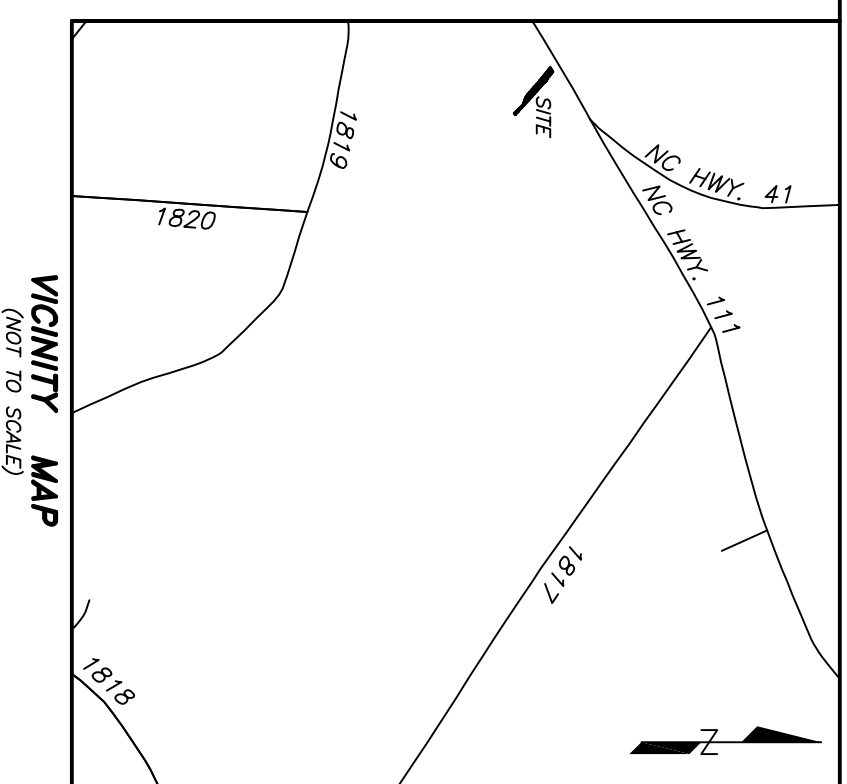
EASEMENT CORNER COORDINATE TABLE

#	NORTHING	EASTING
79	396,276.6015'	2,359,341.1137'
80	396,221.2587'	2,359,410.5283'
81	396,199.3252'	2,359,449.1910'
82	396,160.9778'	2,359,483.5951'
83	396,029.5716'	2,359,632.2435'
87	396,243.4007'	2,359,285.8397'
88	396,101.6423'	2,359,459.8595'
89	396,031.8545'	2,359,539.0902'
90	395,974.6855'	2,359,603.6114'
91	395,959.6211'	2,359,624.8626'
92	395,927.7196'	2,359,714.7327'
93	395,841.8086'	2,359,798.0619'
94	395,826.8613'	2,359,815.3061'
95	395,844.3457'	2,359,834.7359'

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "HATCHER 1974")

NC GEODETIC SURVEY MONUMENT REFERENCE TABLE

FROM: "BROWN 1974"	TO: "HATCHER 1974"
N=395,131.0634'	N=398,054.6107'
E=2,357,379.5569'	E=2,362,295.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685,1941 (GRID) 5,685,386 (MEASURED)



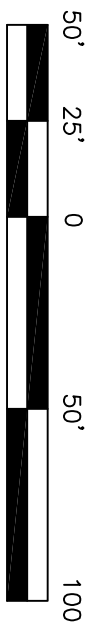
"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES, OR RECORDATION.

THE JIM SMITH PROPERTY
FOR THE STATE OF NORTH CAROLINA

S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

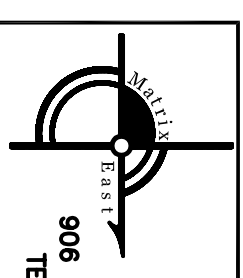
CONSERVATION EASEMENT
SURVEY OF

CYPRESS CREEK TOWNSHIP
DUPLIN COUNTY, NC
JANUARY 7, 2013
1" = 50'



ALLINE L. SMITH
WORTH L. LANDEN
DB 656, PG 471

- NOTES:
1. COMBINED FACTOR IS 0.99999904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.



MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS
906 N. QUEEN ST., SUITE A
TEL: 252-522-2500

KINSTON, NC 28501
FAX: 252-522-4747

FIRM LIC. # P-0221	EMAIL: surveyor@matrixeast.net
DRAWN BY: CKP/JMM	PROJECT NO.: 20110047
SURVEYED BY: LDJ/CCK	DATE: JANUARY 7, 2013
SCALE: 1" = 50'	DRAWING NAME: JIM SMITH

1. REVIEW OFFICER OF
 DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO
 WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY
 REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____

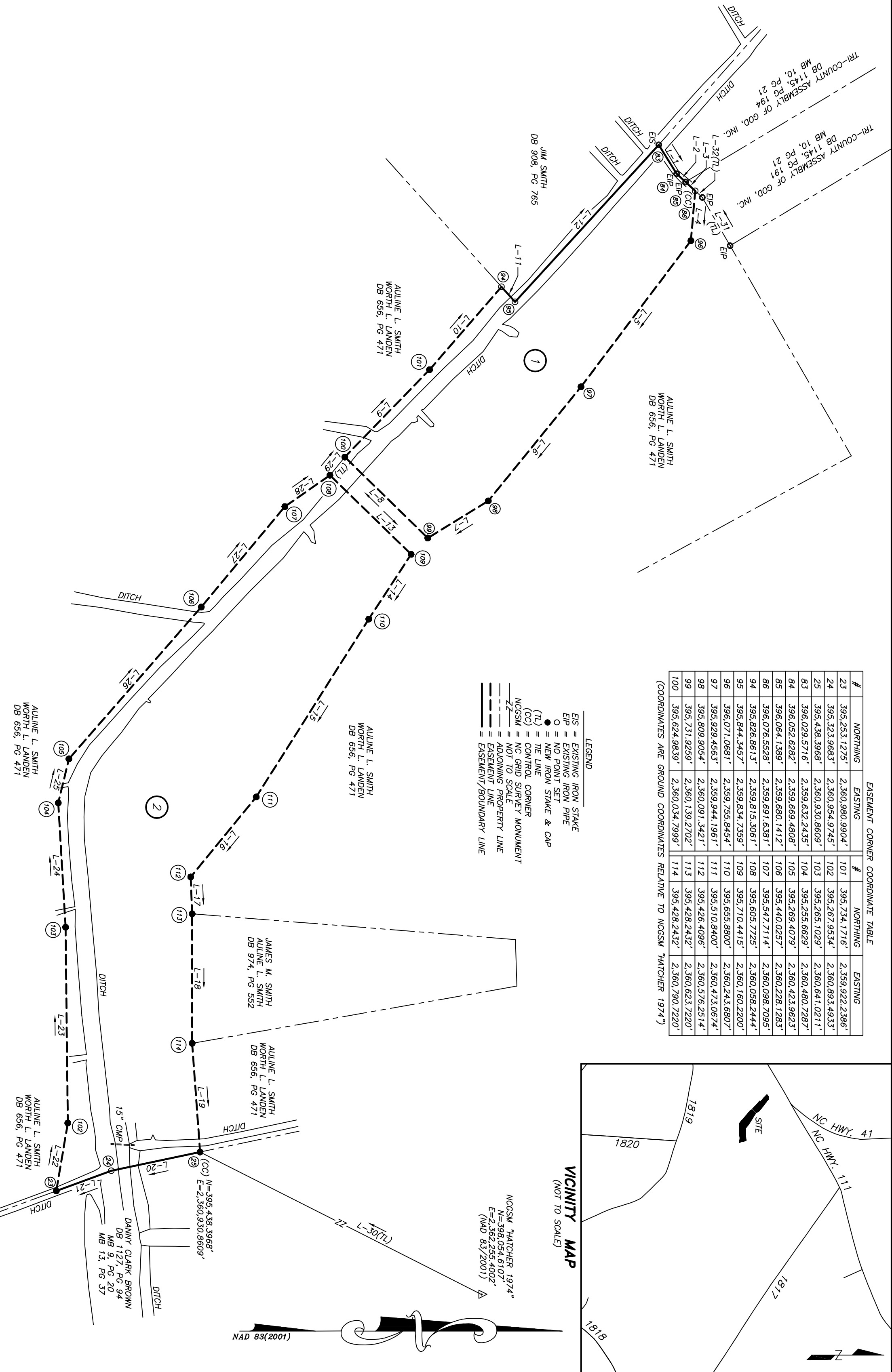
DATE _____

FILED FOR REGISTRATION _____
 2013 _____ M _____ PAGE _____
 PLAT CABINET _____

REGISTER OF DEEDS
 DUPLIN COUNTY

FLOOD STATEMENT
 THIS PROPERTY IS LOCATED IN ZONE "X" AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFP RATE MAPS DATED FEBRUARY 16, 2006. COMMUNITY PANEL NUMBERS 370083-3348-L & 370083-3368-L.

LINE	BEARING	LENGTH
L-1	N 58°14.06' E	43.80'
L-2	N 42°48.14' E	15.80'
L-3	N 42°48.14' E	18.92'
L-4	S 89°07.03' E	64.44'
L-5	S 83°03.44' E	233.65'
L-6	S 90°34.26' E	189.59'
L-7	S 31°34.33' E	91.53'
L-8	N 44°19.49' W	148.50'
L-9	N 45°52.18' W	156.82'
L-10	N 49°04.52' W	141.51'
L-11	N 48°01.00' E	26.14'
L-12	N 47°33.00' W	274.43'
L-13	N 44°15.12' E	146.13'
L-14	S 56°49.33' E	99.71'
L-15	S 57°41.42' E	271.39'
L-16	S 50°42.30' E	133.32'
L-17	N 87°47.17' E	47.51'
L-18	N 90°00.00' E	167.00'
L-19	N 85°51.21' E	140.51'
L-20	S 11°54.00' E	116.94'
L-21	S 20°09.56' E	75.47'
L-22	N 80°22.58' W	88.74'
L-23	S 89°21.11' W	252.49'
L-24	S 86°37.42' W	160.57'
L-25	N 76°23.20' W	58.41'
L-26	N 48°56.11' W	259.73'
L-27	N 50°14.14' W	186.36'
L-28	N 34°32.22' W	70.77'
L-29	N 50°40.03' W	30.31'
L-30	S 26°51.08' W	2,932.40'
L-31	S 60°03.03' W	71.68'
L-32	S 42°48.14' W	12.53'



EASEMENT CORNER COORDINATE TABLE

#	NORTHING	EASTING	#	NORTHING	EASTING
23	395,253.1275'	2,360,980.9904'	101	395,734.1716'	2,359,922.2386'
24	395,323.9683'	2,360,954.9745'	102	395,267.9534'	2,360,893.4933'
25	395,438.3968'	2,360,930.8609'	103	395,265.1029'	2,360,641.0211'
83	396,029.5716'	2,359,632.2435'	104	395,255.6629'	2,360,480.7287'
84	396,052.6282'	2,359,669.4808'	105	395,269.4079'	2,360,423.9623'
85	396,064.1389'	2,359,680.1412'	106	395,440.0297'	2,360,228.1283'
86	396,076.5528'	2,359,691.6381'	107	395,547.7114'	2,360,098.7095'
94	395,826.8613'	2,359,815.3061'	108	395,605.7725'	2,360,058.2444'
95	395,844.3457'	2,359,834.2359'	109	395,710.4415'	2,360,180.2202'
96	395,871.0681'	2,359,755.8454'	110	395,655.8800'	2,360,243.8807'
97	395,929.4563'	2,359,944.1961'	111	395,510.8400'	2,360,473.0674'
98	395,809.9054'	2,360,091.3421'	112	395,426.4096'	2,360,576.2514'
99	395,231.9259'	2,360,139.2702'	113	395,428.2432'	2,360,623.7220'
100	395,624.9839'	2,360,034.7999'	114	395,428.2432'	2,360,790.7220'

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCSM "WATCHER 1974")

VICINITY MAP
 (NOT TO SCALE)

**"PRELIMINARY PLAT"
 NOT FOR SALES, CONVEYANCES,
 OR RECORDATION.**

**THE AULINE SMITH & WORTH L. LANDEN PROPERTY
 FOR THE STATE OF NORTH CAROLINA**

S.P.O. FILE #XX-X
 NCEEP RFP #16-004101
 NCEEP PROJECT #XXXXX
 NCEEP PROJECT NAME: MUDDY RUN 2

CONSERVATION EASEMENT
 SURVEY OF _____
 CYPRESS CREEK TOWNSHIP
 DUPLIN COUNTY, NC
 JANUARY 7, 2013
 1" = 100'

ACREAGE DATA
 (BY COMPUTER)
 AREA 1 = 1.843 AC±
 AREA 2 = 3.390 AC±
 TOTAL = 5.233 AC±
 SOURCE OF TITLE
 DB 656, PG 471

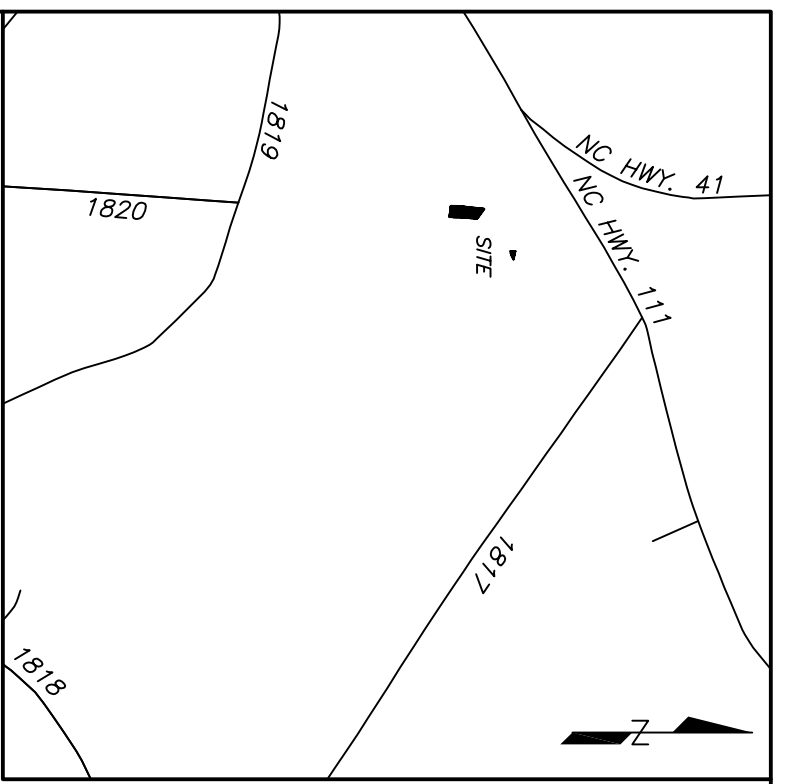
NC GEODETIC SURVEY MONUMENT
 REFERENCE TABLE

FROM: "BROWN 1974"	TO: "WATCHER 1974"
N=395.1310684'	N=398.0546107'
E=2,357,379.5589'	E=2,362,253.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685.1541' (GRID) 5,685.86' (MEASURED)

MATRIX EAST, PLLC
 PROFESSIONAL LAND SURVEYORS
 906 N. QUEEN ST., SUITE A
 TEL: 252-522-2500
 KINSTON, NC 28501
 FAX: 252-522-4747

FIRM LIC. # P-0221
 DRAWN BY: CKP/JNM
 SURVEYED BY: LDJ/CCK
 DATE: JANUARY 7, 2013
 DRAWING NAME: A.SMITH

STATE OF NORTH CAROLINA
 DUPLIN COUNTY
 CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR
 I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR
 AND CERTIFY THAT THIS SURVEY IS OF ANOTHER
 CATEGORY TO WITH AN EASEMENT SURVEY.
 L-4189



I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY, TO WIT, AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA
 CHRISTOPHER K. PADERICK
 I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER SUPERVISION FROM AN ACTUAL SURVEY AND UNDER SUPERVISION FROM AN ACTUAL SURVEY. BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON. 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 27TH DAY OF JANUARY, A.D., 2013.

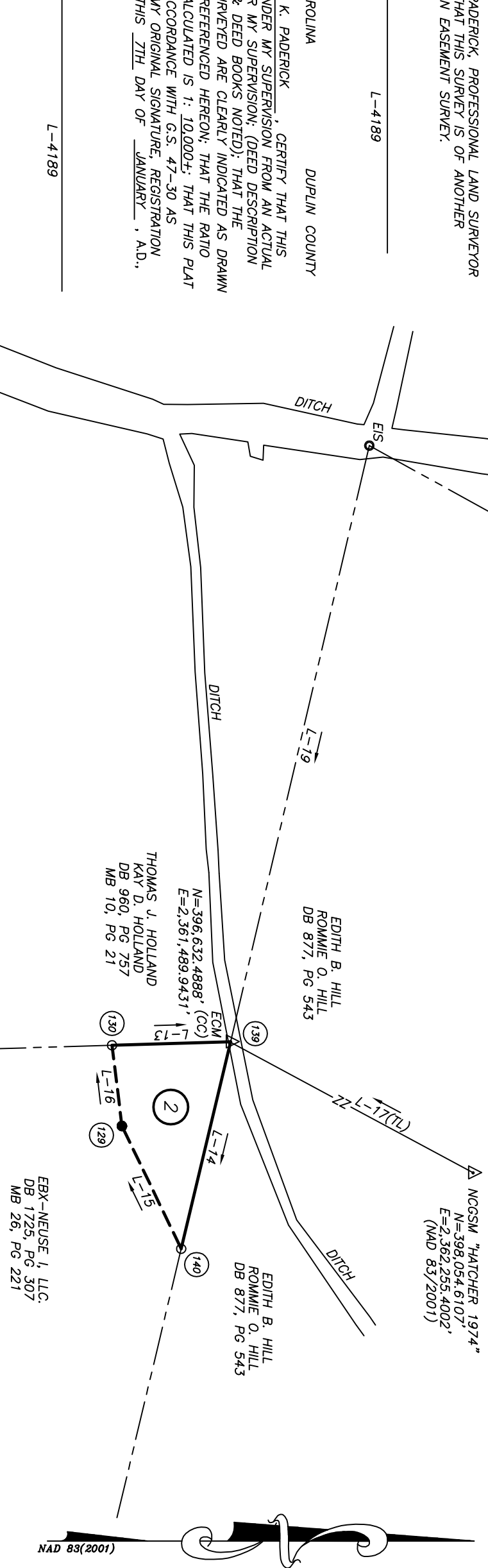
LINE	BEARING	LENGTH
L-1	S 07°42'38" W	59.15'
L-2	S 03°53'17" W	119.28'
L-3	S 02°23'26" W	136.65'
L-4	N 82°56'04" W	128.47'
L-5	N 01°31'18" E	206.23'
L-6	N 06°33'26" E	206.91'
L-7	N 04°49'36" E	71.41'
L-8	N 71°37'20" E	2.96'
L-9	S 53°37'25" E	141.61'
L-10	N 71°37'20" E	251.16'
L-11	S 53°37'25" E	478.08'
L-12	N 01°40'32" W	665.42'
L-13	N 01°40'32" W	57.29'
L-14	S 76°34'12" E	103.65'
L-15	S 64°13'28" W	66.43'
L-16	S 83°01'24" W	39.89'
L-17	S 28°12'06" W	1,615.06'
L-18	S 82°56'04" E	147.06'
L-19	S 78°53'41" E	298.21'

THOMAS J. HOLLAND
 KAY D. HOLLAND
 DB 960, PG 757
 MB 10, PG 21

EBX-NEUSE 1, LLC
 DB 1725, PG 307
 MB 26, PG 221

THOMAS J. HOLLAND
 KAY D. HOLLAND
 DB 960, PG 757
 MB 10, PG 21

EBX-NEUSE 1, LLC
 DB 1725, PG 307
 MB 26, PG 221



NCGSM "HATCHER 1974"
 N=398,054.6107'
 E=2,362,255.4002'
 (NAD 83/2001)

EDITH B. HILL
 ROMMIE O. HILL
 DB 877, PG 543

EDITH B. HILL
 ROMMIE O. HILL
 DB 877, PG 543

THOMAS J. HOLLAND
 KAY D. HOLLAND
 DB 960, PG 757
 MB 10, PG 21

EBX-NEUSE 1, LLC
 DB 1725, PG 307
 MB 26, PG 221

#	NORTHING	EASTING
115	395,894.2860'	2,360,976.9233'
116	395,999.4746'	2,360,979.7175'
117	396,205.0304'	2,361,003.3454'
118	395,878.4837'	2,361,104.4173'
119	396,015.0164'	2,361,110.1169'
120	396,134.5209'	2,361,118.2289'
121	396,276.1848'	2,361,009.3537'
122	396,277.1180'	2,361,012.1627'
123	396,193.1336'	2,361,126.1746'
129	396,579.5366'	2,361,530.9329'
130	396,574.7274'	2,361,491.6329'
139	396,632.4888'	2,361,489.9431'
140	396,608.4154'	2,361,590.7584'

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "HATCHER 1974")

NC GEODETIC SURVEY MONUMENT	REFERENCE TABLE	TO: "HATCHER 1974"
FROM: "BROWN 1974"	N=395,131.0634'	N=398,054.6107'
	E=2,357,379.3589'	E=2,362,255.4002'
GRID BEARING	N 99°03'11" E	5,685.1541' (GRID)
		5,685.86' (MEASURED)

I, _____, REVIEW OFFICER OF _____ COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____
 DATE _____

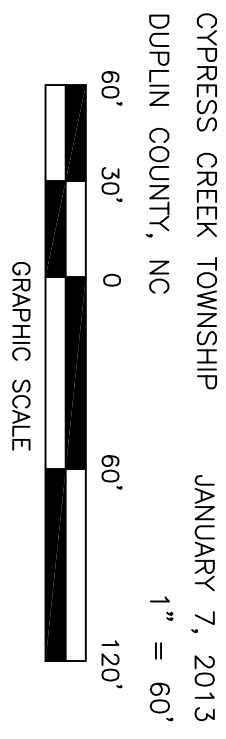
FILED FOR REGISTRATION _____
 2013, _____ M _____ PAGE _____
 PLAT CABINET _____

REGISTER OF DEEDS
 DUPLIN COUNTY

FLOOD STATEMENT
 THIS PROPERTY IS LOCATED IN ZONE "X."
 AND IS NOT DETERMINED BY A SPECIAL FLOOD HAZARD
 AREA, AS DETERMINED BY NFP RATE MAP
 DATED FEBRUARY 16, 2006.
 NUMBER 320083-3388-L.

**"PRELIMINARY PLAT"
 NOT FOR SALES, CONVEYANCES,
 OR RECORDATION.**

CONSERVATION EASEMENT
 SURVEY OF
**FOR THE EBX NEUSE PROPERTY
 FOR THE STATE OF NORTH CAROLINA**
 S.P.O. FILE #XX-X
 NCEEP RFP #16-004101
 NCEEP PROJECT #XXXXX
 NCEEP PROJECT NAME: MUDDY RUN 2



CYPRESS CREEK TOWNSHIP JANUARY 7, 2013
 DUPLIN COUNTY, NC 1" = 60'

MATRIX EAST, PLLC
 PROFESSIONAL LAND SURVEYORS
 906 N. QUEEN ST., SUITE A KINSTON, NC 28501
 TEL: 252-522-2500 FAX: 252-522-4747

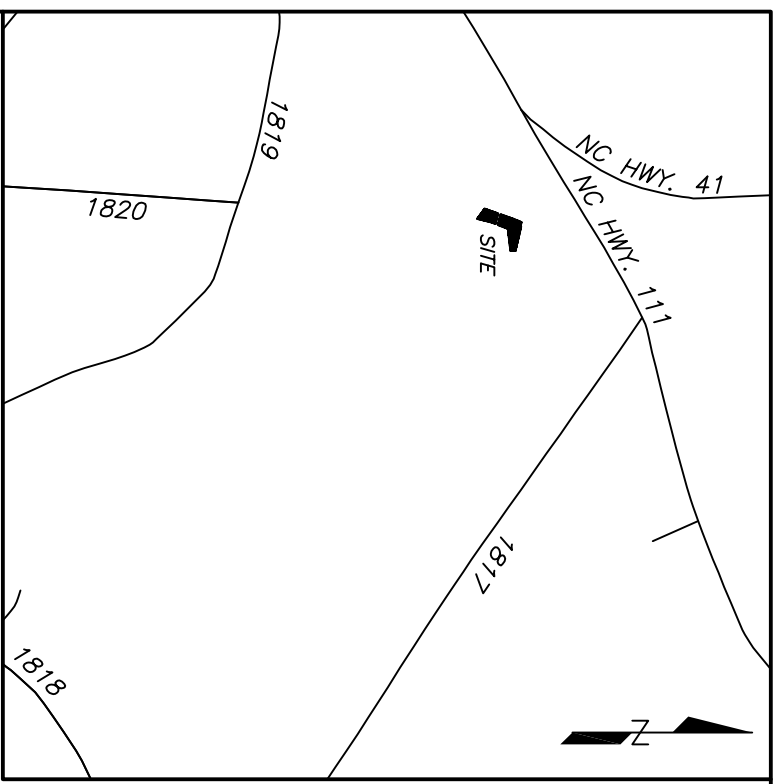
ACREAGE DATA (BY COMPUTER)
 AREA 1 = 1.014 AC±
 AREA 2 = 0.076 AC±
 TOTAL = 1.090 AC±

SOURCE OF TITLE
 DB 1725, PG 307
 MB 26, PG 221

FIRM LIC. # P-0221 EMAIL: surveyor@matrixeast.net
 DRAWN BY: CKP/JMM PROJECT NO.: 20110047
 SURVEYED BY: LDJ/CCK DATE: JANUARY 7, 2013
 SCALE: 1" = 60'
SHEET 5 OF 13

- LEGEND
- ES = EXISTING IRON STAKE
 - NIS = NEW IRON STAKE
 - ECM = EXISTING CONCRETE MONUMENT
 - EIP = EXISTING IRON PIPE
 - = NEW IRON STAKE & CAP
 - = NO POINT SET
 - (TL) = TILE LINE
 - (CC) = CONTROL CORNER
 - NCSM = NO GRID SURVEY MONUMENT
 - ZZ = ADJOINING PROPERTY LINE
 - = ADJOINING PROPERTY LINE
 - = EASEMENT LINE
 - = EASEMENT/BOUNDARY LINE

- NOTES:
1. COMBINED FACTOR IS 0.99989904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF. UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.



EASEMENT CORNER COORDINATE TABLE			
#	NORTHING	EASTING	
121	396,276.1848'	2,361,009.3537'	
122	396,277.1180'	2,361,012.1627'	
123	396,193.1336'	2,361,126.1746'	
124	396,287.1546'	2,361,010.2800'	
125	396,433.3666'	2,361,062.9618'	
126	396,211.6649'	2,361,128.6836'	
127	396,357.7886'	2,361,166.0575'	
128	396,403.9806'	2,361,183.8361'	
130	396,574.7274'	2,361,491.6329'	
131	396,543.7329'	2,361,238.3493'	
132	396,432.2098'	2,361,194.7141'	
133	396,461.7538'	2,361,073.1900'	
134	396,592.1526'	2,361,117.9962'	
135	396,701.4961'	2,361,161.2101'	
136	396,690.1065'	2,361,209.0344'	
137	396,697.5276'	2,361,210.5716'	
139	396,632.4888'	2,361,489.9431'	
301	396,482.0511'	2,361,080.5033'	

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM HATCHER 1974')

NC GEODETIC SURVEY MONUMENT REFERENCE TABLE		TO: "HATCHER 1974"	
FROM: "BROWN 1974"	N=395,131.0634'	N=398,054.6107'	GRID DISTANCE
	E=2,357,379.5569'	E=2,362,293.4002'	(MEASURED)
	GRID BEARING	5,695.1541' (GRID)	
	N 59°03'11" E	5,695.86' (MEASURED)	

NCGSM "HATCHER 1974"	
N=398,054.6107'	GRID DISTANCE
E=2,362,293.4002'	(MEASURED)
(NAD 83/2011)	

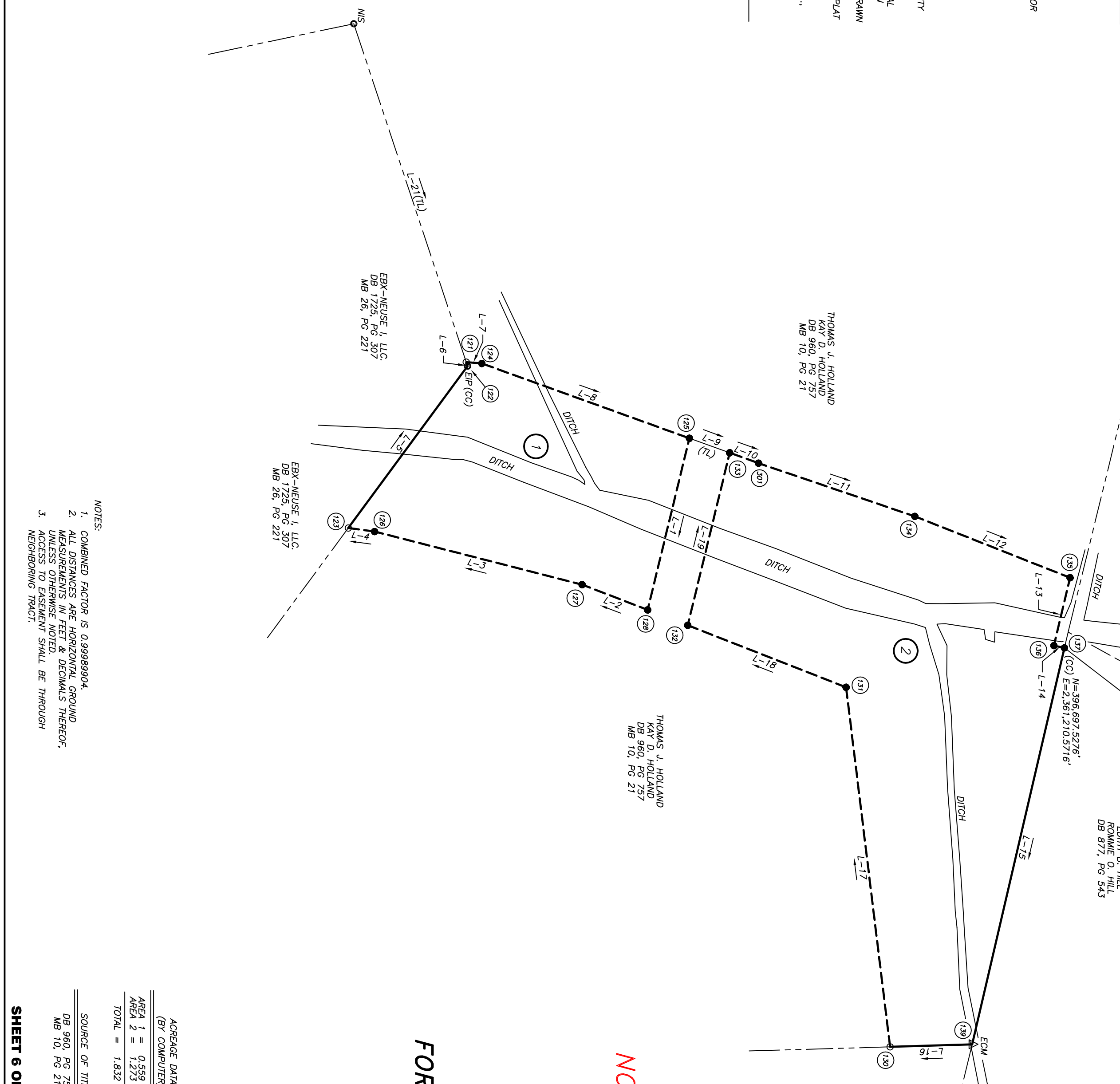
I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA
 CHRISTOPHER K. PADERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION, (GIVE DESCRIPTION OF THE SURVEY HEREIN). THE BOUNDARIES NOT SHOWN ARE CLEARLY INDICATED FROM INFORMATION REFERENCED HEREON, THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000. THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. § 20 AS AMENDED WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 27TH DAY OF JANUARY, A.D., 2013.

L-4189

LINE	BEARING	LENGTH
L-1	S 76°20'09" E	124.40'
L-2	S 21°03'03" W	49.50'
L-3	S 14°20'49" W	150.83'
L-4	S 07°42'38" W	18.70'
L-5	N 53°37'25" W	141.61'
L-6	S 71°37'20" W	2.96'
L-7	N 04°49'36" E	11.01'
L-8	N 19°48'53" E	155.41'
L-9	N 19°48'53" E	30.17'
L-10	N 19°48'53" E	21.57'
L-11	N 18°48'02" E	116.31'
L-12	N 21°34'09" E	112.58'
L-13	S 76°36'16" E	49.16'
L-14	N 11°42'11" E	7.82'
L-15	S 76°53'41" E	289.84'
L-16	S 01°40'32" E	312.79'
L-17	S 83°01'24" W	253.17'
L-18	S 21°22'07" W	119.76'
L-19	N 76°20'09" W	125.08'
L-20	S 37°35'35" W	1,712.70'
L-21	N 71°37'20" E	251.16'

- LEGEND
- NIS = NEW IRON STAKE
 - ECM = EXISTING CONCRETE MONUMENT
 - CCM = EXISTING CONCRETE MONUMENT
 - = NEW IRON STAKE & CAP
 - = NO POINT SET
 - (TL) = THE LINE
 - (CC) = CONTROL CORNER
 - NCGSM = NC GRID SURVEY MONUMENT
 - ZZ = NOT TO SCALE
 - = ADJOINING PROPERTY LINE
 - = EASEMENT
 - = EASEMENT/BOUNDARY LINE



- NOTES:
1. COMBINED FACTOR IS 0.999999904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF. UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

ACREAGE DATA (BY COMPUTER)	
AREA 1 =	0.559 AC±
AREA 2 =	1.273 AC±
TOTAL =	1.832 AC±

SOURCE OF TITLE
 DB 960, PG 757
 MB 10, PG 21

SHEET 6 OF 13

MATRIX EAST, PLLC
 PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A KINSTON, NC 28501
 TEL: 252-522-2500 FAX: 252-522-4747

CONSERVATION EASEMENT SURVEY OF

THE HOLLAND PROPERTY FOR THE STATE OF NORTH CAROLINA

S.P.O. FILE #XX-X
 NCEEP RFP #16-004101
 NCEEP PROJECT #XXXXX
 NCEEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP JANUARY 7, 2013
 DUPLIN COUNTY, NC 1" = 60'

GRAPHIC SCALE
 60' 30' 0 60' 120'

FIRM LIC. # P-0221	EMAIL: surveyor@mtxest.net
DRAWN BY: CKP/JNM	PROJECT NO.: 20110047
SURVEYED BY: LDJ/CCK	DATE: JANUARY 7, 2013
SCALE: 1" = 60'	DRAWING NAME: HOLLAND

"PRELIMINARY PLAT"
 NOT FOR SALES, CONVEYANCES,
 OR RECORDATION.

FLOOD STATEMENT
 THIS PROPERTY IS LOCATED IN ZONE "X."
 AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFP RATE MAP DATED FEBRUARY 16, 2006. COMMUNITY PANEL NUMBER 370083-3368-L.

1. REVIEW OFFICER OF DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____ DATE _____

REGISTER OF DEEDS DUPLIN COUNTY

FILED FOR REGISTRATION _____ 2013 _____ M _____ PAGE _____ PLAT CABINET _____

REVIEW OFFICER OF
DUPULIN COUNTY CERTIFY THAT THE MAP OR PLAT TO
WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY
REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____
DATE _____

FILED FOR REGISTRATION _____
2013 _____ M _____
PLAT CABINET _____ PAGE _____

REGISTER OF DEEDS
DUPULIN COUNTY

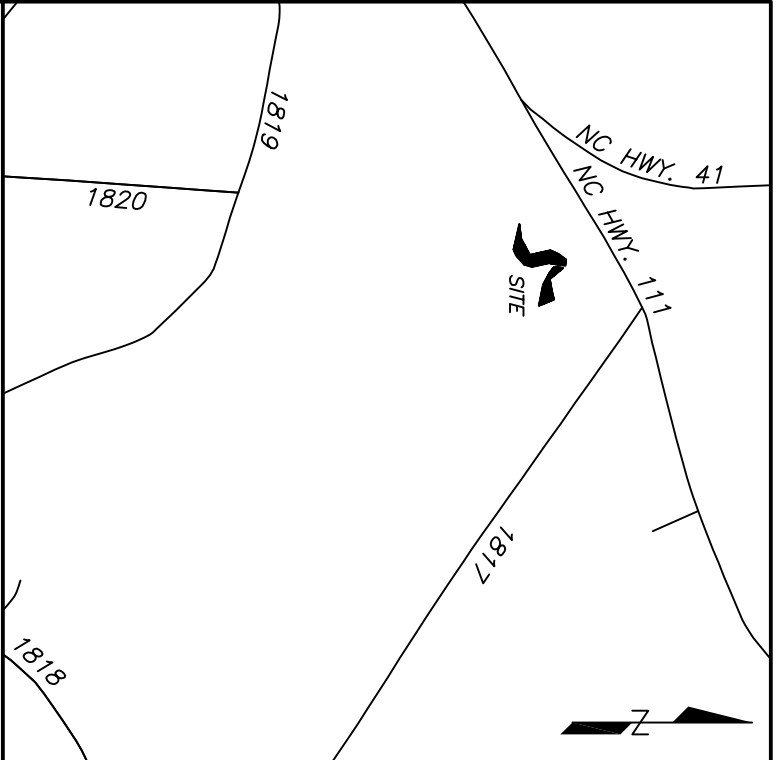
NC GEODETIC SURVEY MONUMENT
REFERENCE TABLE

FROM: "BROWN 1974"	TO: "HATCHER 1974"
N=395,131.0634'	N=398,054.6107'
E=2,357,379.5569'	E=2,362,255.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685.1541' (GRID) 5,685.66' (MEASURED)

NCSSM "HATCHER 1974"
N=398,054.6107'
E=2,362,255.4002'
(NAD 83/2001)

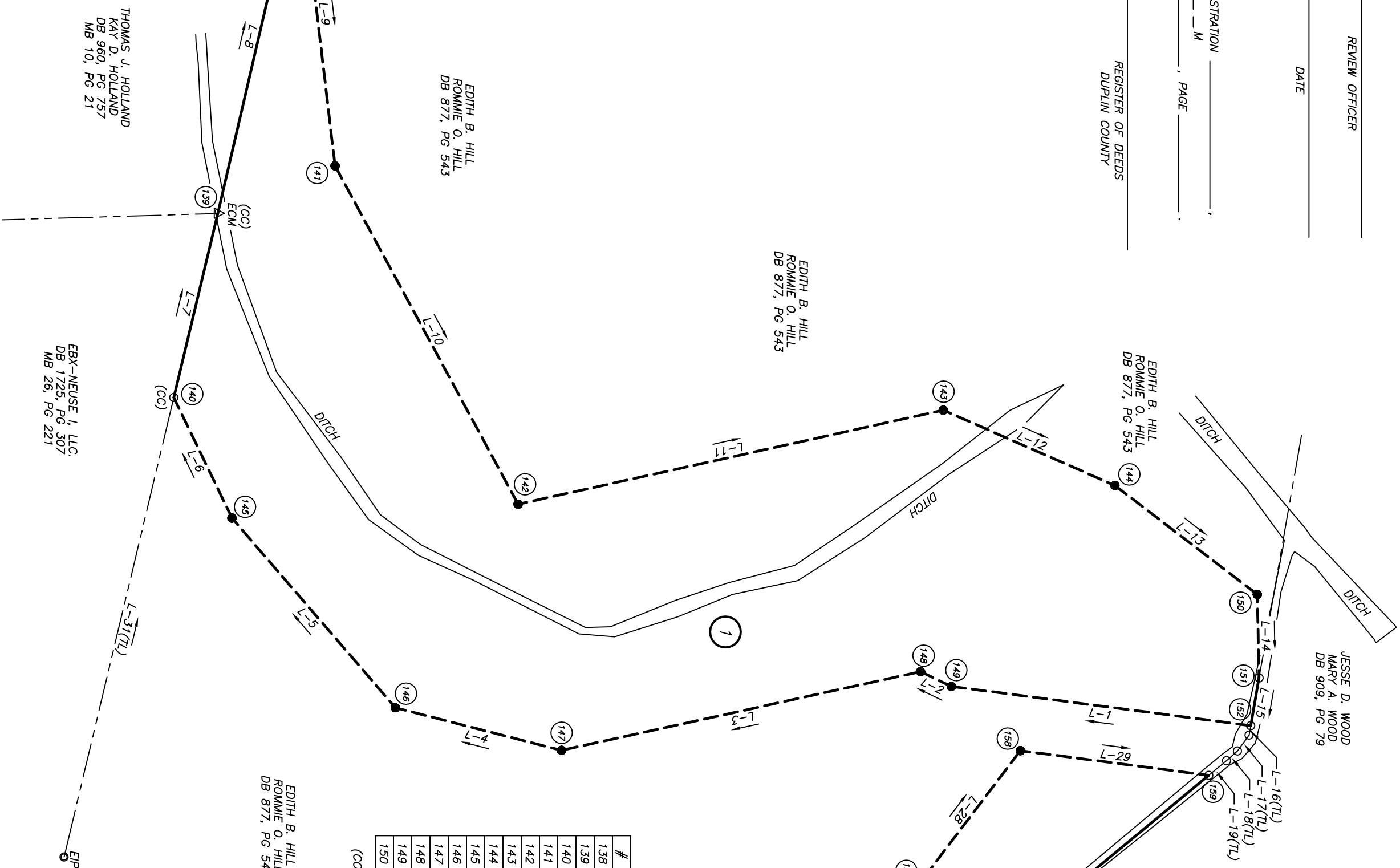
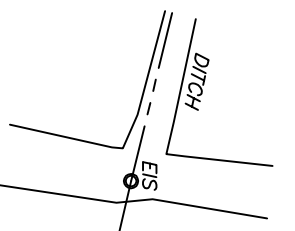
FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X-X"
AND IS NOT WITHIN A SPECIAL FLOOD HAZARD
AREA, AS DETERMINED BY NFIP RATE MAP
DATED FEBRUARY 16, 2006. : COMMUNITY PANEL
NUMBER 370083-3368-1.

VICINITY MAP
(NOT TO SCALE)



LINE TABLE

LINE	BEARING	LENGTH
L-1	S 07°27'39" W	165.44'
L-2	S 25°37'33" W	18.23'
L-3	S 12°21'25" E	201.48'
L-4	S 14°23'01" W	93.94'
L-5	S 49°14'42" W	137.25'
L-6	S 64°13'58" W	213.66'
L-7	N 76°34'12" W	103.65'
L-8	N 76°53'41" W	192.11'
L-9	N 83°15'07" E	166.99'
L-10	N 61°35'16" E	210.84'
L-11	N 12°29'29" W	238.69'
L-12	N 23°41'42" E	102.23'
L-13	N 37°23'51" E	98.24'
L-14	N 88°43'51" E	45.73'
L-15	S 80°04'37" E	26.58'
L-16	S 80°04'37" E	5.26'
L-17	S 53°49'50" E	10.77'
L-18	S 41°37'17" E	8.02'
L-19	S 39°36'32" E	12.62'
L-20	S 39°36'32" E	197.85'
L-21	N 79°54'13" E	123.37'
L-22	N 77°55'29" E	75.60'
L-23	N 77°55'29" E	39.15'
L-24	S 22°31'04" E	100.02'
L-25	S 22°31'16" E	84.35'
L-26	N 78°34'15" W	242.62'
L-27	N 61°56'51" W	154.08'
L-28	N 52°46'45" W	88.11'
L-29	N 07°27'39" E	104.14'
L-30	S 05°39'49" W	990.57'
L-31	N 76°34'12" W	258.89'
L-32	S 76°53'41" E	101.10'



EASEMENT CORNER COORDINATE TABLE

#	NORTHING	EASTING	#	NORTHING	EASTING
138	396,677.1822'	2,361,297.9620'	151	397,203.2269'	2,361,744.4055'
139	396,632.4888'	2,361,489.9431'	152	397,198.6469'	2,361,770.5854'
140	396,608.4154'	2,361,590.7584'	154	396,976.4788'	2,362,195.9495'
141	396,696.8051'	2,361,463.7992'	155	396,898.5614'	2,362,228.2574'
142	396,797.1265'	2,361,649.2460'	156	396,946.6379'	2,361,990.4468'
143	397,030.1940'	2,361,597.6933'	157	397,019.1112'	2,361,854.4767'
144	397,124.2215'	2,361,638.9761'	158	397,072.4108'	2,361,794.3099'
145	396,640.3081'	2,361,656.8279'	159	397,175.6682'	2,361,797.5323'
146	396,729.9150'	2,361,760.7845'	160	397,023.2409'	2,361,923.9711'
147	396,820.9098'	2,361,784.1204'	161	397,044.8688'	2,362,045.4326'
148	397,017.7193'	2,361,741.0036'	165	397,060.6839'	2,362,119.3585'
149	397,034.6033'	2,361,749.1025'	166	397,068.8744'	2,362,157.6443'
150	397,202.2363'	2,361,698.6899'			

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCSSM "HATCHER 1974")

"PRELIMINARY PLAT"
**NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

1. CHRISTOPHER K. PADEBICK, PROFESSIONAL LAND SURVEYOR
NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER
CATEGORY TO WIT: AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA
DUPULIN COUNTY

CHRISTOPHER K. PADEBICK, CERTIFY THAT THIS
PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL
SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION
RECORDED IN MAP & DEED BOOKS NOTED); THAT THE
BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN
FROM INFORMATION REFERENCED HEREON; 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 7TH DAY OF JANUARY, A.D.,
2013.

L-4189

NOTES:
1. COMBINED FACTOR IS 0.999899904.
2. ALL DISTANCES ARE HORIZONTAL GROUND
MEASUREMENTS IN FEET & DECIMALS THEREOF.
UNLESS OTHERWISE NOTED.
3. NEIGHBORING TRACTS:

LEGEND

---	EXISTING IRON STAKE
---	EXISTING CONCRETE MONUMENT
---	EXISTING IRON PIPE
---	NEW IRON STAKE & CAP
---	NEW IRON SET
---	CONTROL CORNER
---	NCSSM
---	NOT TO SCALE
---	ADJOINING PROPERTY LINE
---	EASEMENT LINE
---	EASEMENT/BOUNDARY LINE

APPEARANCE DATA
(BY COMPUTER)

AREA 1 =	2.163 AC±
AREA 2 =	0.944 AC±
TOTAL =	3.107 AC±

SOURCE OF TITLE
DB 877, PG 543

CONSERVATION EASEMENT
SURVEY OF

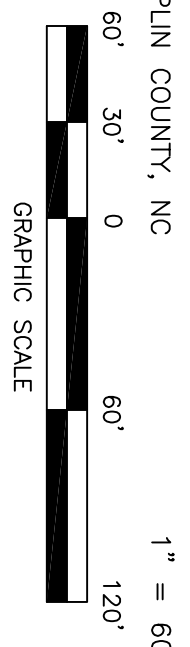
FOR THE HILL PROPERTY
FOR THE STATE OF NORTH CAROLINA
S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP
DUPULIN COUNTY, NC
JANUARY 7, 2013
1" = 60'

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS
906 N. QUEEN ST., SUITE A
TEL: 252-522-2500
KINSTON, NC 28501
FAX: 252-522-4747

FRM LIC. # P-0221
DRAWN BY: CKP/JMM
SURVEYED BY: LDJ/CCK
SCALE: 1" = 60'

EMAIL: surveyor@matrixeast.net
PROJECT NO.: 201110047
DATE: JANUARY 7, 2013
DRAWING NAME: HILL



1. DUPLIN COUNTY, GEORGY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

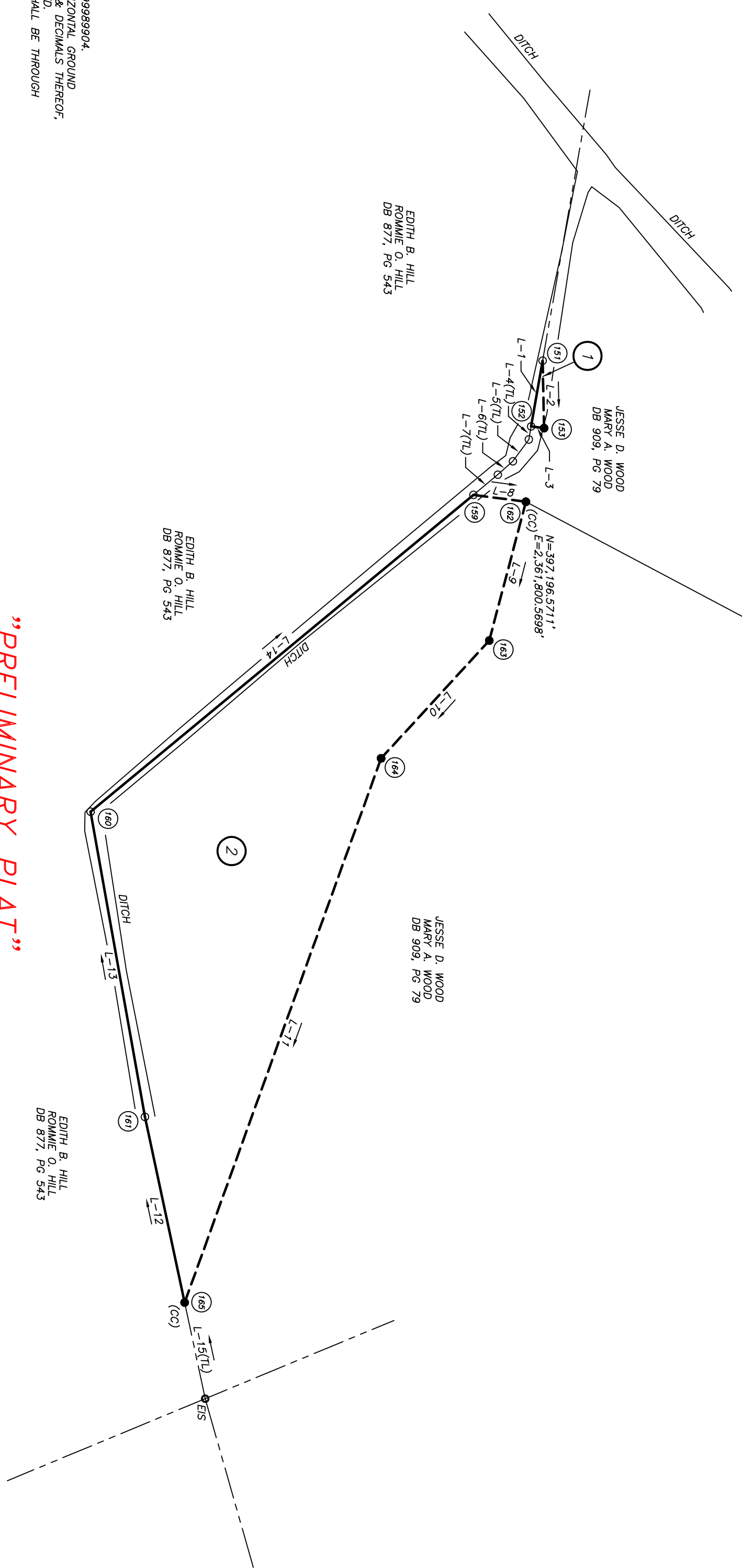
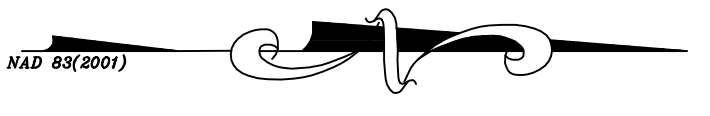
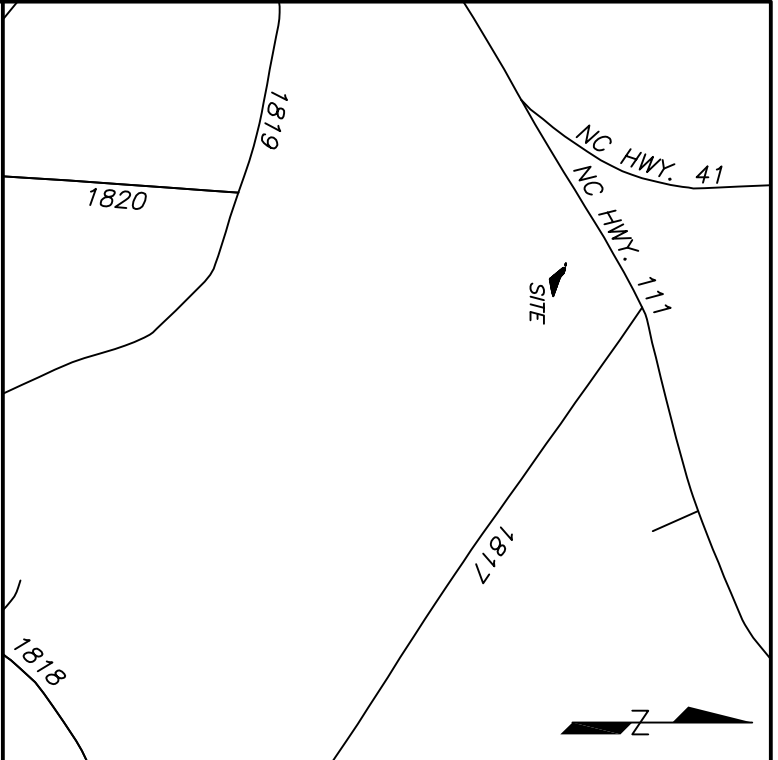
REVIEW OFFICER _____
DATE _____

FILED FOR REGISTRATION _____
2013 _____ M _____ PAGE _____
PLAT CABINET _____

REGISTER OF DEEDS
DUPLIN COUNTY

NGCSM "HATCHER 1974"
N=398,054.6107'
E=2,362,255.4002'
(MAD 59,2001)

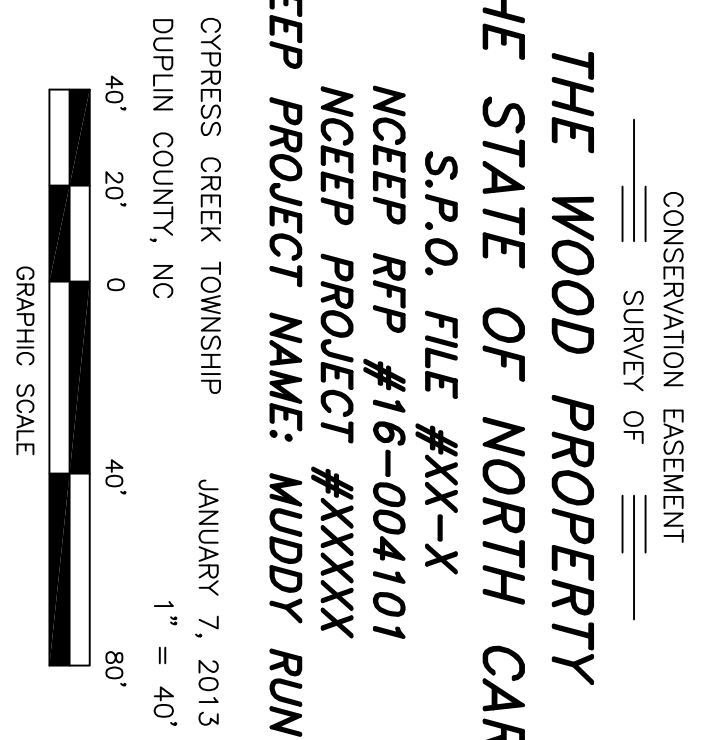
FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X."
AND IS NOT WITHIN A SPECIAL FLOOD HAZARD
AREA, AS DETERMINED BY NFIP RATE MAP
DATED FEBRUARY 16, 2006. : COMMUNITY PANEL
NUMBER 370083-3368-1.



**“PRELIMINARY PLAT”
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

**THE WOOD PROPERTY
FOR THE STATE OF NORTH CAROLINA**

**S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2**



LINE	BEARING	LENGTH
L-1	N 80°04'37" W	26.59'
L-2	N 88°45'31" E	26.86'
L-3	S 07°27'39" W	5.21'
L-4	S 80°04'37" E	5.26'
L-5	S 53°49'50" E	10.27'
L-6	S 41°37'17" E	8.02'
L-7	S 39°36'32" E	12.62'
L-8	N 07°27'39" E	21.06'
L-9	S 79°12'22" E	57.19'
L-10	S 47°26'26" E	63.67'
L-11	S 70°08'40" E	230.33'
L-12	S 77°55'29" W	75.60'
L-13	S 79°54'13" W	123.37'
L-14	N 39°36'32" W	197.85'
L-15	S 77°55'29" W	39.15'
L-16	S 27°55'38" W	971.13'

#	NORTHING	EASTING
151	397,203.2269'	2,361,744.4055'
152	397,198.6469'	2,361,770.5854'
153	397,203.8088'	2,361,771.2614'
159	397,175.6692'	2,361,797.8323'
160	397,023.2409'	2,361,923.9711'
161	397,044.8698'	2,362,045.4325'
162	397,196.5711'	2,361,800.5698'
163	397,181.9789'	2,361,855.8228'
164	397,138.9163'	2,361,902.7196'
165	397,060.6839'	2,362,119.3585'

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NGCSM "HATCHER 1974")

- NOTES:
1. COMBINED FACTOR IS 0.99989904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

1. CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

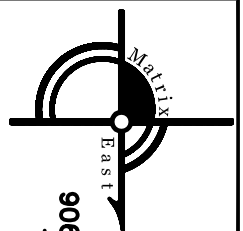
L-4189

1. CHRISTOPHER K. PADERICK, GEORGY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1: 10,000.4; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED, WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 7TH DAY OF JANUARY, A.D., 2013.

L-4189

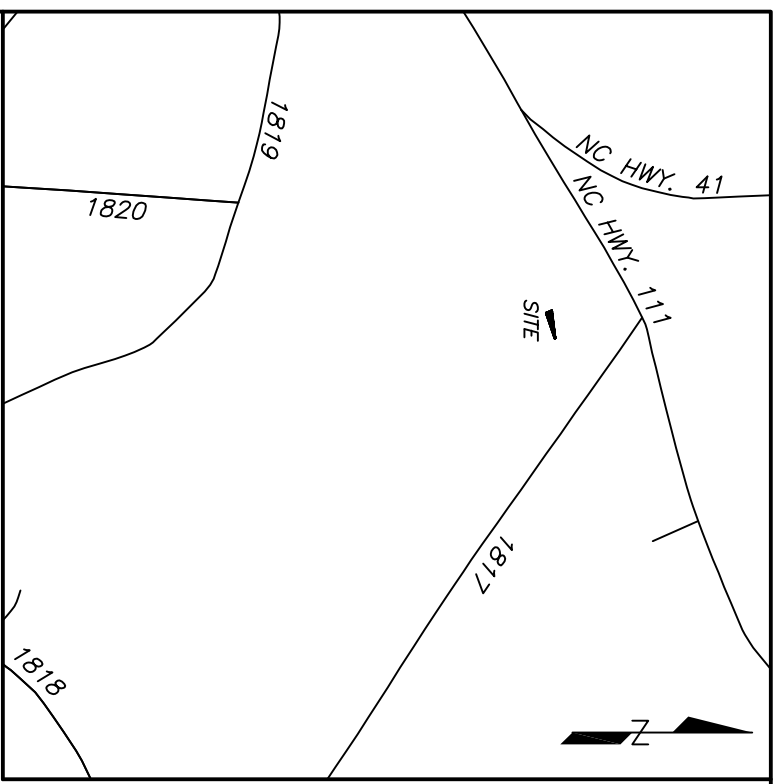
NC GEODETIC SURVEY MONUMENT REFERENCE TABLE	
FROM: "BROWN 1974" N=395,131.0634' E=2,357,379.5569'	TO: "HATCHER 1974" N=398,054.6107' E=2,362,255.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,885.1541' (GRID) 5,883.08 (MEASURED)

- LEGEND
- ES = EXISTING IRON STAKE
 - NI = NEW IRON STAKE & CAP
 - (T) = TIE POINT SET
 - (C) = CONTROL CORNER
 - NGCSM = NC GRID SURVEY MONUMENT
 - Z = NOT TO SCALE
 - Z- = ADJOINING PROPERTY LINE
 - - - = EASEMENT LINE
 - - - - - = EASEMENT/BOUNDARY LINE



MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS
906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221	EMAIL: surveyor@mtxeast.net
DRAWN BY: CKP/JNM	PROJECT NO.: 20110047
SURVEYED BY: LDJ/CCK	DATE: JANUARY 7, 2013
SCALE: 1" = 40'	DRAWING NAME: WOOD



LINE	BEARING	LENGTH
L-1	N 82°47'19" E	322.24'
L-2	S 09°56'16" E	111.06'
L-3	S 70°59'59" W	308.92'
L-4	N 42°31'04" W	78.99'
L-5	S 70°59'59" W	69.31'
L-6	S 22°31'04" E	23.03'
L-7	S 13°25'40" E	993.73'

#	NORTHING	EASTING
154	396,976.4798'	2,362,195.9495'
167	397,047.5973'	2,362,166.4653'
169	397,089.0486'	2,362,486.1613'
169	397,072.1391'	2,362,489.0073'

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "ATCHER 1974")

I, CHRISTOPHER K. PADENRICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY; TO WIT: AN EASEMENT SURVEY.

L-4189

STATE OF NORTH CAROLINA DUPLIN COUNTY

I, CHRISTOPHER K. PADENRICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED). THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON, THAT THE RATIO OF PRECISION AS CALCULATED IS 1: 100,000; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-50 AS AMENDED, WITH THE ORIGINAL SURVEYING REGISTRATION NUMBER AND SEAL THIS 7TH DAY OF JANUARY, A.D., 2013.

L-4189

I, _____ REVIEW OFFICER OF _____ COUNTY, CERTIFY THAT THE PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____
DATE _____

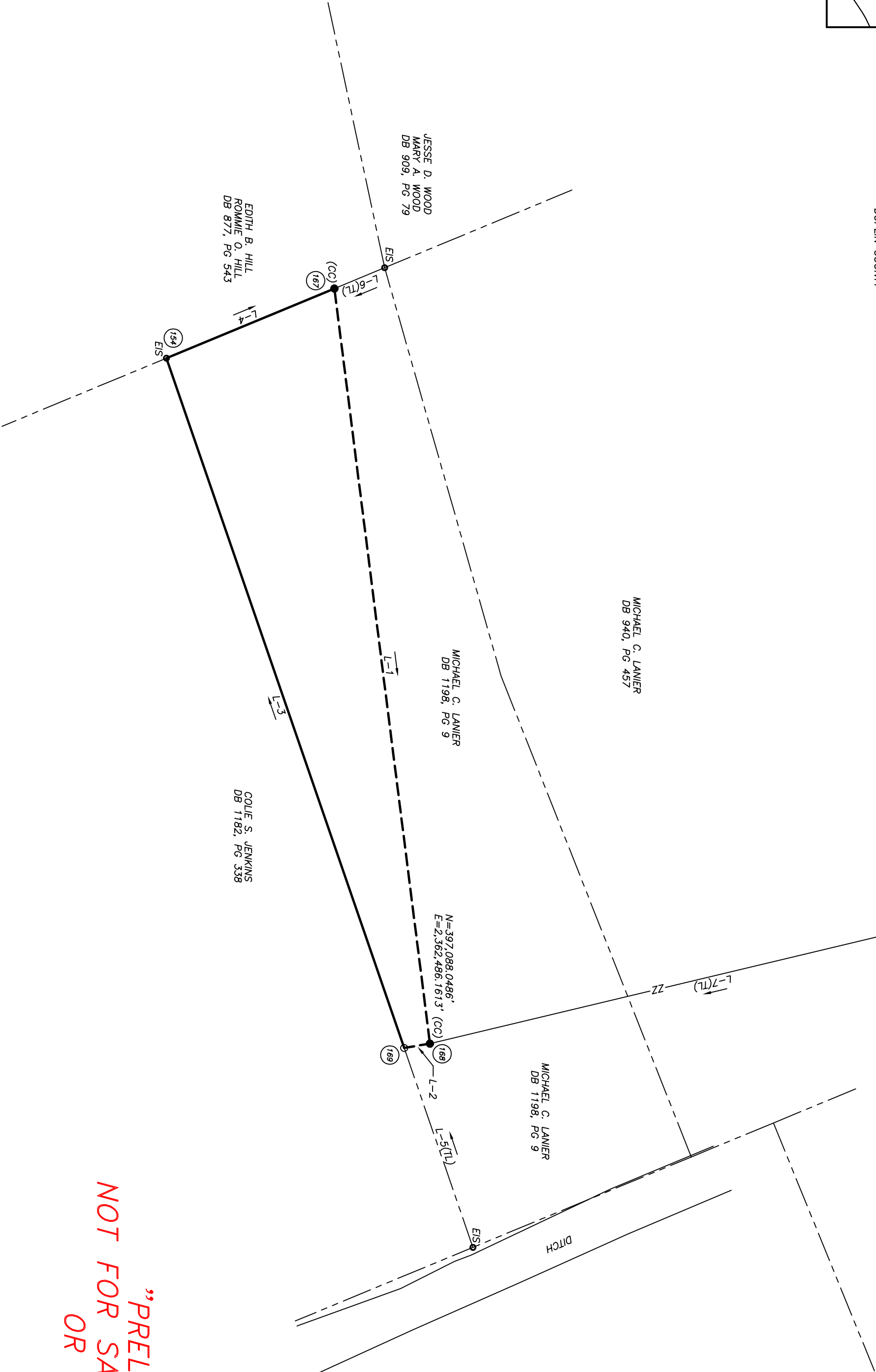
FILED FOR REGISTRATION _____, 2013, _____ M, _____ PAGE _____, PLAT CABINET _____.

REGISTER OF DEEDS
DUPLIN COUNTY

FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X". AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFIP RATE MAP DATED FEBRUARY 16, 2006. COMMUNITY PANEL NUMBER 370083-3369-L.

- NOTES:
1. COMBINED FACTOR IS 0.99989904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. NEIGHBORING TRACT.

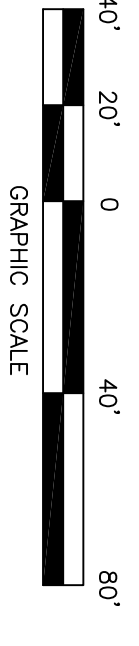
NCGSM "ATCHER 1974"
N=398,054.6107'
E=2,362,255.4002'
(NAD 83/2001)



CONSERVATION EASEMENT
SURVEY OF
THE LANIER PROPERTY
FOR THE STATE OF NORTH CAROLINA

S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP JANUARY 7, 2013
DUPLIN COUNTY, NC



NC GEODETIC SURVEY MONUMENT REFERENCE TABLE			
FROM: "BROWN 1974"	TO: "ATCHER 1974"		
N=395,131.0634'	N=398,054.6107'		
E=2,357,379.5569'	E=2,362,255.4002'		
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685.1541' (GRID)		
	5,685.86' (MEASURED)		



"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES, OR RECORDATION.

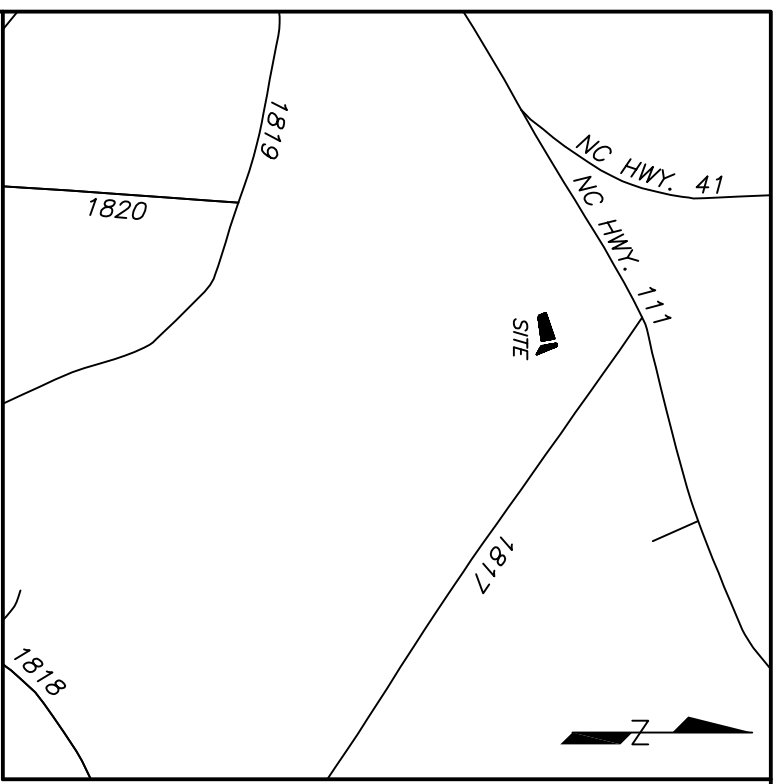
- LEGEND
- = EXISTING IRON STAKE
 - = NEW IRON STAKE & CAP
 - = NO POINT SET
 - (TL) = THE LINE
 - (CO) = CONTROL CORNER
 - = NCGSM = NC GRID SURVEY MONUMENT
 - = MONUMENT SURVEY PROPERTY LINE
 - = EASEMENT LINE
 - = EASEMENT/BOUNDARY LINE

AVERAGE DATA (BY COMPUTER) 0.313 AC±
SOURCE OF TITLE DB 1198, PG 9

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS
906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221 EMAIL: surveyor@matrixeast.net
DRAWN BY: CKP/JNM PROJECT NO.: 201110047
SURVEYED BY: LDJ/CCK DATE: JANUARY 7, 2013
SCALE: 1" = 40' DRAWING NAME: LANIER

SHEET 9 OF 13



NC GEODETIC SURVEY MONUMENT REFERENCE TABLE			
FROM: "BROWN 1974"		TO: "HATCHER 1974"	
N=395,131.0634'	E=2,357,379.5569'	N=398,054.6107'	E=2,362,255.4002'
GRID BEARING N 59°03'11" E		GRID DISTANCE 5,688.154' (GRID) 5,683.98' (MEASURED)	

EASEMENT CORNER COORDINATE TABLE			
#	NORTHING	EASTING	COORDINATES ARE GRID COORDINATES RELATIVE TO NCGSM "HATCHER 1974"
154	396,976.4788'	2,362,195.9495'	
155	396,698.6614'	2,362,228.2574'	
169	397,077.1391'	2,362,488.0073'	
170	396,928.6363'	2,362,513.1362'	
171	396,892.3055'	2,362,259.2022'	
172	397,096.9533'	2,362,545.4666'	
173	396,926.1373'	2,362,574.3665'	
174	396,871.7543'	2,362,569.5493'	
175	397,106.2401'	2,362,572.4415'	

- NOTES:
1. COMBINED FACTOR IS 0.99989904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.



REVIEW OFFICER OF
DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

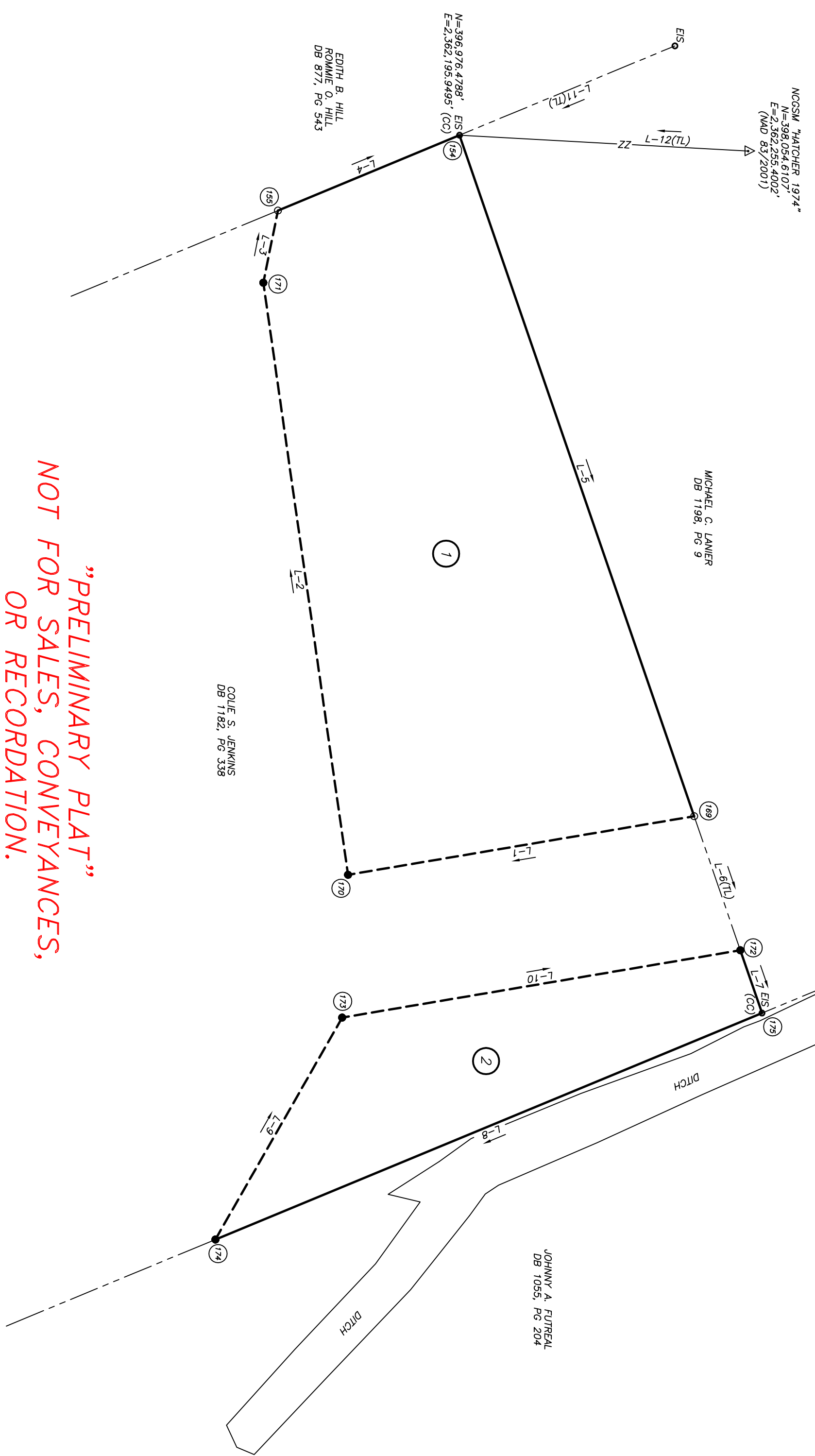
REVIEW OFFICER _____
DATE _____

FILED FOR REGISTRATION _____
2013 JAN _____ M _____ PAGE _____
PLAT CABINET _____

REGISTER OF DEEDS
DUPLIN COUNTY

FLOOD STATEMENT

THIS PROPERTY IS LOCATED IN ZONE "X-X" AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFIP RATE MAP DATED FEBRUARY 16, 2006 : COMMUNITY PANEL NUMBER 370083-3368-L.



LINE	BEARING	LENGTH
L-1	S 09.36 16" E	130.61'
L-2	S 81.51 28" W	256.92'
L-3	N 78.34 15" W	31.57'
L-4	N 22.31 16" W	84.35'
L-5	N 70.58 59" E	308.92'
L-6	N 70.58 59" E	60.81'
L-7	N 70.58 59" E	28.50'
L-8	S 22.29 45" E	253.80'
L-9	N 60.15 30" E	109.62'
L-10	N 09.35 35" W	173.24'
L-11	S 22.31 04" E	100.02'
L-12	S 03.09 22" W	1,079.77'
L-13	S 22.29 45" E	100.05'

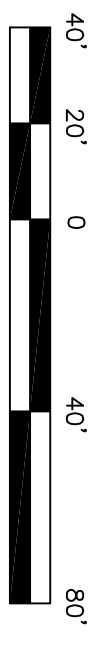
"PRELIMINARY PLAT"
**NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

CONSERVATION EASEMENT
SURVEY OF

**THE JENKINS PROPERTY
FOR THE STATE OF NORTH CAROLINA**

S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP
DUPLIN COUNTY, NC
JANUARY 7, 2013
1" = 40'



I, CHRISTOPHER K. PADERICK, PROFESSIONAL LAND SURVEYOR AND REGISTERED PROFESSIONAL SURVEYOR OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

I, CHRISTOPHER K. PADERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED). THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON; 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 7TH DAY OF JANUARY, A.D., 2013.

LEGEND

ES = EXISTING IRON STAKE
EAX = EXISTING AXLE
● = NEW IRON STAKE & CAP
○ = NEW IRON SET
(TL) = THE LINE
(CO) = CONTROL CORNER
NCGSM = NC GRID SURVEY MONUMENT
Z- = NOT TO SCALE
-Z- = ADJOINING PROPERTY LINE
--- = EASEMENT LINE
--- = EASEMENT/BOUNDARY LINE

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FIRM LIC. # P-0221
DRAWN BY: CKP/JNM
SURVEYED BY: LDJ/CCK
SCALE: 1" = 40'

EMAIL: surveyor@mtxeast.net
PROJECT NO.: 20110047
DATE: JANUARY 7, 2013
DRAWING NAME: JENKINS

ACREAGE DATA
(BY COMPUTER)

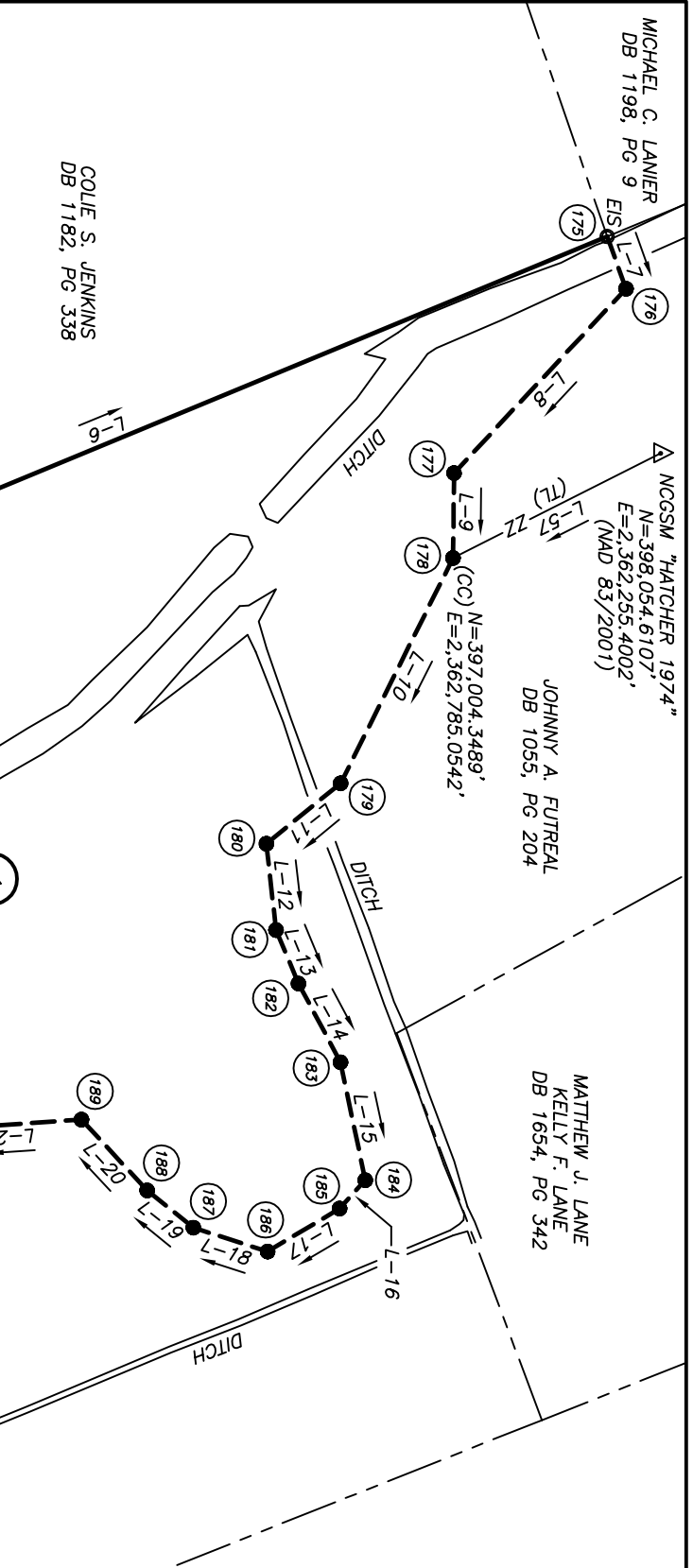
AREA 1 = 0.824 AC±
AREA 2 = 0.252 AC±
TOTAL = 1.076 AC±

SOURCE OF TITLE
DB 1182, PG 338

SHEET 10 OF 13

L-4189

NC GEODETIC SURVEY MONUMENT REFERENCE TABLE		TO: "HATCHER 1974"	
FROM: "BROWN 1974"	N=395,131.0634'	N=396,054.6107'	GRID DISTANCE
	E=2,357,379.5569'	E=2,362,255.4002'	5,685.1541' (GRID)
	GRID BEARING	N 59°03'11" E	5,685.86' (MEASURED)



1. DURING COUNTY CERTIFY THAT THE REVIEW OFFICER OF WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____ DATE _____

REGISTER OF DEEDS
DUPLIN COUNTY

FILED FOR REGISTRATION _____ M _____ PAGE _____
2013 _____

PLAT CABINET _____

STATE OF NORTH CAROLINA
DUPLIN COUNTY

CHRISTOPHER K. BAUERICK
PLAT WAS DRAWN UNDER MY SUPERVISION FROM THE SURVEY MADE UNDER SUPERVISOR'S ORDER. DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED. THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON. 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 7TH DAY OF JANUARY, A.D., 2013.

EASEMENT CORNER COORDINATE TABLE					
#	NORTHING	EASTING	#	NORTHING	EASTING
175	397,106.2401'	2,362,522.4415'	202	395,232.2610'	2,364,146.2843'
176	397,118.7270'	2,362,606.9805'	203	395,322.1642'	2,364,076.7422'
177	397,004.9971'	2,362,728.9461'	204	395,327.2840'	2,363,862.2454'
178	397,004.3489'	2,362,785.0542'	205	395,334.3366'	2,363,704.9877'
179	396,930.0397'	2,362,934.0537'	206	395,522.7727'	2,363,645.4799'
180	396,880.9611'	2,362,974.0369'	207	395,632.1345'	2,363,609.4431'
181	396,887.2936'	2,363,031.0997'	208	395,743.2780'	2,363,605.6020'
182	396,902.1677'	2,363,086.5687'	209	395,899.4302'	2,363,485.0157'
183	396,929.9682'	2,363,118.5585'	210	396,109.9943'	2,363,331.9340'
184	396,946.3212'	2,363,196.5757'	211	396,198.6751'	2,363,455.1376'
185	396,929.3514'	2,363,215.3132'	212	396,109.4575'	2,363,521.6572'
186	396,881.7384'	2,363,243.7440'	213	396,026.4205'	2,363,585.7106'
187	396,832.6031'	2,363,227.9383'	214	395,937.3454'	2,363,653.9865'
188	396,802.1030'	2,363,203.3406'	215	395,920.9802'	2,363,697.2123'
189	396,758.6940'	2,363,156.4964'	216	395,877.4817'	2,363,787.8168'
190	396,663.1158'	2,363,163.0880'	217	395,820.9350'	2,363,783.0016'
191	396,624.3456'	2,363,195.5621'	218	395,769.6227'	2,363,820.2651'
192	396,569.6601'	2,363,234.4267'	219	395,741.5539'	2,363,746.8892'
193	396,531.2448'	2,363,195.3616'	220	395,710.5249'	2,363,751.3846'
194	396,429.0210'	2,363,286.0719'	221	395,504.2288'	2,363,797.2553'
195	396,344.5869'	2,363,317.1642'	222	395,479.9344'	2,363,807.5570'
196	396,224.5134'	2,363,430.7954'	223	395,471.2400'	2,363,933.1838'
197	396,125.1057'	2,363,301.5906'	224	395,222.7966'	2,364,156.9012'
198	396,474.1828'	2,363,172.1483'	225	395,239.5160'	2,364,215.7929'
199	396,474.1828'	2,363,044.4366'	226	395,458.3661'	2,364,048.5586'
200	396,519.4656'	2,363,016.0257'	227	395,467.3021'	2,364,042.0831'
201	396,451.0466'	2,362,843.7774'			

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSM "HATCHER 1974")

LINE	BEARING	LENGTH
L-1	S 52°25'34" W	163.02'
L-2	N 39°57'32" W	201.55'
L-3	N 33°16'39" W	232.75'
L-4	N 32°06'16" W	53.46'
L-5	S 68°20'11" W	185.34'
L-6	N 22°29'45" W	709.16'
L-7	N 70°07'25" E	36.73'
L-8	S 47°00'04" E	166.76'
L-9	S 89°20'17" E	56.11'
L-10	S 63°29'37" E	166.50'
L-11	S 39°10'08" E	63.30'
L-12	N 83°40'03" E	57.41'
L-13	N 67°14'56" E	38.46'
L-14	N 61°51'55" E	58.96'
L-15	N 28°09'42" E	79.21'
L-16	S 47°20'03" E	25.28'
L-17	S 30°20'33" E	55.46'
L-18	S 17°49'55" W	51.61'
L-19	S 38°53'07" W	63.86'
L-20	S 47°10'47" W	39.18'
L-21	S 03°56'43" E	95.81'
L-22	S 39°56'59" E	50.57'
L-23	S 35°24'04" E	67.09'
L-24	S 45°28'50" W	54.79'
L-25	S 34°40'21" E	124.30'
L-26	S 31°10'44" E	98.69'
L-27	S 43°25'16" E	165.33'
L-28	S 43°17'32" E	35.50'
L-29	S 36°47'25" E	111.41'
L-30	S 41°39'00" E	111.13'
L-31	S 33°1'39" E	106.44'
L-32	S 69°15'48" E	46.22'
L-33	S 64°21'17" E	100.51'
L-34	S 04°52'02" W	56.75'
L-35	S 36°19'25" E	63.69'
L-36	S 69°11'02" W	78.99'
L-37	S 08°14'37" E	31.35'
L-38	S 12°32'10" E	211.33'
L-39	S 22°58'44" E	26.39'
L-40	S 66°02'27" E	125.93'
L-41	S 87°55'45" E	108.97'
L-42	S 35°53'43" E	118.04'
L-43	S 37°23'07" E	273.43'
L-44	S 24°09'03" W	61.22'
L-45	N 46°48'56" W	14.56'
L-46	N 37°32'39" W	113.27'
L-47	N 88°31'58" W	214.56'
L-48	N 80°14'22" W	159.57'
L-49	N 19°27'29" W	178.64'
L-50	N 18°14'17" W	115.15'
L-51	N 01°58'46" W	111.21'
L-52	N 35°18'21" W	191.34'
L-53	N 34°31'27" W	122.57'
L-54	N 40°30'55" W	144.12'
L-55	N 54°15'03" E	151.81'
L-56	S 74°09'03" W	46.22'
L-57	S 26°45'44" E	1,176.26'

CONSERVATION EASEMENT
SURVEY OF

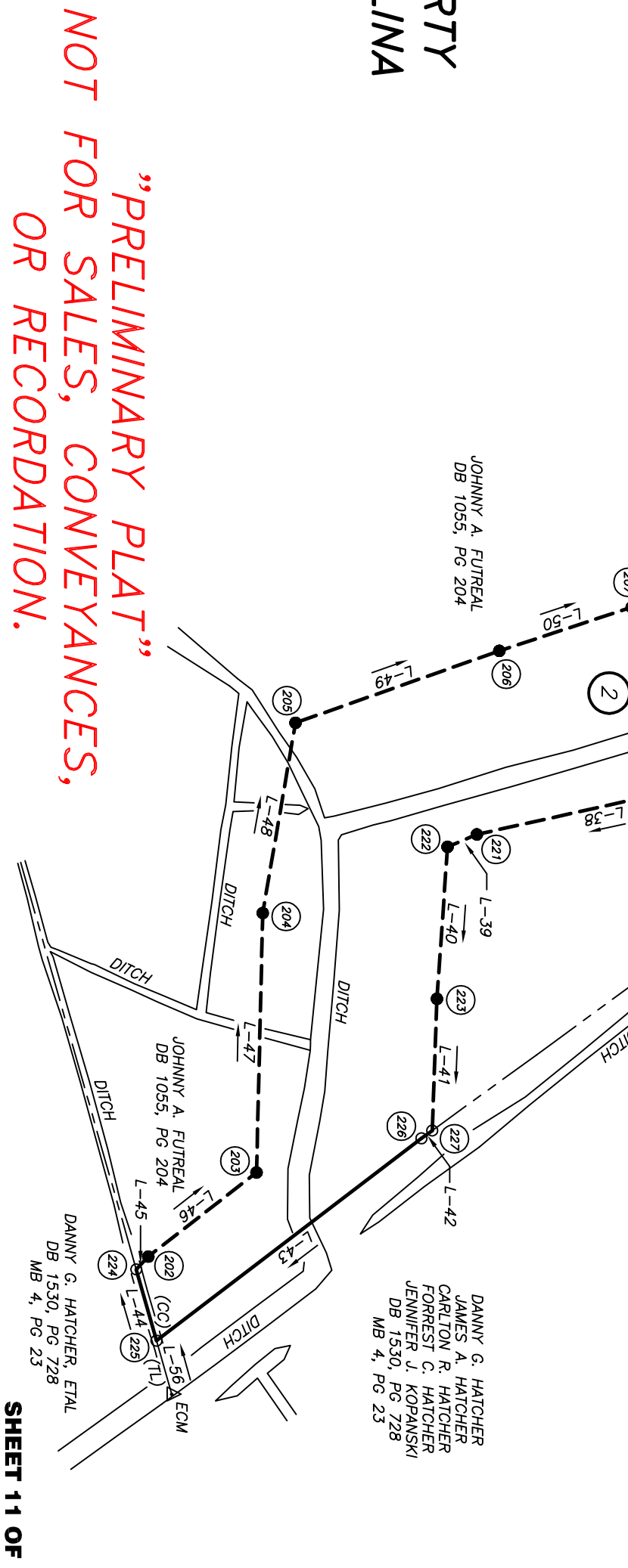
**THE JOHNNY A. FUTREAL PROPERTY
FOR THE STATE OF NORTH CAROLINA**

S.P.O. FILE #31-N
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP
DUPLIN COUNTY, NC
JANUARY 7, 2013

1" = 120'

GRAPHIC SCALE



MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A
KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

EMAIL: surveyor@matrixeast.net
PROJECT NO.: 20110047
DATE: JANUARY 7, 2013
DRAWING NAME: FUTREAL 2

SCALE: 1" = 120'

SHEET 11 OF 13

NOTES:
1. COMBINED FACTOR IS 0.999899904.
2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X-X" AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NCEP RATE MAP DATED FEBRUARY 16, 2006. COMMUNITY PANEL NUMBER 370083-3368-L.

LEGEND
EIS = EXISTING IRON STAKE
ECM = EXISTING CONCRETE MONUMENT
● = NEW IRON STAKE & CAP
(T) = THE LINE
(CO) = CONTROL CORNER
NCGSM = NC GRID SURVEY MONUMENT
Z- = NOT TO SCALE
--- = ADJOINING PROPERTY LINE
--- = EASEMENT/BOUNDARY LINE

ACREAGE DATA
(BY COMPUTER)
AREA 1 = 6.616 AC±
AREA 2 = 4.402 AC±
TOTAL = 11.018 AC±

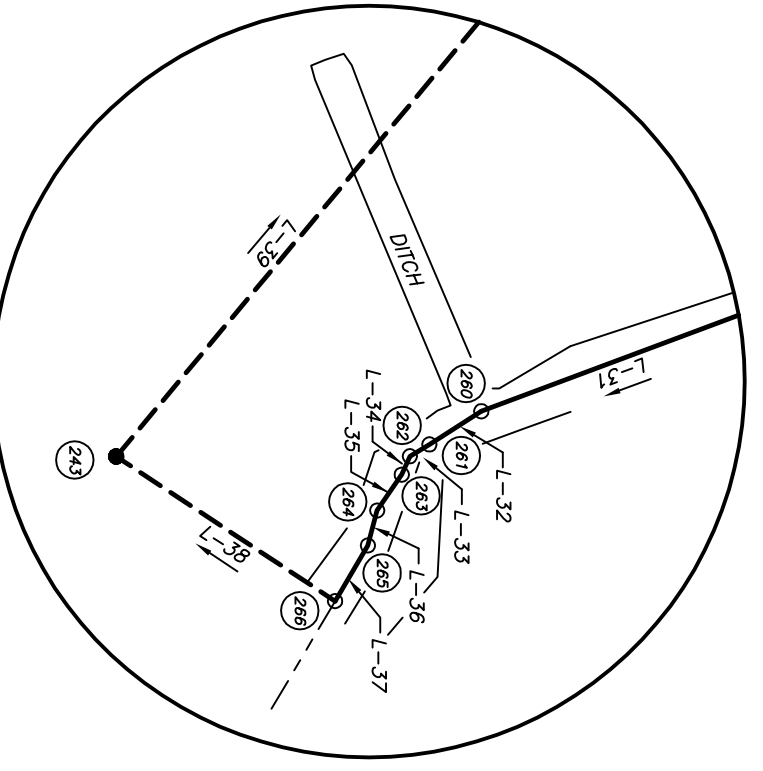
SOURCE OF TITLE
DB 1055, PG 204

1. CHRISTOPHER K. BAUERICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY. TO WIT, AN EASEMENT SURVEY.

L-4189

"PRELIMINARY PLAT"
**NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

NC GEODETIC SURVEY MONUMENT REFERENCE TABLE	
FROM: "BROWN 1974"	TO: "HATCHER 1974"
N=395,131.0634'	N=398,054.6107'
E=2,357,379.5969'	E=2,362,255.4002'
GRID BEARING N 59°03'11" E	GRID DISTANCE 5,685.1541' (GRID) 5,685.86' (MEASURED)



INSET "A"
(SCALE: 1" = 50')

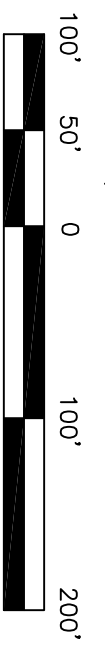
#	NORTHING	EASTING	#	NORTHING	EASTING
224	395,222.7966'	2,364,156.9012'	246	394,515.5245'	2,364,419.0507'
225	395,239.5160'	2,364,215.7929'	247	394,659.2927'	2,364,417.0427'
226	395,458.5661'	2,364,048.5585'	248	394,731.7529'	2,364,352.2841'
227	395,467.5021'	2,364,042.0831'	249	394,802.8209'	2,364,325.9499'
228	395,463.2330'	2,364,154.6103'	250	394,878.0777'	2,364,463.8438'
229	395,440.5707'	2,364,260.4692'	251	394,773.3177'	2,364,546.7857'
230	395,328.8509'	2,364,326.7355'	252	394,807.8406'	2,364,608.3283'
231	395,319.9801'	2,364,365.7361'	253	394,812.3030'	2,364,661.5616'
232	395,296.8500'	2,364,389.1469'	254	394,814.6327'	2,364,666.7392'
233	395,245.8482'	2,364,391.4150'	255	394,697.1250'	2,364,483.9813'
234	395,219.5200'	2,364,402.7355'	256	394,635.9758'	2,364,505.4296'
235	395,109.7028'	2,364,460.0994'	257	394,577.0681'	2,364,524.8221'
236	395,009.7949'	2,364,418.0079'	258	394,524.1927'	2,364,543.6522'
237	394,968.7571'	2,364,420.8741'	259	394,427.9130'	2,364,577.8997'
238	394,889.8260'	2,364,276.6272'	260	394,351.7992'	2,364,606.3066'
239	394,946.8659'	2,364,251.8596'	261	394,338.2701'	2,364,618.0150'
240	395,027.3737'	2,364,235.0331'	262	394,333.1785'	2,364,618.0150'
241	395,156.5999'	2,364,261.9799'	263	394,331.0721'	2,364,622.8140'
242	395,178.3856'	2,364,204.2200'	264	394,324.6726'	2,364,632.1507'
243	394,256.6837'	2,364,618.0830'	265	394,322.2483'	2,364,641.2545'
244	394,372.3519'	2,364,479.6115'	266	394,313.6889'	2,364,655.7530'
245	394,423.6608'	2,364,447.5925'			

(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGSWM "HATCHER 1974")

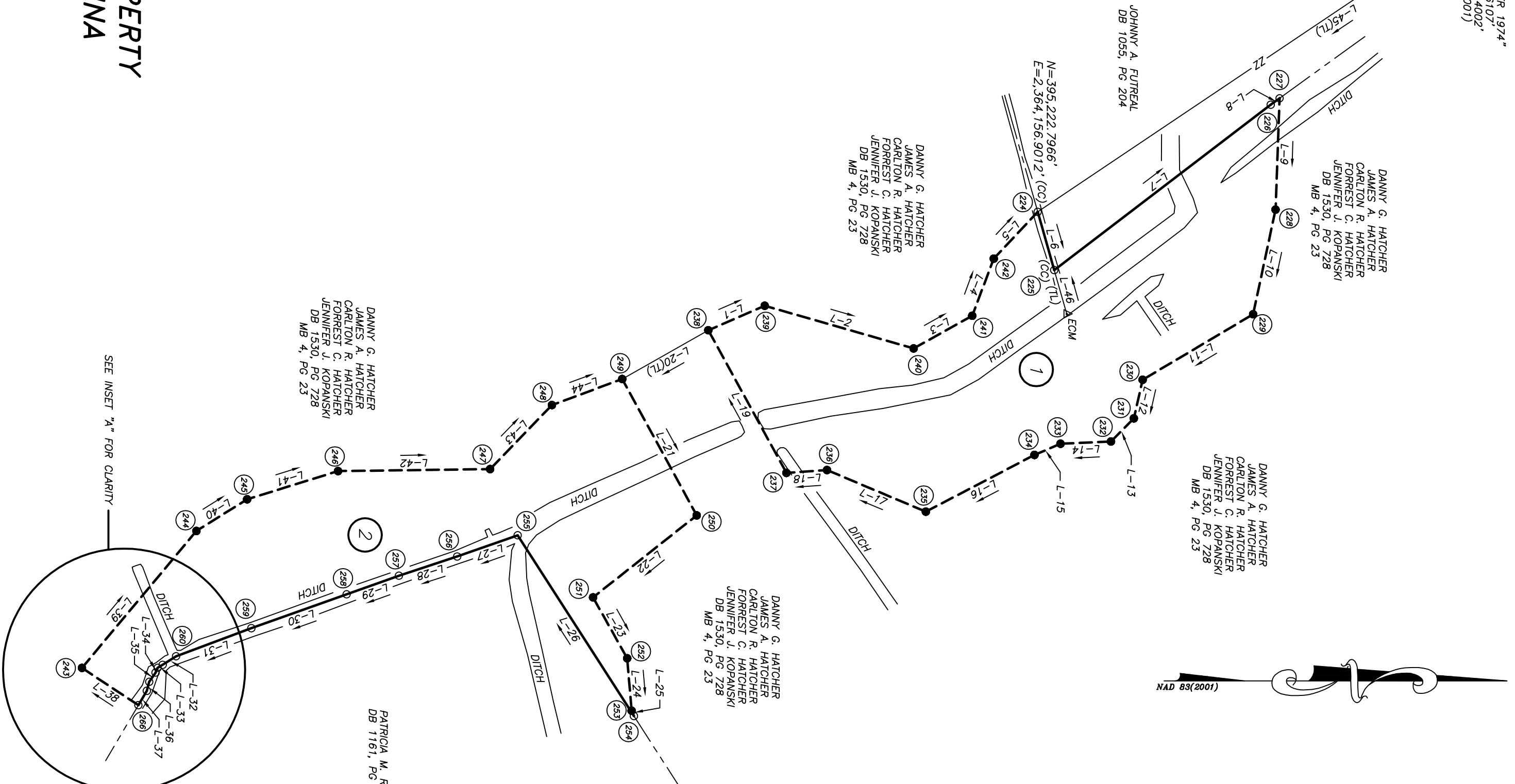
THE DANNY G. HATCHER, ETAL PROPERTY
FOR THE STATE OF NORTH CAROLINA

S.P.O. FILE #31-1
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2

CYPRESS CREEK TOWNSHIP JANUARY 7, 2013
DUPLIN COUNTY, NC 1" = 100'



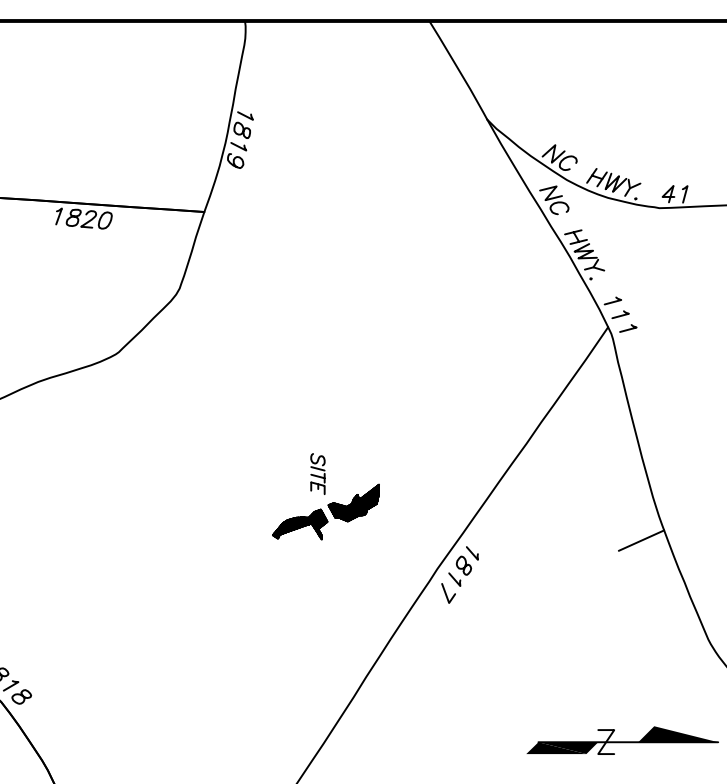
GRAPHIC SCALE



I, CHRISTOPHER K. PAERICK, PROFESSIONAL LAND SURVEYOR NO. 4189, CERTIFY THAT THIS SURVEY IS OF ANOTHER CATEGORY, TO WIT: AN EASEMENT SURVEY.

STATE OF NORTH CAROLINA
DUPLIN COUNTY

I, CHRISTOPHER K. PAERICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION. (DEED DESCRIPTION RECORDED IN MAP & DEED BOOKS NOTED); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION REFERENCED HEREON; 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 7TH DAY OF JANUARY, A.D., 2013.



I, _____, REVIEW OFFICER OF _____ COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

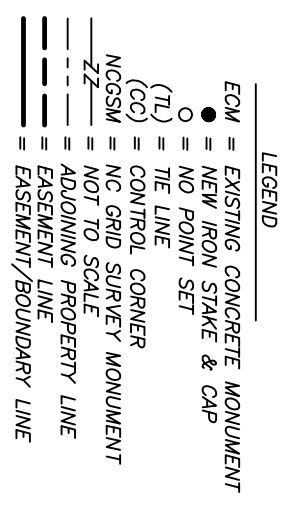
REVIEW OFFICER _____
DATE _____
FILED FOR REGISTRATION _____
2013 _____ M _____ PAGE _____
PLAT CABINET _____

REGISTER OF DEEDS
DUPLIN COUNTY

FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X". AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NCEP RATE MAP DATED FEBRUARY 16, 2006. COMMUNITY PANEL NUMBER 370083-3368-1.

NOTES:
1. COMBINED FACTOR IS 0.99989994.
2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF.
3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

LINE	BEARING	LENGTH
L-1	N 232°16' W	62.19'
L-2	N 16°00'20" E	156.58'
L-3	N 29°09'55" W	67.83'
L-4	N 69°20'05" W	61.73'
L-5	N 46°48'56" W	64.90'
L-6	N 74°09'03" E	61.22'
L-7	N 37°23'07" W	275.43'
L-8	N 35°55'45" E	112.80'
L-9	S 77°54'59" E	108.86'
L-10	S 30°40'27" E	129.89'
L-11	S 17°11'09" E	40.00'
L-12	S 77°11'09" E	32.91'
L-13	S 45°20'44" E	51.05'
L-14	S 02°32'47" E	28.66'
L-15	S 23°15'59" E	123.90'
L-16	S 27°34'50" E	108.41'
L-17	S 22°50'45" W	41.14'
L-18	S 03°59'42" E	164.43'
L-19	S 67°18'46" W	100.01'
L-20	S 28°32'55" E	157.09'
L-21	N 61°22'34" E	133.62'
L-22	S 38°22'11" E	70.56'
L-23	N 60°42'34" E	53.22'
L-24	N 85°11'25" E	5.86'
L-25	N 66°34'36" E	217.28'
L-26	S 57°15'37" W	64.80'
L-27	S 19°19'43" E	62.02'
L-28	S 18°13'18" E	102.19'
L-29	S 19°36'07" E	56.13'
L-30	S 19°34'51" E	81.24'
L-31	S 20°27'59" E	16.05'
L-32	S 37°31'29" E	5.99'
L-33	S 37°10'52" E	11.32'
L-34	S 68°18'06" E	17.28'
L-35	S 59°34'22" E	9.42'
L-36	S 79°05'18" E	16.83'
L-37	S 39°28'24" E	68.34'
L-38	S 33°27'10" W	180.43'
L-39	N 50°07'38" W	60.48'
L-40	N 31°57'57" W	96.20'
L-41	N 17°15'36" W	153.74'
L-42	N 00°44'54" W	90.00'
L-43	N 46°01'00" W	75.79'
L-44	N 20°19'56" W	3,410.99'
L-45	S 33°52'50" E	48.22'
L-46	S 74°09'03" W	48.22'



MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FRM LIC. # P-0221	EMAIL: surveyor@matrixeast.net
DRAWN BY: CKP/JNM	PROJECT NO.: 20110047
SURVEYED BY: LDJ/COCK	DATE: JANUARY 7, 2013
SCALE: 1" = 100'	DRAWING NAME: HATCHER 2

"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.

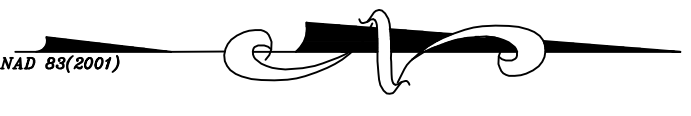
1. DUPLIN COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER _____

DATE _____

FILED FOR REGISTRATION _____
PLAT CABINET _____ PAGE _____

REGISTER OF DEEDS
DUPLIN COUNTY



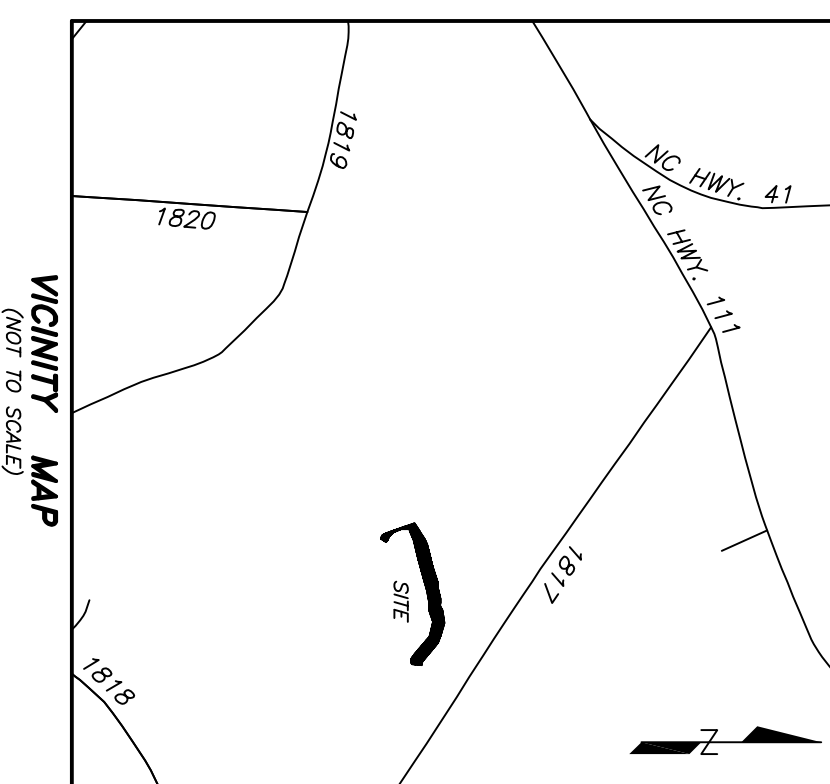
NC GEODETIC SURVEY MONUMENT REFERENCE TABLE			
FROM: "BROWN 1974"	TO: "HATCHER 1974"	GRID BEARING	GRID DISTANCE
N=395,131.0634'	N=398,054.6107'	N 59°03'11" E	5,685.1541' (GRID)
E=2,357,379.5569'	E=2,362,255.4002'		5,685.96' (MEASURED)
(NAD 83/2011)			

EASEMENT CORNER COORDINATE TABLE					
#	NORTHING	EASTING	#	NORTHING	EASTING
254	394,814.6327'	2,364,666.7392'	278	394,863.5336'	2,365,383.2504'
255	394,697.1250'	2,364,483.9813'	279	394,884.2082'	2,365,474.0689'
256	394,635.9758'	2,364,505.4296'	280	394,907.9794'	2,365,605.9140'
257	394,577.0681'	2,364,524.8221'	281	394,868.1092'	2,365,773.2036'
258	394,524.1927'	2,364,543.6522'	282	394,700.8227'	2,365,968.3543'
259	394,427.9130'	2,364,572.8937'	283	394,674.1897'	2,366,006.0207'
260	394,351.7992'	2,364,606.3066'	284	394,659.4897'	2,366,026.3789'
261	394,338.2701'	2,364,614.9337'	285	394,666.6093'	2,366,061.8378'
262	394,333.1785'	2,364,618.0150'	286	394,666.6166'	2,366,085.3789'
263	394,333.0721'	2,364,622.8140'	287	394,776.8493'	2,366,095.4955'
264	394,324.6726'	2,364,632.1507'	288	394,783.9777'	2,366,097.0272'
265	394,322.2483'	2,364,641.2545'	289	394,908.4156'	2,365,908.5431'
266	394,313.6989'	2,364,658.7530'	290	394,964.2558'	2,365,839.4550'
267	394,371.0115'	2,364,693.6195'	291	394,993.7162'	2,365,780.8079'
268	394,402.1735'	2,364,638.1272'	292	395,014.1600'	2,365,616.3146'
269	394,455.1050'	2,364,584.1204'	293	395,036.6302'	2,365,424.5124'
270	394,536.8067'	2,364,549.6202'	294	394,998.0280'	2,365,424.5124'
271	394,642.2079'	2,364,548.8311'	295	394,963.9276'	2,365,226.0426'
272	394,682.5935'	2,364,672.2254'	296	394,902.6322'	2,365,149.4387'
273	394,687.5254'	2,364,672.2254'	297	394,927.9881'	2,365,149.4387'
274	394,736.4404'	2,364,878.7254'	298	394,865.4146'	2,364,824.7425'
275	394,806.4268'	2,365,135.7173'	299	394,840.7857'	2,364,727.0620'
276	394,839.2655'	2,365,249.7198'	300		

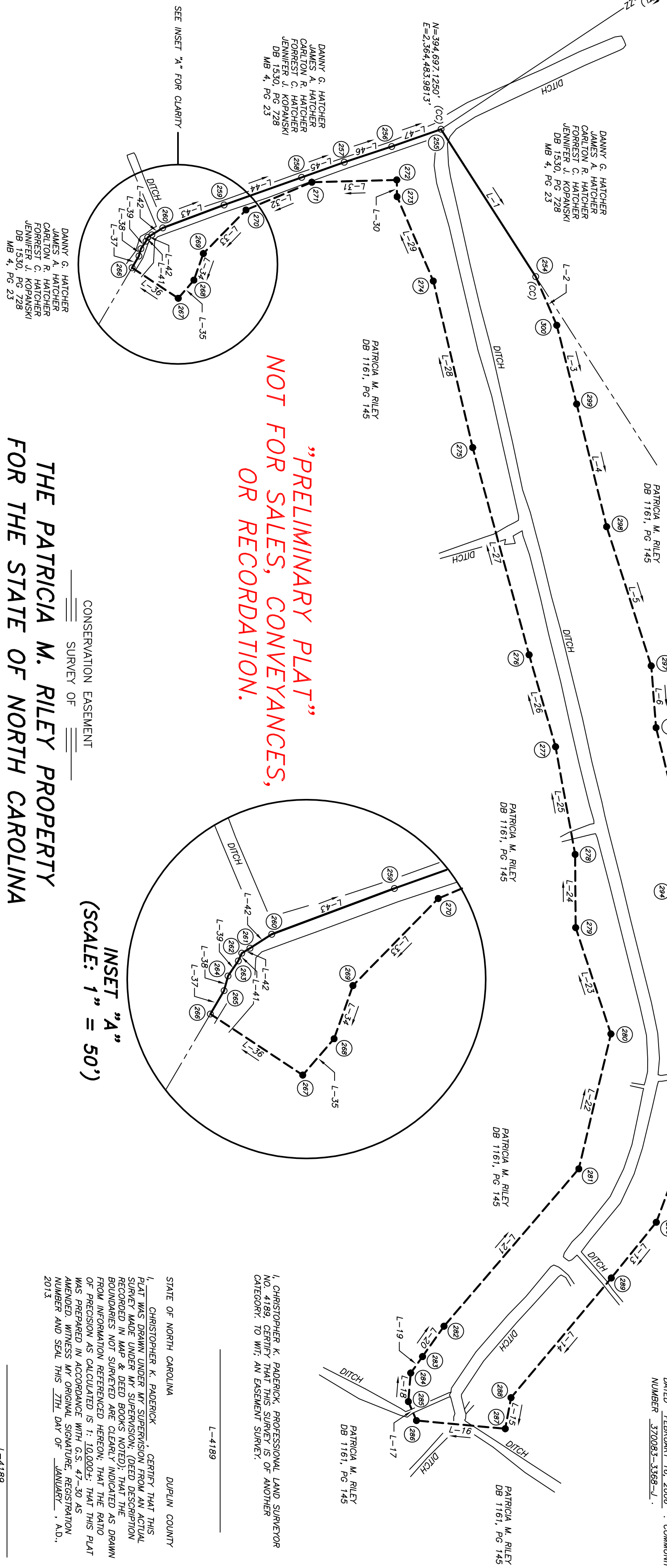
(COORDINATES ARE GROUND COORDINATES RELATIVE TO NCGS "HATCHER 1974")

LINE TABLE			
LINE	BEARING	LENGTH	
L-1	N 57°15'37" E	217.28'	
L-2	N 66°34'36" E	65.74'	
L-3	N 75°50'15" E	100.74'	
L-4	N 76°15'03" E	156.59'	
L-5	N 72°13'02" E	181.25'	
L-6	N 65°13'48" E	76.84'	
L-7	S 76°14'26" E	124.69'	
L-8	S 68°51'28" E	77.66'	
L-9	N 68°43'19" E	57.02'	
L-10	N 81°01'21" E	142.67'	
L-11	S 73°30'03" E	150.49'	
L-12	S 69°30'44" E	84.17'	
L-13	S 51°03'12" E	88.83'	
L-14	S 79°30'07" E	193.73'	
L-15	S 79°30'07" E	39.12'	
L-16	S 66°18'08" W	110.69'	
L-17	S 66°57'57" W	25.58'	
L-18	N 85°21'18" W	35.58'	
L-19	N 54°11'18" W	25.13'	
L-20	N 54°43'24" W	46.12'	
L-21	N 49°23'46" W	257.04'	
L-22	N 76°35'41" W	171.98'	
L-23	S 71°38'05" W	138.92'	
L-24	S 89°34'28" W	90.92'	

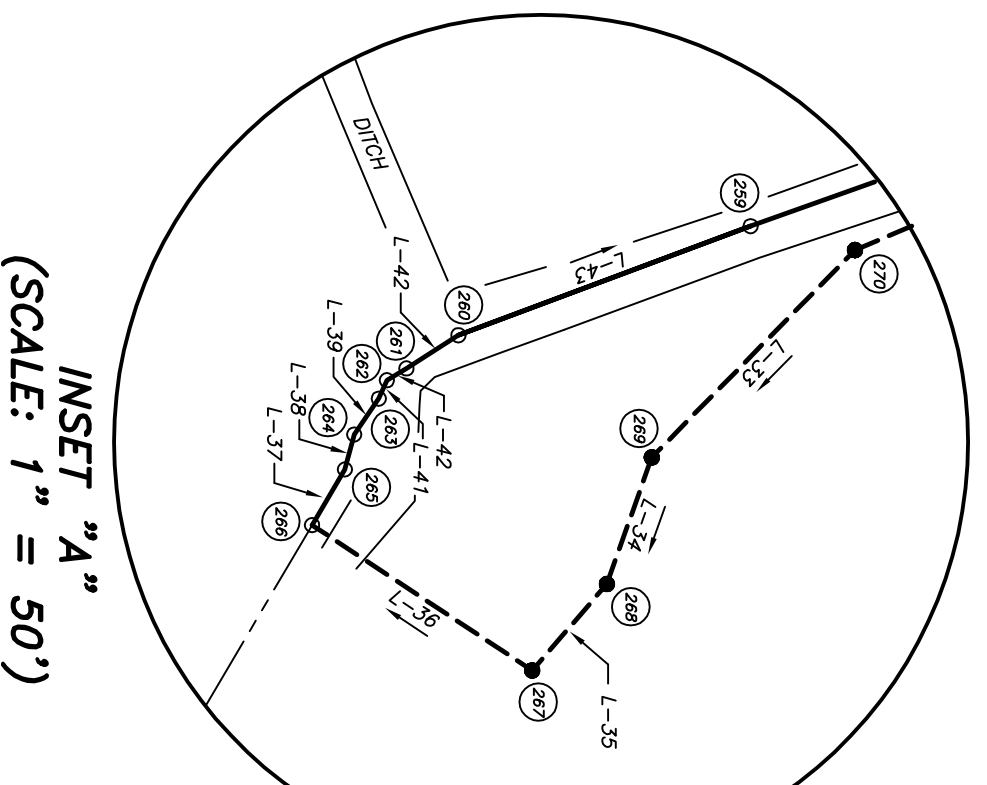
LINE TABLE			
LINE	BEARING	LENGTH	
L-25	S 79°41'58" W	135.22'	
L-26	S 73°55'51" W	118.64'	
L-27	S 74°45'58" W	286.35'	
L-28	S 76°40'25" W	212.21'	
L-29	S 66°45'52" W	113.89'	
L-30	S 89°56'05" W	20.24'	
L-31	S 01°32'28" E	105.44'	
L-32	S 22°51'43" E	98.02'	
L-33	S 45°34'34" E	73.82'	
L-34	S 20°28'08" E	34.98'	
L-35	S 49°02'59" E	23.77'	
L-36	S 33°22'10" W	68.69'	
L-37	N 59°28'24" W	16.83'	
L-38	N 75°05'18" W	9.42'	
L-39	N 55°34'22" W	11.32'	
L-40	N 66°18'08" W	5.24'	
L-41	N 31°10'52" W	5.95'	
L-42	N 32°31'28" W	16.05'	
L-43	N 20°27'59" W	81.24'	
L-44	N 19°34'51" W	102.19'	
L-45	N 19°38'07" W	56.13'	
L-46	N 18°13'18" W	62.02'	
L-47	N 19°19'43" W	64.80'	
L-48	S 33°34'29" E	4,029.80'	



FLOOD STATEMENT
THIS PROPERTY IS LOCATED IN ZONE "X-X" AND IS NOT WITHIN A SPECIAL FLOOD HAZARD AREA, AS DETERMINED BY NFIP RATE MAP DATED FEBRUARY 16, 2006. : COMMUNITY PANEL NUMBER 370083-3369-L.



**"PRELIMINARY PLAT"
NOT FOR SALES, CONVEYANCES,
OR RECORDATION.**

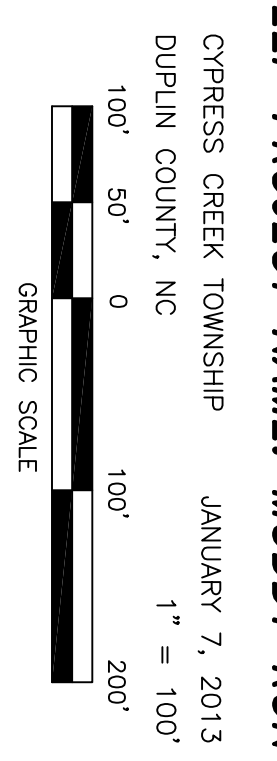


- LEGEND**
- = NEW IRON STAKE & CAP
 - (TL) = NE LINE
 - (CL) = CONTROL CORNER
 - (CO) = CONTROL CORNER
 - NCSSM = NO. 000 SCALE
 - L- = ADJOINING PROPERTY LINE
 - = EASEMENT/BOUNDARY LINE

- NOTES:**
1. COMBINED FACTOR IS 0.99989904.
 2. ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN FEET & DECIMALS THEREOF, UNLESS OTHERWISE NOTED.
 3. ACCESS TO EASEMENT SHALL BE THROUGH NEIGHBORING TRACT.

**THE PATRICIA M. RILEY PROPERTY
FOR THE STATE OF NORTH CAROLINA**

S.P.O. FILE #XX-X
NCEEP RFP #16-004101
NCEEP PROJECT #XXXXX
NCEEP PROJECT NAME: MUDDY RUN 2



ACREAGE DATA
(BY COMPUTER)
5.210 AC±

SOURCE OF TITLE
DB 1161, PG 145

MATRIX EAST, PLLC
PROFESSIONAL LAND SURVEYORS

906 N. QUEEN ST., SUITE A KINSTON, NC 28501
TEL: 252-522-2500 FAX: 252-522-4747

FRM LIC. # P-0221 EMAIL: surveyor@matrixeast.net
DRAWN BY: CKP/JNM PROJECT NO.: 20110047
SURVEYED BY: LDJ/CKC DATE: JANUARY 7, 2013
SCALE: 1" = 100' DRAWING NAME: RILEY

STATE OF NORTH CAROLINA DUPLIN COUNTY

I, CHRISTOPHER K. PAEDRICK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION, (DEED DESCRIPTION RECORDS NOT SAVED BOOKS EXEMPT). THE MONUMENTS, BEARINGS, AND DISTANCES THEREON, WERE DRAWN FROM INFORMATION REFERENCED HEREON, THAT THE RADIO OF PRECISIONS CALCULATED WITHIN THIS PLAT WAS PREPARED BY OCCASIONAL SURVEYING, REGISTRATION, AND SEAL THIS 7TH DAY OF JANUARY, A.D., 2013.

L-4189

APPENDIX B

Baseline Information Data

Muddy Run USACE Routine Wetland Data Forms

Mapped Soil Series and Boring Logs

Muddy Run NCDWQ Stream Determination Data Forms

Reference Reach NCDWQ Stream Determination Data Forms

Muddy Run II NCDWQ Habitat Assessment Data Forms

Muddy Run II Aquatic Habitat Assessment

Channel Stability Assessment Forms

EDR Report

Project Site and Reference Site Photographs

Environmental Screening and Resource Agency Correspondence

- Muddy Run II CE

- Farmland Conversion Impact Rating (Form AD 1006)

- FEMA Floodplain Checklist

- Muddy Run II Correspondence

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Muddy Run City/County: Duplin Sampling Date: Nov 29, 2011
 Applicant/Owner: EBX State: NC Sampling Point: A/B upland
 Investigator(s): G Lankford Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0%
 Subregion (LRR or MLRA): LRR T/MLRA 153A Lat: 34.83033 Long: -77.79163 Datum: _____
 Soil Map Unit Name: Rains fine sandy loam, 0 to 1 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: Site recently clear-cut. Vegetation is mostly absent. Previous site visits prior to clear-cutting indicated canopy vegetation as dominantly hydrophytic. Dredged channel and shallow ditches drain surface waters and lower groundwater elevation near drainage features.	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply) _____ <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Marl Deposits (B15) (LRR U) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Other (Explain in Remarks)	Secondary Indicators (minimum of two required) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>19 inches</u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>14 inches</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	

Remarks:

Appears to have slightly higher topography and sandy textured soils.

VEGETATION – Use scientific names of plants.

Sampling Point: A/B upland

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. _____	_____	<input type="checkbox"/>	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A)
2. _____	_____	<input type="checkbox"/>	_____	Total Number of Dominant Species Across All Strata: <u>75%</u> (B)
3. _____	_____	<input type="checkbox"/>	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>57%</u> (A/B)
4. _____	_____	<input type="checkbox"/>	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Sapling Stratum (Plot size: _____)				
1. _____	_____	<input type="checkbox"/>	_____	
2. _____	_____	<input type="checkbox"/>	_____	
3. _____	_____	<input type="checkbox"/>	_____	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Shrub Stratum (Plot size: <u>20 ft radius</u>)				
1. <u>Ligustrum sinense</u>	1%	<input checked="" type="checkbox"/>	FAC	
2. <u>Ulmus alata</u>	1%	<input checked="" type="checkbox"/>	FACU+	
3. <u>Quercus michauxii</u>	1%	<input checked="" type="checkbox"/>	FACW	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
3% = Total Cover				
Herb Stratum (Plot size: <u>20 ft radius</u>)				
1. <u>Eupatorium capillifolium</u>	1%	<input checked="" type="checkbox"/>	FACU	
2. <u>Centella asiatica</u>	1%	<input checked="" type="checkbox"/>	FACW	
3. _____	_____	<input type="checkbox"/>	_____	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
8. _____	_____	<input type="checkbox"/>	_____	
9. _____	_____	<input type="checkbox"/>	_____	
10. _____	_____	<input type="checkbox"/>	_____	
11. _____	_____	<input type="checkbox"/>	_____	
12. _____	_____	<input type="checkbox"/>	_____	
2% = Total Cover				
Woody Vine Stratum (Plot size: <u>20 ft radius</u>)				
1. <u>Toxicodendron radicans</u>	1%	<input checked="" type="checkbox"/>	FAC	
2. <u>Smilax smallii</u>	1%	<input checked="" type="checkbox"/>	FACU	
3. _____	_____	<input type="checkbox"/>	_____	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
2% = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				

Remarks: (If observed, list morphological adaptations below).
 Site is recent clear-cut. Recent forest vegetation was forested. Site is currently slash and windrows. A few stumps are sprouting.

SOIL

Sampling Point: A/B upland

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10 YR 4/2		10 YR 5/2	4%	C	M	SL	
14-21	10YR 4/2	85%	7.5 YR 2.5/2	2%	C	M	SL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Organic Bodies (A6) (LRR P, T, U)
- 5 cm Mucky Mineral (A7) (LRR P, T, U)
- Muck Presence (A8) (LRR U)
- 1 cm Muck (A9) (LRR P, T)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Coast Prairie Redox (A16) (MLRA 150A)
- Sandy Mucky Mineral (S1) (LRR O, S)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surface (S7) (LRR P, S, T, U)

- Polyvalue Below Surface (S8) (LRR S, T, U)
- Thin Dark Surface (S9) (LRR S, T, U)
- Loamy Mucky Mineral (F1) (LRR O)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Marl (F10) (LRR U)
- Depleted Ochric (F11) (MLRA 151)
- Iron-Manganese Masses (F12) (LRR O, P, T)
- Umbric Surface (F13) (LRR P, T, U)
- Delta Ochric (F17) (MLRA 151)
- Reduced Vertic (F18) (MLRA 150A, 150B)
- Piedmont Floodplain Soils (F19) (MLRA 149A)
- Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)

Indicators for Problematic Hydric Soils³:

- 1 cm Muck (A9) (LRR O)
- 2 cm Muck (A10) (LRR S)
- Reduced Vertic (F18) (outside MLRA 150A,B)
- Piedmont Floodplain Soils (F19) (LRR P, S, T)
- Anomalous Bright Loamy Soils (F20) (MLRA 153B)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12) (LRR T, U)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Muddy Run City/County: Duplin Sampling Date: Nov 29, 2011
 Applicant/Owner: EBX State: NC Sampling Point: AB-wet
 Investigator(s): G Lankford Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0%
 Subregion (LRR or MLRA): LRR T/MLRA 153A Lat: 34.83033 Long: -77.79163 Datum: _____
 Soil Map Unit Name: Rains fine sandy loam, 0 to 1 percent slopes NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation Soil or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation Soil or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: Site recently clear-cut. Vegetation is mostly absent. Previous site visits prior to clear-cutting indicated canopy vegetation as dominantly hydrophytic. Dredged channel and shallow ditches drain surface waters and lower groundwater elevation near drainage features.	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply) <table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> Surface Water (A1)</td> <td><input type="checkbox"/> Water-Stained Leaves (B9)</td> </tr> <tr> <td><input checked="" type="checkbox"/> High Water Table (A2)</td> <td><input type="checkbox"/> Aquatic Fauna (B13)</td> </tr> <tr> <td><input type="checkbox"/> Saturation (A3)</td> <td><input type="checkbox"/> Marl Deposits (B15) (LRR U)</td> </tr> <tr> <td><input type="checkbox"/> Water Marks (B1)</td> <td><input type="checkbox"/> Hydrogen Sulfide Odor (C1)</td> </tr> <tr> <td><input type="checkbox"/> Sediment Deposits (B2)</td> <td><input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)</td> </tr> <tr> <td><input type="checkbox"/> Drift Deposits (B3)</td> <td><input type="checkbox"/> Presence of Reduced Iron (C4)</td> </tr> <tr> <td><input type="checkbox"/> Algal Mat or Crust (B4)</td> <td><input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)</td> </tr> <tr> <td><input type="checkbox"/> Iron Deposits (B5)</td> <td><input type="checkbox"/> Thin Muck Surface (C7)</td> </tr> <tr> <td><input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)</td> <td><input type="checkbox"/> Other (Explain in Remarks)</td> </tr> </table>	<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input checked="" type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	Secondary Indicators (minimum of two required) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)																		
<input checked="" type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)																		
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)																		
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)																		
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)																		
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)																		
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)																		
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)																		
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)																		

Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>6 inches</u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>6 inches</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appears to have retained sufficient hydrology due to shallow ditches, clayey subsoil, and nearly level topography.

VEGETATION – Use scientific names of plants.

Sampling Point: SB 1

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
1. _____	_____	<input type="checkbox"/>	_____	Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A)
2. _____	_____	<input type="checkbox"/>	_____	Total Number of Dominant Species Across All Strata: <u>6</u> (B)
3. _____	_____	<input type="checkbox"/>	_____	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>67%</u> (A/B)
4. _____	_____	<input type="checkbox"/>	_____	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Sapling Stratum (Plot size: _____)				
1. _____	_____	<input type="checkbox"/>	_____	
2. _____	_____	<input type="checkbox"/>	_____	
3. _____	_____	<input type="checkbox"/>	_____	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Shrub Stratum (Plot size: _____)				
1. <u>Ligustrum sinense</u>	1%	<input checked="" type="checkbox"/>	FAC	
2. <u>Platanus occidentalis</u>	1%	<input checked="" type="checkbox"/>	FACW-	
3. <u>Acer rubrum</u>	1%	<input checked="" type="checkbox"/>	FAC	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Herb Stratum (Plot size: _____)				
1. <u>Eupatorium capillifolium</u>	1%	<input checked="" type="checkbox"/>	FACU	
2. _____	_____	<input type="checkbox"/>	_____	
3. _____	_____	<input type="checkbox"/>	_____	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
6. _____	_____	<input type="checkbox"/>	_____	
7. _____	_____	<input type="checkbox"/>	_____	
8. _____	_____	<input type="checkbox"/>	_____	
9. _____	_____	<input type="checkbox"/>	_____	
10. _____	_____	<input type="checkbox"/>	_____	
11. _____	_____	<input type="checkbox"/>	_____	
12. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Woody Vine Stratum (Plot size: _____)				
1. <u>Toxicodendron radicans</u>	1%	<input checked="" type="checkbox"/>	FAC	
2. <u>Smilax smallii</u>	1%	<input checked="" type="checkbox"/>	FACU	
3. _____	_____	<input type="checkbox"/>	_____	
4. _____	_____	<input type="checkbox"/>	_____	
5. _____	_____	<input type="checkbox"/>	_____	
_____ = Total Cover				
Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>				

Remarks: (If observed, list morphological adaptations below).
 Site is recent clear-cut. Recent forest vegetation was forested. Site is currently slash and windrows. A few stumps are sprouting.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-8	7.5YR 2.5/2						SL	
8-17	10YR 4/1	85%	10 YR 4/3	10%	C	M	SCL	
--	--	--	10 YR 4/6	5%	C	M	--	
17-22	7.5YR 5/1	90%	7.5 YR 5/6	10%	C	M	SL	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- Organic Bodies (A6) (LRR P, T, U)
- 5 cm Mucky Mineral (A7) (LRR P, T, U)
- Muck Presence (A8) (LRR U)
- 1 cm Muck (A9) (LRR P, T)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Coast Prairie Redox (A16) (MLRA 150A)
- Sandy Mucky Mineral (S1) (LRR O, S)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Dark Surface (S7) (LRR P, S, T, U)

- Polyvalue Below Surface (S8) (LRR S, T, U)
- Thin Dark Surface (S9) (LRR S, T, U)
- Loamy Mucky Mineral (F1) (LRR O)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Marl (F10) (LRR U)
- Depleted Ochric (F11) (MLRA 151)
- Iron-Manganese Masses (F12) (LRR O, P, T)
- Umbric Surface (F13) (LRR P, T, U)
- Delta Ochric (F17) (MLRA 151)
- Reduced Vertic (F18) (MLRA 150A, 150B)
- Piedmont Floodplain Soils (F19) (MLRA 149A)
- Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)

Indicators for Problematic Hydric Soils³:

- 1 cm Muck (A9) (LRR O)
- 2 cm Muck (A10) (LRR S)
- Reduced Vertic (F18) (outside MLRA 150A,B)
- Piedmont Floodplain Soils (F19) (LRR P, S, T)
- Anomalous Bright Loamy Soils (F20) (MLRA 153B)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12) (LRR T, U)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

Mapped Soil Series

Map Unit	Series Name (Taxonomic Subgroup)	Drainage Class	Representative Percent Hydric Composition	Reach
GoA	Goldsboro loamy sand (Aquic Paleudults)	Moderately well	1% Muckalee, undrained 5% Rains, undrained	R-3, R-4, R-5, R-6, R-7, R-9, R-10
NbA	Noboco loamy fine sand (Oxyaquic Paleudults)	Moderately well to well	None	R-2
RaA	Rains fine sandy loam (Typic Paleaquults)	Poorly	10% Rains, undrained 80% Rains, drained	R-1, R-2, R-3, R-5, R-6, R-7, R-8, R-9

General Soil Description

The upland soils found in this area of the county formed in fine-textured sediments from marine deposits and fluviomarine deposits of the coastal plain uplands. Stream channels are generally shallow and meandering in loamy and sandy alluvium.

Soil Series Map Unit Descriptions

Goldsboro loamy sand (GoA), 0 to 2 percent slopes. This unit is a moderately well drained soil found on hillslope summits and shoulders. They have moderate permeability and runoff is negligible to medium. The seasonal high water table ranges from 24 to 36 inches below the surface. It has often has clayey subsoil. This soil unit is typically cultivated. This soil is considered to have hydric inclusions by the NRCS.

Noboco loamy fine sand (NbB), 0 to 2 percent slopes. This unit is a moderately well to well drained soil found on summits and shoulder of upland marine terraces. The seasonal high water table ranges from 30 to 40 inches below the surface. It has typically has clayey subsoil. They have moderate permeability and runoff is low. This soil is not considered to have hydric inclusions by the NRCS.

Rains fine sandy loam (RaA), 0 to 1 percent slopes. This unit is a poorly drained soil found across flats, depressions and Carolina bays. They have moderate permeability and runoff is negligible. This soil may experience flooding. The seasonal high water table ranges from 0 to 12 inches below the surface. It has often has clayey subsoil. This soil is considered hydric when undrained by the NRCS.

Site Soil Investigation

Approximately 80 auger borings were evaluated across the proposed wetland restoration areas and adjacent non-hydric areas by George Lankford, a licensed soil scientist. Depth to hydric criteria was recorded and typical soil profiles were documented. Three representative soil profiles are shown in the table below.

Soil Boring Log

Depth	Matrix Color	Mottle Colors	Mottle Percentage	Texture
SB-75	W1			Mapped as Rains
0-9	7.5 YR 3/2	--	--	fine Sandy Loam
9-15	7.5 YR 4/2	10 YR 5/2 7.5 YR 4/6	10% 5%	Sandy Loam
15-18	10 YR 6/2	10 YR 4/6	15%	Sandy Loam
Sample point is in cultivated field ~ 15 feet from channel and ~ 20 from ditch at field edge. Spoil and deposition are likely due to landscape position.				

Depth	Matrix Color	Mottle Colors	Mottle Percentage	Texture
SB-1	W2		Mapped as Rains	
Depth	Matrix Color	Mottle Color	Mottle Percentage	Texture
0-6	7.5 YR 2.5/2	---	---	Sandy Loam
6-12	7.5 YR 6/2	7.5 YR 5/8	5%	Sandy Loam
12-16	7.5 YR 5/1	7.5 YR 4/6	5%	Sandy Clay
Plow pan at ~8 inches				

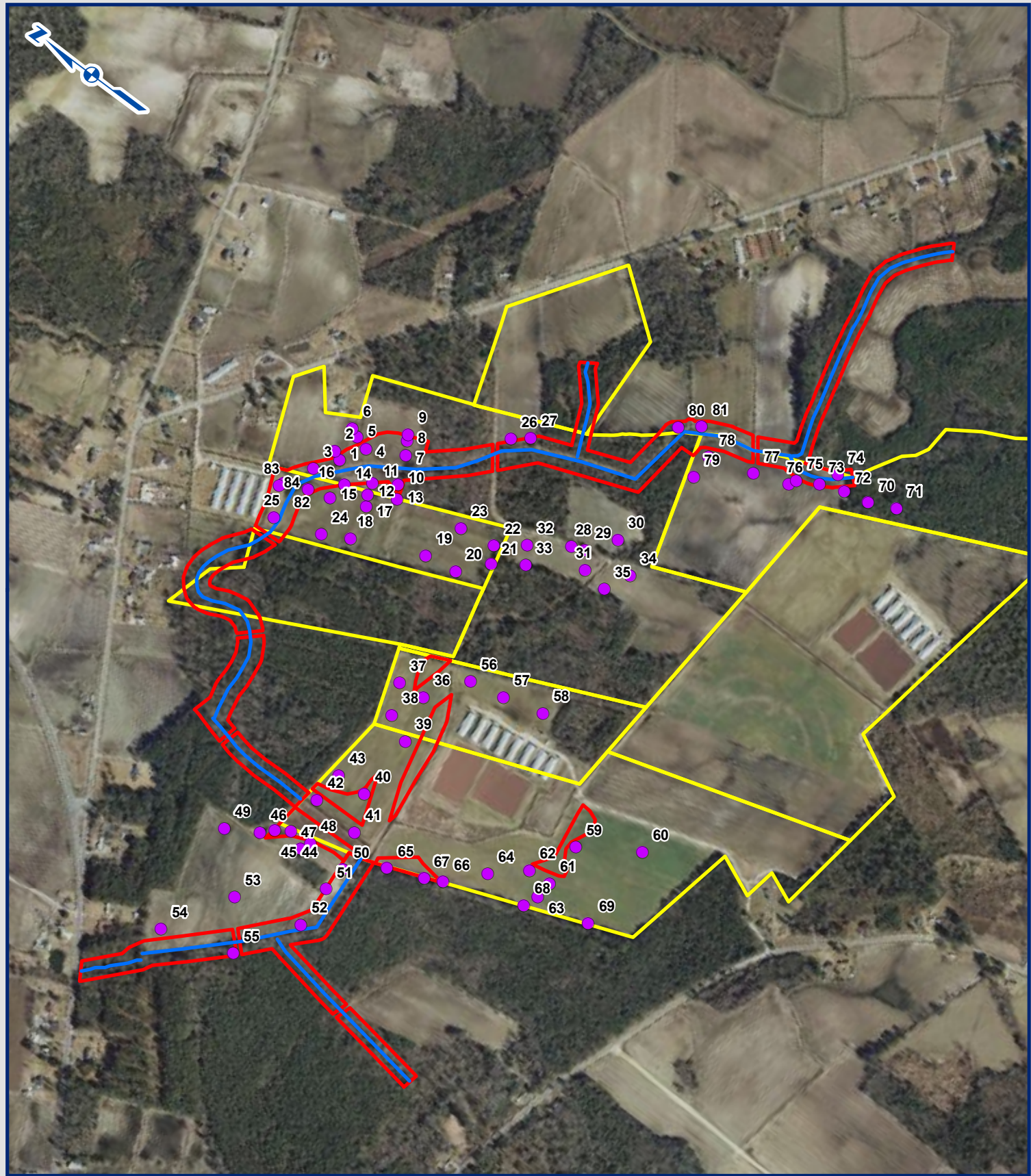
SB-62	W10		Mapped as Rains	
0-5	10 YR 4/2	---	---	Sandy Loam
5-11	10 YR 4/1	10 YR 6/2 10 YR 3/4	45%	Sandy Loam (brittle)
11-17	10 YR 4/2	10 YR 4/6	20%	Sandy Loam
17-22	10 YR 5/2	10 YR 5/8	40%	Sandy Cclay

SB-70	Reference		Mapped as Rains	
0-9	7.5 YR 2.5/1	---	---	fine Sandy Loam
9-13	10 YR 2/1	10 YR 5/1 10 YR 4/6	5% 5%	fine Sandy Clay Loam
13-17	10 YR 4/1	10 YR 3/3 10 YR 2/1	5% 3%	Sandy Clay Loam
17-24	10 YR 5/2	10 YR 4/6	20%	Sandy Clay

All soils exhibited a dark sandy loam or fine sandy loam surface texture. Nearly all borings in the wetland areas have indicators of disturbance in the surface horizon likely due to plowing or other soil disturbance. Mottles of redoxomorphic concentrations are the identifying soil morphological characteristic. These wetland areas typically have gray clayey subsoil that functions as a restrictive horizon, although a few areas have sandy subsoil. Soils with gray sandy subsoil also have redoxomorphic concentrations. The surrounding areas exhibited a gradual increase in depth of the sandy surface and to the characteristic features until replaced by a bright sandy clay layer.



Soil Scientist Seal



Soil Boring Locations Map Muddy Run II Site

0 400 800 1,600 Feet

1 inch = 800 feet

Legend

- Soil Boring Locations
- Proposed Streams
- Muddy Run II Site
- Target Parcels

Muddy Run II Existing Conditions Summary

		Reach 1	Reach 2	Reach 3a	Reach 3b	Reach 3c	Reach 4	Reach 5a	Reach 5b	Reach 6
Left Bank	Buffer Type	Herbaceous	Mature Hardwood	Herbaceous	Mature Hardwood	Mature Hardwood	Mature Hardwood	Other Woody Cover	Other Woody Cover	Other Woody Cover
	Buffer Condition	Disturbance	Invasives	Disturbance	Stable	Stable	Stable	Disturbance	Stable	Stable
	Bank Vegetation	No Mature Hardwoods	Mature Hardwood	No Mature Hardwoods	Mature Hardwood	Mature Hardwood	Mature Hardwood	Mature Hardwood	Mature Hardwood	Mature Hardwood
	Bank Stability	Moderately Unstable	Moderately Unstable	Moderately Unstable	Stable	Stable	Stable	Moderately Unstable	Stable	Moderately Unstable
Right Bank	Buffer Type	Mature Hardwood	Mature Hardwood	Herbaceous	Mature Hardwood	Other Woody Cover	Mature Hardwood	Herbaceous	Other Woody Cover	Other Woody Cover
	Buffer Condition	Invasives	Invasives	Stable	Stable	Stable	Stable	Invasives	Invasives	Stable
	Bank Vegetation	No Mature Hardwoods	Mature Hardwood	No Mature Hardwoods	Mature Hardwood	Mature Hardwood	Mature Hardwood	No Mature Hardwoods	Mature Hardwood	Mature Hardwood
	Bank Stability	Moderately Unstable	Moderately Unstable	Moderately Unstable	Stable	Stable	Stable	Moderately Unstable	Stable	Moderately Unstable
	Bed Stability	Aggrading	Aggrading	Aggrading	Aggrading	Stable	Stable	Aggrading	Stable	Aggrading
	Channel Size	Oversized	Oversized	Oversized	Oversized	Appropriately Sized	Appropriately Sized	Oversized	Oversized	Oversized
NC DWQ Stream Identification (V4.11)										
	Geomorphology	9.0	8.0	18.0	12.5	19.0	14.0	16.0	17.0	8.0
	Hydrology	7.5	8.5	7.5	5.5	10.0	8.0	9.0	10.0	6.5
	Biology	8.25	8.25	11.0	5.25	11.5	10.0	10.5	10.5	6.25
	Total Score	24.75	24.75	36.5	23.25	40.5	32.0	35.5	37.5	20.75
	Classification	Intermittant	Intermittant	Perennial	Intermittant	Perennial	Perennial	Perennial	Perennial	Intermittant
USACE Stream Quality Assessment Worksheet										
	Physical	19	17	20	45	31	36	22	21	23
	Stability	8	12	9	16	14	14	8	7	13
	Habitat	3	6	3	12	8	11	4	9	7
	Biology	3	2	7	5	6	11	5	11	2
	Total Score	33	37	39	78	59	72	39	48	45
	Proposed Mitigation Type	Headwater Valley Restoration	Headwater Valley Restoration	Priority 1 Restoration	Priority 1 Restoration	Preservation	Preservation	Priority 1 Restoration	Enhancement II	Headwater Valley Restoration

NC DWQ Stream Identification Form Version 4.11

Date: 12/02/2011	Project/Site: MR Reference Site	Latitude:
Evaluator: AFM, BSH	County: Duplin County, NC	Longitude:
Total Points: Stream is at least intermittent if ≥ 19 or perennial if $\geq 30^*$ 40	Stream Determination (circle one) Ephemeral Intermittent <u>Perennial</u>	Other e.g. Quad Name:

A. Geomorphology (Subtotal = 21.5)

	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 = 11)

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 = 7.5)

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:

Muddy Run II Reference Reach Aquatic Habitat Assessment

Transect	Habitat	Location	Position	Diameter (ft)	length (ft)	Diameter (in)	Radius (in)	length (in)	Volume (in)
1	shal	mid	sub	0.08	0.65	0.96	0.48	7.8	5.64
1	shal	mid	sub	0.1	0.70	1.2	0.6	8.4	9.50
1	shal	mid	sub	0.03	2.00	0.36	0.18	24	2.44
2	shal	rb	sub	0.02	0.70	0.24	0.12	8.4	0.38
2	shal	mid	sub	0.03	0.30	0.36	0.18	3.6	0.37
2	shal	mid	sub	0.05	0.70	0.6	0.3	8.4	2.37
2	shal	mid	sub	0.02	0.90	0.24	0.12	10.8	0.49
2	shal	lb	par sub	0.02	1.50	0.24	0.12	18	0.81
2	shal	mid	sub	0.03	1.00	0.36	0.18	12	1.22
2	shal	lb	sub	0.04	1.10	0.48	0.24	13.2	2.39
2	shal	mid	sub	0.05	0.90	0.6	0.3	10.8	3.05
2	shal	rb	sub	0.05	1.30	0.6	0.3	15.6	4.41
2	shal	mid	sub	0.05	1.30	0.6	0.3	15.6	4.41
2	shal	mid	par emb	0.05	1.50	0.6	0.3	18	5.09
2	shal	lb	emb	0.1	1.30	1.2	0.6	15.6	17.63
2	shal	mid	sub	0.2	1.00	2.4	1.2	12	54.26
2	shal	mid	sub	0.03	2.10	0.36	0.18	25.2	2.56
2	shal	lb	sus/sub	0.03	3.20	0.36	0.18	38.4	3.91
2	shal	lb	sub	0.04	1.80	0.48	0.24	21.6	3.91
2	shal	mid	sub	0.05	1.90	0.6	0.3	22.8	6.44
2	shal	rb	sus/sub	0.05	2.70	0.6	0.3	32.4	9.16
2	shal	across	sus/sub	0.1	1.80	1.2	0.6	21.6	24.42
2	shal	lb	sus/sub	0.1	2.00	1.2	0.6	24	27.13
2	shal	across	sus/sub	0.1	3.00	1.2	0.6	36	40.69
2	shal	rb	sus/sub	0.15	2.00	1.8	0.9	24	61.04
2	shal	lb	sus	0.02	4.00	0.24	0.12	48	2.17
3	pool	lb	sub	0.02	0.80	0.24	0.12	9.6	0.43
3	pool	mid	sub	0.03	0.60	0.36	0.18	7.2	0.73
3	pool	lb	par sub	0.02	1.20	0.24	0.12	14.4	0.65
3	pool	rb	sub	0.15	1.30	1.8	0.9	15.6	39.68
3	pool	rb	emb	0.25	1.60	3	1.5	19.2	135.65
3	pool	rb	sus	0.03	3.00	0.36	0.18	36	3.66
3	pool	mid	emb	0.10	3.00	1.2	0.6	36	40.69
3	pool	lb	emb	0.15	2.00	1.8	0.9	24	61.04
3	pool	rb	sus	0.30	2.00	3.6	1.8	24	244.17
3	pool	lb	sus/sub	0.30	3.00	3.6	1.8	36	366.25
3	pool	rb	sus	0.05	6.00	0.6	0.3	72	20.35
4	shal	mid	sub	0.03	0.45	0.36	0.18	5.4	0.55
4	shal	mid	sub	0.05	0.25	0.6	0.3	3	0.85
4	shal	mid	sub	0.10	0.45	1.2	0.6	5.4	6.10
4	shal	mid	sub	0.02	0.90	0.24	0.12	10.8	0.49
4	shal	mid	sub	0.02	0.90	0.24	0.12	10.8	0.49
4	shal	mid	sub	0.05	1.25	0.6	0.3	15	4.24
4	shal	mid	sub	0.03	3.00	0.36	0.18	36	3.66
5	pool	lb	par	0.03	0.80	0.36	0.18	9.6	0.98

Muddy Run II Reference Reach Aquatic Habitat Assessment

Transect	Habitat	Location	Position	Diameter (ft)	length (ft)	Diameter (in)	Radius (in)	length (in)	Volume (in)
5	pool	mid	sub	0.10	0.50	1.2	0.6	6	6.78
5	pool	mid	sub	0.03	0.90	0.36	0.18	10.8	1.10
5	pool	mid	sub	0.03	1.60	0.36	0.18	19.2	1.95
5	pool	mid	sub	0.02	2.00	0.24	0.12	24	1.09
5	pool	mid	sub	0.04	2.00	0.48	0.24	24	4.34
5	pool	mid	sub	0.07	2.60	0.84	0.42	31.2	17.28
5	pool	mid	sub	0.10	2.00	1.2	0.6	24	27.13
5	pool	mid	sub	0.10	2.70	1.2	0.6	32.4	36.62
5	pool	mid	sub	0.20	2.30	2.4	1.2	27.6	124.80
5	pool	rb	sus	0.30	2.00	3.6	1.8	24	244.17
5	pool	rb	sus/sub	0.35	3.00	4.2	2.1	36	498.51
5	pool	lb	sus/sub	0.40	2.20	4.8	2.4	26.4	477.48
5	pool	lb	par sub	0.40	2.80	4.8	2.4	33.6	607.70
5	pool	rb-mid	sus-emb	1.80	3.00	21.6	10.8	36	1318.50
5	pool	mid	float	0.02	3.70	0.24	0.12	44.4	2.01
5	pool	mid-rt	par sub	0.05	4.00	0.6	0.3	48	13.56
5	pool	mid-rt	sub	0.08	3.50	0.96	0.48	42	30.39
5	pool	rb	sus	0.40	3.60	4.8	2.4	43.2	781.33
6	shal	mid	sub	0.03	0.40	0.36	0.18	4.8	0.49
6	shal	rb	sub	0.03	0.83	0.36	0.18	9.96	1.01
6	shal	mid	sub	0.05	0.35	0.6	0.3	4.2	1.19
6	shal	lb	sus/emb	0.07	0.60	0.84	0.42	7.2	3.99
6	shal	mid	sub	0.10	0.50	1.2	0.6	6	6.78
6	shal	mid	emb/sub	0.13	0.60	1.56	0.78	7.2	13.75
6	shal	mid	sub	0.03	1.30	0.36	0.18	15.6	1.59
6	shal	mid	sub	0.05	1.50	0.6	0.3	18	5.09
6	shal	mid	sub	0.08	0.90	0.96	0.48	10.8	7.81
6	shal	mid	sub	0.10	1.00	1.2	0.6	12	13.56
6	shal	mid	sub	0.15	0.95	1.8	0.9	11.4	28.99
6	shal	lb	sus	0.15	1.40	1.8	0.9	16.8	42.73
6	shal	rb	float	0.25	1.60	3	1.5	19.2	135.65
6	shal	lb	emb	0.40	1.00	4.8	2.4	12	217.04
6	shal	mid	sub	0.03	1.75	0.36	0.18	21	2.14
6	shal	rb	sus	0.03	1.80	0.36	0.18	21.6	2.20
6	shal	rb	sub	0.03	1.85	0.36	0.18	22.2	2.26
6	shal	mid	sub	0.05	2.20	0.6	0.3	26.4	7.46
6	shal	mid	sub	0.05	2.60	0.6	0.3	31.2	8.82
6	shal	across	sus	0.35	3.00	4.2	2.1	36	498.51
7	shal	mid	sub	0.03	0.50	0.36	0.18	6	0.61
7	shal	mid	sub	0.05	0.80	0.6	0.3	9.6	2.71
7	shal	mid	sub	0.10	0.50	1.2	0.6	6	6.78
7	shal	mid	sub	0.02	1.00	0.24	0.12	12	0.54
7	shal	mid	sub	0.03	1.00	0.36	0.18	12	1.22
7	shal	lb	sus	0.25	1.00	3	1.5	12	84.78
7	shal	mid	par	0.02	3.00	0.24	0.12	36	1.63

Muddy Run II Reference Reach Aquatic Habitat Assessment

Transect	Habitat	Location	Position	Diameter (ft)	length (ft)	Diameter (in)	Radius (in)	length (in)	Volume (in)
7	shal	mid	sub	0.03	2.00	0.36	0.18	24	2.44
7	shal	lb	sus	0.30	2.00	3.6	1.8	24	244.17
8	pool	mid	sub	0.04	0.70	0.48	0.24	8.4	1.52
8	pool	rb	sub	0.03	1.60	0.36	0.18	19.2	1.95
8	pool	rb	sub	0.03	2.10	0.36	0.18	25.2	2.56
9	shal	mid	sub	0.05	0.40	0.6	0.3	4.8	1.36
9	shal	rb	sub	0.05	0.60	0.6	0.3	7.2	2.03
9	shal	mid	emb	0.05	0.60	0.6	0.3	7.2	2.03
9	shal	mid	sub	0.05	0.80	0.6	0.3	9.6	2.71
9	shal	mid	sub	0.10	0.75	1.2	0.6	9	10.17
9	shal	mid	sub	0.12	0.60	1.44	0.72	7.2	11.72
9	shal	lb	par	0.19	0.40	2.28	1.14	4.8	19.59
9	shal	mid	sub	0.20	0.40	2.4	1.2	4.8	21.70
9	shal	lb	par	0.25	0.70	3	1.5	8.4	59.35
9	shal	mid	sub	0.03	1.10	0.36	0.18	13.2	1.34
9	shal	mid	par	0.06	1.60	0.72	0.36	19.2	7.81
9	shal	mid	sub	0.04	2.00	0.48	0.24	24	4.34
9	shal	rb	sub	0.06	2.50	0.72	0.36	30	12.21
9	shal	rb	emb	0.50	2.10	6	3	25.2	712.15
10	shal	rb	emb	0.10	0.50	1.2	0.6	6	6.78
10	shal	lb	sub	0.10	0.60	1.2	0.6	7.2	8.14
10	shal	mid	sub	0.10	0.70	1.2	0.6	8.4	9.50
10	shal	lb	par	0.15	0.80	1.8	0.9	9.6	24.42
10	shal	mid	sub	0.20	0.65	2.4	1.2	7.8	35.27
10	shal	mid	sub	0.15	2.50	1.8	0.9	30	76.30
10	shal	across	emb	0.22	2.90	2.64	1.32	34.8	190.40
10	shal	across	emb	0.30	2.80	3.6	1.8	33.6	341.83

Muddy Run II Reach 3A Aquatic Habitat Assessment

Transect	Habitat	Location	Position	Diameter	length	Diameter (in)	Radius (in)	length (in)	Volume (in)
T-1	Run	RB	Bed	0.05	0.30	0.6	0.3	3.6	1.02
T-1	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-1	Run	Mid	Par	0.05	1.30	0.6	0.3	15.6	4.41
T-1	Run	Mid	Bed	0.05	0.25	0.6	0.3	3	0.85
T-1	Run	Mid	Bed	0.05	0.35	0.6	0.3	4.2	1.19
T-1	Run	Mid	Bed	0.03	0.15	0.36	0.18	1.8	0.18
T-1	Run	Mid	Bed	0.03	0.52	0.36	0.18	6.24	0.63
T-1	Run	Mid	Bed	0.03	0.40	0.36	0.18	4.8	0.49
T-1	Run	RB	Sus/ Emb	0.06	3.00	0.72	0.36	36	14.65
T-1	Run	Mid	Emb	0.03	0.45	0.36	0.18	5.4	0.55
T-2	Run	Mid	Bed	0.05	1.35	0.6	0.3	16.2	4.58
T-2	Run	RB	Sus/ Emb	0.03	1.30	0.36	0.18	15.6	1.59
T-2	Run	Mid	Bed	0.03	0.50	0.36	0.18	6	0.61
T-3	Run	RB	Emb	0.02	1.10	0.24	0.12	13.2	0.60
T-3	Run	RB	Emb	0.04	1.10	0.48	0.24	13.2	2.39
T-3	Run	Mid	Bed	0.05	0.40	0.6	0.3	4.8	1.36
T-4	Run	Mid	Bed	0.06	0.70	0.72	0.36	8.4	3.42
T-4	Run	Mid	Emb	0.06	0.50	0.72	0.36	6	2.44
T-5	Run	LB	Sus	0.05	2.50	0.6	0.3	30	8.48
T-5	Run	LB	Sus	0.03	2.10	0.36	0.18	25.2	2.56
T-5	Run	LB	Sus	0.02	1.90	0.24	0.12	22.8	1.03
T-5	Run	LB	Sus	0.07	6.00	0.84	0.42	72	39.88
T-6	Run	RB	Sus	0.03	1.90	0.36	0.18	22.8	2.32
T-6	Run	RB	Sus	0.03	1.00	0.36	0.18	12	1.22
T-6	Run	RB	Sus	0.02	1.70	0.24	0.12	20.4	0.92
T-6	Run	Mid	Bed	0.03	0.60	0.36	0.18	7.2	0.73
T-6	Run	Mid	Emb	0.03	0.45	0.36	0.18	5.4	0.55
T-7	Run	Mid	Bed	0.03	2.80	0.36	0.18	33.6	3.42
T-7	Run	Mid	Emb	0.08	1.50	0.96	0.48	18	13.02
T-8	Run	RB	Sus	0.03	1.20	0.36	0.18	14.4	1.46
T-8	Run	Mid	Bed	0.04	0.70	0.48	0.24	8.4	1.52
T-8	Run	Mid	Bed	0.04	0.30	0.48	0.24	3.6	0.65
T-8	Run	Mid	Bed	0.03	0.50	0.36	0.18	6	0.61
T-9	Run	RB	Sus	0.05	3.00	0.6	0.3	36	10.17
T-9	Run	Mid	Bed	0.03	2.00	0.36	0.18	24	2.44
T-9	Run	LB	Sus	0.02	2.00	0.24	0.12	24	1.09
T-9	Run	LB	Sus	0.03	3.10	0.36	0.18	37.2	3.78
T-9	Run	Mid	Sub	0.02	3.20	0.24	0.12	38.4	1.74
T-9	Run	Mid	Sub	0.10	1.30	1.2	0.6	15.6	17.63
T-9	Run	Mid	Sub	0.10	1.10	1.2	0.6	13.2	14.92
T-9	Run	Mid	Bed	0.10	3.00	1.2	0.6	36	40.69
T-9	Run	Mid	sub	0.03	1.20	0.36	0.18	14.4	1.46
T-9	Run	Mid	Bed	0.02	0.60	0.24	0.12	7.2	0.33
T-9	Run	RB	Bed	0.20	0.35	2.4	1.2	4.2	18.99
T-10	Run	Mid	Bed	0.02	3.30	0.24	0.12	39.6	1.79
T-10	Run	Mid	Bed	0.04	7.00	0.48	0.24	84	15.19
T-10	Run	Mid	Bed	0.03	2.80	0.36	0.18	33.6	3.42

Muddy Run II Reach 5A Aquatic Habitat Assessment

Transect	Habitat	Location	Position	Diameter	length	Diameter (in)	Radius (in)	length (in)	Volume (in)
T-10	Run	Mid	Sub	0.02	4.50	0.24	0.12	54	2.44
T-10	Run	Mid	Sub	0.03	2.10	0.36	0.18	25.2	2.56
T-10	Run	LB	Sus	0.02	1.50	0.24	0.12	18	0.81
T-10	Run	LB	Sub	0.02	1.30	0.24	0.12	15.6	0.71
T-10	Run	RB	Sub	0.03	1.40	0.36	0.18	16.8	1.71
T-10	Run	LB	Sus	0.06	1.70	0.72	0.36	20.4	8.30
T-10	Run	RB	Sus	0.02	5.00	0.24	0.12	60	2.71
T-10	Run	RB	Sus	0.04	1.50	0.48	0.24	18	3.26
T-10	Run	LB	Sus	0.02	0.70	0.24	0.12	8.4	0.38
T-10	Run	LB	Sus	0.02	1.00	0.24	0.12	12	0.54
T-10	Run	Mid	Sub	0.02	4.00	0.24	0.12	48	2.17
T-10	Run	RB	Sus	0.05	1.00	0.6	0.3	12	3.39
T-10	Run	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09
T-10	Run	Mid	Sub	0.05	4.00	0.6	0.3	48	13.56
T-10	Run	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09
T-10	Run	LB	Sus	0.02	3.50	0.24	0.12	42	1.90
T-10	Run	RB	Sus	0.04	1.70	0.48	0.24	20.4	3.69
T-10	Run	Mid	Sub	0.04	1.60	0.48	0.24	19.2	3.47
T-10	Run	RB	Sus	0.10	2.00	1.2	0.6	24	27.13
T-9	Run	RB	Sus	0.50	0.70	6	3	8.4	237.38
T-9	Run	Mid	Sub	0.04	2.00	0.48	0.24	24	4.34
T-9	Run	Mid	Sub	0.02	1.80	0.24	0.12	21.6	0.98
T-9	Run	Mid	Sub	0.04	3.80	0.48	0.24	45.6	8.25
T-9	Run	Mid	Sub	0.05	3.00	0.6	0.3	36	10.17
T-9	Run	Mid	Sub	0.05	2.70	0.6	0.3	32.4	9.16
T-9	Run	Mid	Sub	0.04	3.50	0.48	0.24	42	7.60
T-9	Run	Mid	Sub	0.05	1.70	0.6	0.3	20.4	5.77
T-9	Run	Mid	Sub	0.03	2.10	0.36	0.18	25.2	2.56
T-9	Run	Mid	Sub	0.02	1.30	0.24	0.12	15.6	0.71
T-9	Run	Mid	Sub	0.02	3.90	0.24	0.12	46.8	2.12
T-9	Run	Mid	Sub	0.02	1.50	0.24	0.12	18	0.81
T-9	Run	LB	Sus	0.03	2.40	0.36	0.18	28.8	2.93
T-9	Run	RB	Sus	0.03	2.40	0.36	0.18	28.8	2.93
T-8	Pool	RB	Sus	0.02	0.50	0.24	0.12	6	0.27
T-8	Pool	RB	Sus	0.05	1.00	0.6	0.3	12	3.39
T-8	Pool	RB	Sus	0.05	12.00	0.6	0.3	144	40.69
T-8	Pool	RB	Par Sub	0.10	1.40	1.2	0.6	16.8	18.99
T-8	Pool	Mid	Sub	0.20	0.70	2.4	1.2	8.4	37.98
T-8	Pool	Mid	Sub	0.10	1.15	1.2	0.6	13.8	15.60
T-7	Run	RB	Emb	0.03	1.00	0.36	0.18	12	1.22
T-7	Run	Mid	Sub	0.10	0.70	1.2	0.6	8.4	9.50
T-7	Run	LB	Sus	0.03	2.00	0.36	0.18	24	2.44
T-7	Run	RB	Sus	0.03	1.00	0.36	0.18	12	1.22
T-6	Pool	Mid	Sub	0.05	3.20	0.6	0.3	38.4	10.85
T-6	Pool	Mid	Sus	0.03	0.80	0.36	0.18	9.6	0.98
T-6	Run	Mid	Sub	0.02	3.00	0.24	0.12	36	1.63
T-6	Run	Mid	Emb	0.10	3.00	1.2	0.6	36	40.69
T-6	Run	Mid	Emb	0.04	2.50	0.48	0.24	30	5.43
T-6	Run	Mid	Emb	0.15	6.00	1.8	0.9	72	183.12
T-6	Run	Mid	Sub	0.05	1.50	0.6	0.3	18	5.09

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T-6	Run	Mid	Sub	0.04	0.40	0.48	0.24	4.8	0.87
T-6	Run	Mid	Sub	0.03	0.50	0.36	0.18	6	0.61
T-6	Run	Mid	Sub	0.02	0.35	0.24	0.12	4.2	0.19
T-6	Run	Mid	Sub	0.05	0.35	0.6	0.3	4.2	1.19
T-6	Run	Mid	Sub	0.03	1.60	0.36	0.18	19.2	1.95
T-6	Run	Mid	Emb	0.04	2.00	0.48	0.24	24	4.34
T-6	Run	Mid	Emb	0.05	1.50	0.6	0.3	18	5.09
T-6	Run	Mid	Sub	0.13	0.18	1.56	0.78	2.16	4.13
T-6	Run	Mid	Sub	0.08	0.30	0.96	0.48	3.6	2.60
T-6	Run	Mid	Emb	0.15	2.50	1.8	0.9	30	76.30
T-6	Run	Mid	Sub	0.03	3.00	0.36	0.18	36	3.66
T-6	Run	Mid	Sub	0.05	0.90	0.6	0.3	10.8	3.05
T-6	Run	Mid	Sub	0.02	0.70	0.24	0.12	8.4	0.38
T-6	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-6	Run	Mid	Sub	0.02	0.35	0.24	0.12	4.2	0.19
T-6	Run	Mid	Emb	0.03	6.00	0.36	0.18	72	7.32
T-6	Run	RB	Sus	0.03	2.50	0.36	0.18	30	3.05
T-6	Run	RB	Sus	0.02	2.20	0.24	0.12	26.4	1.19
T-6	Run	RB	Sus	0.02	2.50	0.24	0.12	30	1.36
T-6	Run	RB	Sus	0.04	0.80	0.48	0.24	9.6	1.74
T-6	Run	RB	Sus	0.02	0.85	0.24	0.12	10.2	0.46
T-5	Run	LB	Sus	0.02	1.10	0.24	0.12	13.2	0.60
T-5	Run	LB	Sus	0.02	2.20	0.24	0.12	26.4	1.19
T-5	Run	LB	Sub	0.03	2.40	0.36	0.18	28.8	2.93
T-5	Run	LB	Sub	0.03	1.40	0.36	0.18	16.8	1.71
T-5	Run	LB	Sus	0.05	3.80	0.6	0.3	45.6	12.89
T-4	Run	LB	Sus	0.02	1.70	0.24	0.12	20.4	0.92
T-4	Run	Mid	Sub	0.05	2.50	0.6	0.3	30	8.48
T-4	Run	LB	Sus	0.05	0.90	0.6	0.3	10.8	3.05
T-4	Run	Mid	Sub	0.05	0.70	0.6	0.3	8.4	2.37
T-3	Run	Mid	Sub	0.03	2.00	0.36	0.18	24	2.44
T-3	Run	LB	Sus	0.06	6.00	0.72	0.36	72	29.30
T-3	Run	Mid	Sub	0.02	1.80	0.24	0.12	21.6	0.98
T-3	Run	Mid	Sub	0.02	2.50	0.24	0.12	30	1.36
T-3	Run	RB	Sus	0.02	0.50	0.24	0.12	6	0.27
T-2	Run	Mid	Sub	0.05	3.00	0.6	0.3	36	10.17
T-2	Run	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09
T-2	Run	Mid	Sus	0.05	1.40	0.6	0.3	16.8	4.75
T-2	Run	Mid	Sus	0.10	1.60	1.2	0.6	19.2	21.70
T-2	Run	Mid	Sub	0.50	6.00	6	3	72	2034.72
T-2	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-2	Run	Mid	Sub	0.02	1.80	0.24	0.12	21.6	0.98
T-2	Run	Mid	Emb	0.03	2.00	0.36	0.18	24	2.44
T-2	Run	Mid	Sub	0.03	0.65	0.36	0.18	7.8	0.79
T-2	Run	Mid	Emb	0.07	0.45	0.84	0.42	5.4	2.99
T-2	Run	Mid	Sub	0.02	0.17	0.24	0.12	2.04	0.09
T-2	Run	Mid	Sub	0.02	0.45	0.24	0.12	5.4	0.24
T-2	Run	Mid	Sub	0.50	0.40	6	3	4.8	135.65
T-2	Run	LB	Sub	0.04	1.90	0.48	0.24	22.8	4.12
T-2	Run	RB	Sus	0.02	0.80	0.24	0.12	9.6	0.43
T-2	Run	RB	Sus	0.02	2.00	0.24	0.12	24	1.09

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T-2	Run	RB	Sus	0.02	1.00	0.24	0.12	12	0.54
T-2	Run	LB	Sus	0.03	0.70	0.36	0.18	8.4	0.85
T-2	Run	LB	Sus	0.02	1.30	0.24	0.12	15.6	0.71
T-1	Run	LB	Sus	0.03	2.30	0.36	0.18	27.6	2.81
T-1	Run	Mid	Sub	0.03	3.30	0.36	0.18	39.6	4.03
T-1	Run	LB	Sus	0.02	2.50	0.24	0.12	30	1.36
T-1	Run	RB	Sus	0.02	1.80	0.24	0.12	21.6	0.98
T-1	Run	Mid	Par sub	0.03	3.60	0.36	0.18	43.2	4.39
T-1	Run	LB	Sus	0.02	2.00	0.24	0.12	24	1.09
T-1	Run	LB	Sus	0.02	2.00	0.24	0.12	24	1.09
T-1	Run	LB	Sus	0.03	5.50	0.36	0.18	66	6.71
T-1	Run	LB	Sus	0.02	1.70	0.24	0.12	20.4	0.92
T-1	Run	LB	Sus	0.03	0.30	0.36	0.18	3.6	0.37
T-1	Run	LB	Emb	0.03	2.30	0.36	0.18	27.6	2.81

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Transect	Habitat	Location	Position	Diameter	length	Diameter (in)	Radius (in)	length (in)	Volume (in)
T-10	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-10	Run	Mid	Emb	0.05	1.50	0.6	0.3	18	5.09
T-10	Run	Mid	Emb	0.06	2.80	0.72	0.36	33.6	13.67
T-10	Run	Mid	Sub	0.04	0.30	0.48	0.24	3.6	0.65
T-10	Run	Mid	Sub	0.05	0.90	0.6	0.3	10.8	3.05
T-10	Run	Mid	Sub	0.13	2.30	1.56	0.78	27.6	52.73
T-10	Run	Mid	Emb	0.10	2.00	1.2	0.6	24	27.13
T-10	Run	Mid	Sub	0.04	0.60	0.48	0.24	7.2	1.30
T-10	Run	Mid	Sub	0.06	1.40	0.72	0.36	16.8	6.84
T-10	Run	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09
T-10	Run	RB	Emb	0.13	3.20	1.56	0.78	38.4	73.36
T-10	Run	Mid	Sub	0.03	2.00	0.36	0.18	24	2.44
T-10	Run	Mid	Par Emb	0.20	3.90	2.4	1.2	46.8	211.61
T-10	Run	Mid	Sub	0.02	0.50	0.24	0.12	6	0.27
T-10	Run	RB	Sus	0.03	1.40	0.36	0.18	16.8	1.71
T-10	Run	RB	Sus	0.03	0.35	0.36	0.18	4.2	0.43
T-10	Run	RB	Sus	0.04	1.50	0.48	0.24	18	3.26
T-10	Run	RB	Sus	0.03	0.70	0.36	0.18	8.4	0.85
T-10	Run	Mid	Sub	0.04	1.00	0.48	0.24	12	2.17
T-10	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-9	Run	Mid	Sub	0.04	1.50	0.48	0.24	18	3.26
T-9	Run	Mid	Sub	0.02	2.40	0.24	0.12	28.8	1.30
T-9	Run	LB	Sus	0.05	5.00	0.6	0.3	60	16.96
T-9	Run	Mid	Sub	0.04	3.00	0.48	0.24	36	6.51
T-9	Run	Mid	Sub	0.03	2.50	0.36	0.18	30	3.05
T-9	Pool	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09
T-9	Run	Mid	Emb	0.02	1.00	0.24	0.12	12	0.54
T-9	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-9	Run	Mid	Emb	0.02	2.50	0.24	0.12	30	1.36
T-9	Run	Mid	Sub	0.03	0.50	0.36	0.18	6	0.61
T-9	Run	Mid	Sub	0.05	2.00	0.6	0.3	24	6.78
T-9	Run	Mid	Sub	0.40	2.80	4.8	2.4	33.6	607.70
T-9	Run	LB	Emb	0.05	2.90	0.6	0.3	34.8	9.83
T-9	Run	LB	Sus	0.10	2.50	1.2	0.6	30	33.91
T-9	Run	LB	Sus	0.03	4.00	0.36	0.18	48	4.88
T-9	Run	Mid	Emb	0.02	0.60	0.24	0.12	7.2	0.33
T-9	Run	Mid	Emb	0.02	2.00	0.24	0.12	24	1.09
T-9	Run	LB	Sus	0.10	0.30	1.2	0.6	3.6	4.07
T-9	Run	RB	Sus	0.03	3.00	0.36	0.18	36	3.66
T-9	Run	RB	Sus	0.03	1.20	0.36	0.18	14.4	1.46
T-9	Run	RB	Sus	0.03	2.00	0.36	0.18	24	2.44
T-9	Run	Mid	Emb	0.02	3.60	0.24	0.12	43.2	1.95
T-8	Run	Mid	Sub	0.05	9.00	0.6	0.3	108	30.52
T-8	Run	Mid	Sub	0.02	2.50	0.24	0.12	30	1.36
T-8	Run	Mid	Sub	0.02	2.80	0.24	0.12	33.6	1.52
T-8	Run	Mid	Sub	0.04	4.00	0.48	0.24	48	8.68
T-8	Run	Mid	Sub	0.03	0.70	0.36	0.18	8.4	0.85
T-8	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-8	Run	RB	Sus	0.02	1.30	0.24	0.12	15.6	0.71
T-8	Run	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09

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T-8	Run	Mid	Sub	0.06	1.40	0.72	0.36	16.8	6.84
T-8	Run	Mid	Sub	0.02	3.80	0.24	0.12	45.6	2.06
T-8	Run	RB	Sus	0.03	1.20	0.36	0.18	14.4	1.46
T-8	Run	RB	Sus	0.02	1.80	0.24	0.12	21.6	0.98
T-8	Run	RB	Sus	0.02	1.30	0.24	0.12	15.6	0.71
T-8	Run	RB	Sus	0.05	4.00	0.6	0.3	48	13.56
T-8	Run	RB	Sus	3.00	2.00	36	18	24	8294.40
T-8	Run	LB	Sus	0.50	0.50	6	3	6	129.60
T-8	Run	Mid	Sub	0.30	4.00	3.6	1.8	48	488.33
T-8	Run	Mid	Sub	0.05	10.00	0.6	0.3	120	33.91
T-8	Run	Mid	Sub	0.02	20.00	0.24	0.12	240	10.85
T-7	Run	Mid	Sub	0.05	1.00	0.6	0.3	12	3.39
T-7	Run	Mid	Sub	0.02	3.00	0.24	0.12	36	1.63
T-7	Run	Mid	Sub	0.07	0.90	0.84	0.42	10.8	5.98
T-7	Run	Mid	Sub	0.20	1.70	2.4	1.2	20.4	92.24
T-7	Pool	Mid	Sub	0.03	10.00	0.36	0.18	120	12.21
T-7	Run	Mid	Emb	0.05	2.80	0.6	0.3	33.6	9.50
T-7	Run	Mid	Sub	0.04	1.00	0.48	0.24	12	2.17
T-7	Pool	LB	Sus	0.05	3.50	0.6	0.3	42	11.87
T-7	Pool	Mid	Sub	0.02	6.00	0.24	0.12	72	3.26
T-7	Pool	Mid	Sub	0.06	1.70	0.72	0.36	20.4	8.30
T-7	Run	Mid	Sub	0.04	5.00	0.48	0.24	60	10.85
T-7	Run	Mid	Sub	0.04	4.00	0.48	0.24	48	8.68
T-7	Run	RB	Sus	0.03	3.00	0.36	0.18	36	3.66
T-7	Run	Mid	Emb	0.05	1.00	0.6	0.3	12	3.39
T-7	Run	Mid	Sub	0.10	2.50	1.2	0.6	30	33.91
T-7	Run	Mid	Sub	0.04	6.00	0.48	0.24	72	13.02
T-7	Run	Mid	Emb	0.15	1.30	1.8	0.9	15.6	39.68
T-7	Run	Mid	Emb	0.05	1.60	0.6	0.3	19.2	5.43
T-7	Run	Mid	Emb	0.04	3.50	0.48	0.24	42	7.60
T-7	Run	Mid	Sub	0.03	1.00	0.36	0.18	12	1.22
T-7	Run	Mid	Sub	0.03	4.00	0.36	0.18	48	4.88
T-7	Run	Mid	Emb	0.15	2.00	1.8	0.9	24	61.04
T-7	Run	Mid	Sub	0.70	3.00	8.4	4.2	36	1088.64
T-7	Run	RB	Sus	0.04	4.00	0.48	0.24	48	8.68
T-7	Run	RB	Sus	0.04	4.00	0.48	0.24	48	8.68
T-7	Run	Mid	Par Emb	0.25	3.00	3	1.5	36	254.34
T-7	Run	Mid	Sub	0.10	3.00	1.2	0.6	36	40.69
T-7	Run	RB	Sus	0.02	4.00	0.24	0.12	48	2.17
T-7	Run	Mid	Sub	0.05	4.00	0.6	0.3	48	13.56
T-6	Pool	Mid	Sub	0.04	7.00	0.48	0.24	84	15.19
T-6	Pool	Mid	Sub	0.04	1.60	0.48	0.24	19.2	3.47
T-6	Run	Mid	Sub	0.02	2.00	0.24	0.12	24	1.09
T-6	Run	RB	Sus	0.05	3.00	0.6	0.3	36	10.17
T-6	Run	RB	Emb	0.10	5.00	1.2	0.6	60	67.82
T-6	Run	Mid	Emb	0.08	3.00	0.96	0.48	36	26.04
T-6	Run	Mid	Emb	0.05	1.00	0.6	0.3	12	3.39
T-6	Run	Mid	Emb	0.10	1.30	1.2	0.6	15.6	17.63
T-6	Run	Mid	Sub	0.07	2.00	0.84	0.42	24	13.29
T-6	Run	LB	Emb	0.06	1.50	0.72	0.36	18	7.32
T-6	Run	Mid	Sub	0.05	1.40	0.6	0.3	16.8	4.75

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T-6	Run	RB	Emb	0.15	3.00	1.8	0.9	36	91.56
T-6	Run	RB	Sus	0.02	3.00	0.24	0.12	36	1.63
T-6	Run	RB	Emb	0.10	3.00	1.2	0.6	36	40.69
T-5	Pool	Mid	Sub	0.03	1.50	0.36	0.18	18	1.83
T-5	Run	Mid	Sub	0.10	0.90	1.2	0.6	10.8	12.21
T-5	Run	Mid	Sub	0.05	4.00	0.6	0.3	48	13.56
T-5	Run	Mid	Sub	0.05	10.00	0.6	0.3	120	33.91
T-5	Run	Mid	Sub	0.02	3.50	0.24	0.12	42	1.90
T-5	Run	Mid	Sus	0.05	5.50	0.6	0.3	66	18.65
T-5	Pool	Mid	Sub	0.05	7.00	0.6	0.3	84	23.74
T-5	Pool	Mid	Sub	0.03	4.00	0.36	0.18	48	4.88
T-5	Pool	RB	Emb	0.10	1.00	1.2	0.6	12	13.56
T-5	Pool	Mid	Emb	0.30	3.00	3.6	1.8	36	366.25
T-5	Run	Mid	Sub	0.10	6.50	1.2	0.6	78	88.17
T-5	Run	Mid	Emb	0.10	4.50	1.2	0.6	54	61.04
T-5	Run	Mid	Emb	0.05	3.50	0.6	0.3	42	11.87
T-5	Run	Mid	Bed	0.30	1.00	3.6	1.8	12	122.08
T-5	Run	Mid	Sub	0.03	2.00	0.36	0.18	24	2.44
T-5	Run	Mid	Emb	0.06	4.80	0.72	0.36	57.6	23.44
T-5	Run	LB	Emb	0.15	2.10	1.8	0.9	25.2	64.09
T-5	Run	Mid	Sus	0.10	1.50	1.2	0.6	18	20.35
T-5	Run	Mid	Emb	0.10	1.20	1.2	0.6	14.4	16.28
T-5	Run	Mid	Sub	0.03	4.00	0.36	0.18	48	4.88
T-5	Run	Mid	Sub	0.04	8.00	0.48	0.24	96	17.36
T-5	Run	RB	Sus	0.05	6.00	0.6	0.3	72	20.35
T-5	Run	Mid	Sub	0.50	1.60	6	3	19.2	542.59
T-4	Run	RB	Sus	0.02	2.00	0.24	0.12	24	1.09
T-4	Run	RB	Sus	0.10	7.00	1.2	0.6	84	94.95
T-4	Run	Mid	Emb	0.70	3.00	8.4	4.2	36	1994.03
T-4	Run	Mid	Sub	0.05	6.00	0.6	0.3	72	20.35
T-4	Run	Mid	Sus	0.03	4.00	0.36	0.18	48	4.88
T-4	Run	RB	Sub	0.04	3.00	0.48	0.24	36	6.51
T-4	Run	Mid	Sub	0.05	3.00	0.6	0.3	36	10.17
T-4	Run	Mid	Sub	0.06	3.00	0.72	0.36	36	14.65
T-4	Run	Mid	Sub	0.05	3.50	0.6	0.3	42	11.87
T-4	Run	Mid	Sub	0.04	5.00	0.48	0.24	60	10.85
T-4	Run	Mid	Emb	0.04	4.00	0.48	0.24	48	8.68
T-4	Run	Mid	Emb	0.20	3.00	2.4	1.2	36	162.78
T-4	Run	Mid	Sus	0.10	2.00	1.2	0.6	24	27.13
T-4	Run	RB	Sus	0.07	4.00	0.84	0.42	48	26.59
T-4	Run	RB	Sus	0.05	4.00	0.6	0.3	48	13.56
T-4	Run	RB	Sus	0.07	3.50	0.84	0.42	42	23.26
T-4	Run	Mid	Sub	0.20	2.50	2.4	1.2	30	432.00
T-3	Run	Mid	Sub	0.03	1.00	0.36	0.18	12	1.22
T-3	Run	Mid	Sub	0.03	0.80	0.36	0.18	9.6	0.98
T-3	Run	Mid	Sub	0.02	0.90	0.24	0.12	10.8	0.49
T-3	Run	RB	Sus	0.04	5.00	0.48	0.24	60	10.85
T-3	Run	RB	Sus	0.20	4.00	2.4	1.2	48	217.04
T-3	Run	RB	Sus	0.04	3.50	0.48	0.24	42	7.60
T-3	Run	Mid	Emb	0.03	1.30	0.36	0.18	15.6	1.59
T-3	Run	Mid	Sub	0.10	5.50	1.2	0.6	66	74.61

Muddy Run II Reach 5B Aquatic Habitat Assessment

T-3	Run	Mid	Sub	0.02	3.00	0.24	0.12	36	1.63
T-3	Run	Mid	Sub	0.02	4.00	0.24	0.12	48	2.17
T-3	Run	Mid	Emb	0.06	1.50	0.72	0.36	18	7.32
T-3	Run	RB	Sus	0.02	1.40	0.24	0.12	16.8	0.76
T-3	Run	LB	Sus	0.02	2.00	0.24	0.12	24	1.09
T-3	Run	Mid	Sub	0.60	3.70	7.2	3.6	44.4	1806.83
T-3	Run	Mid	Emb	0.07	4.50	0.84	0.42	54	29.91
T-3	Run	RB	Sus	0.05	2.00	0.6	0.3	24	6.78
T-3	Run	Mid	Emb	0.20	1.00	2.4	1.2	12	54.26
T-2	Run	Mid	Sub	0.10	3.60	1.2	0.6	43.2	48.83
T-2	Run	Mid	Sub	0.20	4.50	2.4	1.2	54	244.17
T-2	Run	Mid	Sub	0.03	2.00	0.36	0.18	24	2.44
T-2	Run	Mid	Sub	0.03	1.70	0.36	0.18	20.4	2.08
T-2	Run	RB	Sus	0.05	10.00	0.6	0.3	120	33.91
T-2	Run	RB	Sus	0.10	3.00	1.2	0.6	36	40.69
T-2	Run	RB	Sus	0.15	10.00	1.8	0.9	120	305.21
T-2	Run	RB	Sus	0.40	20.00	4.8	2.4	240	4340.74
T-2	Run	Mid	Sub	0.04	2.00	0.48	0.24	24	4.34
T-2	Run	RB	Sus	0.03	4.00	0.36	0.18	48	4.88
T-1	Run	Mid	Sub	0.10	6.50	1.2	0.6	78	88.17
T-1	Run	Mid	Sub	0.16	3.90	1.92	0.96	46.8	135.43
T-1	Run	Mid	Emb	0.13	2.00	1.56	0.78	24	45.85
T-1	Run	Mid	Sub	0.10	4.00	1.2	0.6	48	54.26
T-1	Run	Mid	Sub	0.02	1.00	0.24	0.12	12	0.54
T-1	Run	Mid	Emb	0.10	2.00	1.2	0.6	24	27.13
T-1	Run	Mid	Sub	0.05	4.00	0.6	0.3	48	13.56
T-1	Run	Mid	Sub	0.03	0.40	0.36	0.18	4.8	0.49
T-1	Run	Mid	Sub	0.08	6.00	0.96	0.48	72	52.09
T-1	Run	Mid	Sub	0.03	1.50	0.36	0.18	18	1.83
T-1	Run	Mid	Sub	0.05	2.20	0.6	0.3	26.4	7.46
T-1	Run	Mid	Sub	0.03	2.50	0.36	0.18	30	3.05
T-1	Run	Mid	Sub	0.06	2.20	0.72	0.36	26.4	10.74
T-1	Run	Mid	Sub	0.04	4.00	0.48	0.24	48	8.68
T-1	Run	Mid	Sub	0.02	4.00	0.24	0.12	48	2.17
T-1	Run	Mid	Sub	0.05	1.80	0.6	0.3	21.6	6.10
T-1	Run	RB	Sub	0.02	1.50	0.24	0.12	18	0.81
T-1	Run	Mid	Emb	0.04	1.60	0.48	0.24	19.2	3.47
T-1	Run	Mid	Sub	0.02	2.30	0.24	0.12	27.6	1.25
T-1	Run	Mid	Sub	0.02	0.60	0.24	0.12	7.2	0.33
T-1	Run	Mid	Sub	0.03	0.90	0.36	0.18	10.8	1.10
T-1	Run	Mid	Emb	0.03	2.50	0.36	0.18	30	3.05
T-1	Run	LB	Sus	0.02	4.00	0.24	0.12	48	2.17
T-1	Run	Mid	Sub	0.03	2.30	0.36	0.18	27.6	2.81

Muddy Run II Reference Reach Riparian Buffer

Transect	Location	Coverage	%E	%D	DBH	Species
1	LB	80	15	85	8	bay sp, black gum, Am. Holly, RM, TP
1	RB	90	15	85	12.5	TP, SG, Am holly, black gum
2	LB	65	10	90	9	TP, Am holly, SG
2	RB	80	10	90	15	SG, black gum, TP
3	LB	90	10	90	10	black gum, RM, TP, Am holly
3	RB	60	30	70	7	SG, Am holly, bay, black gum
4	LB	85	10	90	10	SG, TP, Am holly
4	RB	35	50	50	3	Am holly, green briar, cane, bay, SG
5	LB	90	10	90	8	TP, bay sp, RM, beech, sw. gum, black gum
5	RB	60	25	75	9	black gum, SG, Am holly, TP
6	LB	90	10	90	8	TP, bay sp, RM, beech, sw. gum, black gum
6	RB	70	50	50	4-6	bay, holly, black gum
7	LB	75	10	90	10	TP, RM, Am. Holly, swamp chestnut oak
7	RB	60	40	60	8	Am holly, TP, SG
8	LB	55	20	80	7	TP, red maple, loblolly, Am. Holly, privet
8	RB	80	40	60	6	water oak, TP, Am holly, RM
9	LB	70	25	75	10	Luael oak, Am. Holly, tulip poplar, loblolly
9	RB	80	20	80	6	TP, Am holly, water oak, RM
10	LB	60	20/25	75	11.5	Luael oak, Am. Holly, tulip poplar, loblolly
10	RB	80	15	85	11	loblolly, Sw. ches. Oak, Am holly, RM, SG, TP, privet

Muddy Run II Reach 3A Riparian Buffer

Transect	Location	Coverage	%E	%D	DBH	Species
1	LB	65	0	100	4	privet, tulip poplar, sycamore
1	RB	20	0	100	1	privet, black willow
2	LB	20	0	100	1.5	swamp chestnut oak, sweetbay, sycamore, privet, devils walking stick
2	RB	40	0	100	3	water oak, privet, black willow, sycamore
3	LB	40	0	100	2	privet, sweetgum, tulip poplar, sycamore
3	RB	20	0	100	1.5	privet, water oak, black willow, red maple
4	LB	55	2	98	2	red mulberry, American holly, sweetgum, privet, swamp chestnut oak, tulip poplar
4	RB	30	0	100	1.5	black willow, privet, green ash
5	LB	80	0	100	3.5	privet, swamp chestnut oak, sweetgum, tulip poplar
5	RB	20	0	100	3	red maple, sycamore, American elm
6	LB	75	0	100	2.5	swamp chestnut oak, sweet bay, sweetgum, privet, ironwood
6	RB	25	15	85	2	privet, sweetgum, sycamore, loblolly
7	LB	75	0	100	3	swamp chestnut oak, ironwood, tulip poplar, sycamore
7	RB	20	0	100	2.5	sycamore, swamp chestnut oak, black cherry, elderberry
8	LB	70	50	50	2	holly, swamp chestnut oak, loblolly, water oak
8	RB	35	10	90	4	sycamore, tulip poplar, loblolly, sweetgum
9	LB	55	0	100	2.5	American elm, water oak, swamp chestnut oak, sweetgum, red maple
9	RB	40	0	100	4.5	tulip poplar, red maple
10	LB	65	20	80	2.5	privet, sycamore, loblolly, sweetgum, water oak
10	RB	0	0	100	0	cultivated field- no trees

Muddy Run II Reach 5A Riparian Buffer

Transect	Location	Coverage	%E	%D	DBH	Species
1	LB	55	3	97	3	water oak, red maple, sweetgum, laurel oak, loblolly
1	RB	0	0	0	0	Agricultural field and grass covered road
2	LB	45	15	85	3.5	privet, water oak, red maple, sweetgum, loblolly
2	RB	0	0	0	0	Agricultural field and grass covered road
3	LB	50	5	95	3.5	red maple, privet, laurel oak, sweetgum, loblolly
3	RB	0	0	0	0	Agricultural field and grass covered road
4	LB	60	0	100	3	sweetgum, red maple, water oak, tulip poplar
4	RB	0	0	0	0	Agricultural field and grass covered road
5	LB	70	5	95	4	sycamore, sweetgum, red maple, water oak, loblolly
5	RB	0	0	0	0	Agricultural field and grass covered road
6	LB	65	3	97	5	red maple, privet, sweetgum, swamp chestnut oak, sycamore, water oak, tulip polar, loblolly
6	RB	0	0	0	0	Agricultural field and grass covered road
7	LB	65	3	97	4	red maple, loblolly, sweetgum, American elm, water oak
7	RB	0	0	0	0	Agricultural field and grass covered road
8	LB	50	7	93	4	privet, sweetgum, red maple, loblolly, swamp chestnut oak, water oak
8	RB	0	0	0	0	Agricultural field and grass covered road
9	LB	55	5	95	4	tulip poplar, red maple, water oak, loblolly
9	RB	0	0	0	0	Agricultural field and grass covered road
10	LB	45	5	95	6	red maple, loblolly, sycamore, water oak, tulip poplar, sweetgum
10	RB	0	0	0	0	Agricultural field and grass covered road

Muddy Run II Reach 5B Riparian Buffer

Transect	Location	Coverage	%E	%D	DBH	Species
1	LB	85	5	95	6	loblolly, red maple, sweetgum, red bay
1	RB	20	0	100	2	red maple, privet, sycamore, sweetgum
2	LB	90	5	95	4	sweetgum, loblolly, water oak, red maple, green ash
2	RB	15	10	90	2	sycamore, privet, loblolly, muscle wood
3	LB	85	5	95	4	sweetgum, laurel oak, loblolly, red maple, water oak, swamp chestnut oak
3	RB	10	15	85	1.5	red maple, loblolly, privet
4	LB	85	5	95	5	loblolly, red maple, sweetgum, laurel oak, sycamore, water oak
4	RB	10	0	100	1	black walnut, privet, sweetgum
5	LB	85	5	95	4	loblolly, sweetgum, red maple, swamp chestnut oak, laurel oak, water oak
5	RB	10	0	100	2	privet, red maple, sycamore
6	LB	85	15	85	5	loblolly, red maple, sweetgum, tulip poplar, swamp chestnut oak, sycamore
6	RB	10	0	100	2	privet, black walnut, red maple
7	LB	85	15	85	5	sweetgum, sycamore, loblolly, laurel oak, red maple
7	RB	5	0	100	1	privet, black walnut, red maple
8	LB	80	10	90	5	loblolly, water oak, loblolly bay, sycamore, swamp chestnut oak
8	RB	5	5	95	2	privet, loblolly, red maple
9	LB	80	5	95	4	red maple, sweetgum, loblolly, green ash, American elm
9	RB	5	2	98	2.5	privet, red maple, loblolly
10	LB	75	5	95	4	sweetgum, loblolly, American elm, tulip poplar
10	RB	10	5	95	1	privet, red maple, loblolly

Muddy Run II Reference Reach Fish Cover

Transect	Width	Length	Cover Type	Location	Notes	Area (ft ²)
1	0.6	9	under cut	LB		5.4
1	0.4	1	root	RB		0.4
2	0.3	1.5	under cut	LB		0.5
2	3	3	overhang/dead brush	RB		9.0
3	1.5	3	overhang veg	RB		4.5
3	0.5	4.4	root overhang	RB		2.2
3	0.4	1	under cut	RB		0.4
3	0.4	0.5	root overhang	LB		0.2
4	1	3	overhang veg	RB		3.0
5	0.7	10	root overhang/cut	LB		7.0
5	0.4	6.5	root overhang/cut	RB		2.6
5	2	2	overhang veg	RB		4.0
5	4	3	overhang veg	RB		12.0
5	1	4	overhang veg	LB		4.0
5	2	2	overhang veg	LB		4.0
6	0.5	1	root overhang	RB	(in water)	0.5
7	0.6	0.8	log overhang	LB	(in water)	0.5
7	0.3	2	log overhang	LB	(in water)	0.6
8	4.6	3.9	overhang veg	RB		17.9
8	0.25	4	under cut bank	RB		1.0
9	0.3	0.5	stick overhang	LB		0.2
9	0.3	0.5	stick overhang	LB		0.2
9	0.3	1	under cut	LB		0.3
9	3	3.7	veg/brush overhang	RB		11.1
10	1	1.2	veg overhang	RB		1.2
10	0.2	1.5	under cut	RB		0.3
10	0.4	1.5	under cut	RB		0.6
10	2	2	veg overhang	RB		4.0

Muddy Run II Reach 3A Fish Cover

Transect	Width	Length	Cover Type	Location	Notes	Area (ft ²)
1	3	10	aquatic vegetation	chan		19.5
2	4.1	10	aquatic vegetation	chan		18.5
3	5.4	10	aquatic vegetation	chan		24.3
4	6	10	aquatic vegetation	chan		48.0
5	6.5	10	aquatic vegetation	chan		65.0
6	6	10	aquatic vegetation	chan		51.0
7	6.2	10	aquatic vegetation	chan		43.4
8	5.6	10	aquatic vegetation	chan		22.4
9	6	10	aquatic vegetation	chan		1.8
10	5.1	10	aquatic vegetation	chan		45.9

Muddy Run II Reach 5A Fish Cover

Transect	Width	Lenth	Cover Type	Location	Notes	Area (ft ²)
1	5.2	10	Aquatic vegetation	chan		18.2
2	3.7	10	Aquatic vegetation	chan		14.8
3	4	10	Aquatic vegetation	chan		24.0
3	4	10	Undercut bank			24.0
4	4.4	10	Aquatic vegetation	chan		17.6
5	4.5	10	Aquatic vegetation	chan		27.0
6	5.7	10	Aquatic vegetation	chan		17.1
6	5.7	10	Undercut bank			17.1
7	4.5	10	Aquatic vegetation	chan		22.5
8	4.7	10	Aquatic vegetation	chan		7.1
9	4.9	10	Aquatic vegetation	chan		9.8
10	5	10	Aquatic vegetation	chan		2.5

Muddy Run II Reach 5A Fish Cover

Transect	Width	Lenth	Cover Type	Location	Notes	Area (ft ²)
1	6.4	10	Undercut bank			1.8
2	5.7	10	Undercut bank			2.0
3	5.3	10	Undercut bank			0.6
3	5.3	10	Log	chan		0.4
4	5	10	log edge (sub)	chan		0.3
4	5	10	debris (sus)	chan		0.8
4	5	10	Undercut bank			1.6
6	5.4	10	root (sus)	chan		0.4
7	6.5	10	Undercut bank			7.2
8	6	10	Undercut bank			2.8
8	6	10	log	chan		0.9
8	6	10	sus/sub woody debris	chan		9.3
9	6.2	10	log edge	chan		0.2
10	6.1	10	Undercut bank			0.3

Stream: Reach I MR II
 Reach: 1
 Date: 6-25-11
 Weather: _____
 Location: _____

Observers: AS, FM, BSH
 Project: MR II
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	6
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	9
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	9
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	10
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y < 12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	10
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	4

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	9
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	7
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	8
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	7
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	7
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	—

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

96

Stream: MRTI
 Reach: REACH 2
 Date: 6/25/12
 Weather: PARTLY CLOUDY 5.80°
 Location: _____

Observers: AS, BN, FM
 Project: _____
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	8
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	9
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	11
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	11
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10
6. Bar development	For $S < 0.02$ and $w/y > 12$, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For $S > 0.02$ and w/y are < 12, no bars are evident	For $S < 0.02$ and $w/y > 12$, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For $S > 0.02$ and $w/y < 12$, no bars are evident	For $S < 0.02$ and $w/y > 12$, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for $S > 0.02$ and $w/y < 12$	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for $S < 0.02$ and $w/y > 12$	10
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	9
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	9
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	3
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	2
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	1
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

86

Stream: MRII Reach 3a
 Reach: 3a non clear cut
 Date: 6-25-2012
 Weather: Mid 80's, partly cloudy
 Location: _____

Observers: FM + BSH + AS
 Project: _____
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	7
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	10
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	11
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	11
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10
6. Bar development	For S < 0.02 and wly > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and wly are < 12, no bars are evident	For S < 0.02 and wly > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and wly < 12, no bars are evident	For S < 0.02 and wly > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and wly < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and wly > 12	10
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	1

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	9
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	7
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	10
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	3
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	3
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	—

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

92

Stream: MR II 3a clear out
 Reach: 3a
 Date: 10-25-12
 Weather: upper 80's partly cloudy
 Location: _____

Observers: FM, AS, BSH
 Project: _____
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	10
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	9
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	11
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge	11
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	3
6. Bar development	For $S < 0.02$ and $w/y > 12$, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For $S > 0.02$ and w/y are < 12, no bars are evident	For $S < 0.02$ and $w/y > 12$, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For $S > 0.02$ and $w/y < 12$, no bars are evident	For $S < 0.02$ and $w/y > 12$, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for $S > 0.02$ and $w/y < 12$	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for $S < 0.02$ and $w/y > 12$	10
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	8
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	10
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	10
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	4
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	2
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	—

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

91

Stream: MR II
 Reach: 3C
 Date: 6-26-12
 Weather: _____
 Location: _____

Observers: _____
 Project: _____
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	4
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	4
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	5
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge	8
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	11
6. Bar development	For S < 0.02 and wly > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and wly are < 12, no bars are evident	For S < 0.02 and wly > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and wly < 12, no bars are evident	For S < 0.02 and wly > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and wly < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and wly > 12	7
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	5

6- BARS → FEW BARS; LOW ϵ ; WIDTH $\approx \frac{1}{3}$ TO $\frac{1}{2}$ W_{50%}; FINE SAND; SPORADIC VEG

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	11
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	11
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	3
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	3
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	3
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	—

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

75

Stream: MR II
 Reach: 4 - PRESERVATION
 Date: 6/26/12
 Weather: SUNNY 75°
 Location: DUBLIN CO

Observers: AS, BH, Em
 Project: MR II
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	6
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	5
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	2
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	7
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge	6
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	11
6. Bar development	For $S < 0.02$ and $w/y > 12$, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For $S > 0.02$ and w/y are < 12, no bars are evident	For $S < 0.02$ and $w/y > 12$, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For $S > 0.02$ and $w/y < 12$, no bars are evident	For $S < 0.02$ and $w/y > 12$, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for $S > 0.02$ and $w/y < 12$	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for $S < 0.02$ and $w/y > 12$	7
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	5

FINE SAND / MUCK

SOME BARS, CHANNEL REFORM UP IN BKS, ALL BARS WAX 1/2 TO 1/2 W/ST

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	10
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	7
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	3
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	4
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	4
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	✓

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

75

Stream: MR II
 Reach: 5a US
 Date: _____
 Weather: _____
 Location: _____

Observers: _____
 Project: _____
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	9
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	6
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	11
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	11
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	11
6. Bar development	For $S < 0.02$ and $w/y > 12$, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For $S > 0.02$ and w/y are < 12, no bars are evident	For $S < 0.02$ and $w/y > 12$, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For $S > 0.02$ and $w/y < 12$, no bars are evident	For $S < 0.02$ and $w/y > 12$, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for $S > 0.02$ and $w/y < 12$	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for $S < 0.02$ and $w/y > 12$	10
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	2

fine sand,
some clay

no bars

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	11
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	11
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	8
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	7
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	6
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	—

LB = 3, little veg on bank, thick riparian
RB = 3, 5 etc.

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

103

Stream: MRII
 Reach: 5a (DIS in woods)
 Date: 6-27-2012
 Weather: _____
 Location: _____

Observers: FM, BSH, AS
 Project: _____
 Drainage Area: _____
 Stream Type: _____

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	9
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	6
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	7
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge	10
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	11
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y < 12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	9
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

bars ~ 1/3 width of stream
some bars

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	11
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	10
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	7
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	6
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	4
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	—

riparian zone has mature trees some on bank roots enter bank, but veg on bank mostly herbaceous

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

93

Stream: MR II
 Reach: Reach 6
 Date: 10-26-2012
 Weather:
 Location:

Observers: BSH, AS, FM
 Project:
 Drainage Area:
 Stream Type:

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	9
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	10
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	7
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ratio small; deeply confined; no active flood plain; levees are high and along the channel edge	11
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	9
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y < 12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	7
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	4

Some bars
 ~1/3 of stream

Stability Indicator	Excellent (1 - 3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	9
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	11
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	7
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	6
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	5
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	-

mucky sand w/ some clay

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score

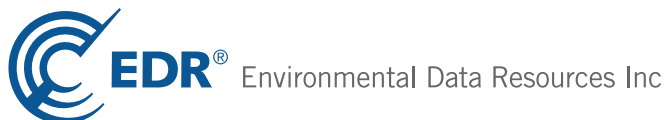
95

Muddy Run II

Highway 111/Ludie Brown Road
Chinquapin, NC 28521

Inquiry Number: 3337526.6s
June 05, 2012

The EDR Radius Map™ Report with GeoCheck®



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Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

HIGHWAY 111/LUDIE BROWN ROAD
CHINQUAPIN, NC 28521

COORDINATES

Latitude (North): 34.8343000 - 34° 50' 3.48"
Longitude (West): 77.7907000 - 77° 47' 26.52"
Universal Transverse Mercator: Zone 18
UTM X (Meters): 244790.5
UTM Y (Meters): 3858022.5
Elevation: 50 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map: 34077-G7 CHINQUAPIN, NC
Most Recent Revision: 1981

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from: 2009, 2010
Source: USDA

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL..... National Priority List

EXECUTIVE SUMMARY

Proposed NPL..... Proposed National Priority List Sites
NPL LIENS..... Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL..... National Priority List Deletions

Federal CERCLIS list

CERCLIS..... Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY..... Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP..... CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS..... Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF..... RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG..... RCRA - Large Quantity Generators
RCRA-SQG..... RCRA - Small Quantity Generators
RCRA-CESQG..... RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS..... Engineering Controls Sites List
US INST CONTROL..... Sites with Institutional Controls

Federal ERNS list

ERNS..... Emergency Response Notification System

State- and tribal - equivalent NPL

NC HSDS..... Hazardous Substance Disposal Site

State- and tribal - equivalent CERCLIS

SHWS..... Inactive Hazardous Sites Inventory

State and tribal landfill and/or solid waste disposal site lists

SWF/LF..... List of Solid Waste Facilities
OLI..... Old Landfill Inventory

State and tribal leaking storage tank lists

LUST..... Regional UST Database

EXECUTIVE SUMMARY

LUST TRUST..... State Trust Fund Database
LAST..... Leaking Aboveground Storage Tanks
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

UST..... Petroleum Underground Storage Tank Database
AST..... AST Database
INDIAN UST..... Underground Storage Tanks on Indian Land
FEMA UST..... Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

INST CONTROL..... No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

INDIAN VCP..... Voluntary Cleanup Priority Listing
VCP..... Responsible Party Voluntary Action Sites

State and tribal Brownfields sites

BROWNFIELDS..... Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS..... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9..... Torres Martinez Reservation Illegal Dump Site Locations
ODI..... Open Dump Inventory
SWRCY..... Recycling Center Listing
HIST LF..... Solid Waste Facility Listing
INDIAN ODI..... Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL..... Clandestine Drug Labs
US HIST CDL..... National Clandestine Laboratory Register

Local Land Records

LIENS 2..... CERCLA Lien Information
LUCIS..... Land Use Control Information System

Records of Emergency Release Reports

HMIRS..... Hazardous Materials Information Reporting System

Other Ascertainable Records

RCRA-NonGen..... RCRA - Non Generators

EXECUTIVE SUMMARY

DOT OPS.....	Incident and Accident Data
DOD.....	Department of Defense Sites
FUDS.....	Formerly Used Defense Sites
CONSENT.....	Superfund (CERCLA) Consent Decrees
ROD.....	Records Of Decision
UMTRA.....	Uranium Mill Tailings Sites
MINES.....	Mines Master Index File
TRIS.....	Toxic Chemical Release Inventory System
TSCA.....	Toxic Substances Control Act
FTTS.....	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS.....	FIFRA/TSCA Tracking System Administrative Case Listing
SSTS.....	Section 7 Tracking Systems
ICIS.....	Integrated Compliance Information System
PADS.....	PCB Activity Database System
MLTS.....	Material Licensing Tracking System
RADINFO.....	Radiation Information Database
FINDS.....	Facility Index System/Facility Registry System
RAATS.....	RCRA Administrative Action Tracking System
IMD.....	Incident Management Database
UIC.....	Underground Injection Wells Listing
DRYCLEANERS.....	Drycleaning Sites
NPDES.....	NPDES Facility Location Listing
INDIAN RESERV.....	Indian Reservations
SCRD DRYCLEANERS.....	State Coalition for Remediation of Drycleaners Listing
PCB TRANSFORMER.....	PCB Transformer Registration Database
COAL ASH EPA.....	Coal Combustion Residues Surface Impoundments List
EPA WATCH LIST.....	EPA WATCH LIST
COAL ASH DOE.....	Sleam-Electric Plan Operation Data
2020 CORRECTIVE ACTION.....	2020 Corrective Action Program List
FINANCIAL ASSURANCE.....	Financial Assurance Information Listing
COAL ASH.....	Coal Ash Disposal Sites

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants..... EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were not identified.

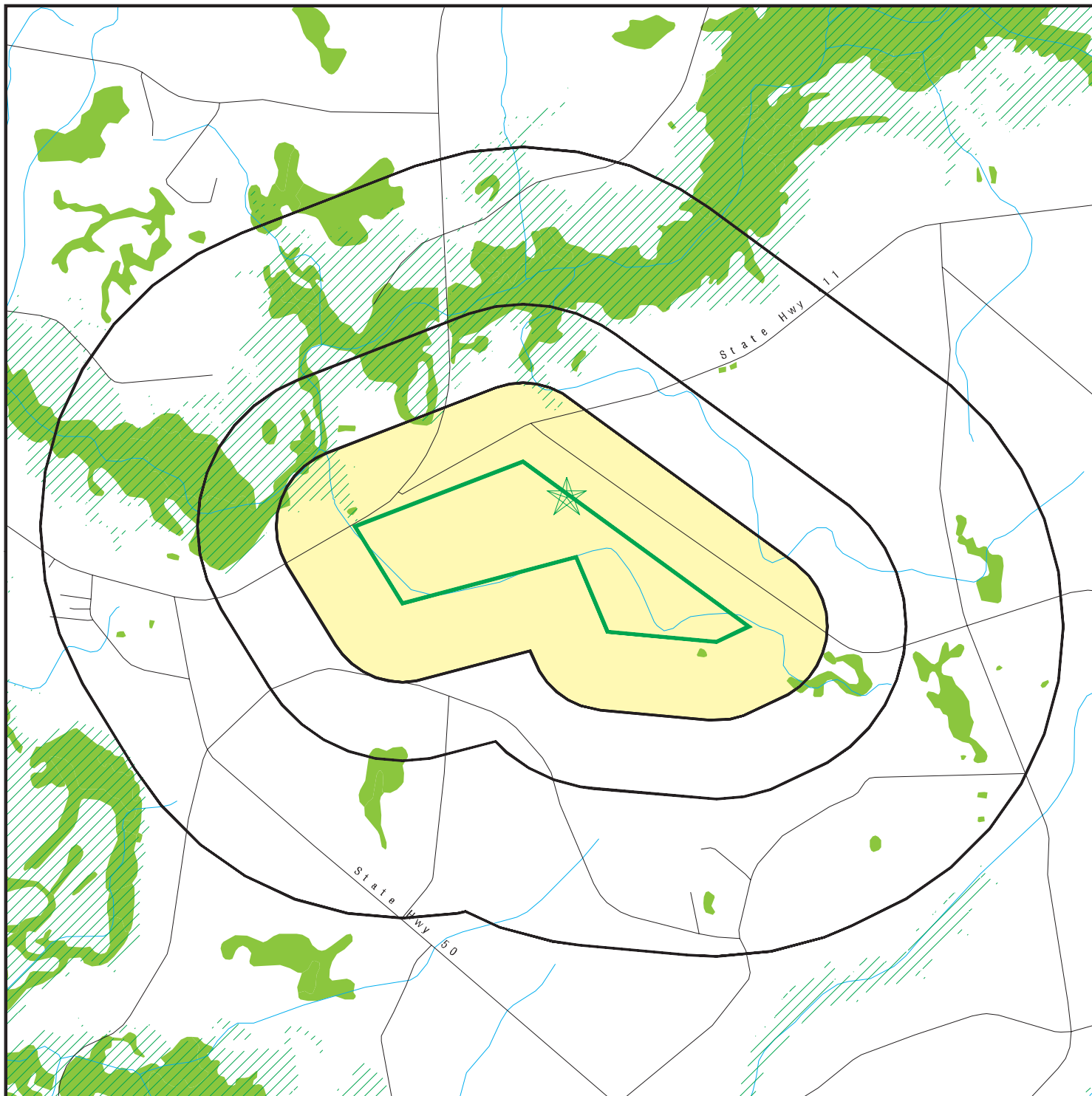
Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 25 records.

<u>Site Name</u>	<u>Database(s)</u>
KING FARMS TRUCK SPILL	LAST
MARIES GAS & GRILL	LUST, UST, FINANCIAL ASSURANCE
JARMAN OIL CO.	LUST, UST
RHODES GRILL	IMD, LUST, UST
HALLIE ALBERTSON RESIDENCE	LUST
MOORE'S GROCERY & GRILL	IMD, LUST
NORRIS LUV STATION	IMD, LUST
MARIE & BILLY'S GAS & GRILL	LUST TRUST
EARL BLIZZARD	UST
QUINNS SUPER VALUE	UST
JAMES T RAYNOR	UST
LINWOOD RALPH KENNEDY	UST
DESSIE THIGPEN	UST
HALL'S PETROLEUM EQUIPMENT CO	UST
MOORES MINI MART #3	UST
NC ARMY NATIONAL GUARD ARMORY	UST
JERRY'S	UST
COMMUNITY FOOD STORE	UST
MARTHA MOORE'S GROCERY	UST
TERRY'S SERVICE CENTER	UST
MOBLEY GROCERY	UST
NORRIS SERVICE STATION	UST
C.A. MILLER SALVAGE	RCRA-NonGen
MOULDING SOLUTIONS	RCRA-NonGen
MARIE AND BILLY'S GAS / GRILL	IMD

OVERVIEW MAP - 3337526.6s



Target Property

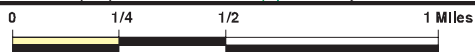
Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

National Priority List Sites

Dept. Defense Sites



Indian Reservations BIA

Power transmission lines

Oil & Gas pipelines from USGS

100-year flood zone

500-year flood zone

National Wetland Inventory

State Wetlands

Hazardous Substance Disposal Sites

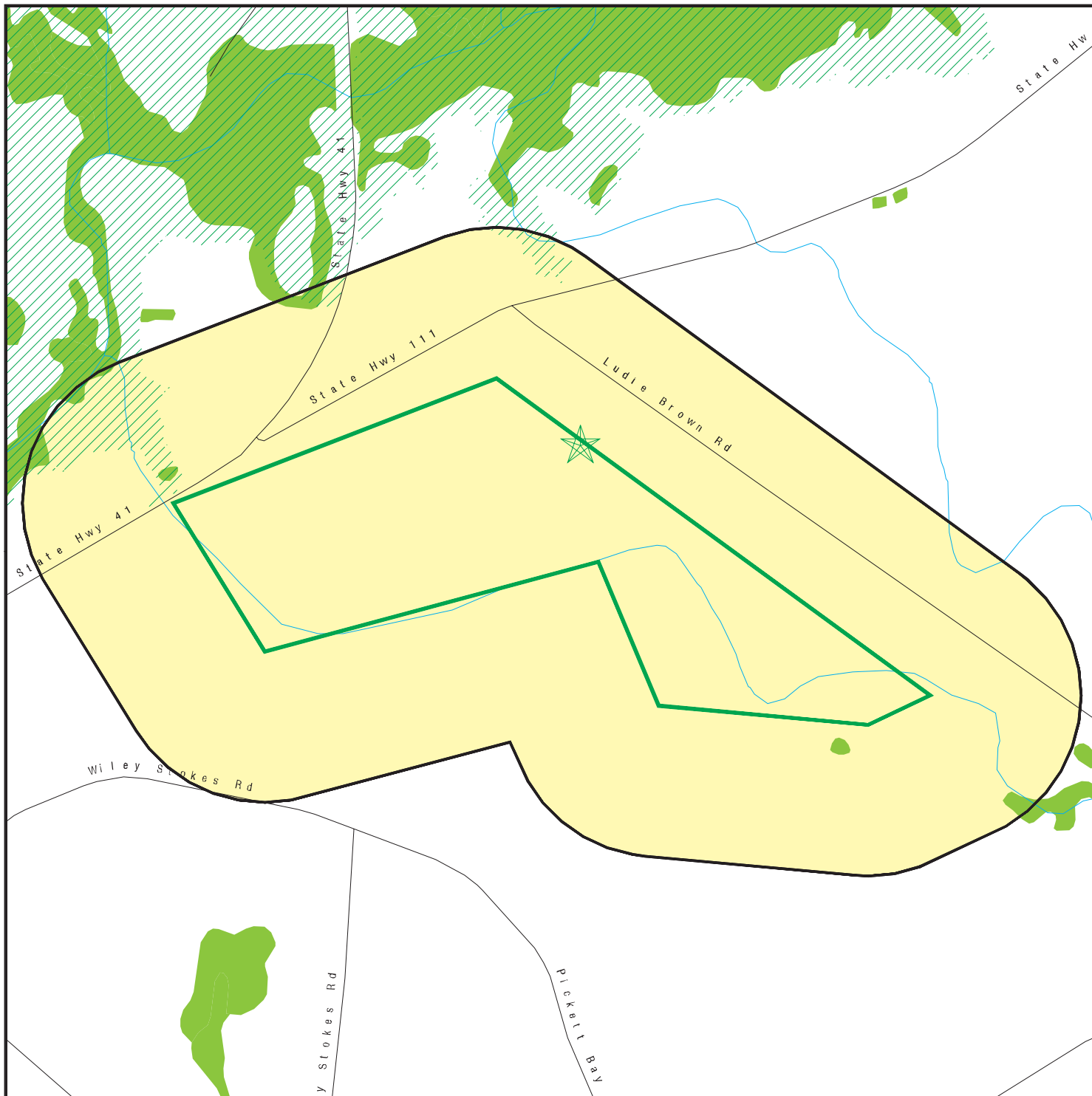


This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Muddy Run II
 ADDRESS: Highway 111/Ludie Brown Road
 Chinquapin NC 28521
 LAT/LONG: 34.8343 / 77.7907

CLIENT: WK Dickson
 CONTACT: George Lankford
 INQUIRY #: 3337526.6s
 DATE: June 05, 2012 12:08 pm

DETAIL MAP - 3337526.6s



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

Sensitive Receptors

National Priority List Sites

Dept. Defense Sites

Indian Reservations BIA

Oil & Gas pipelines from USGS

100-year flood zone

500-year flood zone

National Wetland Inventory

State Wetlands

Hazardous Substance Disposal Sites



This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: Muddy Run II
 ADDRESS: Highway 111/Ludie Brown Road
 Chinquapin NC 28521
 LAT/LONG: 34.8343 / 77.7907

CLIENT: WK Dickson
 CONTACT: George Lankford
 INQUIRY #: 3337526.6s
 DATE: June 05, 2012 12:10 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
<i>Federal NPL site list</i>								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
<i>Federal Delisted NPL site list</i>								
Delisted NPL	1.000		0	0	0	0	NR	0
<i>Federal CERCLIS list</i>								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	1.000		0	0	0	0	NR	0
<i>Federal CERCLIS NFRAP site List</i>								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
<i>Federal RCRA CORRACTS facilities list</i>								
CORRACTS	1.000		0	0	0	0	NR	0
<i>Federal RCRA non-CORRACTS TSD facilities list</i>								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
<i>Federal RCRA generators list</i>								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
<i>Federal institutional controls / engineering controls registries</i>								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
<i>Federal ERNS list</i>								
ERNS	TP		NR	NR	NR	NR	NR	0
<i>State- and tribal - equivalent NPL</i>								
NC HSDS	1.000		0	0	0	0	NR	0
<i>State- and tribal - equivalent CERCLIS</i>								
SHWS	1.000		0	0	0	0	NR	0
<i>State and tribal landfill and/or solid waste disposal site lists</i>								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
<i>State and tribal leaking storage tank lists</i>								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LUST TRUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA-NonGen	0.250		0	0	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
2020 CORRECTIVE ACTION	0.250		0	0	NR	NR	NR	0
FINANCIAL ASSURANCE	TP		NR	NR	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants	1.000		0	0	0	0	NR	0
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NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Map ID
Direction
Distance
Elevation

MAP FINDINGS

Site

Database(s)

EDR ID Number
EPA ID Number

NO SITES FOUND

Count: 25 records.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BEULAVILLE	U004139610	EARL BLIZZARD	RT 1	28518	UST
BEULAVILLE	U001196143	QUINNS SUPER VALUE	RT 1	28518	UST
BEULAVILLE	U004139675	JAMES T RAYNOR	RT 2	28518	UST
BEULAVILLE	U004139143	LINWOOD RALPH KENNEDY	RT 2	28518	UST
BEULAVILLE	U004138789	DESSIE THIGPEN	RT 2	28518	UST
BEULAVILLE	U004139051	HALL'S PETROLEUM EQUIPMENT CO	RT 2	28518	UST
BEULAVILLE	U004138583	JARMAN OIL CO.	HWY 24 E	28518	LUST, UST
BEULAVILLE	1010786765	C.A. MILLER SALVAGE	1127 NC 241	28518	RCRA-NonGen
BEULAVILLE	U001958842	RHODES GRILL	HWY 41 & HWY	28518	IMD, LUST, UST
BEULAVILLE	U001189500	MOORES MINI MART #3	HWY 41 S	28518	UST
BEULAVILLE	S111161184	HALLIE ALBERTSON RESIDENCE	2124 HWY 41 S	28518	LUST
BEULAVILLE	U001958939	NC ARMY NATIONAL GUARD ARMORY	HWY 415 & JACKSON AVE	28518	UST
BEULAVILLE	U004139530	JERRY'S	BEULAVILLE HWY	28518	UST
CHINQUAPIN	U004138527	COMMUNITY FOOD STORE	RT 1	28521	UST
CHINQUAPIN	U003561951	MARTHA MOORE'S GROCERY	RT 1	28521	UST
CHINQUAPIN	U003562509	TERRY'S SERVICE CENTER	RT 1	28521	UST
CHINQUAPIN	S105765983	MOORE'S GROCERY & GRILL	RT 1		IMD, LUST
CHINQUAPIN	U001196918	MOBLEY GROCERY	HWY 111	28521	UST
CHINQUAPIN	1014925468	MOULDING SOLUTIONS	2137 HWY 111 S	28521	RCRA-NonGen
CHINQUAPIN	S110628794	KING FARMS TRUCK SPILL	3186 HWY 41 S	28521	LAST
CHINQUAPIN	S106204826	NORRIS LUV STATION	HWY 41		IMD, LUST
CHINQUAPIN	U001196990	NORRIS SERVICE STATION	HWY 41	28521	UST
CHINQUAPIN	U003091488	MARIES GAS & GRILL	4463 NC HWY 50	28521	LUST, UST, FINANCIAL ASSURANCE
CHINQUAPIN	S106352291	MARIE & BILLY'S GAS & GRILL	4463 S NC HWY50		LUST TRUST
CHINQUAPIN	S105896153	MARIE AND BILLY'S GAS / GRILL	4463 S NC HWY 50		IMD

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 05/08/2012	Source: EPA
Date Data Arrived at EDR: 05/10/2012	Telephone: N/A
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 05/10/2012
Number of Days to Update: 5	Next Scheduled EDR Contact: 07/23/2012
	Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 03/30/2012	Source: EPA
Date Data Arrived at EDR: 04/05/2012	Telephone: N/A
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 04/05/2012
Number of Days to Update: 40	Next Scheduled EDR Contact: 07/23/2012
	Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991	Source: EPA
Date Data Arrived at EDR: 02/02/1994	Telephone: 202-564-4267
Date Made Active in Reports: 03/30/1994	Last EDR Contact: 08/15/2011
Number of Days to Update: 56	Next Scheduled EDR Contact: 11/28/2011
	Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 03/30/2012	Source: EPA
Date Data Arrived at EDR: 04/05/2012	Telephone: N/A
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 04/05/2012
Number of Days to Update: 40	Next Scheduled EDR Contact: 07/23/2012
	Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 12/27/2011	Source: EPA
Date Data Arrived at EDR: 02/27/2012	Telephone: 703-412-9810
Date Made Active in Reports: 03/12/2012	Last EDR Contact: 05/29/2012
Number of Days to Update: 14	Next Scheduled EDR Contact: 09/10/2012
	Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 12/10/2010	Source: Environmental Protection Agency
Date Data Arrived at EDR: 01/11/2011	Telephone: 703-603-8704
Date Made Active in Reports: 02/16/2011	Last EDR Contact: 04/12/2012
Number of Days to Update: 36	Next Scheduled EDR Contact: 07/23/2012
	Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 12/28/2011	Source: EPA
Date Data Arrived at EDR: 02/27/2012	Telephone: 703-412-9810
Date Made Active in Reports: 03/12/2012	Last EDR Contact: 05/29/2012
Number of Days to Update: 14	Next Scheduled EDR Contact: 09/10/2012
	Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 08/19/2011
Date Data Arrived at EDR: 08/31/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 132

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 05/15/2012
Next Scheduled EDR Contact: 08/27/2012
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 04/04/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 04/04/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 04/04/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 04/04/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 12/30/2011	Source: Environmental Protection Agency
Date Data Arrived at EDR: 12/30/2011	Telephone: 703-603-0695
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 03/12/2012
Number of Days to Update: 11	Next Scheduled EDR Contact: 06/25/2012
	Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 12/30/2011	Source: Environmental Protection Agency
Date Data Arrived at EDR: 12/30/2011	Telephone: 703-603-0695
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 03/12/2012
Number of Days to Update: 11	Next Scheduled EDR Contact: 06/25/2012
	Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 10/03/2011	Source: National Response Center, United States Coast Guard
Date Data Arrived at EDR: 10/04/2011	Telephone: 202-267-2180
Date Made Active in Reports: 11/11/2011	Last EDR Contact: 04/03/2012
Number of Days to Update: 38	Next Scheduled EDR Contact: 07/16/2012
	Data Release Frequency: Annually

State- and tribal - equivalent NPL

HSDS: Hazardous Substance Disposal Site

Locations of uncontrolled and unregulated hazardous waste sites. The file includes sites on the National Priority List as well as those on the state priority list.

Date of Government Version: 08/09/2011	Source: North Carolina Center for Geographic Information and Analysis
Date Data Arrived at EDR: 11/08/2011	Telephone: 919-754-6580
Date Made Active in Reports: 12/05/2011	Last EDR Contact: 05/08/2012
Number of Days to Update: 27	Next Scheduled EDR Contact: 08/20/2012
	Data Release Frequency: Biennially

State- and tribal - equivalent CERCLIS

SHWS: Inactive Hazardous Sites Inventory

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 03/01/2012	Source: Department of Environment, Health and Natural Resources
Date Data Arrived at EDR: 04/03/2012	Telephone: 919-508-8400
Date Made Active in Reports: 04/23/2012	Last EDR Contact: 04/03/2012
Number of Days to Update: 20	Next Scheduled EDR Contact: 07/02/2012
	Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: List of Solid Waste Facilities

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 03/14/2012	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 03/16/2012	Telephone: 919-733-0692
Date Made Active in Reports: 04/23/2012	Last EDR Contact: 04/23/2012
Number of Days to Update: 38	Next Scheduled EDR Contact: 07/16/2012
	Data Release Frequency: Semi-Annually

OLI: Old Landfill Inventory

Old landfill inventory location information. (Does not include no further action sites and other agency lead sites).

Date of Government Version: 10/14/2011	Source: Department of Environment & Natural Resources
Date Data Arrived at EDR: 10/20/2011	Telephone: 919-733-4996
Date Made Active in Reports: 11/23/2011	Last EDR Contact: 04/17/2012
Number of Days to Update: 34	Next Scheduled EDR Contact: 07/30/2012
	Data Release Frequency: Varies

State and tribal leaking storage tank lists

LUST: Regional UST Database

This database contains information obtained from the Regional Offices. It provides a more detailed explanation of current and historic activity for individual sites, as well as what was previously found in the Incident Management Database. Sites in this database with Incident Numbers are considered LUSTs.

Date of Government Version: 02/03/2012	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 02/15/2012	Telephone: 919-733-1308
Date Made Active in Reports: 03/20/2012	Last EDR Contact: 05/16/2012
Number of Days to Update: 34	Next Scheduled EDR Contact: 08/27/2012
	Data Release Frequency: Quarterly

LUST TRUST: State Trust Fund Database

This database contains information about claims against the State Trust Funds for reimbursements for expenses incurred while remediating Leaking USTs.

Date of Government Version: 01/13/2012	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 01/19/2012	Telephone: 919-733-1315
Date Made Active in Reports: 02/10/2012	Last EDR Contact: 04/12/2012
Number of Days to Update: 22	Next Scheduled EDR Contact: 07/30/2012
	Data Release Frequency: Semi-Annually

LAST: Leaking Aboveground Storage Tanks

A listing of leaking aboveground storage tank site locations.

Date of Government Version: 02/03/2012	Source: Department of Environment & Natural Resources
Date Data Arrived at EDR: 02/15/2012	Telephone: 877-623-6748
Date Made Active in Reports: 03/20/2012	Last EDR Contact: 05/16/2012
Number of Days to Update: 34	Next Scheduled EDR Contact: 08/27/2012
	Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Arizona, California, New Mexico and Nevada

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 02/14/2012
Date Data Arrived at EDR: 02/17/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 88

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Quarterly

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 12/14/2011
Date Data Arrived at EDR: 12/15/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 26

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Semi-Annually

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 02/01/2012
Date Data Arrived at EDR: 02/02/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 103

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Quarterly

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 10/01/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 10

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 05/01/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 59

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 04/23/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 02/07/2012
Date Data Arrived at EDR: 02/17/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 88

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 25

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Quarterly

State and tribal registered storage tank lists

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

UST: Petroleum Underground Storage Tank Database

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 02/03/2012	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 02/15/2012	Telephone: 919-733-1308
Date Made Active in Reports: 04/05/2012	Last EDR Contact: 05/16/2012
Number of Days to Update: 50	Next Scheduled EDR Contact: 08/27/2012
	Data Release Frequency: Quarterly

AST: AST Database

Facilities with aboveground storage tanks that have a capacity greater than 21,000 gallons.

Date of Government Version: 03/26/2012	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 03/26/2012	Telephone: 919-715-6183
Date Made Active in Reports: 04/30/2012	Last EDR Contact: 03/26/2012
Number of Days to Update: 35	Next Scheduled EDR Contact: 07/09/2012
	Data Release Frequency: Semi-Annually

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 08/18/2011	Source: EPA Region 8
Date Data Arrived at EDR: 08/19/2011	Telephone: 303-312-6137
Date Made Active in Reports: 09/13/2011	Last EDR Contact: 04/30/2012
Number of Days to Update: 25	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Quarterly

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 02/07/2012	Source: EPA Region 7
Date Data Arrived at EDR: 02/17/2012	Telephone: 913-551-7003
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 04/30/2012
Number of Days to Update: 88	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 10/01/2011	Source: EPA, Region 1
Date Data Arrived at EDR: 11/01/2011	Telephone: 617-918-1313
Date Made Active in Reports: 11/11/2011	Last EDR Contact: 05/01/2012
Number of Days to Update: 10	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Varies

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 11/28/2011	Source: EPA Region 9
Date Data Arrived at EDR: 11/29/2011	Telephone: 415-972-3368
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 04/30/2012
Number of Days to Update: 42	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 12/14/2011	Source: EPA Region 4
Date Data Arrived at EDR: 12/15/2011	Telephone: 404-562-9424
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 04/30/2012
Number of Days to Update: 26	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Semi-Annually

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 02/01/2012	Source: EPA Region 10
Date Data Arrived at EDR: 02/02/2012	Telephone: 206-553-2857
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 04/30/2012
Number of Days to Update: 103	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Quarterly

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 05/10/2011	Source: EPA Region 6
Date Data Arrived at EDR: 05/11/2011	Telephone: 214-665-7591
Date Made Active in Reports: 06/14/2011	Last EDR Contact: 04/23/2012
Number of Days to Update: 34	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 02/28/2012	Source: EPA Region 5
Date Data Arrived at EDR: 02/29/2012	Telephone: 312-886-6136
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 04/30/2012
Number of Days to Update: 76	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Varies

FEMA UST: Underground Storage Tank Listing

A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010	Source: FEMA
Date Data Arrived at EDR: 02/16/2010	Telephone: 202-646-5797
Date Made Active in Reports: 04/12/2010	Last EDR Contact: 04/10/2012
Number of Days to Update: 55	Next Scheduled EDR Contact: 07/30/2012
	Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

INST CONTROL: No Further Action Sites With Land Use Restrictions Monitoring

A land use restricted site is a property where there are limits or requirements on future use of the property due to varying levels of cleanup possible, practical, or necessary at the site.

Date of Government Version: 03/01/2012	Source: Department of Environment, Health and Natural Resources
Date Data Arrived at EDR: 04/03/2012	Telephone: 919-508-8400
Date Made Active in Reports: 04/23/2012	Last EDR Contact: 12/17/2110
Number of Days to Update: 20	Next Scheduled EDR Contact: 07/02/2012
	Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 02/17/2012	Source: EPA, Region 1
Date Data Arrived at EDR: 04/03/2012	Telephone: 617-918-1102
Date Made Active in Reports: 05/15/2012	Last EDR Contact: 04/03/2012
Number of Days to Update: 42	Next Scheduled EDR Contact: 07/16/2012
	Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008	Source: EPA, Region 7
Date Data Arrived at EDR: 04/22/2008	Telephone: 913-551-7365
Date Made Active in Reports: 05/19/2008	Last EDR Contact: 04/20/2009
Number of Days to Update: 27	Next Scheduled EDR Contact: 07/20/2009
	Data Release Frequency: Varies

VCP: Responsible Party Voluntary Action Sites

Responsible Party Voluntary Action site locations.

Date of Government Version: 03/01/2012	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 04/03/2012	Telephone: 919-508-8400
Date Made Active in Reports: 04/23/2012	Last EDR Contact: 04/03/2012
Number of Days to Update: 20	Next Scheduled EDR Contact: 07/02/2012
	Data Release Frequency: Semi-Annually

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Projects Inventory

A brownfield site is an abandoned, idled, or underused property where the threat of environmental contamination has hindered its redevelopment. All of the sites in the inventory are working toward a brownfield agreement for cleanup and liability control.

Date of Government Version: 09/30/2010	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 04/15/2011	Telephone: 919-733-4996
Date Made Active in Reports: 05/04/2011	Last EDR Contact: 04/12/2012
Number of Days to Update: 19	Next Scheduled EDR Contact: 07/23/2012
	Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 06/27/2011	Source: Environmental Protection Agency
Date Data Arrived at EDR: 06/27/2011	Telephone: 202-566-2777
Date Made Active in Reports: 09/13/2011	Last EDR Contact: 04/03/2012
Number of Days to Update: 78	Next Scheduled EDR Contact: 07/09/2012
	Data Release Frequency: Semi-Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Local Lists of Landfill / Solid Waste Disposal Sites

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 03/26/2012
Next Scheduled EDR Contact: 07/09/2012
Data Release Frequency: No Update Planned

HIST LF: Solid Waste Facility Listing

A listing of solid waste facilities.

Date of Government Version: 11/06/2006
Date Data Arrived at EDR: 02/13/2007
Date Made Active in Reports: 03/02/2007
Number of Days to Update: 17

Source: Department of Environment & Natural Resources
Telephone: 919-733-0692
Last EDR Contact: 01/19/2009
Next Scheduled EDR Contact: 04/19/2009
Data Release Frequency: Quarterly

SWRCY: Recycling Center Listing

A listing of recycling center locations.

Date of Government Version: 02/06/2012
Date Data Arrived at EDR: 02/08/2012
Date Made Active in Reports: 03/20/2012
Number of Days to Update: 41

Source: Department of Environment & Natural Resources
Telephone: 919-707-8137
Last EDR Contact: 05/21/2012
Next Scheduled EDR Contact: 08/20/2012
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 05/07/2012
Next Scheduled EDR Contact: 08/20/2012
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 10/07/2011
Date Data Arrived at EDR: 12/09/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 32

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 06/04/2012
Next Scheduled EDR Contact: 09/17/2012
Data Release Frequency: Quarterly

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ("Superfund") lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 09/09/2011
Date Data Arrived at EDR: 09/16/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 13

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/09/2005
Date Data Arrived at EDR: 12/11/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 31

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 05/21/2012
Next Scheduled EDR Contact: 09/03/2012
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 10/04/2011
Date Data Arrived at EDR: 10/04/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 38

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 04/03/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Annually

Other Ascertainable Records

RCRA-NonGen: RCRA - Non Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 03/15/2012
Date Data Arrived at EDR: 04/04/2012
Date Made Active in Reports: 05/15/2012
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: (404) 562-8651
Last EDR Contact: 04/04/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data

Department of Transportation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/29/2011
Date Data Arrived at EDR: 08/09/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 94

Source: Department of Transportation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 05/08/2012
Next Scheduled EDR Contact: 08/20/2012
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 04/16/2012
Next Scheduled EDR Contact: 07/30/2012
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 08/12/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 112

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 03/12/2012
Next Scheduled EDR Contact: 06/25/2012
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/01/2011
Date Data Arrived at EDR: 01/25/2012
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 36

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 04/02/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 09/28/2011
Date Data Arrived at EDR: 12/14/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 27

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 03/14/2012
Next Scheduled EDR Contact: 06/25/2012
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 05/29/2012
Next Scheduled EDR Contact: 09/10/2012
Data Release Frequency: Varies

MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 09/08/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 21

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 03/07/2012
Next Scheduled EDR Contact: 06/18/2012
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 09/01/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 131

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 05/29/2012
Next Scheduled EDR Contact: 09/10/2012
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2006
Date Data Arrived at EDR: 09/29/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 64

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 03/28/2012
Next Scheduled EDR Contact: 07/09/2012
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 05/23/2012
Next Scheduled EDR Contact: 09/10/2012
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 05/23/2012
Next Scheduled EDR Contact: 09/10/2012
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 04/30/2012
Next Scheduled EDR Contact: 08/13/2012
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 07/20/2011
Date Data Arrived at EDR: 11/10/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 03/26/2012
Next Scheduled EDR Contact: 07/09/2012
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 11/01/2010
Date Data Arrived at EDR: 11/10/2010
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 98

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/17/2012
Next Scheduled EDR Contact: 07/30/2012
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/21/2011
Date Data Arrived at EDR: 07/15/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 60

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 03/12/2012
Next Scheduled EDR Contact: 06/25/2012
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/10/2012	Source: Environmental Protection Agency
Date Data Arrived at EDR: 01/12/2012	Telephone: 202-343-9775
Date Made Active in Reports: 03/01/2012	Last EDR Contact: 04/10/2012
Number of Days to Update: 49	Next Scheduled EDR Contact: 07/23/2012
	Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 10/23/2011	Source: EPA
Date Data Arrived at EDR: 12/13/2011	Telephone: (404) 562-9900
Date Made Active in Reports: 03/01/2012	Last EDR Contact: 03/13/2012
Number of Days to Update: 79	Next Scheduled EDR Contact: 06/25/2012
	Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995	Source: EPA
Date Data Arrived at EDR: 07/03/1995	Telephone: 202-564-4104
Date Made Active in Reports: 08/07/1995	Last EDR Contact: 06/02/2008
Number of Days to Update: 35	Next Scheduled EDR Contact: 09/01/2008
	Data Release Frequency: No Update Planned

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2009	Source: EPA/NTIS
Date Data Arrived at EDR: 03/01/2011	Telephone: 800-424-9346
Date Made Active in Reports: 05/02/2011	Last EDR Contact: 06/01/2012
Number of Days to Update: 62	Next Scheduled EDR Contact: 09/10/2012
	Data Release Frequency: Biennially

IMD: Incident Management Database

Groundwater and/or soil contamination incidents

Date of Government Version: 07/21/2006	Source: Department of Environment and Natural Resources
Date Data Arrived at EDR: 08/01/2006	Telephone: 919-733-3221
Date Made Active in Reports: 08/23/2006	Last EDR Contact: 07/01/2011
Number of Days to Update: 22	Next Scheduled EDR Contact: 10/17/2011
	Data Release Frequency: No Update Planned

UIC: Underground Injection Wells Listing

A listing of uncerground injection wells locations.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 02/15/2012
Date Data Arrived at EDR: 02/17/2012
Date Made Active in Reports: 03/20/2012
Number of Days to Update: 32

Source: Department of Environment & Natural Resources
Telephone: 919-807-6412
Last EDR Contact: 05/15/2012
Next Scheduled EDR Contact: 08/27/2012
Data Release Frequency: Varies

DRYCLEANERS: Drycleaning Sites

Potential and known drycleaning sites, active and abandoned, that the Drycleaning Solvent Cleanup Program has knowledge of and entered into this database.

Date of Government Version: 03/06/2012
Date Data Arrived at EDR: 03/28/2012
Date Made Active in Reports: 04/23/2012
Number of Days to Update: 26

Source: Department of Environment & Natural Resources
Telephone: 919-508-8400
Last EDR Contact: 03/28/2012
Next Scheduled EDR Contact: 07/09/2012
Data Release Frequency: Varies

NPDES: NPDES Facility Location Listing

General information regarding NPDES(National Pollutant Discharge Elimination System) permits.

Date of Government Version: 05/12/2011
Date Data Arrived at EDR: 05/13/2011
Date Made Active in Reports: 06/16/2011
Number of Days to Update: 34

Source: Department of Environment & Natural Resources
Telephone: 919-733-7015
Last EDR Contact: 03/06/2012
Next Scheduled EDR Contact: 08/20/2012
Data Release Frequency: Varies

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 04/16/2012
Next Scheduled EDR Contact: 07/30/2012
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 04/23/2012
Next Scheduled EDR Contact: 08/06/2012
Data Release Frequency: Varies

FINANCIAL ASSURANCE 1: Financial Assurance Information Listing

A listing of financial assurance information for underground storage tank facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 09/23/2011
Date Data Arrived at EDR: 10/06/2011
Date Made Active in Reports: 11/01/2011
Number of Days to Update: 26

Source: Department of Environment & Natural Resources
Telephone: 919-733-1322
Last EDR Contact: 05/16/2012
Next Scheduled EDR Contact: 08/27/2012
Data Release Frequency: Quarterly

FINANCIAL ASSURANCE 3: Financial Assurance Information

Hazardous waste financial assurance information.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 05/08/2012
Date Data Arrived at EDR: 05/09/2012
Date Made Active in Reports: 05/16/2012
Number of Days to Update: 7

Source: Department of Environment & Natural Resources
Telephone: 919-508-8549
Last EDR Contact: 04/02/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Varies

FINANCIAL ASSURANCE 2: Financial Assurance Information Listing

Information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 04/04/2012
Date Data Arrived at EDR: 04/05/2012
Date Made Active in Reports: 04/23/2012
Number of Days to Update: 18

Source: Department of Environmental & Natural Resources
Telephone: 919-508-8496
Last EDR Contact: 04/03/2012
Next Scheduled EDR Contact: 07/16/2012
Data Release Frequency: Varies

COAL ASH: Coal Ash Disposal Sites

A listing of coal combustion products distribution permits issued by the Division for the treatment, storage, transportation, use and disposal of coal combustion products.

Date of Government Version: 12/31/2007
Date Data Arrived at EDR: 08/04/2009
Date Made Active in Reports: 08/17/2009
Number of Days to Update: 13

Source: Department of Environment & Natural Resources
Telephone: 919-807-6359
Last EDR Contact: 05/07/2012
Next Scheduled EDR Contact: 08/20/2012
Data Release Frequency: Varies

COAL ASH DOE: Sleam-Electric Plan Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 04/16/2012
Next Scheduled EDR Contact: 07/30/2012
Data Release Frequency: Varies

2020 CORRECTIVE ACTION: 2020 Corrective Action Program List

This RCRA cleanup baseline includes facilities expected to need corrective action.

Date of Government Version: 11/11/2011
Date Data Arrived at EDR: 05/18/2012
Date Made Active in Reports: 05/25/2012
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 05/18/2012
Next Scheduled EDR Contact: 08/27/2012
Data Release Frequency: Varies

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/17/2012
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 13

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 05/15/2012
Next Scheduled EDR Contact: 08/27/2012
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 08/17/2010	Source: Environmental Protection Agency
Date Data Arrived at EDR: 01/03/2011	Telephone: N/A
Date Made Active in Reports: 03/21/2011	Last EDR Contact: 03/16/2012
Number of Days to Update: 77	Next Scheduled EDR Contact: 06/25/2012
	Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database

The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011	Source: Environmental Protection Agency
Date Data Arrived at EDR: 10/19/2011	Telephone: 202-566-0517
Date Made Active in Reports: 01/10/2012	Last EDR Contact: 05/04/2012
Number of Days to Update: 83	Next Scheduled EDR Contact: 08/13/2012
	Data Release Frequency: Varies

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005	Source: U.S. Geological Survey
Date Data Arrived at EDR: 02/06/2006	Telephone: 888-275-8747
Date Made Active in Reports: 01/11/2007	Last EDR Contact: 04/16/2012
Number of Days to Update: 339	Next Scheduled EDR Contact: 07/30/2012
	Data Release Frequency: N/A

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A	Source: EDR, Inc.
Date Data Arrived at EDR: N/A	Telephone: N/A
Date Made Active in Reports: N/A	Last EDR Contact: N/A
Number of Days to Update: N/A	Next Scheduled EDR Contact: N/A
	Data Release Frequency: No Update Planned

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 05/21/2012
Date Data Arrived at EDR: 05/22/2012
Date Made Active in Reports: 05/31/2012
Number of Days to Update: 9

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 05/22/2012
Next Scheduled EDR Contact: 09/03/2012
Data Release Frequency: Annually

NJ MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 07/20/2011
Date Made Active in Reports: 08/11/2011
Number of Days to Update: 22

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 04/17/2012
Next Scheduled EDR Contact: 07/30/2012
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data

Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 01/10/2012
Date Data Arrived at EDR: 02/09/2012
Date Made Active in Reports: 03/09/2012
Number of Days to Update: 29

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 05/09/2012
Next Scheduled EDR Contact: 08/20/2012
Data Release Frequency: Annually

PA MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 04/27/2012
Date Made Active in Reports: 06/05/2012
Number of Days to Update: 39

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 04/23/2012
Next Scheduled EDR Contact: 08/06/2012
Data Release Frequency: Annually

RI MANIFEST: Manifest information

Hazardous waste manifest information

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 06/24/2011
Date Made Active in Reports: 06/30/2011
Number of Days to Update: 6

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 02/27/2012
Next Scheduled EDR Contact: 06/11/2012
Data Release Frequency: Annually

WI MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/15/2011
Number of Days to Update: 27

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 03/19/2012
Next Scheduled EDR Contact: 07/02/2012
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data

Source: Rextag Strategies Corp.
Telephone: (281) 769-2247

U.S. Electric Transmission and Power Plants Systems Digital GIS Data

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

AHA Hospitals:

Source: American Hospital Association, Inc.

Telephone: 312-280-5991

The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing

Source: Centers for Medicare & Medicaid Services

Telephone: 410-786-3000

A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes

Source: National Institutes of Health

Telephone: 301-594-6248

Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools

Source: National Center for Education Statistics

Telephone: 202-502-7300

The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools

Source: National Center for Education Statistics

Telephone: 202-502-7300

The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Child Care Facility List

Source: Department of Health & Human Services

Telephone: 919-662-4499

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory

Source: Department of Environment & Natural Resources

Telephone: 919-733-2090

Scanned Digital USGS 7.5' Topographic Map (DRG)

Source: United States Geologic Survey

A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

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GEOCHECK[®] - PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

MUDDY RUN II
HIGHWAY 111/LUDIE BROWN ROAD
CHINQUAPIN, NC 28521

TARGET PROPERTY COORDINATES

Latitude (North):	34.8343 - 34° 50' 3.48"
Longitude (West):	77.7907 - 77° 47' 26.52"
Universal Tranverse Mercator:	Zone 18
UTM X (Meters):	244790.5
UTM Y (Meters):	3858022.5
Elevation:	50 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	34077-G7 CHINQUAPIN, NC
Most Recent Revision:	1981

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

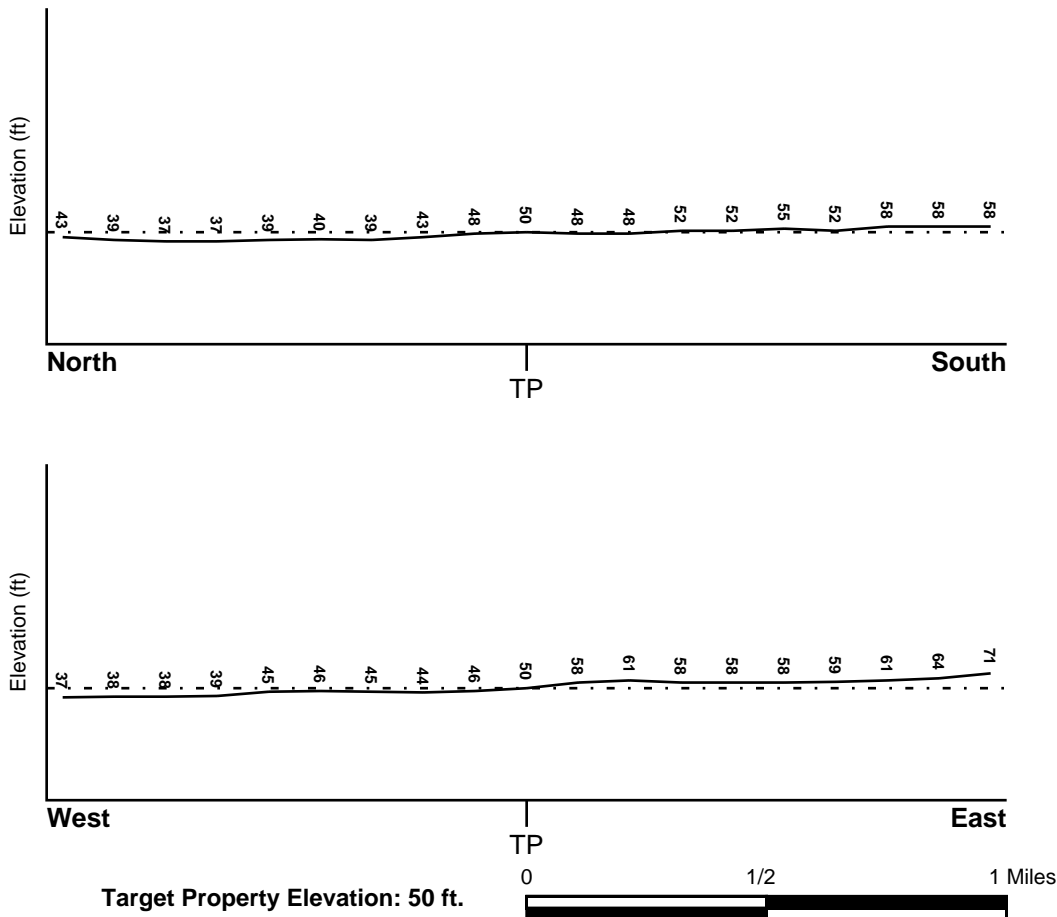
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General WNW

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

<u>Target Property County</u> DUPLIN, NC	<u>FEMA Flood Electronic Data</u> YES - refer to the Overview Map and Detail Map
Flood Plain Panel at Target Property:	37061C - FEMA DFIRM Flood data
Additional Panels in search area:	Not Reported

NATIONAL WETLAND INVENTORY

<u>NWI Quad at Target Property</u> CHINQUAPIN	<u>NWI Electronic Data Coverage</u> YES - refer to the Overview Map and Detail Map
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HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

<u>MAP ID</u>	<u>LOCATION FROM TP</u>	<u>GENERAL DIRECTION GROUNDWATER FLOW</u>
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

Era: Cenozoic
System: Tertiary
Series: Eocene
Code: Te *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratified Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATSGO data.

Soil Component Name: AUTRYVILLE

Soil Surface Texture: sand

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class: Well drained. Soils have intermediate water holding capacity. Depth to water table is more than 6 feet.

Hydric Status: Soil does not meet the requirements for a hydric soil.

Corrosion Potential - Uncoated Steel: LOW

Depth to Bedrock Min: > 60 inches

Depth to Bedrock Max: > 60 inches

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
Layer	Boundary		Soil Texture Class	Classification		Permeability Rate (in/hr)	Soil Reaction (pH)
	Upper	Lower		AASHTO Group	Unified Soil		
1	0 inches	26 inches	sand	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 20.00 Min: 6.00	Max: 6.50 Min: 4.50
2	26 inches	41 inches	sandy loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 6.00 Min: 2.00	Max: 5.50 Min: 4.50
3	41 inches	58 inches	sand	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 20.00 Min: 6.00	Max: 5.50 Min: 4.50
4	58 inches	85 inches	sandy loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 2.00 Min: 0.60	Max: 5.50 Min: 4.50

OTHER SOIL TYPES IN AREA

Based on Soil Conservation Service STATSGO data, the following additional subordinant soil types may appear within the general area of target property.

Soil Surface Textures: loamy sand
loamy fine sand
loam
sandy loam

Surficial Soil Types: loamy sand
loamy fine sand
loam
sandy loam

Shallow Soil Types: loamy sand
sand
sandy clay loam
fine sandy loam

Deeper Soil Types: sandy clay loam

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

stratified
sand
sandy clay

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

<u>DATABASE</u>	<u>SEARCH DISTANCE (miles)</u>
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

<u>MAP ID</u>	<u>WELL ID</u>	<u>LOCATION FROM TP</u>
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

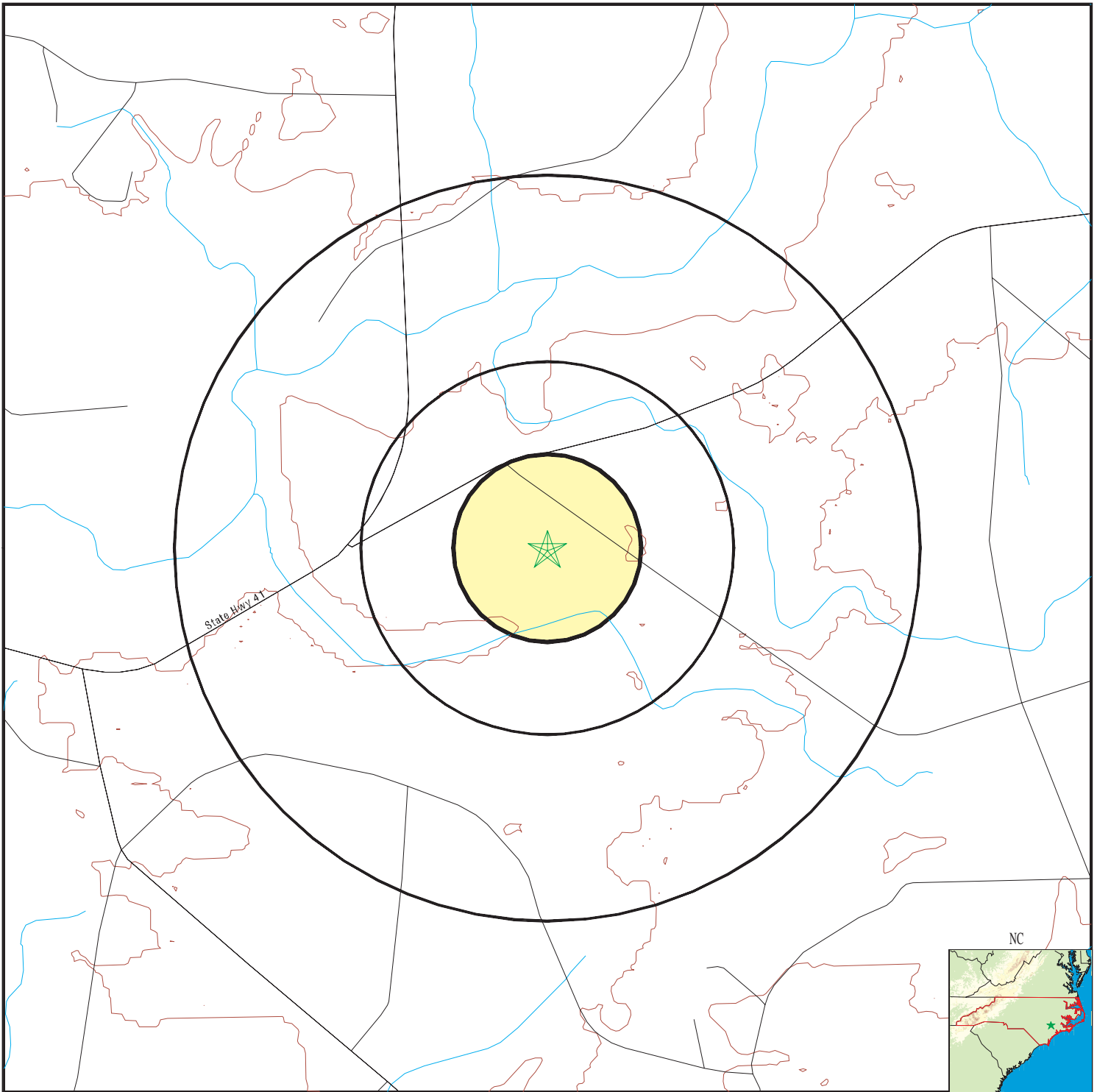
<u>MAP ID</u>	<u>WELL ID</u>	<u>LOCATION FROM TP</u>
No PWS System Found		

Note: PWS System location is not always the same as well location.

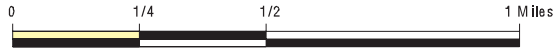
STATE DATABASE WELL INFORMATION

<u>MAP ID</u>	<u>WELL ID</u>	<u>LOCATION FROM TP</u>
No Wells Found		

PHYSICAL SETTING SOURCE MAP - 3337526.6s



- County Boundary
- Major Roads
- Contour Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons



- Groundwater Flow Direction
- Indeterminate Groundwater Flow at Location
- Groundwater Flow Varies at Location
- Wildlife Areas
- Natural Areas
- Rare & Endangered Species



SITE NAME: Muddy Run II
 ADDRESS: Highway 111/Ludie Brown Road
 Chinquapin NC 28521
 LAT/LONG: 34.8343 / 77.7907

CLIENT: WK Dickson
 CONTACT: George Lankford
 INQUIRY #: 3337526.6s
 DATE: June 05, 2012 12:10 pm

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS RADON

AREA RADON INFORMATION

Federal EPA Radon Zone for DUPLIN County: 3

- Note: Zone 1 indoor average level > 4 pCi/L.
 : Zone 2 indoor average level \geq 2 pCi/L and \leq 4 pCi/L.
 : Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for DUPLIN COUNTY, NC

Number of sites tested: 8

<u>Area</u>	<u>Average Activity</u>	<u>% <4 pCi/L</u>	<u>% 4-20 pCi/L</u>	<u>% >20 pCi/L</u>
Living Area - 1st Floor	0.488 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)

Source: United States Geologic Survey

EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Scanned Digital USGS 7.5' Topographic Map (DRG)

Source: United States Geologic Survey

A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory

Source: Department of Environment & Natural Resources

Telephone: 919-733-2090

HYDROGEOLOGIC INFORMATION

AQUIFLOW^R Information System

Source: EDR proprietary database of groundwater flow information

EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit

Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database

Source: Department of Agriculture, Natural Resources Conservation Services

The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database

Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)

Telephone: 800-672-5559

SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems

Source: EPA/Office of Drinking Water

Telephone: 202-564-3750

Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data

Source: EPA/Office of Drinking Water

Telephone: 202-564-3750

Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)

This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

North Carolina Public Water Supply Wells

Source: Department of Environmental Health

Telephone: 919-715-3243

OTHER STATE DATABASE INFORMATION

NC Natural Areas: Significant Natural Heritage Areas

Source: Center for Geographic Information and Analysis

Telephone: 919-733-2090

A polygon coverage identifying sites (terrestrial or aquatic that have particular biodiversity significance.

A site's significance may be due to the presence of rare species, rare or high quality natural communities, or other important ecological features.

NC Game Lands: Wildlife Resources Commission Game Lands

Source: Center for Geographic Information and Analysis

Telephone: 919-733-2090

All publicly owned game lands managed by the North Carolina Wildlife Resources Commission and as listed in Hunting and Fishing Maps.

NC Natural Heritage Sites: Natural Heritage Element Occurrence Sites

Source: Center for Geographic Information and Analysis

Telephone: 919-733-2090

A point coverage identifying locations of rare and endangered species, occurrences of exemplary or unique natural ecosystems (terrestrial or aquatic), and special animal habitats (e.g., colonial waterbird nesting sites).

RADON

State Database: NC Radon

Source: Department of Environment & Natural Resources

Telephone: 919-733-4984

Radon Statistical and Non Statistical Data

Area Radon Information

Source: USGS

Telephone: 703-356-4020

The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.



Muddy Run II

Highway 111/Ludie Brown Road
Chinquapin, NC 28521

Inquiry Number: 3337526.7

June 05, 2012

EDR Historical Topographic Map Report

EDR Historical Topographic Map Report

Environmental Data Resources, Inc.s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topographic Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the early 1900s.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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Muddy Run II

Highway 111/Ludie Brown Road
Chinquapin, NC 28521

Inquiry Number: 3337526.8

June 05, 2012

The EDR Aerial Photo Decade Package

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

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Date EDR Searched Historical Sources:

Aerial Photography June 05, 2012

Target Property:

Highway 111/Ludie Brown Road

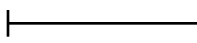
Chinquapin, NC 28521

<u><i>Year</i></u>	<u><i>Scale</i></u>	<u><i>Details</i></u>	<u><i>Source</i></u>
1958	Aerial Photograph. Scale: 1"=750'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: January 01, 1958	EDR
1974	Aerial Photograph. Scale: 1"=1000'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: April 10, 1974	EDR
1977	Aerial Photograph. Scale: 1"=750'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: January 22, 1977	EDR
1977	Aerial Photograph. Scale: 1"=750'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: January 22, 1977	EDR
1983	Aerial Photograph. Scale: 1"=1000'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: March 13, 1983	EDR
1998	Aerial Photograph. Scale: 1"=750'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: February 01, 1998	EDR
1998	Aerial Photograph. Scale: 1"=750'	Panel #: 34077-G7, Chinquapin, NC; Flight Date: February 01, 1998	EDR



INQUIRY #: 3337526.8

YEAR: 1958

 = 750'





INQUIRY #: 3337526.8

YEAR: 1974

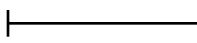
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YEAR: 1977

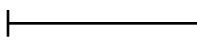
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YEAR: 1977

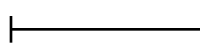
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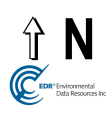




INQUIRY #: 3337526.8

YEAR: 1983

 = 1000'





INQUIRY #: 3337526.8

YEAR: 1998

| = 750'





INQUIRY #: 3337526.8

YEAR: 1998

| = 750'



Muddy Run II Site Photographs



Facing upstream on headwater Reach 1.
6/25/2012



Facing upstream on Reach 2. 6/25/2012



Facing upstream on Reach 3A. 6/25/2012



Facing upstream on Reach 3B. 9/03/2011



Facing downstream on headwater Reach 3C.
6/26/2012



Facing upstream on Reach 4. 6/26/2012

Muddy Run II Site Photographs

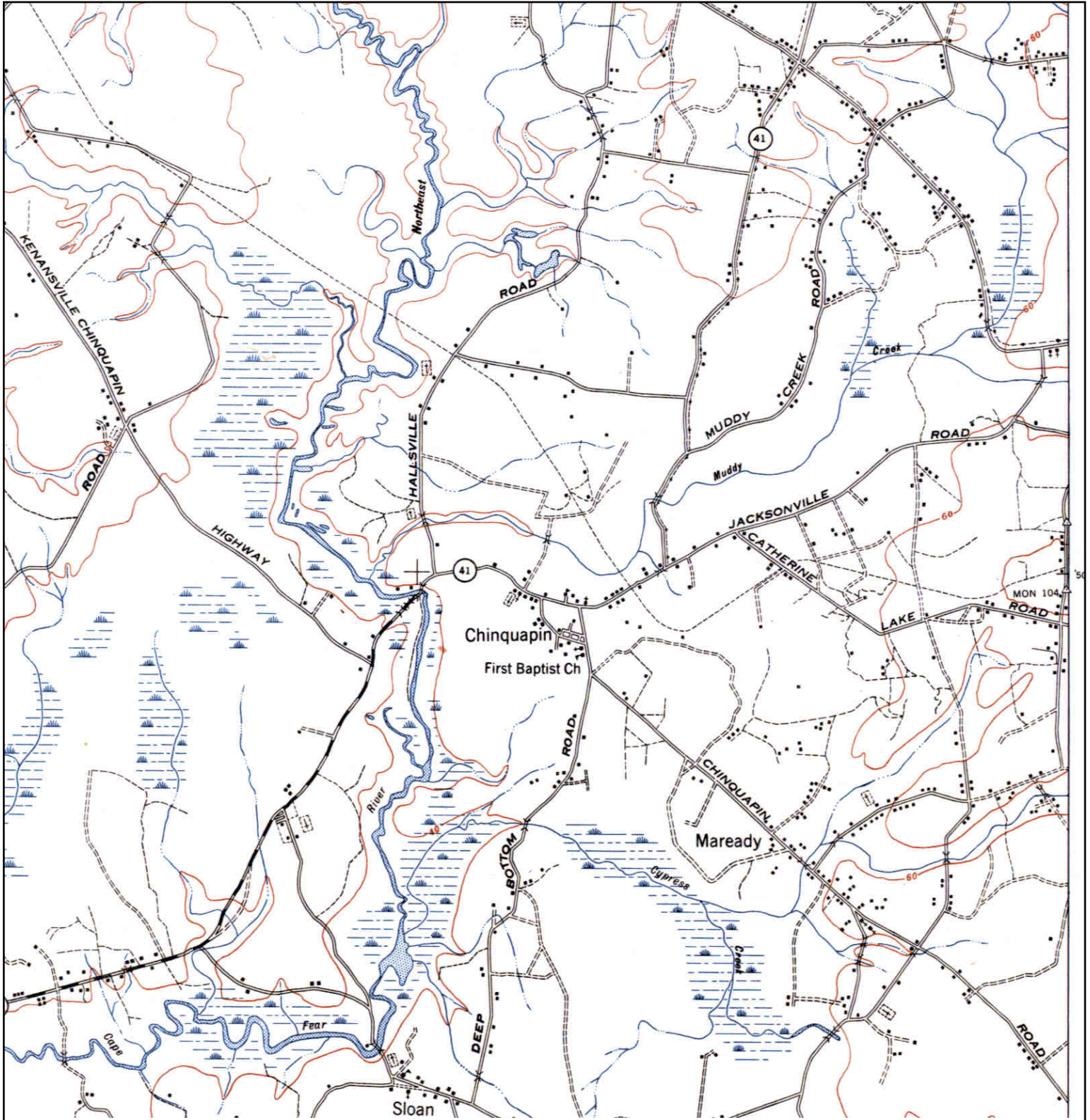



Facing upstream Reach 5A. 6/26/2012



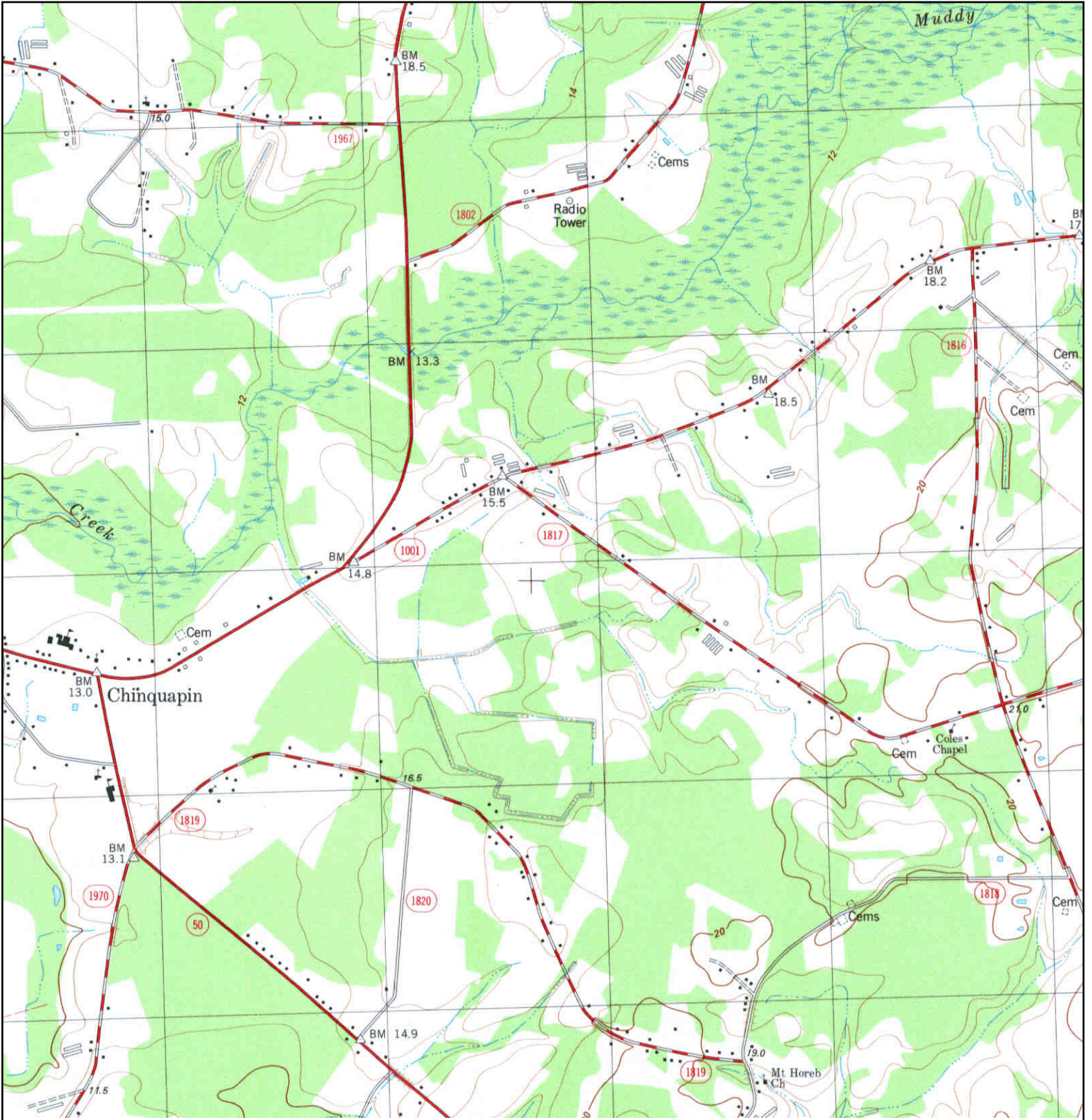
Facing downstream on Reach 5B. 6/27/2012


Historical Topographic Map



	TARGET QUAD	SITE NAME: Muddy Run II	CLIENT: WK Dickson
	NAME: KENANSVILLE	ADDRESS: Highway 111/Ludie Brown Road Chinquapin, NC 28521	CONTACT: George Lankford
	MAP YEAR: 1948	LAT/LONG: 34.8343 / -77.7907	INQUIRY#: 3337526.7
	SERIES: 15		RESEARCH DATE: 06/05/2012
	SCALE: 1:62500		

Historical Topographic Map



	TARGET QUAD	SITE NAME: Muddy Run II	CLIENT: WK Dickson
	NAME: CHINQUAPIN	ADDRESS: Highway 111/Ludie Brown Road Chinquapin, NC 28521	CONTACT: George Lankford
	MAP YEAR: 1981	LAT/LONG: 34.8343 / -77.7907	INQUIRY#: 3337526.7
	SERIES: 7.5		RESEARCH DATE: 06/05/2012
	SCALE: 1:24000		

PHYSICAL SETTING SOURCE RECORDS SEARCHED

EPA Radon Zones

Source: EPA

Telephone: 703-356-4020

Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities

Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater

Source: Department of Commerce, National Oceanic and Atmospheric Administration

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August 9, 2012

Ms. Kristin Miguez
NC Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Subject: Cover Letter for Muddy Run II Site EEP Stream Mitigation Project in Duplin County

Dear Ms. Miguez:

The Muddy Run II Site has been identified to provide in-kind mitigation for unavoidable stream and wetland impacts. The project area is comprised of five unnamed tributaries to Muddy Creek. The Site consists of farmland, concentrated animal feeding operations (CAFO), and wooded areas. Stream channels on the Site have been heavily impacted by channelization and agricultural practices. The purpose of this mitigation project is to restore and enhance a stream/wetland complex within the Cape Fear River Basin.

The US Fish and Wildlife Service (USFWS) database (updated 22 September 2010) lists one endangered species for Duplin County, North Carolina: red-cockaded woodpecker (*Picoides borealis*). The American alligator (*Alligator mississippiensis*) is listed as Threatened due to similarity of appearance, but is not protected. In addition to the USFWS database, the NC Natural Heritage Program (NHP) GIS database was consulted to determine whether previously cataloged occurrences of protected species were mapped within one mile of the project site. Results from NHP indicated that there were no known occurrences within a one-mile radius of the project area. The site is not located in designated critical habitat as described by the USFWS and NOAA. Based on initial site investigations, no suitable habitat exists within the proposed project. Due to a lack of observed habitat within the project area, the biological conclusion for protected species is no effect.

A review of North Carolina State Historic Preservation Office GIS Web Service database did not reveal any listed or potentially eligible historic or archeological resources in the proposed project area. The State Historic Preservation Office has been consulted and has confirmed these findings with a statement of no comment, meaning there will be no impact to historic or archeological resources as a result of this project.

Based on USDA Form AD-1006, all 43.8 acres of the project area are categorized as Prime and Unique Farmland. For the Site Assessment Criteria, the soils at the Poplin Ridge site received 179 out of a possible total of 260 points. Sites with scores greater than 160 are considered to be appropriate for protection under the Farmland Protection Policy Act pending further investigation.

Ms. Miguez
July 27, 2012
Page 2

Please feel free to contact me at dingram@wkdickson.com with any questions you may have regarding this project. We thank you in advance for your time and efforts.

Sincerely,

A handwritten signature in blue ink that reads "Daniel P. Ingram". The signature is written in a cursive style with a large initial 'D'.

W.K. Dickson & Co., Inc.
Daniel Ingram

Appendix A

**Categorical Exclusion Form for Ecosystem Enhancement
Program Projects
Version 1.4**

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

Part 1: General Project Information	
Project Name:	
County Name:	
EEP Number:	
Project Sponsor:	
Project Contact Name:	
Project Contact Address:	
Project Contact E-mail:	
EEP Project Manager:	
Project Description	
<p>The mitigation project at the Muddy Run II Site will involve restoration of the historic condition of coastal plain small stream swamps. Stream buffers throughout the project area will be restored and protected in perpetuity. Priority Level I restoration is proposed on three reaches, headwater valley restoration is proposed on three reaches, Enhancement II is proposed on one reach, and preservation is proposed on two reaches. This will result in ecological improvements, including habitat restoration and a decrease in non-point source pollution from agricultural practices entering Muddy Creek.</p>	
For Official Use Only	
Reviewed By:	
_____	_____
Date	EEP Project Manager
Conditional Approved By:	
_____	_____
Date	For Division Administrator FHWA
<input type="checkbox"/> Check this box if there are outstanding issues	
Final Approval By:	
_____	_____
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?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Has a CAMA permit been secured?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Has NCDRCM agreed that the project is consistent with the NC Coastal Management Program?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)		
1. Is this a "full-delivery" project?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
6. Is there an approved hazardous mitigation plan?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Does the project affect such properties and does the SHPO/THPO concur?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. If the effects are adverse, have they been resolved?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)		
1. Is this a "full-delivery" project?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Does the project require the acquisition of real estate?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Was the property acquisition completed prior to the intent to use federal funds?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Is the site of religious importance to American Indians?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Have the effects of the project on this site been considered?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Antiquities Act (AA)		
1. Is the project located on Federal lands?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Will a permit from the appropriate Federal agency be required?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Has a permit been obtained?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Archaeological Resources Protection Act (ARPA)		
1. Is the project located on federal or Indian lands (reservation)?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Will there be a loss or destruction of archaeological resources?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Will a permit from the appropriate Federal agency be required?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Has a permit been obtained?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Endangered Species Act (ESA)		
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?		<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Is Designated Critical Habitat or suitable habitat present for listed species?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
5. Does the USFWS/NOAA-Fisheries concur in the effects determination?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Has the completed Form AD-1006 been submitted to NRCS?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Have the USFWS and the NCWRC been consulted?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Has the NPS approved of the conversion?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Is suitable habitat present for EFH-protected species?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
4. Will the project adversely affect EFH?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
5. Has consultation with NOAA-Fisheries occurred?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Have the USFWS recommendations been incorporated?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Wilderness Act	
1. Is the project in a Wilderness area?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

MEMORANDUM



720 Corporate Center Drive

Raleigh, North Carolina 27607

919.782.0495 tel.

919.782.9672 fax

TO: Project File 20120090.00.RA A

FROM: Daniel Ingram

DATE: August 9, 2012

RE: Biological Evaluation for Muddy Run II EEP Wetland and Stream mitigation project in Duplin County

Project Background

The Muddy Run II Stream and Wetland Restoration Project is located within an agricultural watershed in Duplin County, North Carolina, approximately six miles south of Beulaville. The purpose of this restoration project is to restore and enhance a stream/wetland complex located within the Cape Fear River Basin. The Muddy Run II site has been identified by NC Ecosystem Enhancement Program to provide compensatory mitigation for unavoidable stream and wetland impacts.

Project Description

The Muddy Run II Mitigation Project will be located on stream reaches upstream of the Muddy Run Stream Restoration project. This site is currently cultivated land and managed forests surrounding tributaries to Muddy Creek. The stream channels have been straightened and channelized. The stream channels have been heavily impacted by channelization and agricultural practices. The project will involve the restoration and protection of streams and wetlands in the Muddy Creek watershed.

The site consists of farmland, concentrated animal feeding operations (CAFO), and wooded areas. The total easement area is 43.8 acres, 23 acres of which are wooded. The remaining area is agricultural or clear-cut. The wooded areas along the corridor designated for restoration are classified as disturbed deciduous forest, and invasive species are prevalent throughout. Several ditches exist throughout the project and flow into the main channel. Each ditch contributes to the overall design discharge of the channel. All existing channels are degraded to a point where they no longer access their floodplain, water quality is poor, and aquatic life is not supported. Little habitat is available to support aquatic life, and the channels are not maximizing their potential to filter nutrients because they are entrenched.

The objective for this restoration project is to restore wetland areas and design a natural waterway through a stream/wetland complex with appropriate cross-sectional dimension and slope that will provide function and meet the appropriate success criteria for the existing streams. Accomplishing this objective entails the restoration of natural stream characteristics, such as stable cross sections, planform, and in-stream habitat. The floodplain areas will be hydrologically reconnected to the channel to provide natural exchange and storage during flooding events. Additional project

objectives, such as restoring the riparian buffer with native vegetation, ensuring hydraulic stability, and eradicating invasive species.

Protected Species

The US Fish and Wildlife Service (USFWS) database (updated 22 September 2010) lists one endangered species for Duplin County, North Carolina: red-cockaded woodpecker (*Picoides borealis*). The American alligator (*Alligator mississippiensis*) is listed as Threatened due to similarity of appearance, but is not protected. In addition to the USFWS database, the NC Natural Heritage Program (NHP) GIS database was consulted to determine whether previously cataloged occurrences of protected species were mapped within one mile of the project site. Results from NHP indicate that there are no known occurrences of federally protected species within a one-mile radius of the project area. No protected species or potential habitat for protected species was observed during preliminary site evaluations.

Red-cockaded Woodpecker (*Picoides borealis*)

Federal Status: Endangered

Federally Listed: 1970

Red-cockaded woodpeckers (RCW) nest in large tracts of open pine stands with a minimum age of 60-120 years. Longleaf pine (*Pinus palustris*) is the most commonly utilized species for cavity trees; other species of southern pine are also acceptable. Dense forests or forests with a large hardwood component are avoided. Cavities for nesting and roosting are constructed in live pines 60 years or older, and are occupied year-round. Because cavities require a year or more to complete, each colony typically has several new cavities under construction at all times. Old cavities may become unsuitable when a tree dies, sap flow decreases, or encroaching understory vegetation makes the cavity vulnerable to predators and competitors. Suitable foraging habitat contains pines at least 30 years old. Each red-cockaded woodpecker colony (one breeding pair plus one or more offspring from previous broods) requires foraging habitat containing at least 8,490 square feet of pine basal area, with at least 6,350 trees 10 inches diameter at breast height or larger, and within 0.5 mile of the cavity tree cluster.

A survey for suitable habitat within the project study area was conducted during general field surveys on November 7, 2011. Investigators were Daniel Ingram and George Lankford. Both investigators have over fourteen years experience in biological surveys. Pedestrian surveys were conducted in the course of project site evaluation and natural community mapping. Within the project study area, no suitable RCW nesting or foraging habitat is present. In addition to the USFWS database, the NC Natural Heritage Program (NHP) GIS database was consulted to determine whether previously cataloged occurrences of protected species were mapped within one mile of the project site. Results from NHP indicate that there are no known occurrences within a one-mile radius of the project area. Based on initial site investigations, no impacts to federally protected species are anticipated as a result of the proposed project.

The forests found in the project area are fragmented and all have a large hardwood component with a dense understory. Mature pines are present within dense hardwood understory growth and high climbing vines. No active colonies are reported within three miles of the project area. Due to the lack of local active colonies and absence of suitable habitat within the project study area, a biological conclusion of "No Effect" is appropriate for this species.

Biological Conclusion:

No Effect

The proposed project offers some potential to improve or create suitable habitat for several Federal Species of Concern. Habitat may be improved or created for species that require riverine habitat by

improving water quality, in-stream and near-stream forage, and providing stable conditions not subject to regular maintenance. Improved stream habitat may benefit American eel (*Anguilla rostrata*) and broadtail madtom (*Noturus sp. cf. leptacanthus*).

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)	Date Of Land Evaluation Request 6/21/12
Name Of Project Muddy Run II EEP Mitigation Site	Federal Agency Involved FHWA-EEP
Proposed Land Use Stream Mitigation Site	County And State Duplin Co., NC

PART II (To be completed by NRCS)	Date Request Received By NRCS 6/21/12
Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply -- do not complete additional parts of this form).	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Acres Irrigated	None
Average Farm Size	153
Major Crop(s) Corn	Farmable Land In Govt. Jurisdiction Acres: 440587 % 84
Name Of Land Evaluation System Used Duplin LE	Name Of Local Site Assessment System None
	Amount Of Farmland As Defined in FPPA Acres: 305682 % 59
	Date Land Evaluation Returned By NRCS 6/21/12

PART III (To be completed by Federal Agency)	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	20.5			
B. Total Acres To Be Converted Indirectly	23.3			
C. Total Acres In Site	43.8	0.0	0.0	0.0

PART IV (To be completed by NRCS) Land Evaluation Information	
A. Total Acres Prime And Unique Farmland	43.8
B. Total Acres Statewide And Local Important Farmland	0.0
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.0
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	55.6

PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)	90	0	0	0
---	----	---	---	---

PART VI (To be completed by Federal Agency) Site Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))	Maximum Points				
1. Area In Nonurban Use	15				
2. Perimeter In Nonurban Use	10				
3. Percent Of Site Being Farmed	9				
4. Protection Provided By State And Local Government	0				
5. Distance From Urban Builtup Area	15				
6. Distance To Urban Support Services	15				
7. Size Of Present Farm Unit Compared To Average	0				
8. Creation Of Nonfarmable Farmland	0				
9. Availability Of Farm Support Services	5				
10. On-Farm Investments	20				
11. Effects Of Conversion On Farm Support Services	0				
12. Compatibility With Existing Agricultural Use	0				
TOTAL SITE ASSESSMENT POINTS	160	89	0	0	0

PART VII (To be completed by Federal Agency)					
Relative Value Of Farmland (From Part V)	100	90	0	0	0
Total Site Assessment (From Part VI above or a local site assessment)	160	89	0	0	0
TOTAL POINTS (Total of above 2 lines)	260	179	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
----------------	-------------------	--

Reason For Selection:



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. Edward Curtis), NC Floodplain Mapping Unit (attn. John Gerber) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Muddy Run II Stream Restoration Project
Name if streams or features:	Unnamed Tributaries to Muddy Creek
County:	Duplin County, NC
Name of river basin:	Cape Fear River Basin
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Duplin County
DFIRM panel number for entire site:	Firm Panel 3368 Map Number: 3720336800J Effective Date: February 16, 2006
Consultant name:	WK Dickson & Co., Inc. Daniel Ingram – Project Manager
Phone number:	(919) 782-0495
Address:	720 Corporate Center Drive Raleigh, NC 27607

Design Information

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

Wk Dickson is designing Muddy Run I Stream Restoration Project in Duplin County, NC to provide stream mitigation units (SMUs) in the Cape Fear River Basin for the NC Ecosystem Enhancement Program (NCEEP). Stream restoration activities include channel and floodplain grading of approximately 6, 800 linear feet of unnamed tributaries to Muddy Creek.

Summarize stream reaches or wetland areas according to their restoration priority.

Stream Reach	Mitigation Type	Total LF	Priority
Reach 1	Headwater Valley Restoration	497	HWV
Reach 2	Headwater Valley Restoration	500	HWV
Reach 2	Restoration	1,373	P1
Reach 3a	Restoration	3,624	P1
Reach 3b	Restoration	1,879	P1
Reach 3c	Enhancement	739	I/II
Reach 4	Restoration	204	P1
Reach 5a	Restoration	1,810	P1
Reach 5b	Enhancement	395	II
Total:		10,931	

Floodplain Information

<p>Is project located in a Special Flood Hazard Area (SFHA)?</p> <p><input type="radio"/> Yes <input checked="" type="radio"/> No</p>
<p>If project is located in a SFHA, check how it was determined:</p> <p><input type="checkbox"/> Redelineation</p> <p><input type="checkbox"/> Detailed Study</p> <p><input type="checkbox"/> Limited Detail Study</p> <p><input type="checkbox"/> Approximate Study</p> <p><input type="checkbox"/> Don't know</p>
<p>List flood zone designation:</p>
<p>Check if applies:</p> <p><input type="checkbox"/> AE Zone</p>

<input type="radio"/> Floodway <input type="radio"/> Non-Encroachment <input checked="" type="radio"/> None <input type="checkbox"/> A Zone <input type="radio"/> Local Setbacks Required <input type="radio"/> No Local Setbacks Required
If local setbacks are required, list how many feet:
Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks? <input type="radio"/> Yes <input checked="" type="radio"/> No
Land Acquisition (Check) <input type="checkbox"/> State owned (fee simple) <input type="checkbox"/> Conservation easment (Design Bid Build) <input checked="" type="checkbox"/> 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? <input checked="" type="radio"/> Yes <input type="radio"/> No Note: if community is not participating, then all requirements should be addressed to NFIP (attn: Edward Curtis, (919) 715-8000 x369)
Name of Local Floodplain Administrator: Randall Tyndall Phone Number: (910) 296-2102 Email: randallt@duplincountync.com

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 (CLMR)
- Other Requirements

List other requirements:

Comments:

Name: _____ Signature: _____

Title: _____ Date: _____



June 7, 2012

Renee Gledhill-Earley
North Carolina State Historic Preservation Office
4617 Mail Service Center
Raleigh NC 27699-4617

Subject: Environmental Review for Muddy Run II Site EEP wetland and stream mitigation project in Duplin County.

Dear Ms. Gledhill-Earley,

The Muddy Run II Site has been identified by NC Ecosystem Enhancement Program to provide compensatory mitigation for unavoidable stream impacts. This site is currently agricultural land and managed pine forests surrounding tributaries to Muddy Creek. The stream channels have been straightened and channelized.

WK Dickson requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential wetland and stream restoration project on the Muddy Run site (a USGS site map with approximate limits of conservation easement is attached).

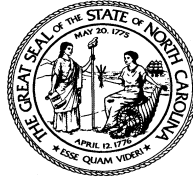
No architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. In addition, the majority of the site has historically been disturbed due to agricultural practices and channel modifications.

We ask that you review this site based on the attached location and project site maps to determine the presence of any historic properties. We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at dingram@wkdickson.com with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in blue ink that reads 'Daniel P. Ingram'.

W.K. Dickson & Co., Inc.
Daniel Ingram



**North Carolina Department of Cultural Resources
State Historic Preservation Office**

Ramona M. Bartos, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

July 3, 2012

Daniel Ingram
W.K. Dickson & Company, Inc.
720 Corporate Center Drive
Raleigh, NC 27607

Re: Muddy Run II Wetland and Stream Mitigation, Duplin County, ER 12-0983

Dear Mr. Ingram:

Thank you for your letter of June 6, 2012, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

A handwritten signature in blue ink that reads "Renee Gledhill-Earley".

for Ramona M. Bartos



June 7, 2012

Mr. Pete Benjamin
US Fish and Wildlife Service
Raleigh Field Office
P.O. Box 33726
Raleigh, NC 27636-3726

Subject: Project Scoping for Muddy Run II Site EEP wetland and stream mitigation project in Duplin County.

Dear Mr. Benjamin,

The Muddy Run II Site has been identified by NC Ecosystem Enhancement Program to provide compensatory mitigation for unavoidable stream impacts. This site is currently cultivated land and managed pine forests surrounding tributaries to Muddy Creek. The stream channels have been straightened and channelized.

We have obtained an updated species list for Duplin County from the FWS web site (<http://www.fws.gov/endangered/>). The only threatened or endangered species for this county is the Red-cockaded woodpecker (*Picooides borealis*). We have determined that no suitable habitat for this species exists within the proposed project boundary.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds, or other trust resources from the construction of a wetland and stream restoration project on the subject property. Maps showing the location and approximate limits of the conservation easement are enclosed.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at dingram@wkdictson.com with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in blue ink that reads 'Daniel P. Ingram'.

W.K. Dickson & Co., Inc.
Daniel Ingram



June 6, 2012

Amanda Schaller
Kenansville USDA Service Center
165 Agriculture Drive
Kenansville, NC 28349

Subject: Environmental Review for Muddy Run II Site EEP wetland and stream mitigation project in Duplin County

Dear Ms. Schaller,

The Muddy Run II Site has been identified by NC Ecosystem Enhancement Program to provide compensatory mitigation for unavoidable stream impacts. This site is currently agricultural land and managed pine forests surrounding tributaries to Muddy Creek. The stream channels have been straightened and channelized. According to the county soil survey, the site is mapped as Goldsboro loamy sand and Rains fine sandy loam. Current stream conditions demonstrate significant degradation with a high degree of incision because of straightening and channelization to promote agricultural activities.

We are requesting that you please complete NRCS Form AD-1006 and return to my attention at the address below. Attached are AD-1006, a USGS map, a site map showing the approximate property lines and areas of potential ground disturbance, and a soil map. If we have not heard from you within 45 days we will assume that prime, unique, statewide, or locally important farmland are not present and will not be affected by this project.

We thank you in advance for your timely response and cooperation. Please feel free to contact me at dingram@wkdickson.com with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in blue ink that reads 'Daniel P. Ingram'.

W.K. Dickson & Co., Inc.
Daniel Ingram

Enclosures

720 Corporate Center Drive
Raleigh, NC 27607
Tel. 919.782.0495
Fax 919.782.9672
www.wkdickson.com

Transportation • Water Resources • Urban Development • Geomatics



June 7, 2012

Molly Ellwood
Southeastern Permit Coordinator
North Carolina Wildlife Resources Commission
1701 Mail Service Center
Raleigh, NC 27699-1701

Subject: Project Scoping for Muddy Run II Site EEP wetland and stream mitigation project in Duplin County.

Dear Ms. Ellwood,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with a potential wetland and stream restoration project on the attached site (USGS site maps with approximate property lines and areas of potential ground disturbance are enclosed). The Muddy Run II Site has been identified by NC Ecosystem Enhancement Program to provide compensatory mitigation for unavoidable stream impacts. This site is currently cultivated land and managed pine forests surrounding tributaries to Muddy Creek.

The Muddy Run II Site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The stream channels have been straightened and channelized.

We thank you in advance for your timely response and cooperation. You may return the comment to my attention at the address below. Please feel free to contact me at dingram@wkdickson.com with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

A handwritten signature in blue ink that reads 'Daniel P. Ingram'.

W.K. Dickson & Co., Inc.
Daniel Ingram

Enclosures

Reference Reach Site Photographs



Facing upstream on Reference Reach at typical run cross section. 12/02/2011



Facing downstream on Reference Reach at typical run cross section. 12/02/2011



Facing upstream on Reference Reach at typical shallow cross section. 12/02/2011



Facing downstream on Reference Reach at typical shallow cross section. 12/02/2011



Facing upstream on Reference Reach at typical pool cross section. 12/02/2011



Facing downstream on Reference Reach at typical pool cross section. 12/02/2011

APPENDIX C

Mitigation Work Plan and Analyses

Muddy Run II Morphological Parameters
Muddy Run II Existing Conditions Profile Charts
Reference Reach Existing Profile Charts
Muddy Run II Stable Channel Design Output
HEC-RAS Data Output
HY8 NCDOT NC41 Culvert
Proposed Wetlands Water Budget

Muddy Run II Morphological Parameters

Feature	Reference Reach			Existing ^{1,2}									Design												
	Pool	Run	Shallow	MRII 1	MRII 2	MRII 3A	MRII 3B	MRII 3C	MRII 4	MRII 5A	MRII 5B	MRII 6	MRII 2	MRII 3A (U/S)	MRII 3A (D/S)	MRII 3B	MRII 4	MRII 5A							
Drainage Area (ac)	286	286	286	68	115	227	NA/313	74/360	45	424/774	583/909	77	68	209	254	333	45	774							
NC Regional Curve Discharge (cfs)			9.3	3	5	8	NA/10	4/11	2	13/18	16/21	4	---	---	---	---	---	---							
Design/Calculated Discharge (cfs)	---	---	13	---	---	---	---	---	---	---	---	---	7	14	16	10	5	40							
Dimension																									
BF Width (ft)	10.9	8.9	7.0	4.8	8.1	6.9	7.1	8.0	4.2	6.7	9.9	6.9	7.6	9.2	12.4	9	5.6	15							
Floodprone Width (ft)	100	100	100	8.7	10.2	8.1	>50	12.9	6.1	11.9	11.6	10.0	>40	>30	>30	>30	>30	>40							
BF Cross Sectional Area (ft ²)	11.4	8.4	5.0	2.3	4.1	2.8	2.4	3.9	2.1	6.6	11.1	6.2	5.9	8.7	15.7	8.3	3.3	22.7							
BF Mean Depth (ft)	1.0	0.9	0.8	0.5	0.5	0.4	0.3	0.5	0.5	1.0	1.1	0.9	0.78	0.9	1.3	0.9	0.6	1.5							
BF Max Depth (ft)	2.1	1.7	1.3	0.8	0.8	0.6	0.8	0.9	0.7	1.5	1.5	1.3	1.3	1.5	2.0	1.5	0.9	2.4							
Width/Depth Ratio	10.4	9.5	8.8	9.6	16.2	17.3	20.9	16.0	8.4	6.7	9.0	7.7	9.7	9.8	9.8	9.7	9.3	9.9							
Entrenchment Ratio	9.2	11.2	15.1	1.8	1.3	1.2	>2.2	1.6	1.5	1.8	1.2	1.4	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2							
Wetted Perimeter (ft)	12.8	9.7	7.4	5.2	8.3	7.1	7.4	8.3	4.6	7.6	11.4	7.8	8.1	9.8	13.2	9.6	6.0	15.9							
Hydraulic Radius (ft)	0.9	0.9	0.7	0.4	0.5	0.4	0.3	0.5	0.4	0.9	1.0	0.8	0.7	0.9	1.2	0.9	0.5	1.4							
Substrate																									
	Fine Sand			Fine Sand									Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand							
Pattern																									
	Min	Max	Med	---	---	---	---	---	---	---	---	---	---	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Channel Beltwidth (ft)	13.6	31.8	23.1	---	---	---	---	---	---	---	---	---	---	14	32	17	39	22	53	16	38	10	24	27	64
Radius of Curvature (ft)	11.0	27.6	17.6	---	---	---	---	---	---	---	---	---	---	11	28	13	34	18	46	13	33	8	21	22	55
Radius of Curvature Ratio	1.5	3.7	2.3	---	---	---	---	---	---	---	---	---	---	1.5	3.7	1.5	3.7	1.5	3.7	1.5	3.7	1.5	3.7	1.5	3.7
Meander Wavelength (ft)	34.9	68.3	54.5	---	---	---	---	---	---	---	---	---	---	35	69	43	84	58	113	42	82	26	51	70	137
Meander Width Ratio	1.8	4.2	3.1	---	---	---	---	---	---	---	---	---	---	1.8	4.2	1.8	4.2	1.8	4.2	1.8	4.2	1.8	4.2	1.8	4.2
Profile																									
Shallow Length (ft)	3.1	30.7	12.6	---	---	---	---	---	---	---	---	---	---	3	31	4	38	5	51	4	37	2	23	6	61
Run Length (ft)	2.2	33.2	11.3	---	---	---	---	---	---	---	---	---	---	2	34	3	41	4	55	3	40	2	25	4	66
Pool Length (ft)	4.2	9.5	5.8	---	---	---	---	---	---	---	---	---	---	4	10	5	12	7	16	5	11	3	7	8	19
Pool -to-Pool Spacing (ft)	17.5	59.8	36.3	---	---	---	---	---	---	---	---	---	---	18	60	22	74	29	99	21	72	13	45	35	120
Additional Reach Parameters																									
Valley Length (ft)		274		382	1678	3301	908	745	90	1620	383	1172	1682	1524	1648	1693	175	1530							
Channel Length (ft)		309		382	1678	3301	908	745	90	1620	383	1172	1828	1738	1890	1849	202	1790							
Sinuosity		1.1		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.09	1.14	1.15	1.09	1.15	1.17							
Water Surface Slope (ft/ft)		0.004		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---							
Channel Slope (ft/ft)		0.003		0.0043	0.0021	0.0016	0.0023	0.0022	0.0034	0.0024	0.0015	0.002427	0.0017	0.0026	0.0005	0.0014	0.0049	0.0017							
Rosgen Classification		E5		G5c	F5	F5	C5	F5	G5c	G5c	G5c	G5c	E5	E5	E5	E5	E5	E5							
*Habitat Index																									

¹ Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

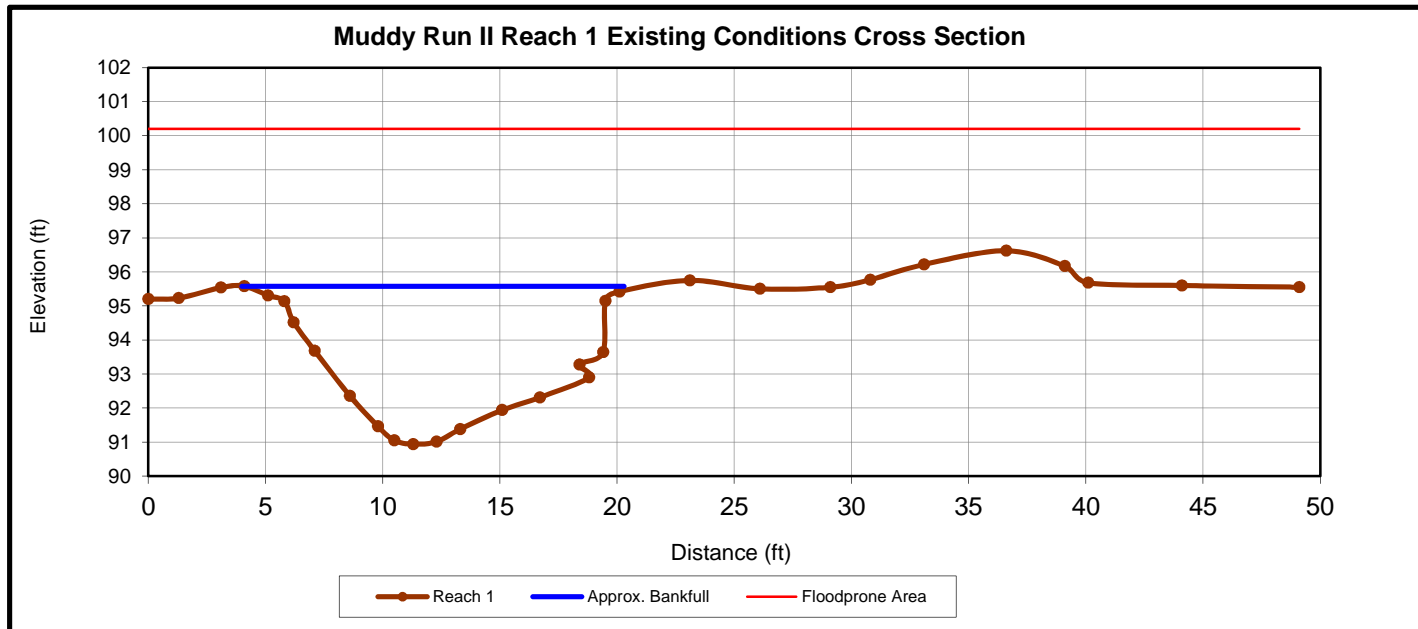
² Two different drainage areas and Regional Curve discharges are provided for some reaches. The first area or discharge reflects existing conditions, the second reflects proposed. Subsequent dimensions are based on existing conditions.



Upstream



Downstream

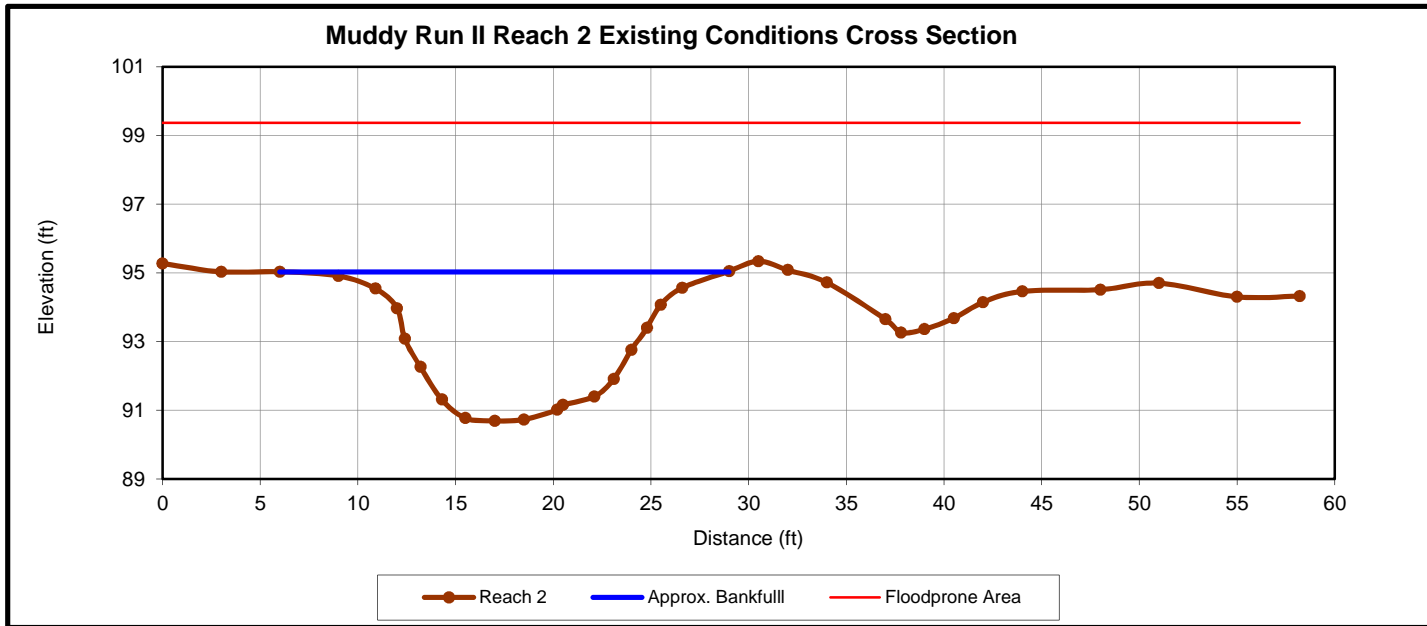




Upstream



Downstream

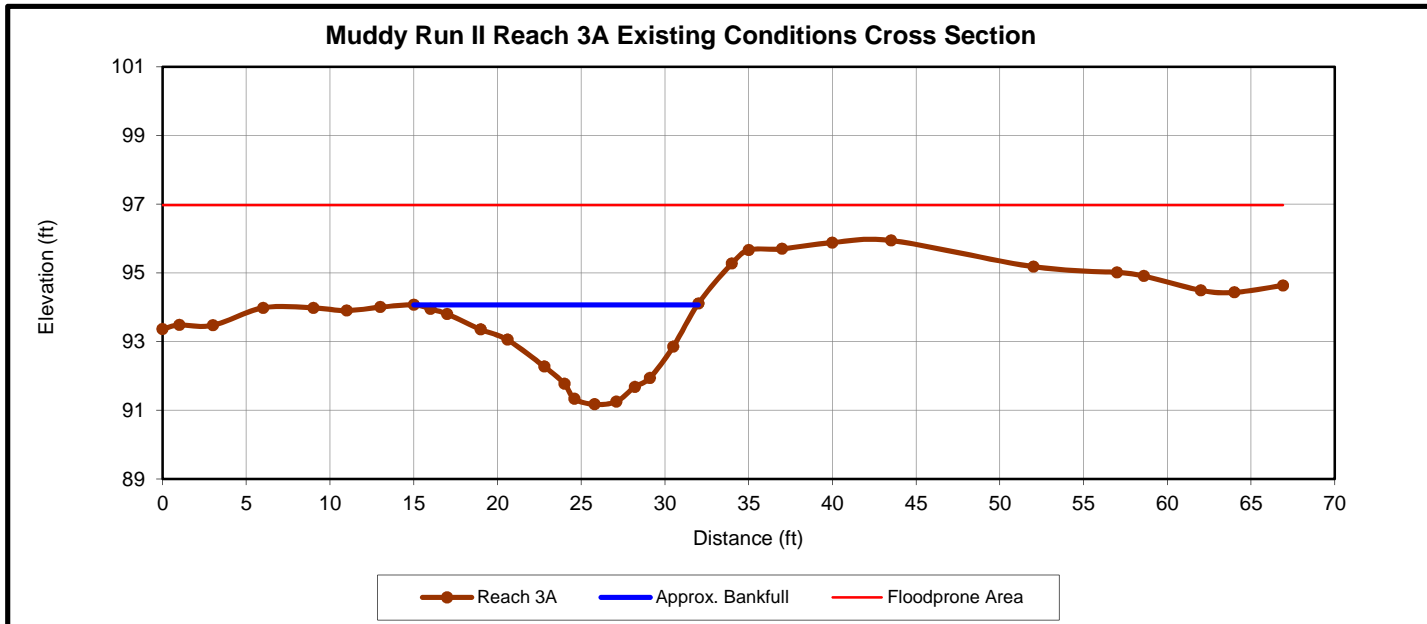




Upstream



Downstream

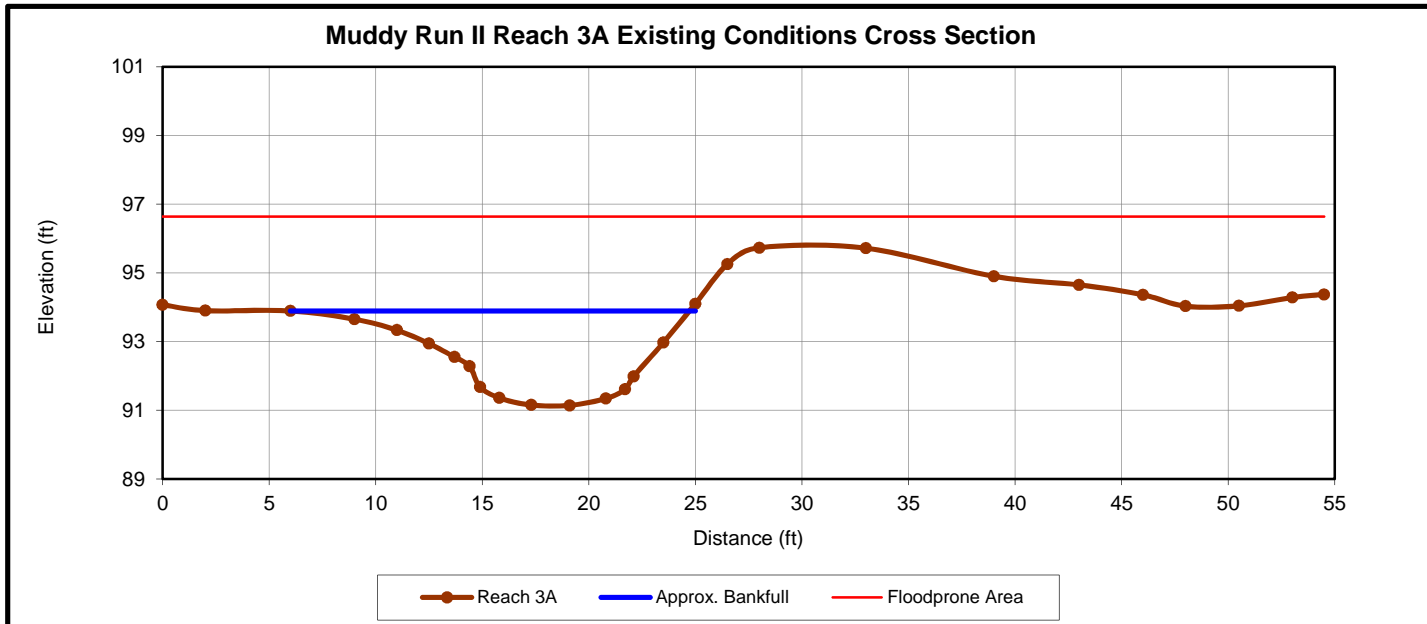




Upstream



Downstream

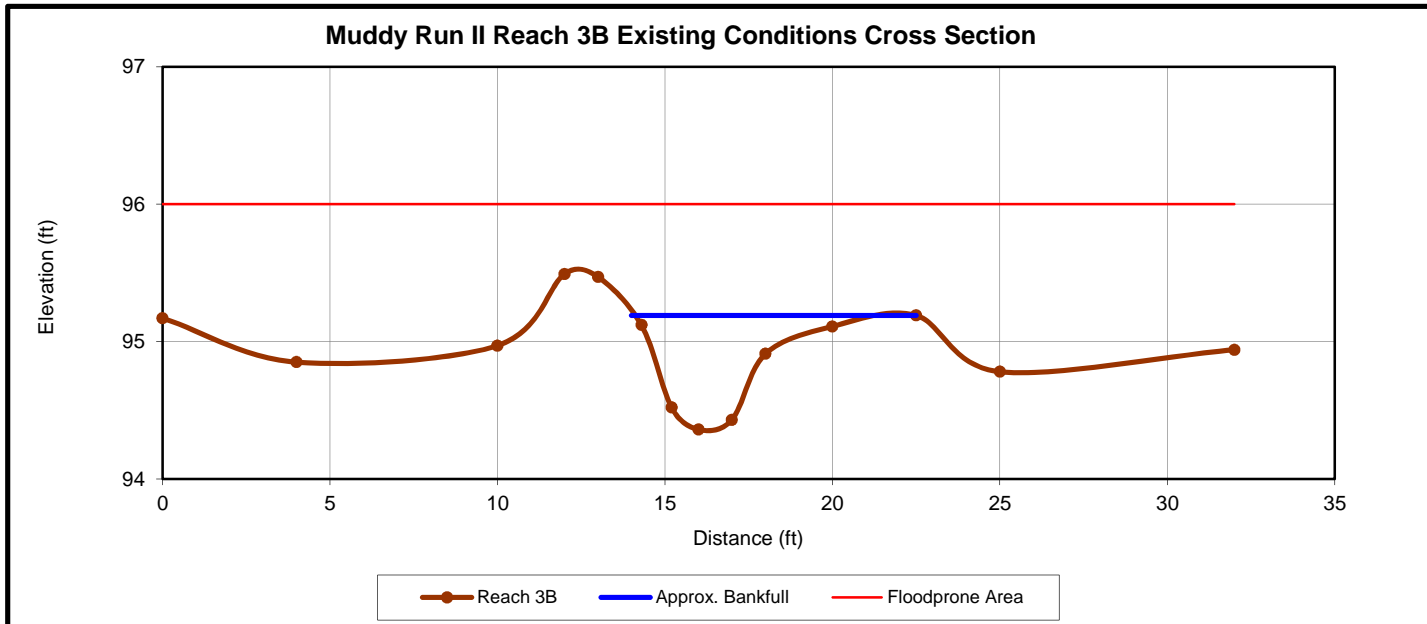




Upstream



Downstream

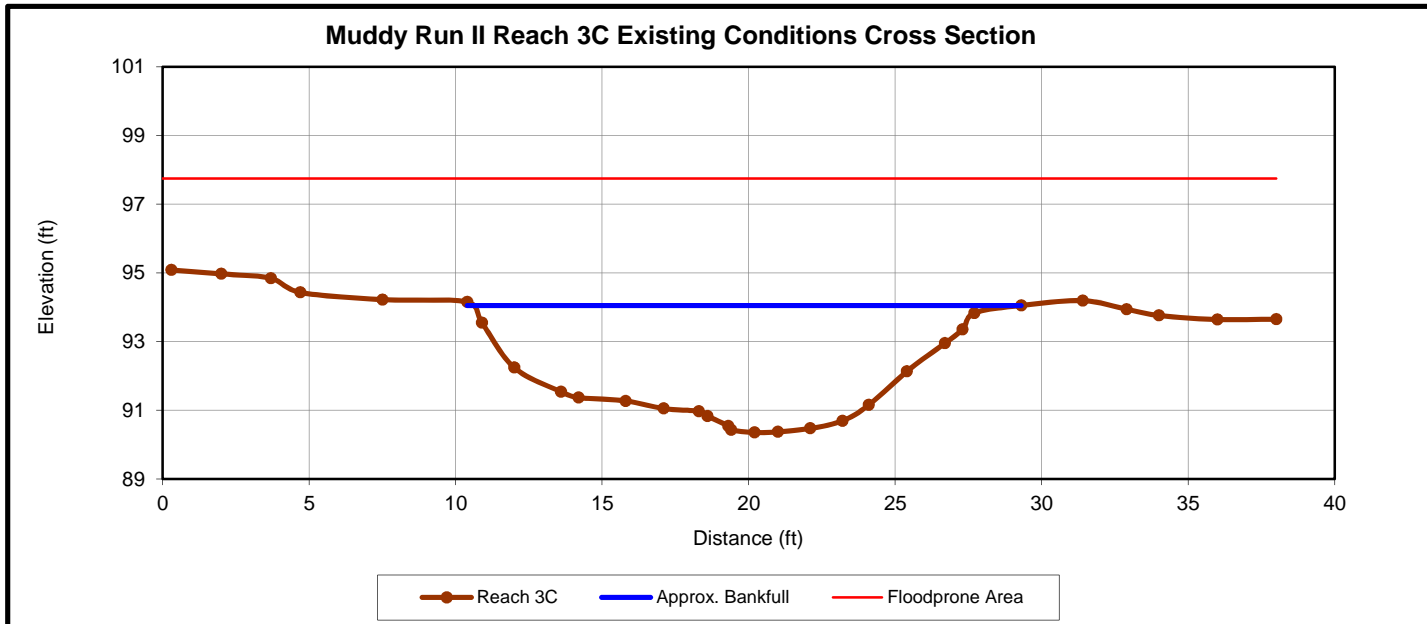




Upstream



Downstream

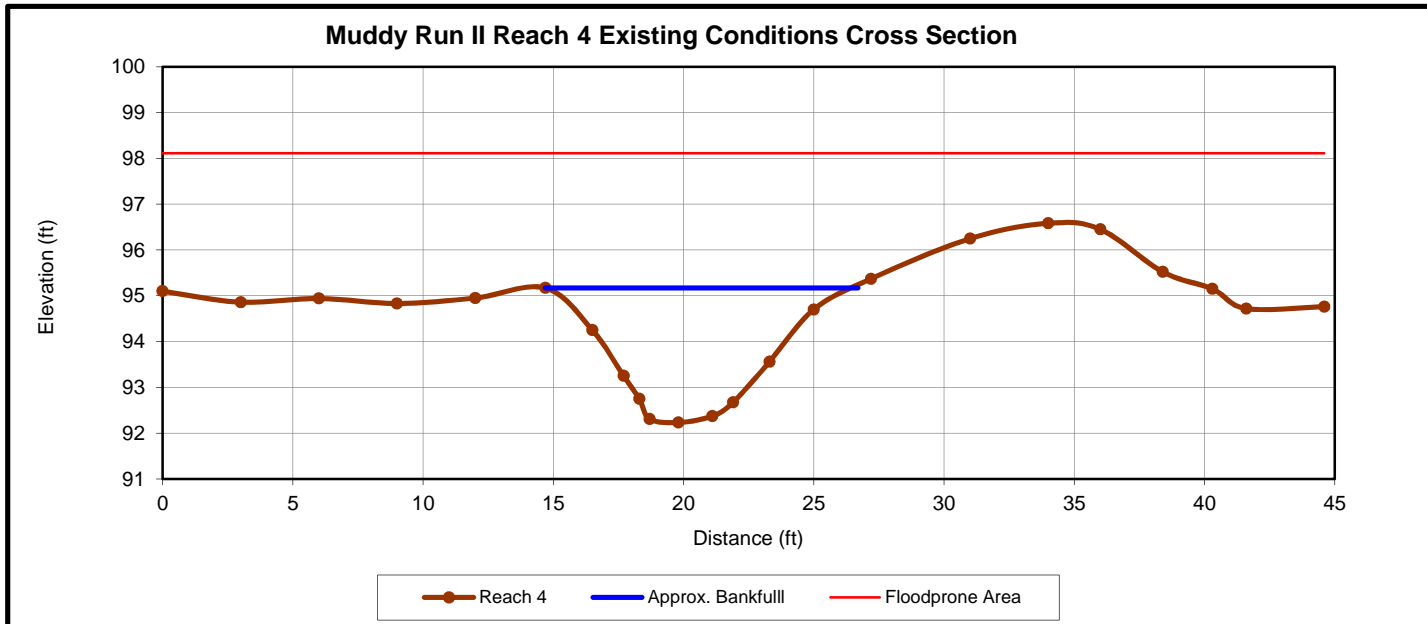




Upstream



Downstream

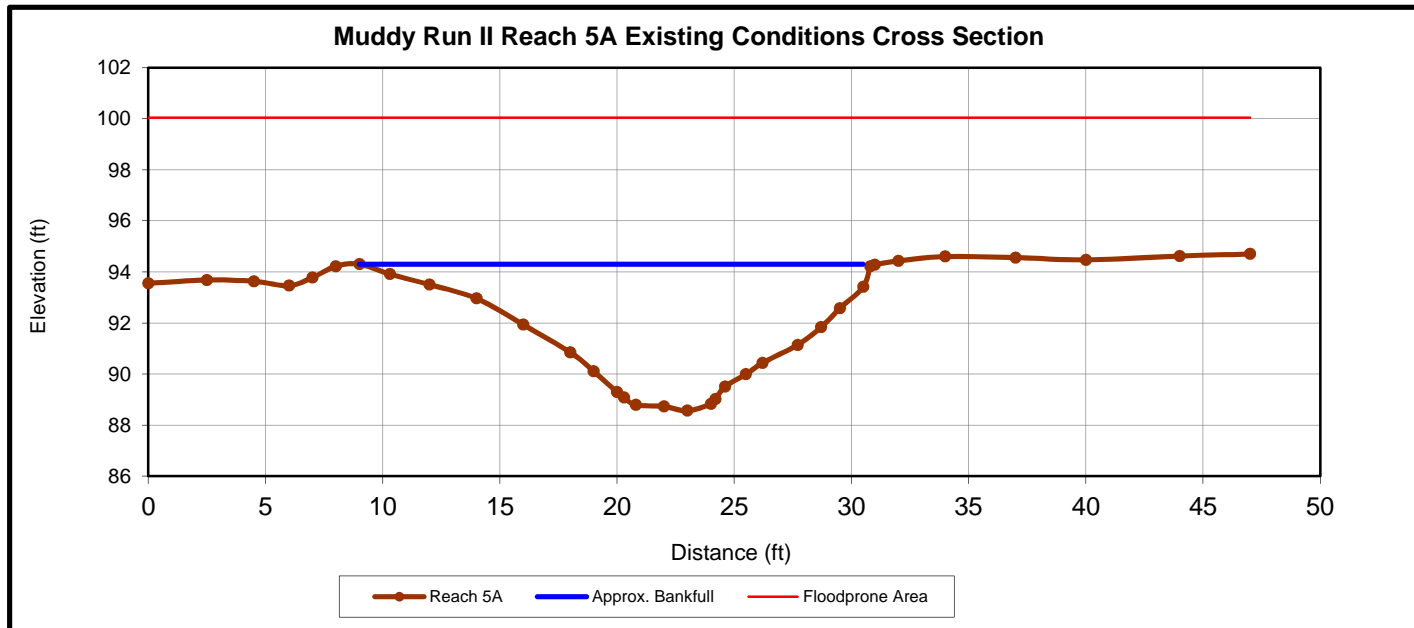




Upstream



Downstream

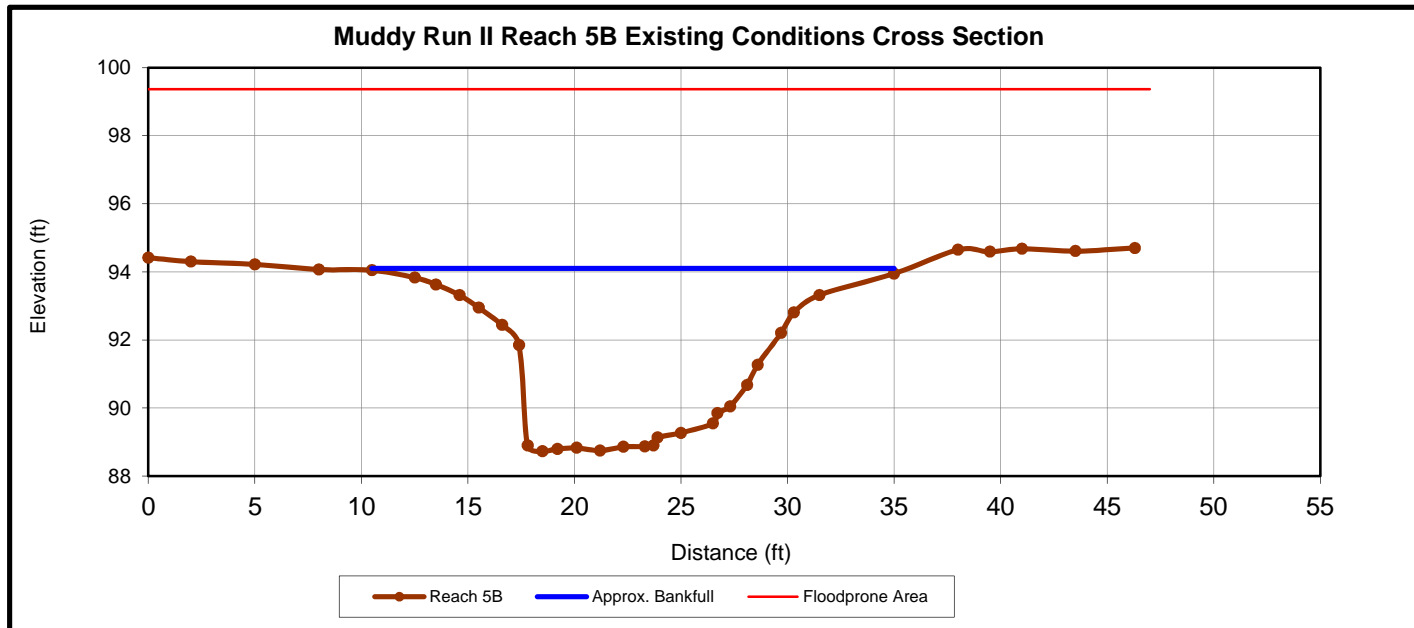




Upstream



Downstream

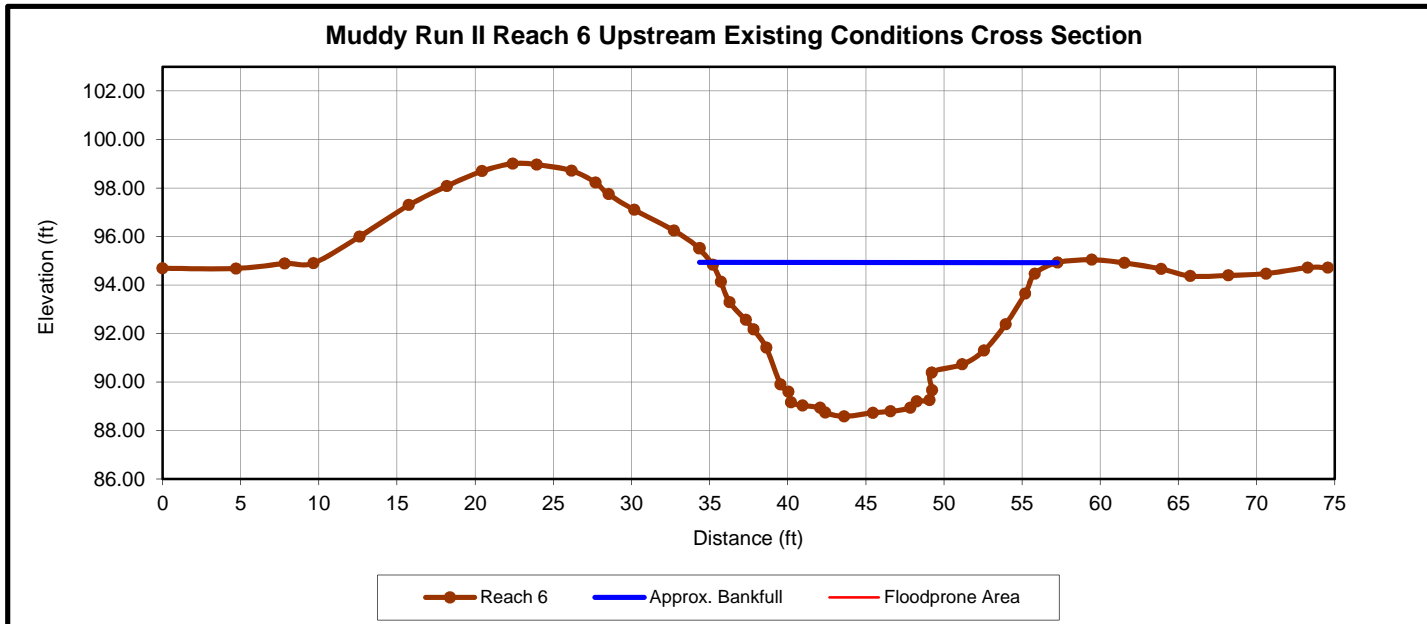




Upstream



Downstream

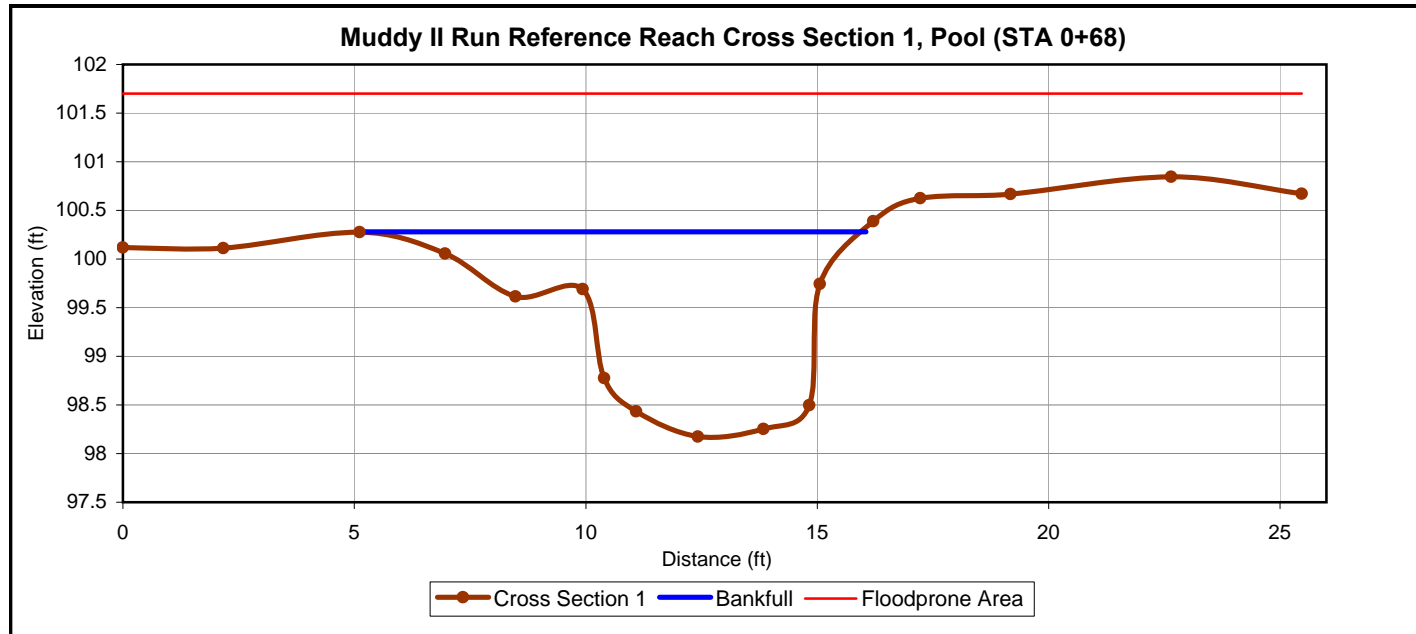




Upstream



Downstream

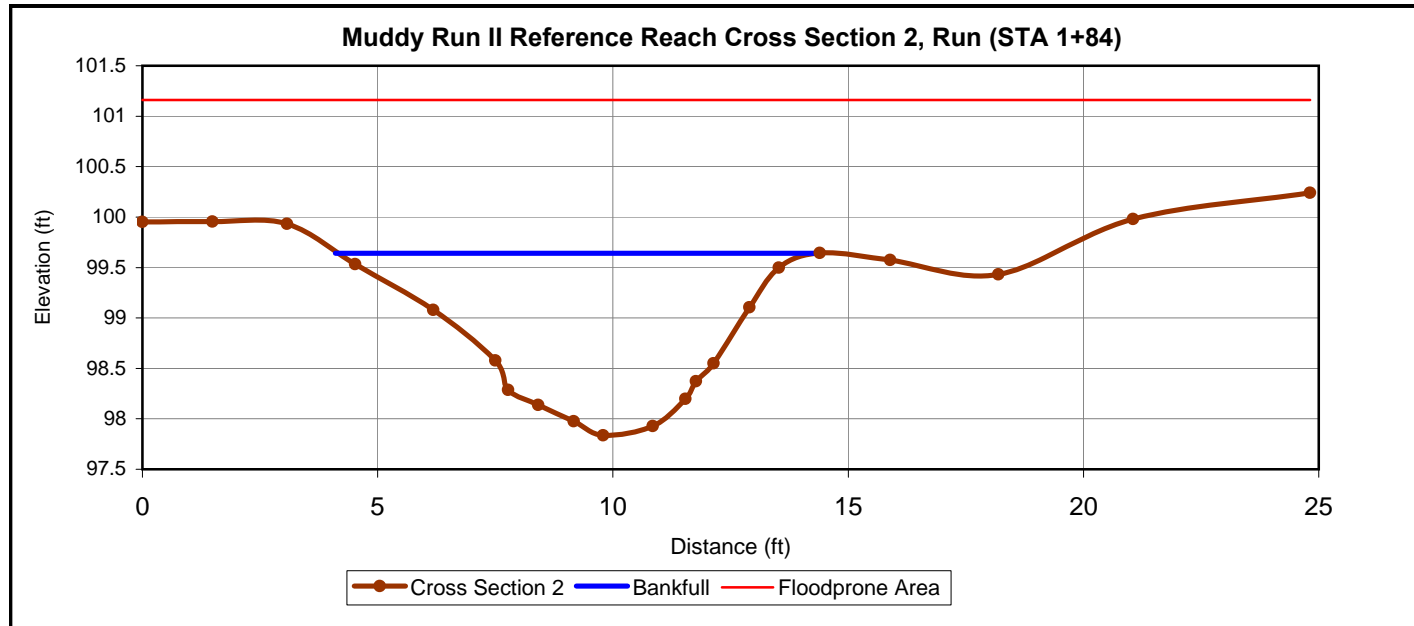




Upstream



Downstream

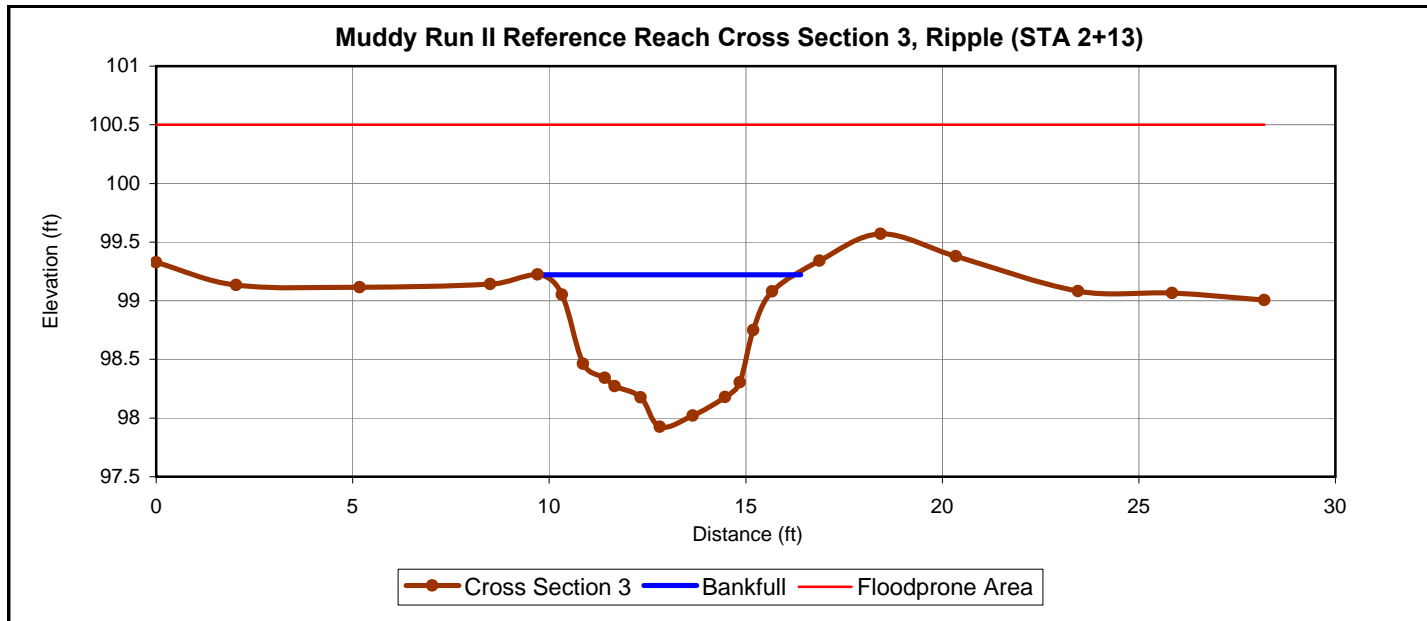




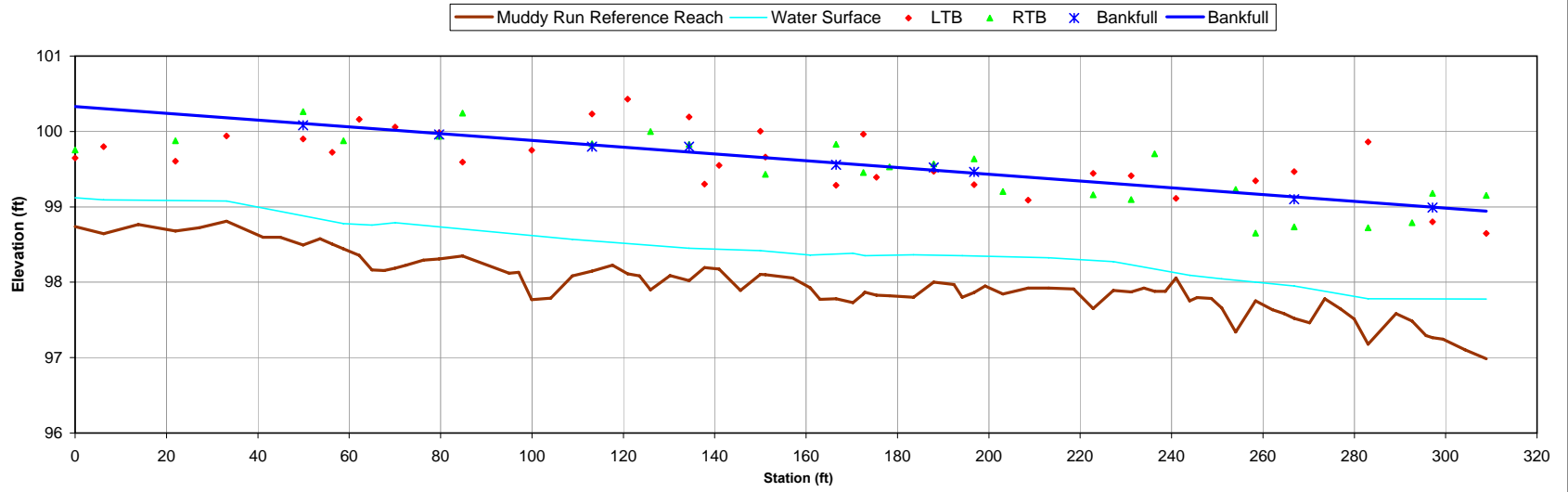
Upstream



Downstream



Muddy Run II Reference Reach Profile
Sta 0+00 to Sta 3+09



Muddy Run II Reach 2

Hydraulic Design Data

Stable Channel Design Results - Copeland Method

d84(mm) = .50, D50(mm) = .20, D16(mm) = .062

Temperature (F)	55
Specific Gravity of Sediments	2.65
Unit Weight of Water (lb/cu ft)	62.385
Viscosity (sq ft/s)	1.32E-05
Discharge (cfs)	7

Upstream Channel

Sediment Concentration (ppm)	197.62
Base Width (ft)	3.4
Channel Slope (ft/ft)	0.0017
	Left Right
Side Slope	2.1 2.1
Roughness Eq	Manning Manning
Roughness Value	0.05 0.05

Stable Channel

Median Channel Width (ft)	7.6
Valley Slope(ft/ft)	0.0027
	Left Right
Side Slope	2.1 2.1
Roughness Eq	Manning Manning
Roughness Value	0.05 0.05

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress	Regime
1	1.3	0.002979	0.047	0.71	1.37	0.21	0.25	Lower
2	1.2	0.002144	0.0439	0.72	1.26	0.2	0.16	Lower
2	2.2	0.002143	0.044	0.72	1.26	0.15	0.3	Lower
3	1.1	0.001793	0.0412	0.71	1.22	0.21	0.12	Lower
4	1	0.001606	0.0386	0.69	1.2	0.21	0.1	Lower
5	0.9	0.001492	0.0364	0.65	1.19	0.22	0.08	Lower
5	1.9	0.00149	0.0364	0.65	1.19	0.15	0.17	Lower
6	0.8	0.001423	0.0345	0.62	1.18	0.24	0.07	Lower
7	0.7	0.00138	0.0329	0.58	1.17	0.25	0.06	Lower
8	0.6	0.001331	0.0312	0.55	1.16	0.26	0.05	Lower
8	1.6	0.001335	0.0312	0.55	1.16	0.16	0.14	Lower
9	0.6	0.001325	0.0299	0.51	1.15	0.26	0.05	Lower
10	0.5	0.001317	0.0291	0.49	1.15	0.27	0.04	Lower
11	0.5	0.00132	0.0286	0.46	1.14	0.28	0.04	Lower
11	1.5	0.001326	0.0283	0.46	1.14	0.16	0.12	Lower
12	0.5	0.001332	0.0275	0.44	1.13	0.29	0.04	Lower
13	0.4	0.001339	0.027	0.41	1.12	0.3	0.04	Lower
14	0.4	0.001363	0.0266	0.39	1.11	0.3	0.04	Lower
14	1.4	0.001358	0.0264	0.39	1.11	0.16	0.12	Lower
15	0.4	0.001377	0.026	0.38	1.1	0.31	0.03	Lower

*****Solution for Minimum Stream Power*****

10.2	0.5	0.001316	0.0289	0.48	1.15	0.28	0.04	Lower
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Muddy Run II Reach 3a (U/S)

Hydraulic Design Data

Stable Channel Design Results - Copeland Method

d84(mm) = .50, D50(mm) = .20, D16(mm) = .062

Temperature (F)	55
Specific Gravity of Sediments	2.65
Unit Weight of Water (lb/cu ft)	62.385
Viscosity (sq ft/s)	1.32E-05
Discharge (cfs)	14

Upstream Channel

Sediment Concentration (ppm)	608.92
Base Width (ft)	4.2
Channel Slope (ft/ft)	0.0026
	Left Right
Side Slope	2.08 2.08
Roughness Eq	Manning Manning
Roughness Value	0.05 0.05

Stable Channel

Median Channel Width (ft)	9.2
Valley Slope(ft/ft)	0.0032
	Left Right
Side Slope	2.08 2.08
Roughness Eq	Manning Manning
Roughness Value	0.05 0.05

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress	Regime
1	1.6	0.005246	0.0474	0.83	1.99	0.28	0.53	Lower*
2	1.5	0.003653	0.0453	0.87	1.8	0.26	0.34	Lower*
3	1.4	0.003017	0.0431	0.87	1.72	0.26	0.26	Lower
4	1.3	0.002658	0.0411	0.85	1.68	0.26	0.21	Lower
5	1.1	0.002443	0.0392	0.83	1.66	0.27	0.17	Lower
6	1	0.002302	0.0375	0.79	1.64	0.28	0.15	Lower
6	2	0.002314	0.0374	0.79	1.63	0.2	0.3	Lower
7	1	0.002228	0.0358	0.75	1.62	0.29	0.13	Lower
8	0.9	0.002133	0.0344	0.72	1.61	0.3	0.12	Lower
9	0.8	0.002079	0.0333	0.69	1.6	0.31	0.11	Lower
10	0.8	0.00206	0.0325	0.66	1.59	0.32	0.1	Lower
11	0.7	0.002044	0.0315	0.63	1.58	0.33	0.09	Lower
12	0.7	0.002043	0.0308	0.6	1.56	0.34	0.09	Lower
13	0.6	0.002057	0.0299	0.57	1.55	0.34	0.08	Lower
14	0.6	0.002054	0.0295	0.55	1.54	0.35	0.08	Lower
15	0.6	0.002084	0.0288	0.52	1.52	0.36	0.07	Lower
16	0.5	0.002099	0.0284	0.5	1.51	0.36	0.07	Lower
17	0.5	0.002117	0.028	0.48	1.5	0.37	0.07	Lower
17	1.5	0.002118	0.028	0.48	1.5	0.21	0.2	Lower
18	0.5	0.002144	0.0275	0.46	1.49	0.37	0.07	Lower

*****Solution for Minimum Stream Power*****

11.5	0.7	0.002045	0.0307	0.61	1.57	0.33	0.09	Lower
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Muddy Run II Reach 3a (D/S)

Hydraulic Design Data

Stable Channel Design Results - Copeland Method

d84(mm) = .50, D50(mm) = .20, D16(mm) = .060

Temperature (F) 55
 Specific Gravity of Sediments 2.65
 Unit Weight of Water (lb/cu ft) 62.385
 Viscosity (sq ft/s) 1.32E-05
 Discharge (cfs) 16

Upstream Channel

Sediment Concentration (ppm) 27.5
 Base Width (ft) 5.8
 Channel Slope (ft/ft) 0.0005
 Left Right
 Side Slope 2.06 2.06
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Stable Channel

Median Channel Width (ft) 12
 Valley Slope(ft/ft) 0.008
 Left Right
 Side Slope 2.06 2.06
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress	Regime
1	2.4	0.001051	0.0481	1.19	1.12	0.13	0.16	Lower
2	2.3	0.000778	0.0457	1.23	1.03	0.12	0.11	Lower
4	2	0.00058	0.0425	1.24	0.97	0.12	0.07	Lower
5	1.9	0.000529	0.0411	1.23	0.96	0.12	0.06	Lower
6	1.7	0.000494	0.0394	1.2	0.95	0.13	0.05	Lower
7	1.6	0.000468	0.0379	1.17	0.95	0.13	0.05	Lower
8	1.5	0.00045	0.0363	1.13	0.94	0.13	0.04	Lower
10	1.3	0.000425	0.0339	1.06	0.94	0.14	0.04	Lower
11	1.3	0.000416	0.0329	1.02	0.94	0.15	0.03	Lower
12	1.2	0.00041	0.0319	0.98	0.94	0.15	0.03	Lower
13	1.1	0.000405	0.0309	0.95	0.93	0.16	0.03	Lower
14	1.1	0.000398	0.0298	0.91	0.93	0.16	0.03	Lower
16	1	0.000394	0.0286	0.85	0.93	0.17	0.02	Lower
17	0.9	0.000397	0.0279	0.81	0.92	0.17	0.02	Lower
18	0.9	0.000395	0.0274	0.79	0.92	0.17	0.02	Lower
19	0.8	0.000397	0.0271	0.77	0.92	0.18	0.02	Lower
20	0.8	0.000398	0.0267	0.74	0.91	0.18	0.02	Lower
22	0.7	0.000403	0.0258	0.69	0.91	0.18	0.02	Lower
23	0.7	0.000403	0.0257	0.68	0.91	0.19	0.02	Lower
24	0.7	0.000409	0.025	0.65	0.9	0.19	0.02	Lower

*****Solution for Minimum Stream Power*****

15.7	1	0.000395	0.0288	0.86	0.93	0.17	0.02	Lower
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Muddy Run II Reach 3b

Hydraulic Design Data

Stable Channel Design Results - Copeland Method

d84(mm) = .50, D50(mm) = .20, D16(mm) = .062

Temperature (F) 55
 Specific Gravity of Sediments 2.65
 Unit Weight of Water (lb/cu ft) 62.385
 Viscosity (sq ft/s) 1.32E-05
 Discharge (cfs) 10

Upstream Channel

Sediment Concentration (ppm) 174.55
 Base Width (ft) 4.2
 Channel Slope (ft/ft) 0.0014
 Left Right
 Side Slope 2.09 2.09
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Stable Channel

Median Channel Width (ft) 9
 Valley Slope(ft/ft) 0.0032
 Left Right
 Side Slope 2.09 2.09
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress	Regime
1	1.6	0.00271	0.0476	0.83	1.44	0.2	0.27	Lower
2	1.5	0.00194	0.0449	0.86	1.32	0.19	0.18	Lower
3	1.4	0.001607	0.0428	0.86	1.27	0.19	0.14	Lower
4	1.2	0.001427	0.0405	0.84	1.24	0.2	0.11	Lower
4	2.2	0.001441	0.0401	0.83	1.24	0.15	0.2	Lower
5	1.1	0.001318	0.0382	0.81	1.23	0.2	0.09	Lower
6	1	0.001247	0.0362	0.77	1.22	0.21	0.08	Lower
7	0.9	0.0012	0.0347	0.73	1.21	0.22	0.07	Lower
8	0.9	0.001166	0.0333	0.7	1.2	0.23	0.06	Lower
9	0.8	0.001126	0.0319	0.66	1.2	0.24	0.06	Lower
10	0.7	0.001115	0.0306	0.63	1.19	0.24	0.05	Lower
11	0.7	0.001112	0.0299	0.6	1.18	0.25	0.05	Lower
12	0.6	0.001104	0.0291	0.57	1.18	0.26	0.04	Lower
13	0.6	0.001114	0.0284	0.54	1.17	0.26	0.04	Lower
14	0.6	0.001115	0.0279	0.52	1.16	0.27	0.04	Lower
14	1.6	0.00112	0.0278	0.52	1.16	0.16	0.11	Lower
15	0.5	0.001122	0.0273	0.5	1.15	0.28	0.04	Lower
16	0.5	0.001137	0.0269	0.48	1.14	0.28	0.04	Lower
17	0.5	0.00115	0.0264	0.46	1.13	0.29	0.04	Lower
18	0.5	0.001159	0.0261	0.44	1.13	0.29	0.03	Lower

*****Solution for Minimum Stream Power*****

11.9	0.6	0.001105	0.0292	0.57	1.18	0.26	0.04	Lower
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Muddy Run II Reach 4

Hydraulic Design Data

Stable Channel Design Results - Copeland Method

d84(mm) = .50, D50(mm) = .20, D16(mm) = .062

Temperature (F) 55
 Specific Gravity of Sediments 2.65
 Unit Weight of Water (lb/cu ft) 62.385
 Viscosity (sq ft/s) 1.32E-05
 Discharge (cfs) 5

Upstream Channel

Sediment Concentration (ppm) 1298.1
 Base Width (ft) 3
 Channel Slope (ft/ft) 0.005
 Left Right
 Side Slope 2 2
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Stable Channel

Median Channel Width (ft) 6
 Valley Slope(ft/ft) 0.006
 Left Right
 Side Slope 2 2
 Roughness Eq Manning Manning
 Roughness Value 0.042 0.042

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress	Regime
1	0.9	0.005565	0.0372	0.51	1.9	0.35	0.32	Upper*
1	1.9	0.005525	0.0374	0.51	1.9	0.24	0.66	Upper*
2	0.8	0.005204	0.0366	0.5	1.84	0.37	0.25	Lower*
2	1.8	0.005207	0.0366	0.5	1.84	0.24	0.57	Lower*
3	0.7	0.004503	0.0346	0.48	1.78	0.39	0.18	Lower*
4	0.6	0.004172	0.0322	0.44	1.73	0.41	0.15	Lower*
4	1.6	0.004179	0.0324	0.44	1.73	0.24	0.41	Lower*
5	0.5	0.004061	0.0307	0.41	1.69	0.42	0.12	Lower*
5	1.5	0.004041	0.0307	0.41	1.69	0.24	0.38	Lower*
6	0.4	0.004022	0.0296	0.38	1.66	0.44	0.11	Lower*
7	0.4	0.004049	0.0285	0.35	1.63	0.46	0.1	Lower
7	1.4	0.004036	0.0288	0.35	1.63	0.24	0.35	Lower*
8	0.4	0.004109	0.0279	0.32	1.6	0.47	0.09	Lower
8	1.4	0.004087	0.028	0.32	1.6	0.24	0.35	Lower
9	0.3	0.004162	0.0275	0.3	1.58	0.48	0.09	Lower
10	0.3	0.004245	0.0269	0.28	1.55	0.5	0.08	Lower
10	1.3	0.00424	0.0269	0.28	1.55	0.24	0.34	Lower
11	0.3	0.004357	0.0263	0.26	1.52	0.5	0.08	Lower
11	1.3	0.004322	0.0264	0.27	1.53	0.24	0.35	Lower
12	0.3	0.004442	0.026	0.25	1.5	0.51	0.07	Lower

*****Solution for Minimum Stream Power*****

5.9	0.4	0.004002	0.0299	0.38	1.67	0.44	0.11	Lower*
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Muddy Run II Reach 5a

Hydraulic Design Data

Stable Channel Design Results - Copeland Method

d84(mm) = .50, D50(mm) = .20, D16(mm) = .062

Temperature (F) 55
 Specific Gravity of Sediments 2.65
 Unit Weight of Water (lb/cu ft) 62.385
 Viscosity (sq ft/s) 1.32E-05
 Discharge (cfs) 44

Upstream Channel

Sediment Concentration (ppm) 501.43
 Base Width (ft) 7
 Channel Slope (ft/ft) 0.0017
 Left Right
 Side Slope 2.11 2.11
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Stable Channel

Median Channel Width (ft) 15
 Valley Slope(ft/ft) 0.0023
 Left Right
 Side Slope 2.11 2.11
 Roughness Eq Manning Manning
 Roughness Value 0.05 0.05

Computed Stable Channels

Bottom Width	Depth	Energy Slope	Comp n-Value	Hyd Radius	Velocity	Froude Number	Shear Stress	Regime
2	2.6	0.003108	0.0472	1.4	2.19	0.24	0.51	Lower*
3	2.5	0.002525	0.0457	1.43	2.06	0.23	0.4	Lower*
4	2.4	0.002193	0.0443	1.44	1.99	0.23	0.33	Lower
6	2.2	0.001818	0.0421	1.43	1.91	0.23	0.25	Lower
8	1.9	0.001623	0.0398	1.38	1.87	0.24	0.2	Lower
9	1.8	0.00157	0.0385	1.34	1.85	0.24	0.18	Lower
10	1.7	0.001515	0.0375	1.31	1.84	0.24	0.17	Lower
12	1.6	0.001438	0.0361	1.25	1.82	0.26	0.14	Lower
14	1.4	0.001378	0.0343	1.18	1.8	0.27	0.12	Lower
15	1.4	0.001362	0.0335	1.15	1.79	0.27	0.12	Lower
16	1.3	0.001366	0.0327	1.11	1.78	0.27	0.11	Lower
18	1.2	0.001343	0.032	1.06	1.77	0.28	0.1	Lower
20	1.1	0.00134	0.0313	1	1.75	0.29	0.09	Lower
21	1.1	0.001342	0.0307	0.97	1.74	0.29	0.09	Lower
22	1	0.001354	0.03	0.94	1.73	0.3	0.09	Lower
24	1	0.001349	0.0298	0.9	1.72	0.31	0.08	Lower
26	0.9	0.001363	0.0294	0.86	1.7	0.31	0.08	Lower
27	0.9	0.001384	0.0287	0.83	1.69	0.31	0.08	Lower
28	0.9	0.001379	0.0286	0.81	1.68	0.32	0.08	Lower
30	0.8	0.001396	0.0283	0.78	1.67	0.32	0.07	Lower

*****Solution for Minimum Stream Power*****

19.6	1.1	0.001341	0.0314	1.01	1.75	0.29	0.1	Lower
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Muddy Run II Reaches 2, 3a, 3b, and 3c (HEC-RAS Output)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel (ft/s)	Chnl Flow Area (sq ft)	Top Width (ft)	Power (lb/ft s)	Total Shear (lb/sq ft)	Chan
MRII-2	29570	2YR	19	57.36	58.19		58.20	0.0023	1.31	30.40	69.11	0.04	0.09	
MRII-2	29570	10YR	52	57.36	58.53		58.57	0.0033	2.09	59.21	96.51	0.11	0.20	
MRII-2	29570	25YR	81	57.36	58.73		58.79	0.0038	2.55	79.68	108.14	0.18	0.28	
MRII-2	29570	Design Q	7	57.36	57.95		57.96	0.0016	0.83	15.99	54.47	0.01	0.04	
MRII-2	29260	2YR	19	56.64	57.28	57.03	57.32	0.0038	1.63	25.51	107.68	0.04	0.14	
MRII-2	29260	10YR	52	56.64	57.67	57.24	57.69	0.0025	1.82	86.84	194.35	0.04	0.15	
MRII-2	29260	25YR	81	56.64	57.90	57.24	57.93	0.0021	1.92	137.01	230.25	0.05	0.16	
MRII-2	29260	Design Q	7	56.64	56.97	56.85	57.01	0.0081	1.52	4.59	31.16	0.24	0.16	
MRII-2	28851	2YR	19	54.26	55.83	55.23	55.90	0.0032	2.17	10.27	22.97	0.20	0.21	
MRII-2	28851	10YR	52	54.26	56.52	55.89	56.62	0.0028	2.80	46.83	82.79	0.11	0.30	
MRII-2	28851	25YR	81	54.26	56.89	56.34	56.98	0.0026	3.06	80.24	106.79	0.12	0.33	
MRII-2	28851	Design Q	7	54.26	55.35	54.85	55.38	0.0024	1.39	5.04	7.01	0.14	0.10	
MRII-2	28454	2YR	19	53.34	54.98	54.31	55.01	0.0016	1.62	24.61	47.18	0.04	0.11	
MRII-2	28454	10YR	52	53.34	55.47	54.95	55.54	0.0026	2.57	51.32	74.17	0.11	0.26	
MRII-2	28454	25YR	81	53.34	55.73	55.15	55.82	0.0033	3.16	75.57	106.26	0.15	0.37	
MRII-2	28454	Design Q	7	53.34	54.45	53.93	54.48	0.0022	1.36	5.14	18.91	0.13	0.10	
MRII-2	28076	2YR	19	52.47	53.80	53.43	53.91	0.0068	2.70	10.22	47.89	0.17	0.35	
MRII-2	28076	10YR	52	52.47	54.52	54.08	54.58	0.0025	2.43	68.84	120.27	0.07	0.23	
MRII-2	28076	25YR	81	52.47	54.96	54.28	54.99	0.0015	2.25	132.93	221.80	0.03	0.18	
MRII-2	28076	Design Q	7	52.47	53.54	53.06	53.57	0.0026	1.44	4.86	6.91	0.16	0.11	
MRII-3a	26409	2YR	27	51.68	53.45	52.81	53.48	0.0015	1.63	37.39	53.74	0.04	0.10	
MRII-3a	26409	10YR	84	51.68	54.13	53.41	54.19	0.0021	2.61	82.49	92.66	0.12	0.23	
MRII-3a	26409	25YR	129	51.68	54.51	53.62	54.61	0.0028	3.41	135.05	188.94	0.12	0.37	
MRII-3a	26409	Design Q	14	51.68	53.11	52.50	53.16	0.0025	1.74	8.03	29.05	0.23	0.13	
MRII-3a	26306	2YR	27	51.40	53.26	52.53	53.30	0.0016	1.80	34.73	78.34	0.03	0.12	
MRII-3a	26306	10YR	84	51.40	53.89	53.34	53.95	0.0021	2.68	100.14	145.33	0.08	0.24	
MRII-3a	26306	25YR	129	51.40	54.27	53.57	54.33	0.0019	2.86	168.07	206.81	0.07	0.26	
MRII-3a	26306	Design Q	14	51.40	52.83	52.22	52.87	0.0025	1.75	8.01	26.99	0.23	0.13	
MRII-3a	26120	2YR	27	50.81	52.55	51.94	52.64	0.0034	2.44	13.57	53.14	0.18	0.23	
MRII-3a	26120	10YR	84	50.81	53.26	52.82	53.36	0.0030	3.15	72.67	90.04	0.17	0.33	
MRII-3a	26120	25YR	129	50.81	53.66	53.04	53.78	0.0030	3.56	119.26	142.62	0.17	0.40	
MRII-3a	26120	Design Q	14	50.81	52.22	51.63	52.27	0.0026	1.77	7.90	19.18	0.24	0.14	
MRII-3a	25930	2YR	27	50.20	52.00	51.33	52.05	0.0019	1.90	32.80	89.42	0.04	0.14	
MRII-3a	25930	10YR	84	50.20	52.88	52.12	52.92	0.0012	2.19	126.02	144.58	0.04	0.16	
MRII-3a	25930	25YR	129	50.20	53.16	52.33	53.23	0.0018	2.88	179.77	237.13	0.06	0.26	
MRII-3a	25930	Design Q	14	50.20	51.63	51.02	51.67	0.0025	1.75	8.01	24.32	0.23	0.13	
MRII-3a	25685	2YR	27	49.40	51.19	50.53	51.27	0.0030	2.37	12.48	31.82	0.29	0.22	
MRII-3a	25685	10YR	84	49.40	51.76	51.39	52.08	0.0073	4.73	28.47	70.39	0.72	0.77	
MRII-3a	25685	25YR	129	49.40	51.98	51.77	52.22	0.0062	4.72	70.45	86.98	0.56	0.73	
MRII-3a	25685	Design Q	14	49.40	50.84	50.22	50.89	0.0024	1.72	8.12	22.56	0.22	0.13	
MRII-3a	25487	2YR	27	48.85	50.41	49.99	50.48	0.0040	2.36	25.07	80.73	0.08	0.23	
MRII-3a	25487	10YR	84	48.85	51.02	50.67	51.08	0.0028	2.75	107.12	167.77	0.09	0.27	
MRII-3a	25487	25YR	129	48.85	51.42	50.84	51.46	0.0018	2.54	197.94	272.53	0.05	0.21	
MRII-3a	25487	Design Q	14	48.85	50.25	49.67	50.30	0.0027	1.80	7.78	32.82	0.25	0.14	
MRII-3a	25328	2YR	27	48.35	50.08	49.49	50.09	0.0012	1.44	65.80	172.78	0.01	0.08	
MRII-3a	25328	10YR	84	48.35	50.89	49.79	50.89	0.0005	1.27	282.32	333.67	0.01	0.05	
MRII-3a	25328	25YR	129	48.35	51.32	50.24	51.33	0.0004	1.27	449.25	424.52	0.01	0.05	
MRII-3a	25328	Design Q	14	48.35	49.74	49.17	49.79	0.0027	1.80	8.65	55.29	0.07	0.14	
MRII-3a	25144	2YR	27	47.85	49.89	48.98	49.91	0.0007	1.26	59.47	99.28	0.01	0.06	
MRII-3a	25144	10YR	84	47.85	50.76	49.71	50.78	0.0006	1.65	195.76	218.88	0.01	0.09	
MRII-3a	25144	25YR	129	47.85	51.22	49.93	51.24	0.0005	1.70	310.90	280.59	0.01	0.09	
MRII-3a	25144	Design Q	14	47.85	49.46	48.67	49.49	0.0013	1.41	13.85	70.25	0.02	0.08	

Muddy Run II Reaches 2, 3a, 3b, and 3c (HEC-RAS Output)

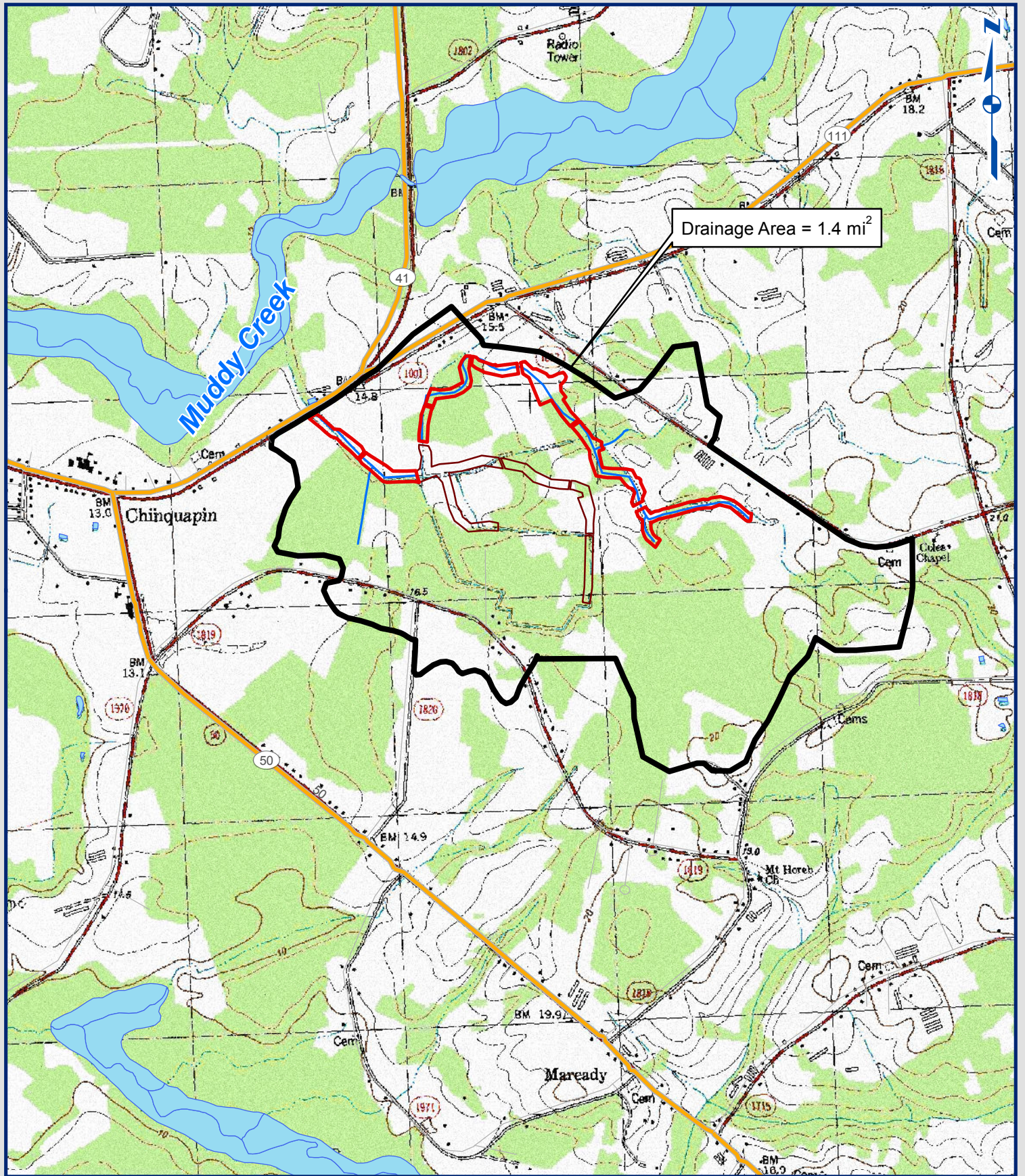
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Power (lb/ft s)	Total Shear (lb/sq ft)	Chan
MRII-3a	24954	2YR	35	47.50	49.65		49.69	0.0014	1.89	46.98	102.50	0.03	0.13	
MRII-3a	24954	10YR	107	47.50	50.57		50.61	0.0010	2.16	183.49	228.98	0.03	0.14	
MRII-3a	24954	25YR	163	47.50	51.07		51.10	0.0008	2.17	327.69	349.92	0.02	0.14	
MRII-3a	24954	Design Q	16	47.50	49.09		49.14	0.0019	1.68	9.94	18.34	0.10	0.12	
MRII-3a	24710	2YR	35	46.87	49.35	48.06	49.38	0.000825	1.56	29.2	55.93	0.05	0.08	
MRII-3a	24710	10YR	107	46.87	50.3	48.96	50.34	0.000836	2.1	132.93	116.1	0.05	0.13	
MRII-3a	24710	25YR	163	46.87	50.81	49.51	50.86	0.000832	2.35	200.69	166.58	0.05	0.16	
MRII-3a	24710	Design Q	16	46.87	48.82	47.68	48.84	0.000593	1.06	15.16	23.32	0.05	0.04	
MRII-3a	24500	2YR	35	46.74	49.2	47.93	49.22	0.000595	1.32	51.92	65.65	0.02	0.06	
MRII-3a	24500	10YR	107	46.74	50.1	48.81	50.15	0.000865	2.1	124.96	97.75	0.06	0.13	
MRII-3a	24500	25YR	163	46.74	50.56	49.18	50.64	0.001178	2.73	177.04	151.99	0.08	0.21	
MRII-3a	24500	Design Q	16	46.74	48.69	47.56	48.71	0.000599	1.06	15.09	25.27	0.05	0.04	
MRII-3a	24218	2YR	35	46.56	49.02	47.75	49.05	0.000569	1.29	58.42	89.71	0.01	0.06	
MRII-3a	24218	10YR	107	46.56	49.86	48.62	49.9	0.000791	1.98	157.08	138.96	0.04	0.12	
MRII-3a	24218	25YR	163	46.56	50.28	49.05	50.33	0.000866	2.29	222.17	172.91	0.05	0.15	
MRII-3a	24218	Design Q	16	46.56	48.51	47.37	48.53	0.000597	1.06	15.11	28.1	0.05	0.04	
MRII-3a	24030	2YR	35	46.46	48.83	47.65	48.88	0.001047	1.69	26.34	73.41	0.04	0.1	
MRII-3a	24030	10YR	107	46.46	49.64	48.52	49.69	0.001134	2.29	133.11	141.41	0.05	0.16	
MRII-3a	24030	25YR	163	46.46	50.03	48.94	50.09	0.001268	2.68	199.51	204.59	0.06	0.21	
MRII-3a	24030	Design Q	16	46.46	48.37	47.28	48.39	0.00065	1.09	14.66	27.51	0.05	0.05	
MRII-3a	23829	2YR	35	46.33	48.68	47.52	48.7	0.000572	1.24	78.43	147.68	0.01	0.05	
MRII-3a	23829	10YR	107	46.33	49.52	48.41	49.53	0.000426	1.41	305.63	347.86	0.01	0.06	
MRII-3a	23829	25YR	163	46.33	49.92	48.72	49.94	0.000387	1.49	458.91	408.35	0.01	0.06	
MRII-3a	23829	Design Q	16	46.33	48.23	47.15	48.25	0.000674	1.11	14.47	56.45	0.05	0.05	
MRII-3a	23618	2YR	35	46.18	48.51	47.37	48.53	0.000606	1.26	69.9	111.88	0.01	0.06	
MRII-3a	23618	10YR	107	46.18	49.36	48.22	49.38	0.000641	1.73	203.5	188.42	0.02	0.09	
MRII-3a	23618	25YR	163	46.18	49.76	48.21	49.79	0.000704	2	293.24	261.85	0.03	0.12	
MRII-3a	23618	Design Q	16	46.18	48.02	47	48.04	0.000775	1.16	13.75	48.86	0.06	0.05	
MRII-3a	23414	2YR	37	46.05	48.2		48.27	0.001954	2.09	20.19	44.07	0.1	0.16	
MRII-3a	23414	10YR	114	46.05	48.84		49.03	0.003835	3.76	63.75	96.83	0.28	0.46	
MRII-3a	23414	25YR	173	46.05	49.16	48.73	49.39	0.004363	4.42	99.92	129.32	0.36	0.61	
MRII-3a	23414	Design Q	16	46.05	47.73		47.77	0.001436	1.5	11.98	11.09	0.14	0.09	
MRII-3b	23224	2YR	20	46.03	47.84		47.88	0.001398	1.65	20.73	72.49	0.02	0.1	
MRII-3b	23224	10YR	44	46.03	48.43		48.46	0.000951	1.75	65.9	80.04	0.03	0.1	
MRII-3b	23224	25YR	64	46.03	48.72		48.76	0.000955	1.94	90.34	83.32	0.05	0.12	
MRII-3b	23224	Design Q	10	46.03	47.42		47.44	0.001442	1.31	7.65	8.73	0.1	0.07	
MRII-3b	23011	2YR	20	45.73	47.58		47.62	0.001272	1.61	16.5	23.61	0.07	0.1	
MRII-3b	23011	10YR	44	45.73	48.18		48.24	0.001366	2.14	44.27	80.74	0.05	0.15	
MRII-3b	23011	25YR	64	45.73	48.47		48.54	0.001389	2.37	68.87	84.71	0.06	0.18	
MRII-3b	23011	Design Q	10	45.73	47.16		47.18	0.001261	1.24	8.04	8.91	0.08	0.07	
MRII-3b	22814	2YR	20	45.43	47.28		47.31	0.001286	1.61	16.53	23.02	0.07	0.1	
MRII-3b	22814	10YR	44	45.43	47.85		47.91	0.001418	2.15	46.82	84.27	0.05	0.16	
MRII-3b	22814	25YR	64	45.43	48.14		48.21	0.00138	2.34	74.06	100.33	0.05	0.18	
MRII-3b	22814	Design Q	10	45.43	46.86		46.88	0.001275	1.25	8	8.9	0.08	0.07	
MRII-3b	22613	2YR	20	45.17	46.99		47.03	0.001404	1.66	15.94	26.03	0.07	0.11	
MRII-3b	22613	10YR	44	45.17	47.48		47.56	0.001923	2.41	30.07	31.79	0.16	0.2	
MRII-3b	22613	25YR	64	45.17	47.69		47.81	0.002574	3.01	45.44	76.61	0.13	0.3	
MRII-3b	22613	Design Q	10	45.17	46.58		46.61	0.001336	1.27	7.87	8.84	0.09	0.07	
MRII-3b	22423	2YR	20	44.92	46.73	45.9	46.77	0.001372	1.63	18.12	39.72	0.05	0.1	
MRII-3b	22423	10YR	44	44.92	47.14	46.36	47.2	0.001808	2.26	56.99	172.52	0.03	0.18	
MRII-3b	22423	25YR	64	44.92	47.33	46.71	47.39	0.001806	2.43	103.4	290.53	0.02	0.2	
MRII-3b	22423	Design Q	10	44.92	46.33	45.62	46.35	0.001341	1.27	7.86	8.83	0.09	0.07	

Muddy Run II Reaches 2, 3a, 3b, and 3c (HEC-RAS Output)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Power Total (lb/ft s)	Shear Chan (lb/sq ft)
MRII-3b	22225	2YR	20	44.74	46.29		46.36	0.003325	2.18	10.76	47.64	0.09	0.2
MRII-3b	22225	10YR	44	44.74	46.67		46.75	0.002972	2.55	49.08	117.47	0.07	0.24
MRII-3b	22225	25YR	64	44.74	46.86		46.94	0.002932	2.77	73.37	145.03	0.08	0.27
MRII-3b	22225	Design Q	10	44.74	45.97		46.01	0.002437	1.58	6.33	8.07	0.18	0.11
MRII-3b	22020	2YR	20	44.21	45.94		45.97	0.001158	1.44	37.08	112.06	0.01	0.08
MRII-3b	22020	10YR	44	44.21	46.31		46.34	0.00131	1.83	86.87	187.94	0.02	0.12
MRII-3b	22020	25YR	64	44.21	46.49		46.53	0.001397	2.03	124.2	222.32	0.03	0.14
MRII-3b	22020	Design Q	10	44.21	45.59		45.62	0.001466	1.31	7.67	22.51	0.04	0.08
MRII-3b	21812	2YR	20	43.87	45.67		45.7	0.001366	1.62	22.11	69.9	0.02	0.1
MRII-3b	21812	10YR	44	43.87	45.99		46.03	0.001673	2.08	73.16	196.27	0.02	0.16
MRII-3b	21812	25YR	64	43.87	46.15		46.2	0.001734	2.27	106.59	208.73	0.03	0.18
MRII-3b	21812	Design Q	10	43.87	45.32		45.34	0.001176	1.21	8.24	9.06	0.08	0.06
MRII-3b	21613	2YR	20	43.7	45.37	44.67	45.41	0.001613	1.64	32.14	151.7	0.01	0.11
MRII-3b	21613	10YR	44	43.7	45.64	45.35	45.68	0.001945	2.07	80.68	214.49	0.02	0.16
MRII-3b	21613	25YR	64	43.7	45.77	45.5	45.82	0.002187	2.34	111.83	245.03	0.04	0.2
MRII-3b	21613	Design Q	10	43.7	45.04		45.07	0.001677	1.38	7.24	8.54	0.12	0.08
MRII-3b	21412	2YR	20	43.25	44.23	44.23	44.54	0.02653	4.53	4.42	15.54	4.5	0.99
MRII-3b	21412	10YR	44	43.25	44.66	44.66	44.84	0.01349	4.03	32.2	200.85	0.28	0.7
MRII-3b	21412	25YR	64	43.25	44.73	44.73	44.89	0.014363	4.32	63.03	345.3	0.17	0.79
MRII-3b	21412	Design Q	10	43.25	43.94	43.94	44.17	0.029564	3.83	2.61	5.85	3.04	0.79
MRII-3c	21214	2YR	27	40.29	41.97		42.03	0.002385	1.98	13.65	12.26	0.31	0.16
MRII-3c	21214	10YR	70	40.29	43.01		43.11	0.00203	2.5	28.02	15.26	0.53	0.21
MRII-3c	21214	25YR	106	40.29	43.62		43.74	0.002008	2.8	37.85	17	0.71	0.25
MRII-3c	21214	Design Q	16	40.29	41.57		41.62	0.00284	1.78	9	10.98	0.25	0.14
MRII-3c	21020	2YR	27	39.43	41.58		41.63	0.001755	1.88	14.39	10.72	0.25	0.13
MRII-3c	21020	10YR	70	39.43	42.6		42.71	0.002095	2.61	26.84	13.57	0.6	0.23
MRII-3c	21020	25YR	106	39.43	43.2		43.33	0.002212	2.97	40.49	41.62	0.33	0.28
MRII-3c	21020	Design Q	16	39.43	41.17		41.21	0.001608	1.56	10.26	9.59	0.16	0.1
MRII-3c	20808	2YR	27	39.13	41.12		41.19	0.002495	2.13	12.7	10.27	0.38	0.18
MRII-3c	20808	10YR	70	39.13	42.02		42.17	0.003138	3.02	23.17	12.8	0.96	0.32
MRII-3c	20808	25YR	106	39.13	42.57		42.76	0.003375	3.47	30.54	14.31	1.38	0.4
MRII-3c	20808	Design Q	16	39.13	40.77		40.82	0.002099	1.71	9.35	9.32	0.21	0.12
MRII-3c	20600	2YR	27	38.93	40.23		40.37	0.007006	2.94	9.19	10.28	1.09	0.37
MRII-3c	20600	10YR	70	38.93	41.17		41.35	0.004925	3.44	20.35	13.39	1.48	0.43
MRII-3c	20600	25YR	106	38.93	41.71		41.94	0.004564	3.79	27.93	14.7	1.86	0.49
MRII-3c	20600	Design Q	16	38.93	39.87		40	0.009777	2.79	5.74	9.06	1.04	0.37
MRII-3c	20400	2YR	27	37.65	39.67		39.72	0.001741	1.8	15.02	12.2	0.23	0.13
MRII-3c	20400	10YR	70	37.65	40.69		40.77	0.001771	2.31	33.49	21.92	0.32	0.18
MRII-3c	20400	25YR	106	37.65	41.26		41.36	0.001788	2.57	47.15	25.91	0.42	0.22
MRII-3c	20400	Design Q	16	37.65	39.26		39.3	0.001694	1.54	10.37	10.45	0.15	0.1
MRII-3c	20200	2YR	27	37.49	39.29	38.46	39.35	0.002001	1.88	14.35	12.11	0.26	0.14
MRII-3c	20200	10YR	70	37.49	40.3	39.08	40.39	0.002003	2.42	29.86	20.84	0.39	0.2
MRII-3c	20200	25YR	106	37.49	40.87	39.46	40.98	0.002002	2.69	42.8	24.71	0.5	0.24
MRII-3c	20200	Design Q	16	37.49	38.89	38.23	38.93	0.002002	1.63	9.83	10.4	0.18	0.11

Muddy Run II Reaches 5a and 5b (HEC-RAS Output)

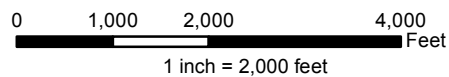
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Power Total (lb/ft s)	Shear Chan (lb/sq ft)
MRII-5a	4105	2-YR	67	38.70	41.75		41.80	0.0057	1.80	42.99	39.21	0.59	0.73
MRII-5a	4105	10-YR	183	38.70	42.81		42.86	0.0051	2.23	153.63	306.89	0.19	0.97
MRII-5a	4105	25-YR	271	38.70	43.14		43.17	0.0041	2.13	288.41	628.97	0.11	0.85
MRII-5a	4105	Design Q	40	38.70	41.29		41.33	0.0058	1.55	26.87	28.32	0.49	0.58
MRII-5a	3900	2-YR	67	38.37	41.17		41.24	0.0016	2.18	44.99	60.32	0.11	0.18
MRII-5a	3900	10-YR	183	38.37	42.12		42.24	0.0020	3.20	134.02	307.97	0.07	0.33
MRII-5a	3900	25-YR	271	38.37	42.54		42.64	0.0018	3.30	327.98	513.73	0.06	0.34
MRII-5a	3900	Design Q	40	38.37	40.75		40.80	0.0015	1.79	22.31	14.90	0.23	0.13
MRII-5a	3699	2-YR	67	38.09	40.77	39.66	40.87	0.0022	2.47	30.61	60.20	0.22	0.23
MRII-5a	3699	10-YR	183	38.09	41.75	40.72	41.85	0.0018	2.99	170.73	196.01	0.10	0.29
MRII-5a	3699	25-YR	271	38.09	42.21	41.29	42.29	0.0016	3.14	314.92	469.16	0.06	0.31
MRII-5a	3699	Design Q	40	38.09	40.44	39.32	40.49	0.0015	1.82	21.94	32.53	0.25	0.13
MRII-5a	3509	2-YR	67	37.83	40.56	39.41	40.59	0.0009	1.64	86.94	100.50	0.04	0.10
MRII-5a	3509	10-YR	183	37.83	41.54	40.44	41.59	0.0010	2.24	232.16	381.51	0.05	0.16
MRII-5a	3509	25-YR	271	37.83	42.00	40.44	42.05	0.0010	2.48	453.58	814.53	0.03	0.19
MRII-5a	3509	Design Q	40	37.83	40.13	39.05	40.19	0.0017	1.88	21.23	45.26	0.27	0.14
MRII-5a	3300	2-YR	67	37.49	40.28	39.07	40.34	0.0015	2.12	50.17	171.94	0.10	0.17
MRII-5a	3300	10-YR	183	37.49	41.18	40.18	41.29	0.0020	3.17	124.01	553.49	0.19	0.33
MRII-5a	3300	25-YR	271	37.49	41.60	40.58	41.74	0.0022	3.66	186.79	667.54	0.21	0.42
MRII-5a	3300	Design Q	40	37.49	39.77	38.72	39.83	0.0018	1.91	20.89	59.91	0.29	0.15
MRII-5a	3099	2-YR	67	37.16	39.91	38.74	40.00	0.0020	2.39	30.36	55.60	0.27	0.21
MRII-5a	3099	10-YR	183	37.16	40.81	39.74	40.90	0.0018	3.00	132.20	168.22	0.22	0.30
MRII-5a	3099	25-YR	271	37.16	41.14	40.25	41.28	0.0024	3.69	169.98	261.19	0.29	0.43
MRII-5a	3099	Design Q	40	37.16	39.40	38.39	39.46	0.0019	1.97	20.32	32.46	0.31	0.16
MRII-5a	2899	2-YR	67	36.81	39.48	38.39	39.57	0.0023	2.50	29.02	53.78	0.28	0.24
MRII-5a	2899	10-YR	183	36.81	40.51	39.41	40.58	0.0014	2.63	148.59	118.26	0.18	0.23
MRII-5a	2899	25-YR	271	36.81	40.68	39.89	40.80	0.0024	3.59	162.10	127.46	0.46	0.41
MRII-5a	2899	Design Q	40	36.81	38.99	38.04	39.06	0.0021	2.05	19.49	31.81	0.36	0.17
MRII-5a	2700	2-YR	67	36.52	38.62	38.10	38.83	0.0071	3.66	18.33	34.95	2.05	0.56
MRII-5a	2700	10-YR	183	36.52	39.47	39.16	39.96	0.0098	5.72	39.92	71.48	2.79	1.19
MRII-5a	2700	25-YR	271	36.52	39.99	39.67	40.18	0.0042	4.36	138.34	110.43	0.63	0.64
MRII-5a	2700	Design Q	40	36.52	38.29	37.75	38.41	0.0053	2.85	14.01	31.46	1.03	0.36
MRII-5b	2499	2-YR	79	34.65	36.68		37.00	0.0115	4.55	17.36	13.43	3.99	0.88
MRII-5b	2499	10-YR	215	34.65	38.15		38.51	0.0055	5.00	60.51	39.93	1.78	0.84
MRII-5b	2499	25-YR	317	34.65	38.90		39.28	0.0045	5.37	92.89	46.95	1.85	0.89
MRII-5b	2499	Design Q	54	34.65	36.24		36.56	0.0154	4.54	11.89	11.59	4.27	0.94
MRII-5b	2301	2-YR	79	32.79	35.72		35.86	0.0032	3.02	26.13	12.99	1.04	0.34
MRII-5b	2301	10-YR	215	32.79	37.22		37.53	0.0044	4.47	48.11	16.42	2.99	0.67
MRII-5b	2301	25-YR	317	32.79	37.93		38.36	0.0047	5.26	61.76	22.28	3.62	0.87
MRII-5b	2301	Design Q	54	32.79	35.28		35.39	0.0029	2.62	20.62	11.95	0.71	0.27
MRII-5b	2099	2-YR	79	32.13	35.13	33.87	35.24	0.0030	2.65	29.76	18.13	0.74	0.28
MRII-5b	2099	10-YR	215	32.13	36.58	35.11	36.77	0.0030	3.53	60.94	24.03	1.51	0.43
MRII-5b	2099	25-YR	317	32.13	37.31	35.65	37.56	0.0030	4.00	79.60	30.45	1.77	0.52
MRII-5b	2099	Design Q	54	32.13	34.71	33.54	34.79	0.0030	2.39	22.56	15.99	0.57	0.24



Drainage Area = 1.4 mi²



USGS/Watershed Map
Muddy Run II Site



- Proposed Streams
- Waterbodies
- Muddy Run II Proposed Easement
- Muddy Run Easement
- Drainage Area

Project: Muddy Run II Mitigation Site
 Table Description: NC HWY 41 - HY-8 Analysis Results
 Prepared By: FM & DK
 Dated: Septmeber 4, 2012

Headwater Elevation (ft)	Total Discharge (cfs)	HWY 41 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
35.68	81	81	0	1
36.45	132.9	132.9	0	1
37.07	184.8	184.8	0	1
37.78	236.7	236.7	0	1
38.5	288.6	288.6	0	1
39.16	340.5	340.5	0	1
39.88	392.4	392.4	0	1
40.67	444	444	0	1
41.45	496.2	496.2	0	1
42.02	548.1	523.23	24.56	9
42.18	600	509.85	89.76	6
41.9	527.75	527.75	0	Overtopping

- NCDOT design storm for culvert is 50-year flow.
- HY8 results show road overtopping at 527.75 cfs.
- USGS Regional Regression Q50 = 446 cfs.
- Approximate Q100 with flow diversion = 522 cfs.

Subject: Duplin NC 41 Pipe Size

Date: Fri, 22 Jul 2005 15:32:35 -0400

From: "Jerry L. Lindsey, P.E." <jlindsey@dot.state.nc.us>

Organization: North Carolina Department of Transportation

To: "Donald L. Rich" <drich@dot.state.nc.us>

CC: "Greg L. Basinger" <glbasinger@dot.state.nc.us> ,
"Karen E. Fussell PE" <kfussell@dot.state.nc.us>

Don,

The pipe size you requested is as follows:

NC 41 0.1 miles southwest of junction with NC 111

Drainage area = 1.4 square miles

Existing structure reported as 1@60,2@48 with +/- 10' bed to crown

Recommended pipe size is 1 @ 102" with headwall

Alternate pipe size is 1 @ 117" X 79" with headwall

2nd alternate is 2 @ 78" with headwall

This recommendation is made from an office review only. Specific site conditions or limitations may dictate the use of alternate structures. If such conditions are noted, please contact this office for further analysis.

Jerry Lindsey

Jerry L. Lindsey, P.E. <jlindsey@dot.state.nc.us>

Regional Hydraulics Engineer

Hydraulics Unit, Highway Design Branch, Preconstruction, Division of Highways

Received 7-27-05

ANTICIPATED DATE

8-15-05

MINIMUM CRITERIA DETERMINATION CHECKLIST

The following questions provide direction in determining when the Department is required to prepare environmental documents for state-funded construction and maintenance activities. Answer questions for Parts A through C by checking either "Yes" or "No". Complete Part D of the checklist when Minimum Criteria Rule categories #8, 12(i) or #15 are used.

TIP Project No.: n/a

State Project No.: n/a

Project Location: Duplin Co - NC 41 - 600' West of NC 111/41

Project Description: Remove one(1) existing 50' line @ 60" CMP and two(2) existing 48" lines @ 48" RCP on a 90 degree skew and replace with one 55" line @ 102" CMP Aluminum with inlet/outlet aluminum basewalls (22'6" w x 10'/11' h respectively) on 76 degree skew . Note: Pipe lengthen due to existing perched conditions and skew adjustment.

Anticipated Permit or Consultation Requirements: COE/DWQ/DCM

Special Project Information: Stream profile: 15' Downstream - water depth is 4', stream width at water is 20', stream width at top of bank is 20' due to blowhole. 15' Upstream - water depth is 1.5', stream width at water is 8', stream width at top of bank is 20'.

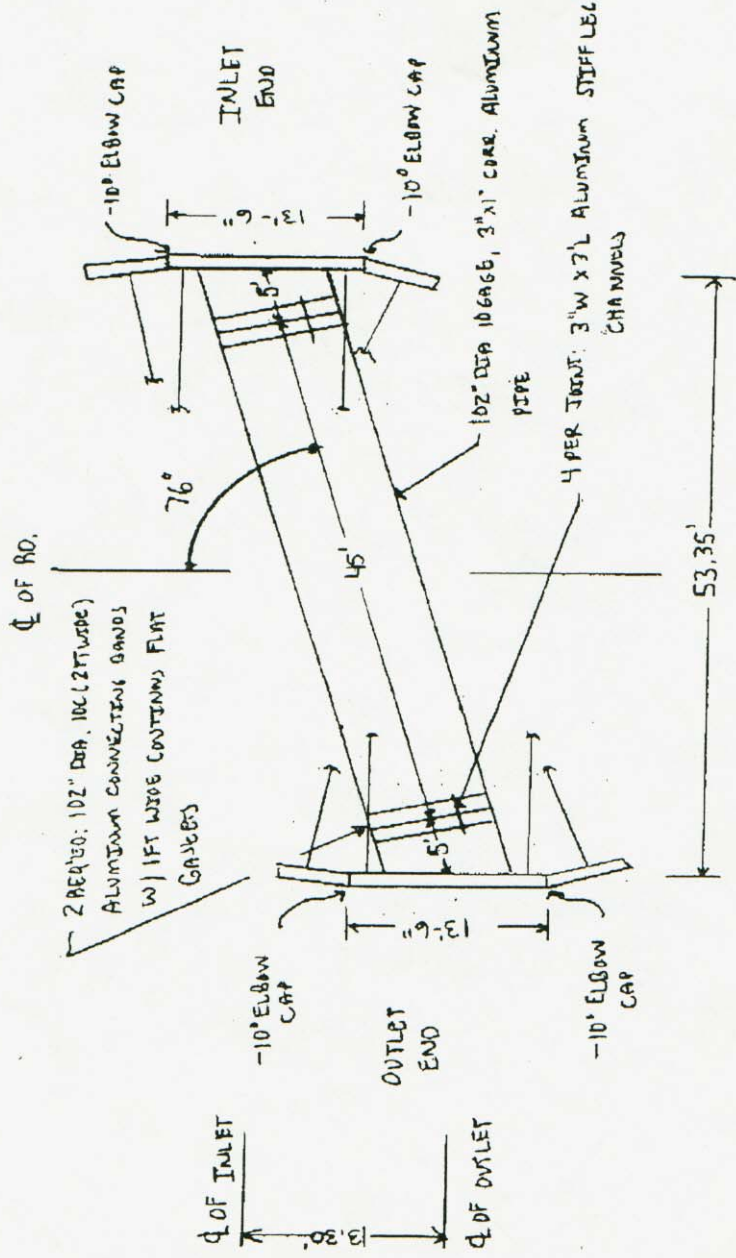
GPS 34.83292 N / 77.80261 W

UT Muddy Creek - CSW

Work authorized under USACE NWP 3. Written authorization from USACE not required. No rip rap to be place in or on banks of stream. Proceed

PLAN VIEW

NOTE: DUE TO COVER RESTRAINTS, PIPE TO BE BACK FILLED WITH #6 OR #7 STONE TO THE TOP OF THE PIPE AND ABC FROM TOP OF PIPE TO THE FINISHED SUB-GRADE



NC DOT BRIDGE MAINT. - DIV 3
 PROJECT: NC 41 600' W OF THE INTERSECTION NC 111/41
 DUBLIN COUNTY, N.C.

**WETLAND RESTORATION-MUDDY RUN II
COASTAL PLAIN SMALL STREAM SWAMP
AVERAGE MONTHLY RUNOFF (Local Watershed)
Proposed Wetland WA Restoration Site**

Land Cover	Watershed draining into upstream wetland		
Watershed	Acres	CN	Acres x CN
Developed/farmstead	0.63	86	53.8
Clear-Cut	5.28	77	406.7
Cultivated	2.78	80	222.1
Total Watershed Acres			Composite CN
8.7			78.61

Monthly Runoff Averages (acre inches)

	January	February	March	April	May	June	July	August	September	October	November	December
Monthly Average Runoff (Q)	0.73	0.85	1.08	0.85	1.10	1.38	2.36	1.93	2.44	1.30	0.86	0.69
Wetland WA Drainage Basin Estimated Runoff	6.35	7.37	9.37	7.37	9.56	11.97	20.52	16.78	21.22	11.29	7.47	6.01

Curve Number
CN = 78.61

24-HR Rainfall Record
P24 = 6.6

Rainfall Needed for Runoff
Q = 0.6898

HYDROGRAPH NET VALUES

Wetland A (Upstream)

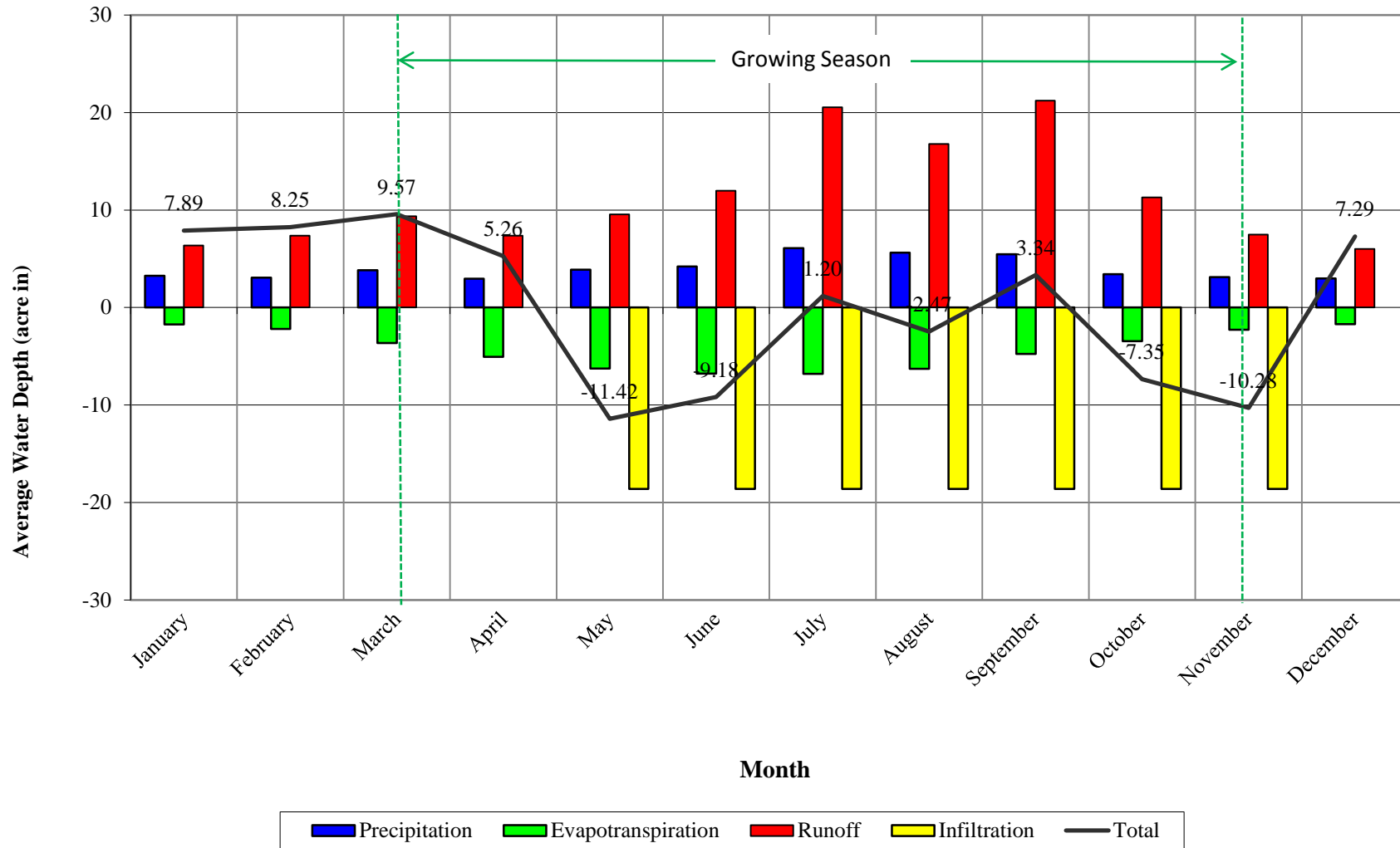
	January	February	March	April	May	June	July	August	September	October	November	December	Total
Precipitation	3.26	3.07	3.83	2.95	3.89	4.21	6.08	5.62	5.47	3.42	3.12	2.97	47.89
Evapotranspiration	-1.72	-2.19	-3.63	-5.05	-6.26	-6.77	-6.81	-6.27	-4.75	-3.46	-2.27	-1.70	-50.87
Infiltration+	0.0	0.0	0.0	0.0	-18.6	-18.6	-18.6	-18.6	-18.6	-18.6	-18.6	0.0	-130.20
Watershed Runoff	6.35	7.37	9.37	7.37	9.56	11.97	20.52	16.78	21.22	11.29	7.47	6.01	135.26
Total	7.89	8.25	9.57	5.26	-11.42	-9.18	1.20	-2.47	3.34	-7.35	-10.28	7.29	2.09

Precipitation data from Warsaw

ET data calculated from weather data from Warsaw

+ based on estimated infiltration of 1millimeter per hour

HYDROGRAPH FOR WETLAND RESTORATION/ ENHANCEMENT MUDDY RUN II- PROPOSED WETLAND WA



References:
The North Carolina State Climatologist;

**WETLAND RESTORATION-MUDDY RUN II
COASTAL PLAIN SMALL STREAM SWAMP
AVERAGE MONTHLY RUNOFF (Local Watershed)
Proposed Wetland WB Restoration Site**

Land Cover	Watershed 5 draining into downstream wetland		
Watershed	Acres	CN	Acres x CN
Forested	1.11	55	61.1
Cultivated	3.80	85	323.0
Total Watershed Acres			Composite CN
4.9			78.22

Monthly Runoff Averages (acre inches)

	January	February	March	April	May	June	July	August	September	October	November	December
Monthly Average Runoff (Q)	0.73	0.85	1.08	0.85	1.10	1.38	2.36	1.93	2.44	1.30	0.86	0.69
Wetland WA Drainage Basin Estimated Runoff	3.59	4.17	5.30	4.16	5.40	6.77	11.60	9.49	12.00	6.38	4.22	3.40

Curve Number
CN = 78.22

24-HR Rainfall Record
P24 = 6.6

Rainfall Needed for Runoff
Q = 0.6898

HYDROGRAPH NET VALUES

Wetland B (Upstream)

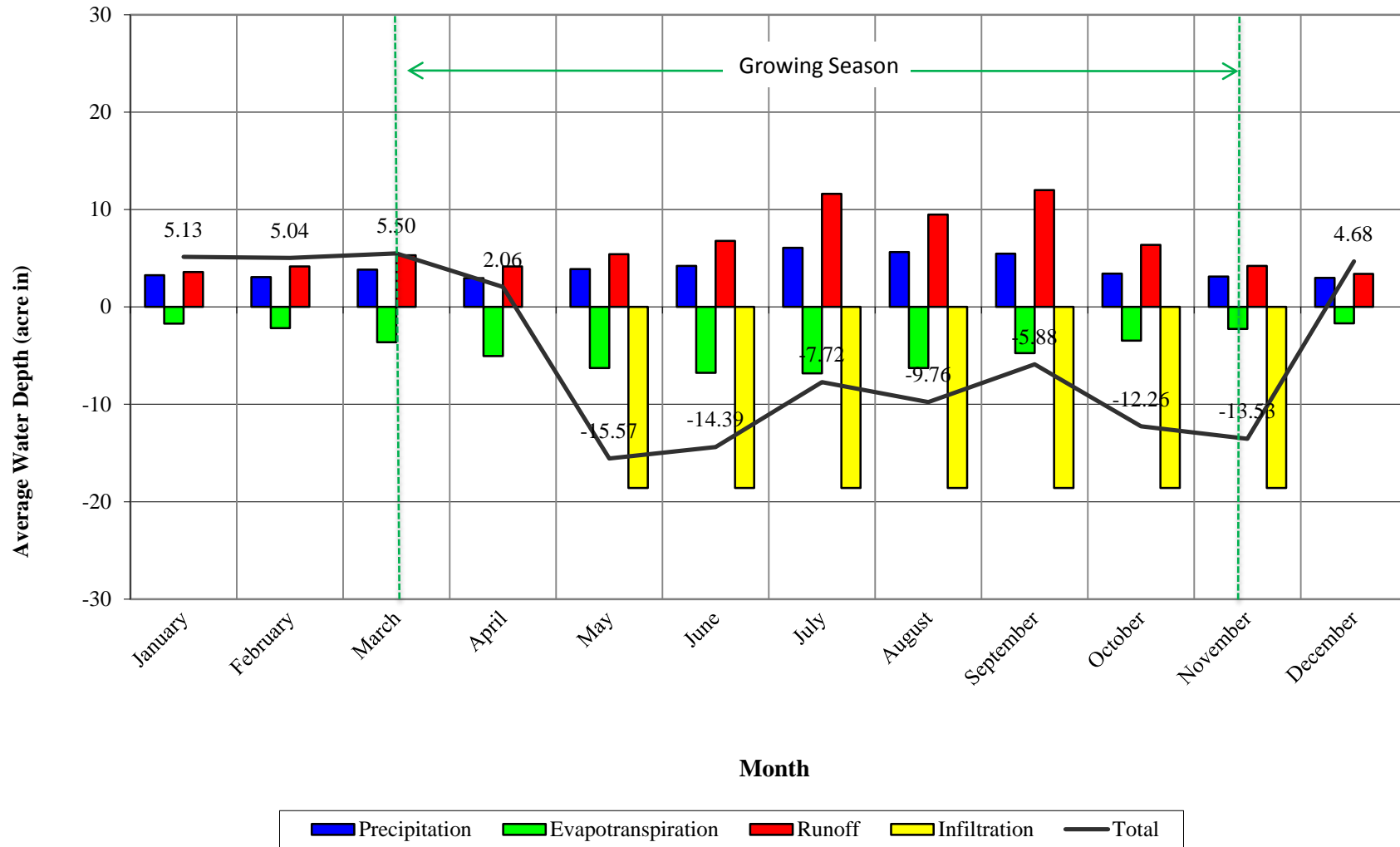
	January	February	March	April	May	June	July	August	September	October	November	December	Total
Precipitation	3.26	3.07	3.83	2.95	3.89	4.21	6.08	5.62	5.47	3.42	3.12	2.97	47.89
Evapotranspiration	-1.72	-2.19	-3.63	-5.05	-6.26	-6.77	-6.81	-6.27	-4.75	-3.46	-2.27	-1.70	-50.87
Infiltration+	0.0	0.0	0.0	0.0	-18.6	-18.6	-18.6	-18.6	-18.6	-18.6	-18.6	0.0	-130.20
Watershed Runoff	3.59	4.17	5.30	4.16	5.40	6.77	11.60	9.49	12.00	6.38	4.22	3.40	76.48
Total	5.13	5.04	5.50	2.06	-15.57	-14.39	-7.72	-9.76	-5.88	-12.26	-13.53	4.68	-56.70

Precipitation data from Warsaw

ET data calculated from weather data from Warsaw

+ based on estimated infiltration of 1millimeter per hour

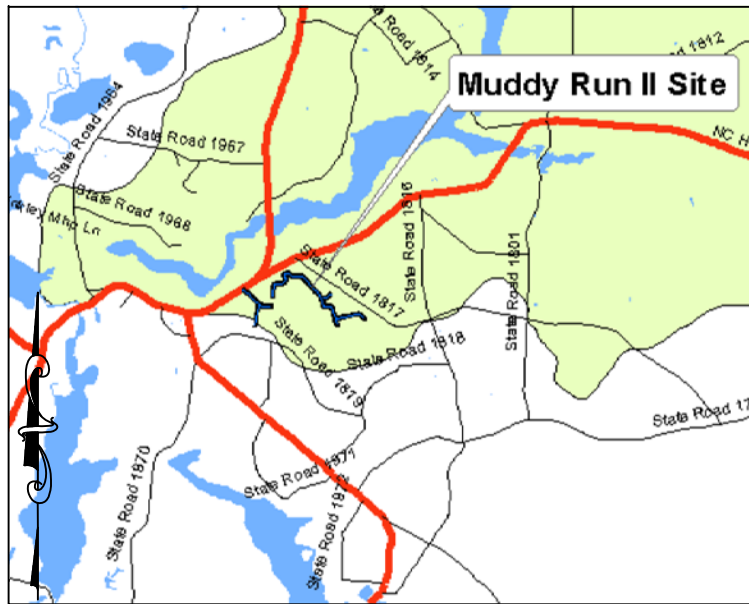
**HYDROGRAPH FOR
WETLAND RESTORATION/ ENHANCEMENT
MUDDY RUN II
PROPOSED WETLAND WB**



References:
The North Carolina State Climatologist;

APPENDIX D

Muddy Run II Design Plan Sheets



VICINITY MAP
NTS

MUDDY RUN II MITIGATION PROJECT

NCEP PROJECT ID #95354

JUNE 2013

LOCATION: DUPLIN COUNTY, NORTH CAROLINA

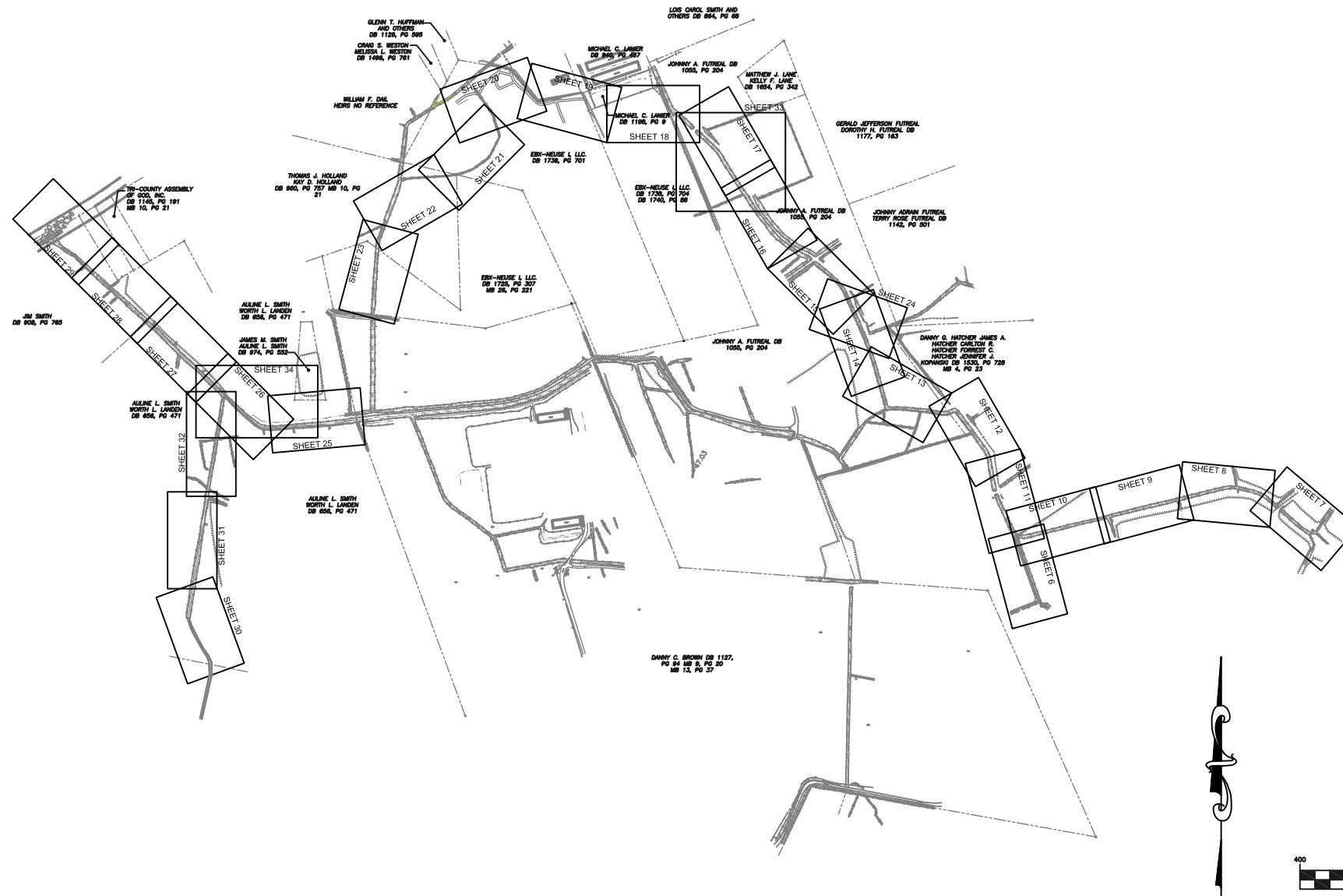
ENVIRONMENTAL BANC & EXCHANGE, LLC

909 CAPABILITY DRIVE, SUITE 3100

RALEIGH, NC 27606



DRAWING LIST	
SHEET NO.	DRAWING TITLE
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2	Existing Conditions
3	Existing Conditions
4	Existing Conditions
5	Existing Conditions
6	Plan And Profile - Reach 1
7	Plan And Profile - Reach 2
8	Plan And Profile - Reach 2
9	Plan And Profile - Reach 2
10	Plan And Profile - Reach 2
11	Plan And Profile - Reach 3A
12	Plan And Profile - Reach 3A
13	Plan And Profile - Reach 3A
14	Plan And Profile - Reach 3A
15	Plan And Profile - Reach 3A
16	Plan And Profile - Reach 3A
17	Plan And Profile - Reach 3A
18	Plan And Profile - Reach 3A & 3B
19	Plan And Profile - Reach 3B
20	Plan And Profile - Reach 3B
21	Plan And Profile - Reach 3B
22	Plan And Profile - Reach 3B & 3C
23	Plan And Profile - Reach 3C
24	Plan And Profile - Reach 4
25	Plan And Profile - Reach 5A
26	Plan And Profile - Reach 5A
27	Plan And Profile - Reach 5A
28	Plan And Profile - Reach 5A
29	Plan And Profile - Reach 5B
30	Plan And Profile - Reach 6
31	Plan And Profile - Reach 6
32	Plan And Profile - Reach 6
33	Welland A
34	Welland B
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36	Planting Plan
37	Planting Plan
38	Detail 1
39	Detail 2
40	Detail 3
41	Detail 4
42	Detail 5



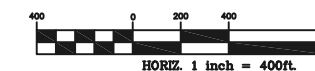
PRELIMINARY
NOT FOR CONSTRUCTION

DESIGN CONSULTANT



720 CORPORATE CENTER DR
RALEIGH, NC 27607
(919) 782-0495

NC LICENSE NO. F-0374





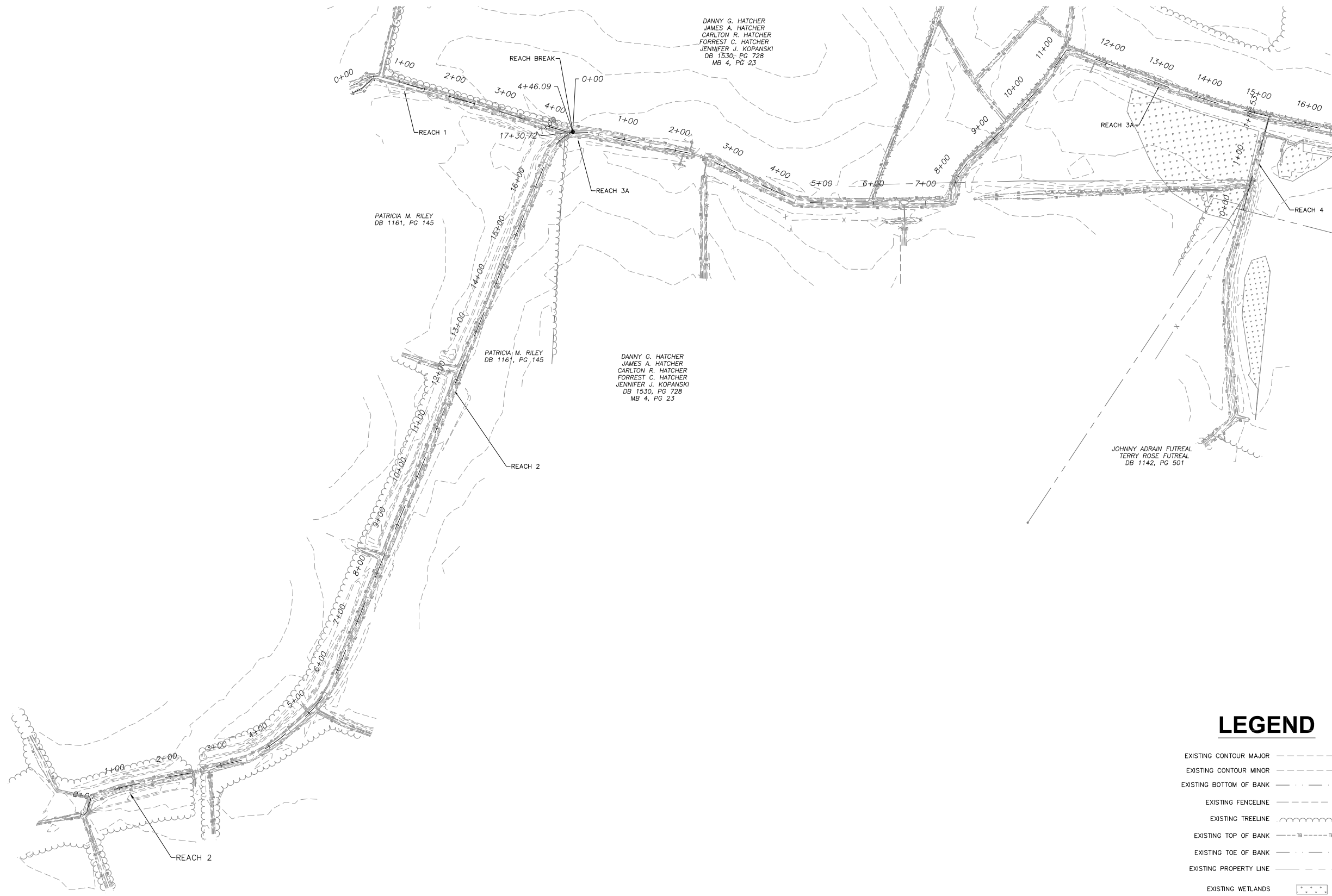
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 2" = FULL SCALE
 1" = HALF SCALE

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				PRELIMINARY - NOT FOR CONSTRUCTION	5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANK & EXCHANGE, LLC
 DRAWING TITLE: Existing Conditions
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13

DRAWING NUMBER:
2
 PROJ. NO.:
 20120090.00.RA



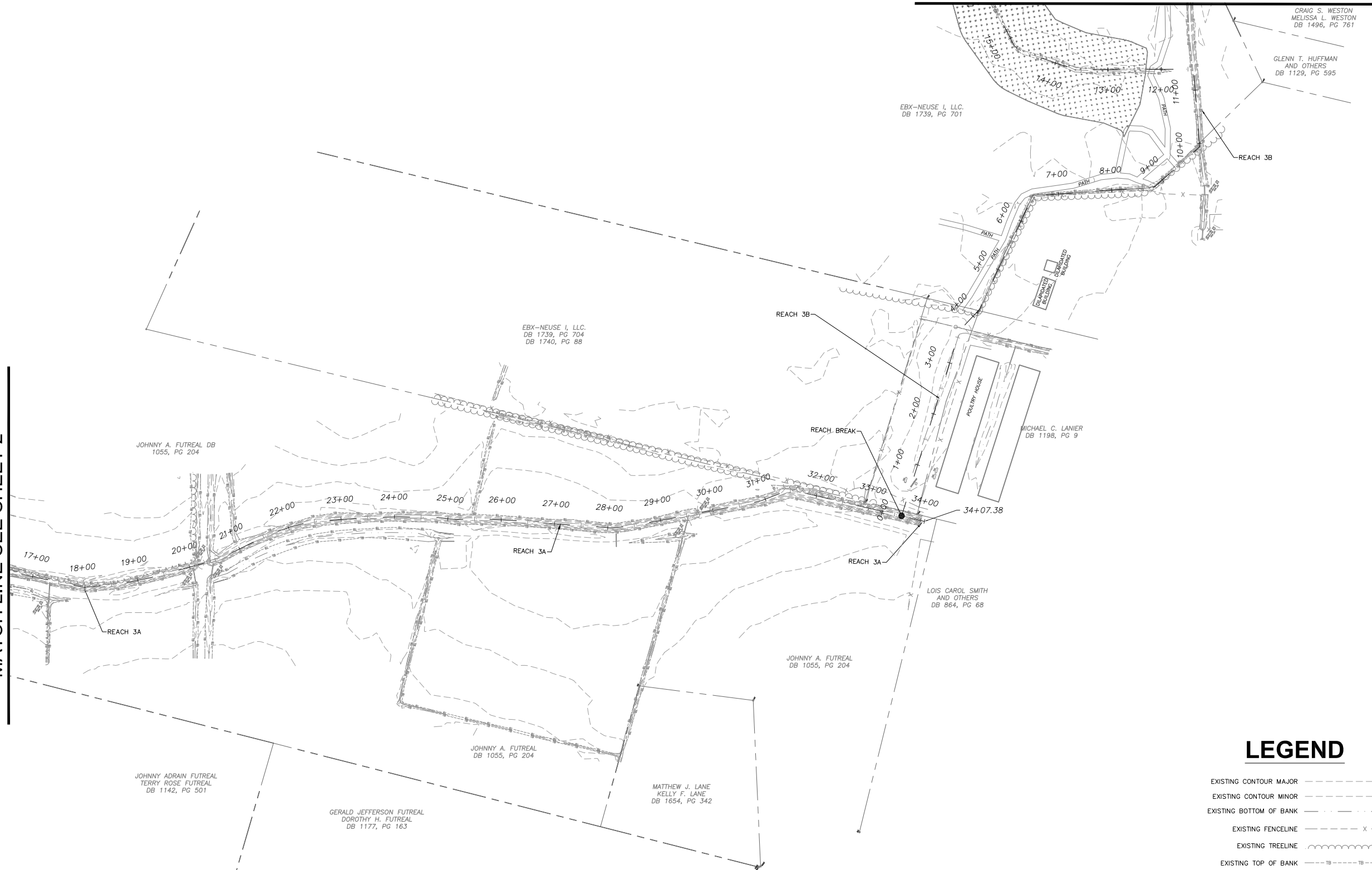
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LEGEND

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- EXISTING CONTOUR MINOR - - - - -
- EXISTING BOTTOM OF BANK - - - - -
- EXISTING FENCELINE - - - - - X - - - - -
- EXISTING TREELINE ~~~~~
- EXISTING TOP OF BANK - - - - -
- EXISTING TOE OF BANK - - - - -
- EXISTING PROPERTY LINE - - - - -
- EXISTING WETLANDS [Symbol]

MATCH LINE SEE SHEET 2

MATCH LINE SEE SHEET 4



LEGEND

- EXISTING CONTOUR MAJOR -----
- EXISTING CONTOUR MINOR - - - - -
- EXISTING BOTTOM OF BANK - - - - -
- EXISTING FENCELINE ----- X -----
- EXISTING TREELINE ~~~~~
- EXISTING TOP OF BANK - - - - -
- EXISTING TOE OF BANK - - - - -
- EXISTING PROPERTY LINE -----
- EXISTING WETLANDS [Symbol]

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 (f) 919.782.9672
 www.wkdickson.com
 NC LICENSE NO. F-0074



FULL SCALE: 1"=100
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 2" = FULL SCALE
 1" = HALF SCALE

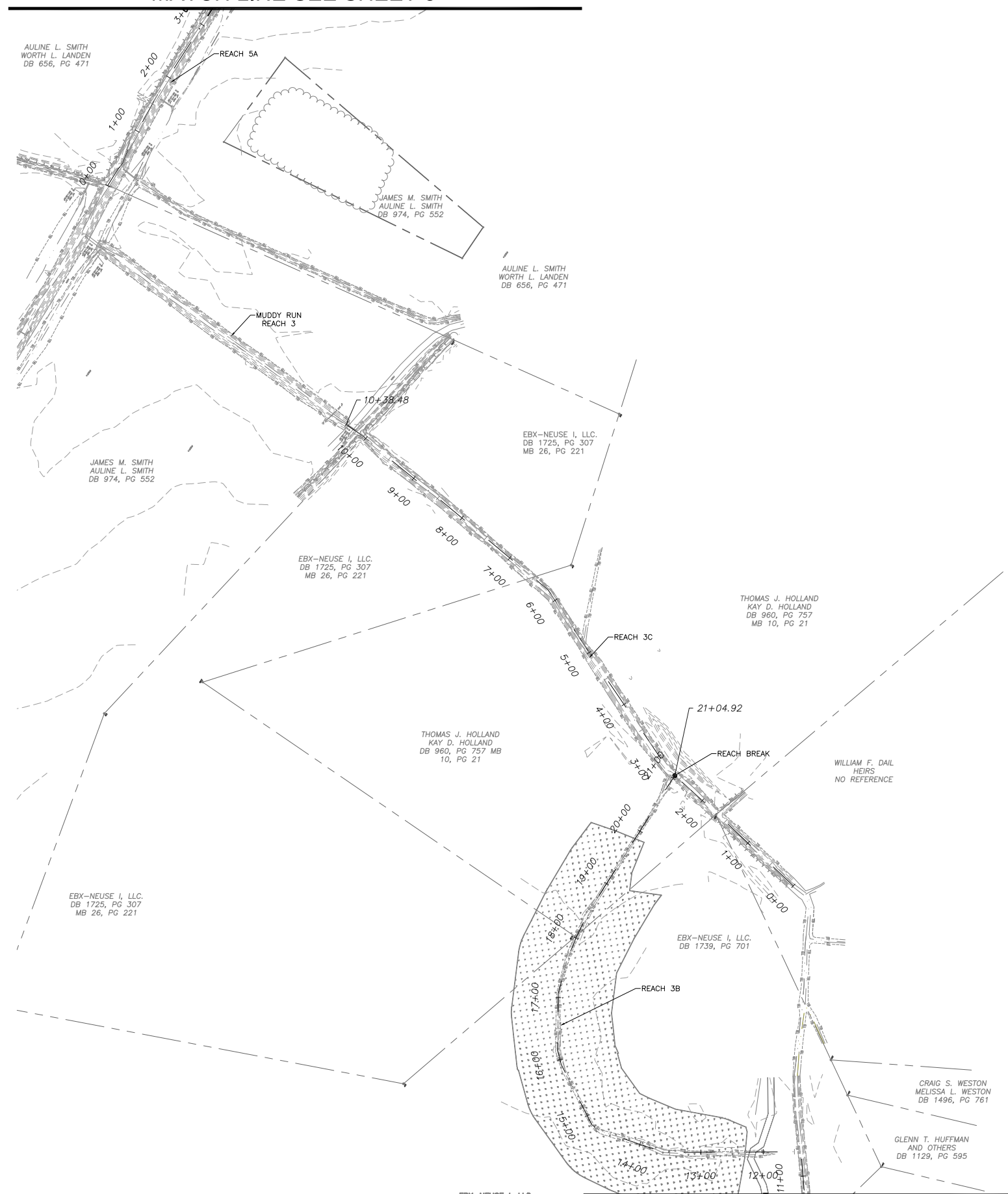
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					5/1/13

PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Existing Conditions
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
3
 PROJ. NO.:
 20120090.00.RA

MATCH LINE SEE SHEET 5



MATCH LINE SEE SHEET 3

LEGEND

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- EXISTING CONTOUR MINOR - - - - -
- EXISTING BOTTOM OF BANK - - - - -
- EXISTING FENCELINE ----- X -----
- EXISTING TREELINE ~~~~~
- EXISTING TOP OF BANK - - - - -
- EXISTING TOE OF BANK - - - - -
- EXISTING PROPERTY LINE -----
- EXISTING WETLANDS [Symbol]

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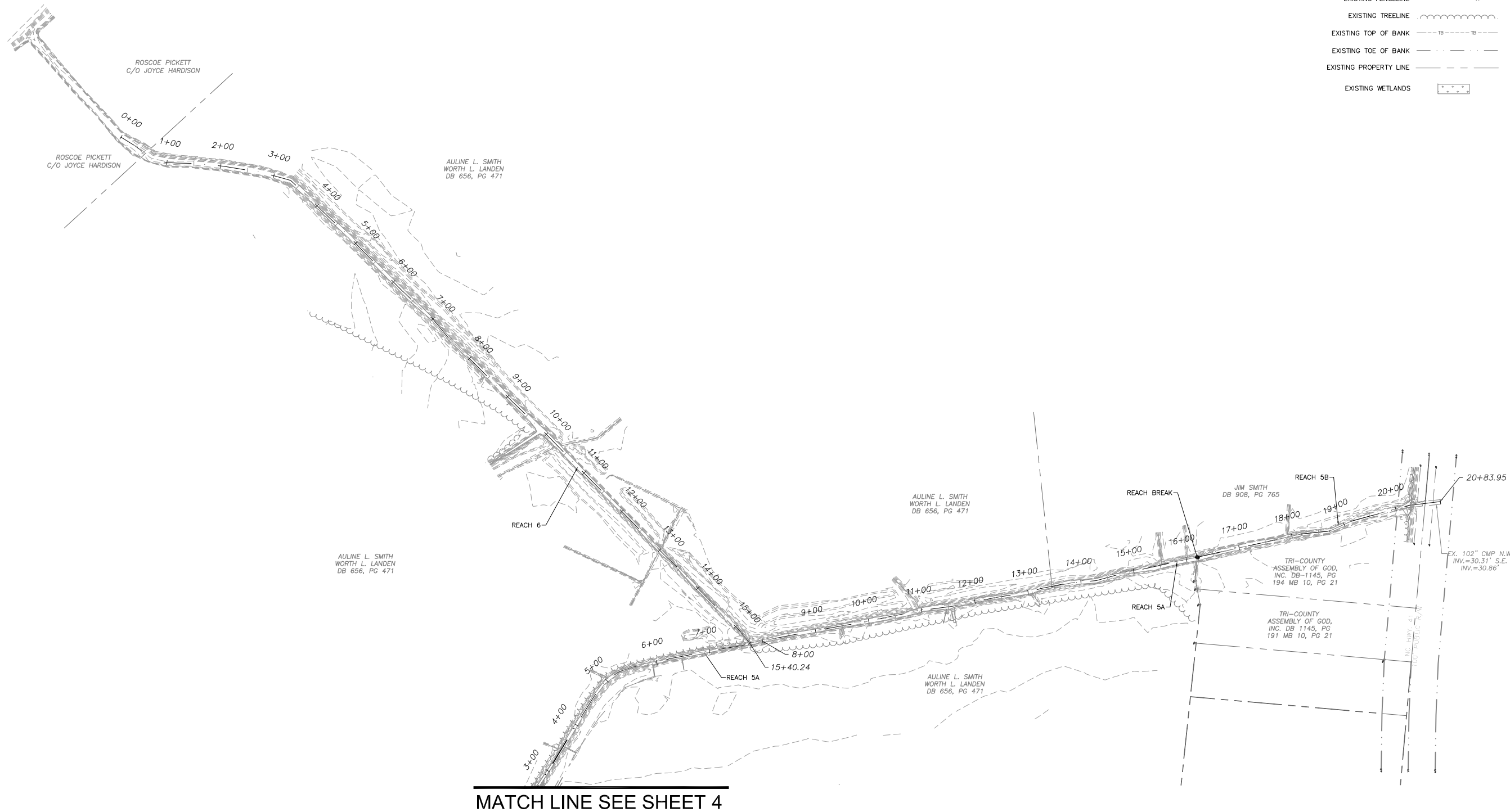
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				PRELIMINARY - NOT FOR CONSTRUCTION	5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Existing Conditions
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13

DRAWING NUMBER:
4
 PROJ. NO.:
 20120090.00.RA



LEGEND

- EXISTING CONTOUR MAJOR -----
- EXISTING CONTOUR MINOR -----
- EXISTING BOTTOM OF BANK -----
- EXISTING FENCELINE ----- X -----
- EXISTING TREELINE -----
- EXISTING TOP OF BANK ----- TB ----- TB -----
- EXISTING TOE OF BANK -----
- EXISTING PROPERTY LINE -----
- EXISTING WETLANDS -----

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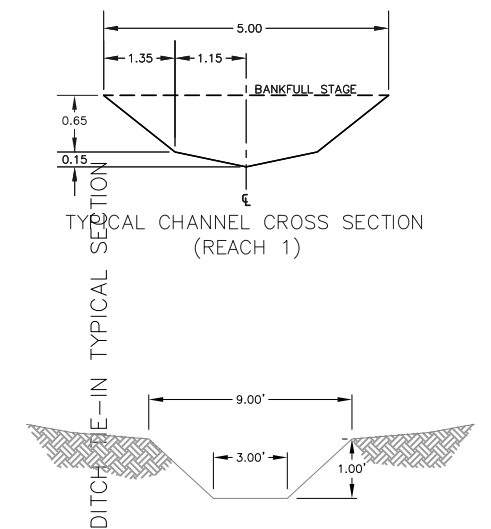
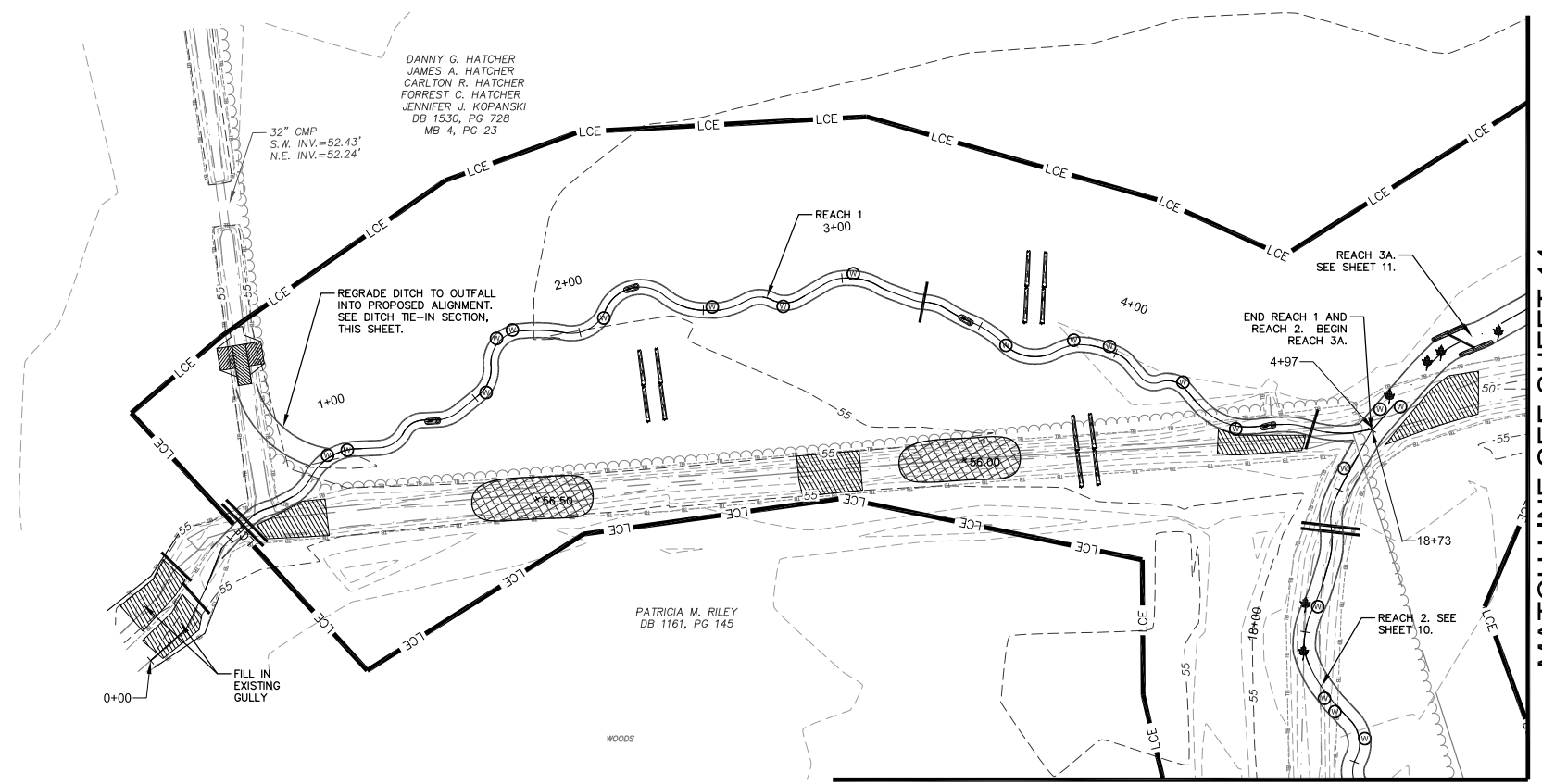
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				PRELIMINARY - NOT FOR CONSTRUCTION	5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Existing Conditions
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C. DATE: FM 01-23-13

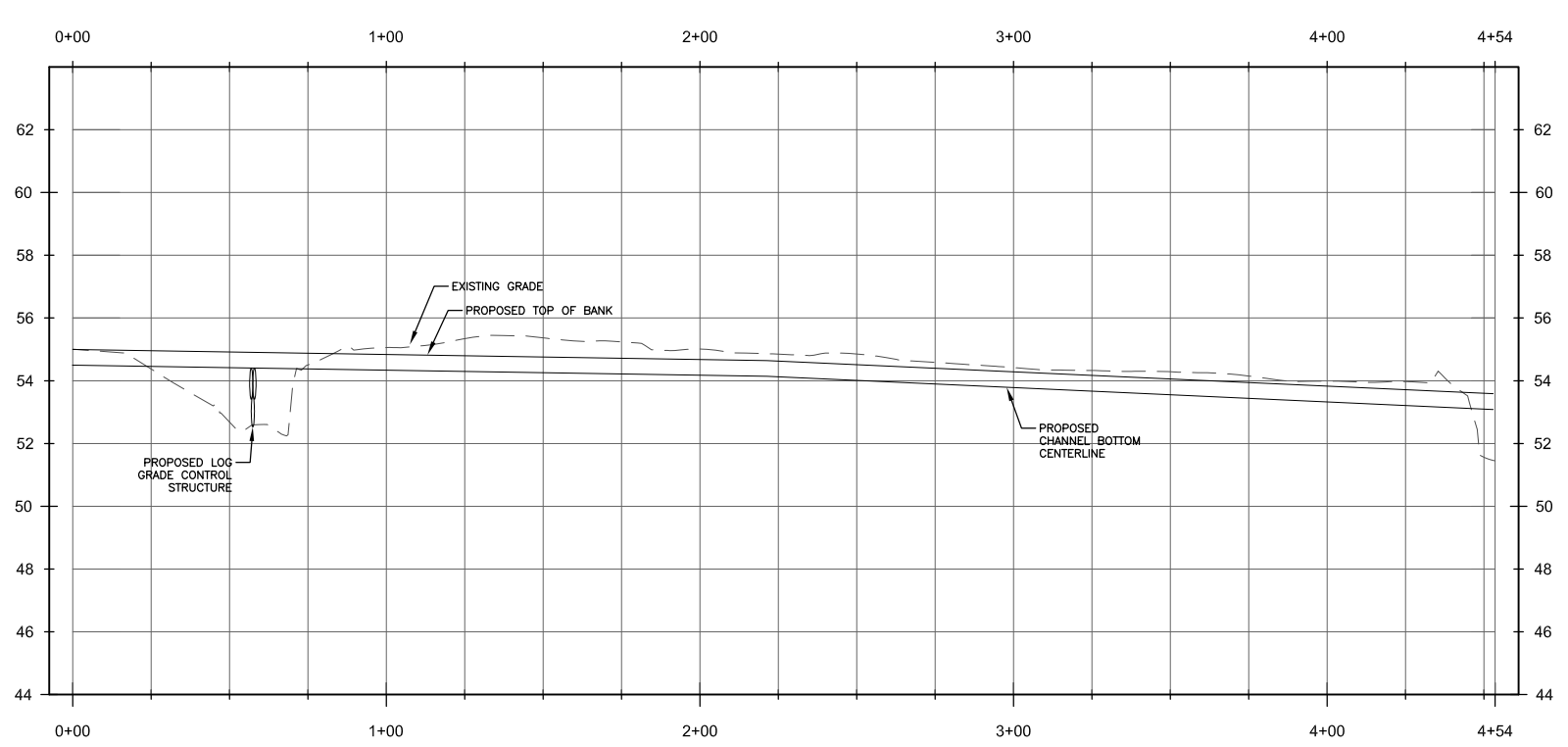
DRAWING NUMBER:
5
 PROJ. NO.: 20120090.00.RA



- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MINIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 42 FOR DIMENSIONS.
 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	- - - - -50
EXISTING CONTOUR MINOR	- - - - -46
PROPOSED CONTOUR MAJOR	— (50) —
PROPOSED CONTOUR MINOR	— (42) —
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	— TB —
PROPOSED CENTERLINE OF CHANNEL	— C —
EXISTING FENCELINE	— X —
EXISTING TREELINE	— T —
PROPOSED CHANNEL BOTTOM	— CB —
PROPOSED TOP OF BANK	— TP —
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	[Symbol]
LOG STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	[Symbol]
VEGETATED SILL (SEE DETAIL SHEET 39)	[Symbol]
WETLAND DEPRESSION	[Symbol]
PROPOSED FILL AREA	[Symbol]
PROPOSED WETLAND	[Symbol]
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	[Symbol]
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	[Symbol]
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	[Symbol]
LEAF PACK (SEE DETAIL SHEET 40)	[Symbol]
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	[Symbol]
RAPTOR POLE (SEE DETAIL SHEET 42)	[Symbol]
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	[Symbol]
EXISTING TREE	[Symbol]
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	[Symbol]
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]



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FULL SCALE: 1"=30 H, 1"=3 V

0 30

2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC

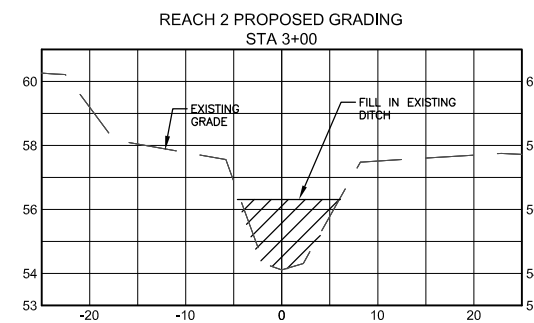
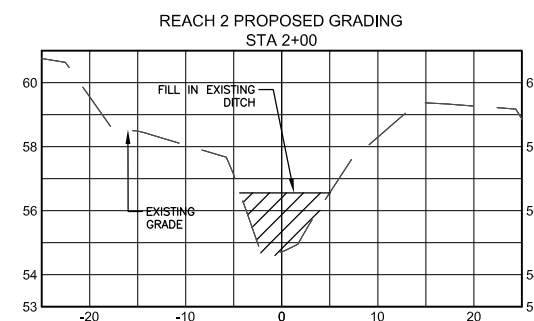
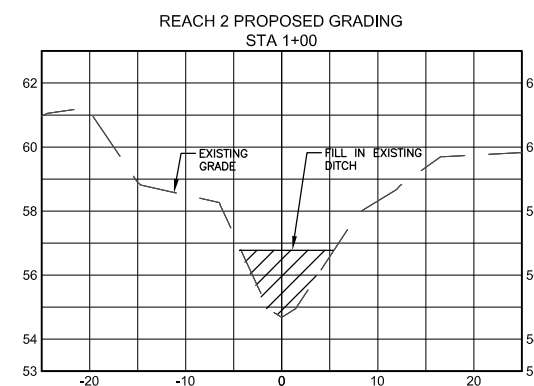
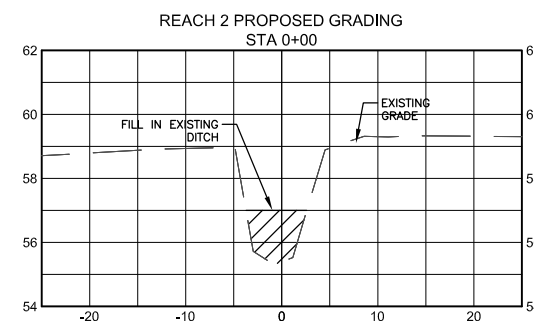
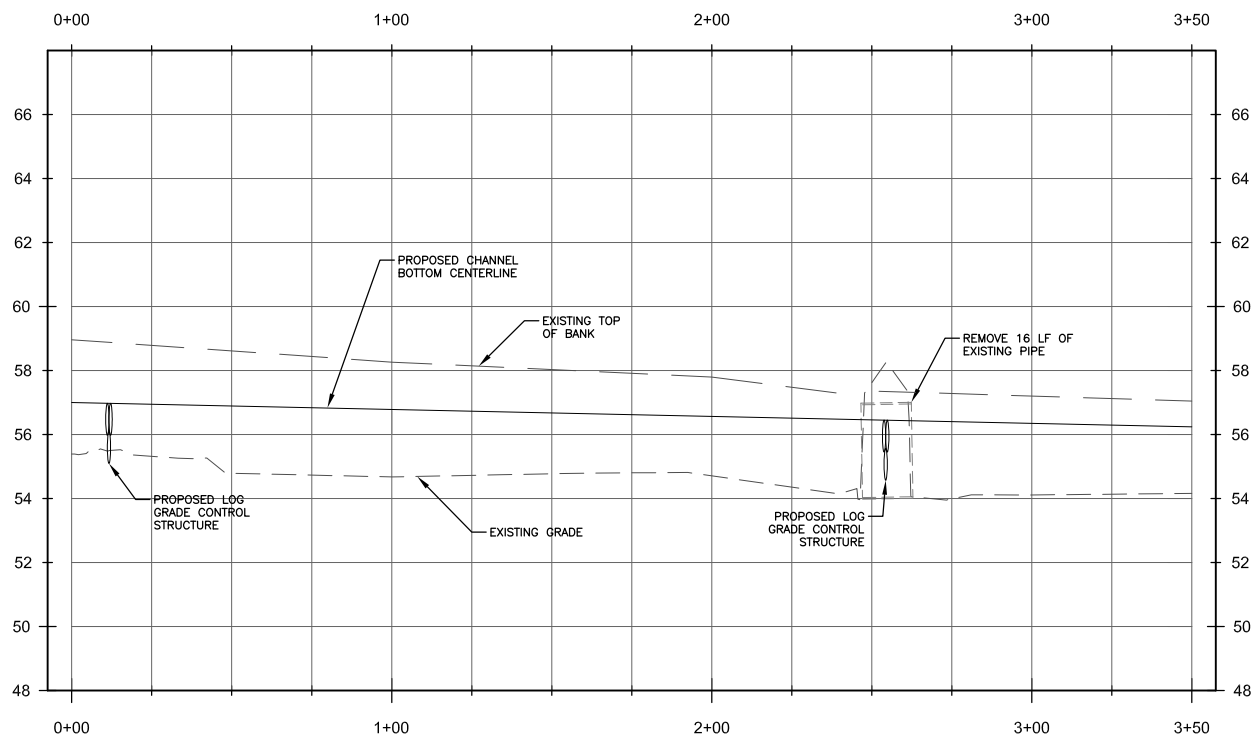
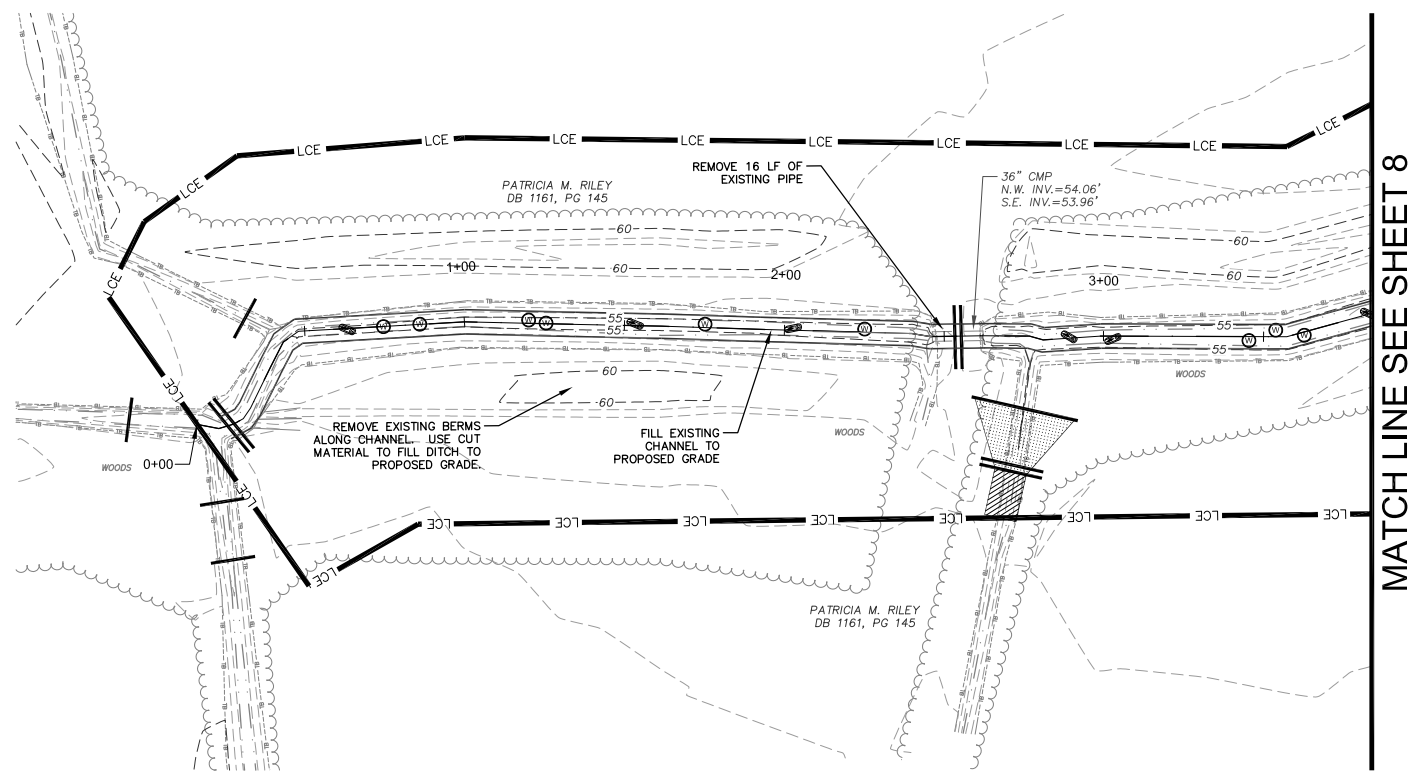
DRAWING TITLE: Plan And Profile - Reach 1

OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13

DRAWING NUMBER:
6

PROJ. NO.: 20120090.00.RA



REACH 2 CROSS SECTIONS
(VERTICAL SCALE 1"=3'
HORIZONTAL SCALE 1"=10')

NOTES:

1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MINIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 42 FOR DIMENSIONS.
6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR ---50---
- EXISTING CONTOUR MINOR ---46---
- PROPOSED CONTOUR MAJOR ---50---
- PROPOSED CONTOUR MINOR ---42---
- PROPOSED SPOT SHOT * 49.32
- EXISTING TOP OF BANK ---TB---
- EXISTING BOTTOM OF BANK ------
- PROPOSED CENTERLINE OF CHANNEL ------
- EXISTING FENCELINE ---X-X---
- EXISTING TREELINE ------
- PROPOSED CHANNEL BOTTOM ------
- PROPOSED TOP OF BANK ------
- LIMITS OF PROPOSED CONSERVATION EASEMENT ---LCE---
- LOG TOE PROTECTION (SEE DETAIL SHEET 39) ---|---
- LOG STRUCTURE (SEE DETAIL SHEET 41) ---|---
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39) ---|---
- VEGETATED SILL (SEE DETAIL SHEET 39) ---|---
- WETLAND DEPRESSION ---|---
- PROPOSED FILL AREA ---|---
- PROPOSED WETLAND ---|---
- PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39) ---|---
- CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42) ---|---
- LARGE WOODY DEBRIS (SEE DETAIL SHEET 41) ---|---
- LEAF PACK (SEE DETAIL SHEET 40) ---|---
- SMALL WOODY DEBRIS (SEE DETAIL SHEET 40) ---|---
- RAPTOR POLE (SEE DETAIL SHEET 42) ---|---
- LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40) ---|---
- EXISTING TREE ---|---
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40) ---|---
- BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40) ---|---
- FLOODPLAIN SILL (SEE DETAIL SHEET 41) ---|---
- DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41) ---|---

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NC LICENSE NO. F-0074



LEGEND
FULL SCALE: 1"=30 H, 1"=3 V
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	PLOT DATE:
					5/1/13

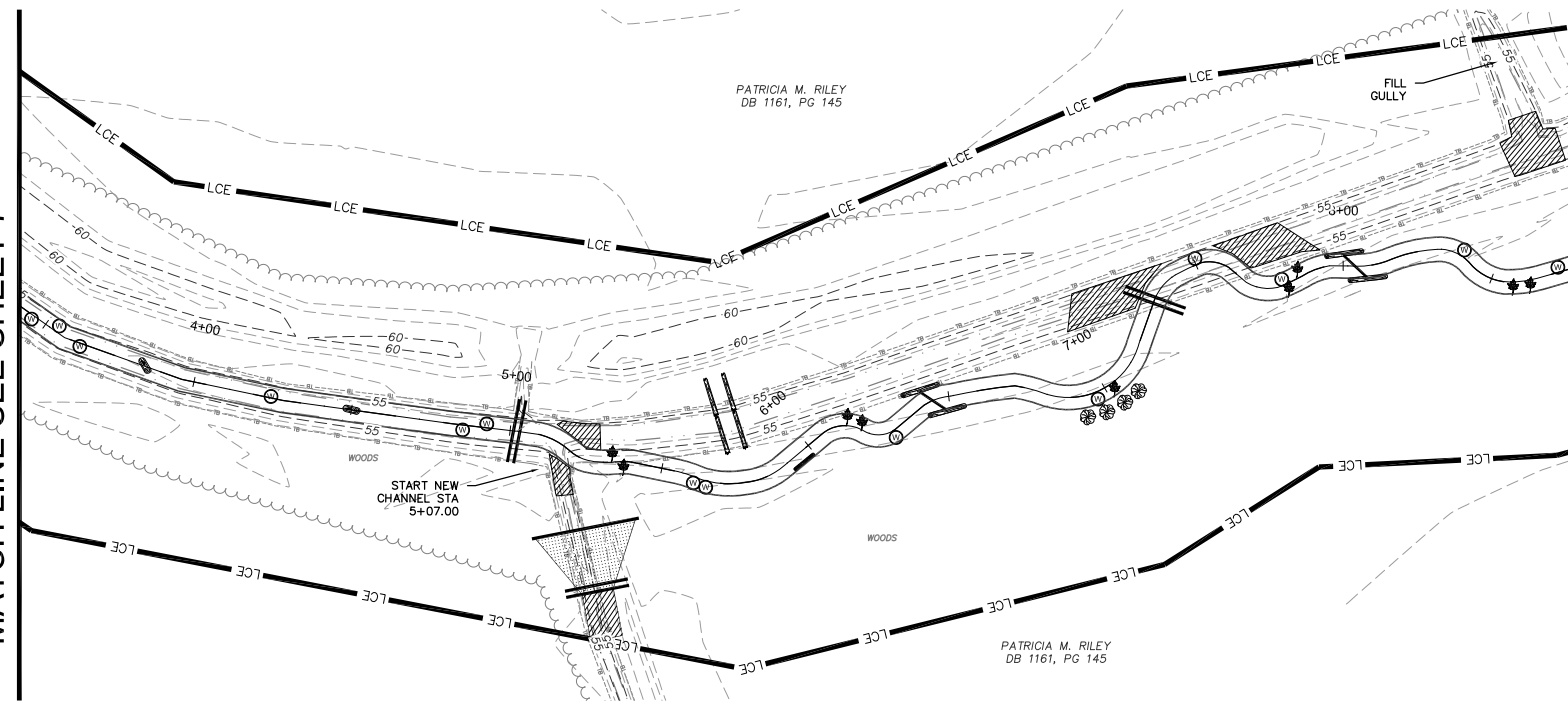
PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 2
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

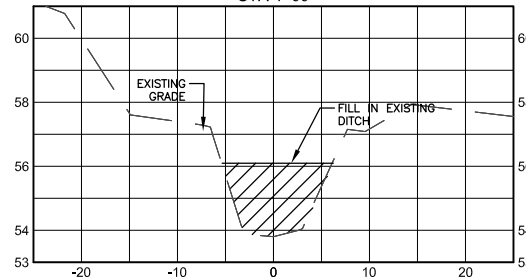
PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
7
PROJ. NO.: 20120090.00.RA

MATCH LINE SEE SHEET 7

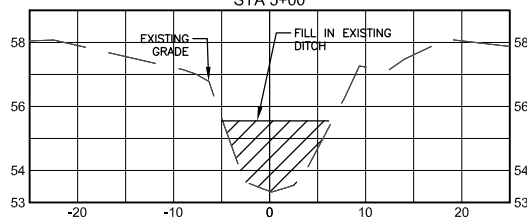
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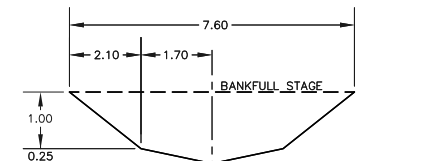
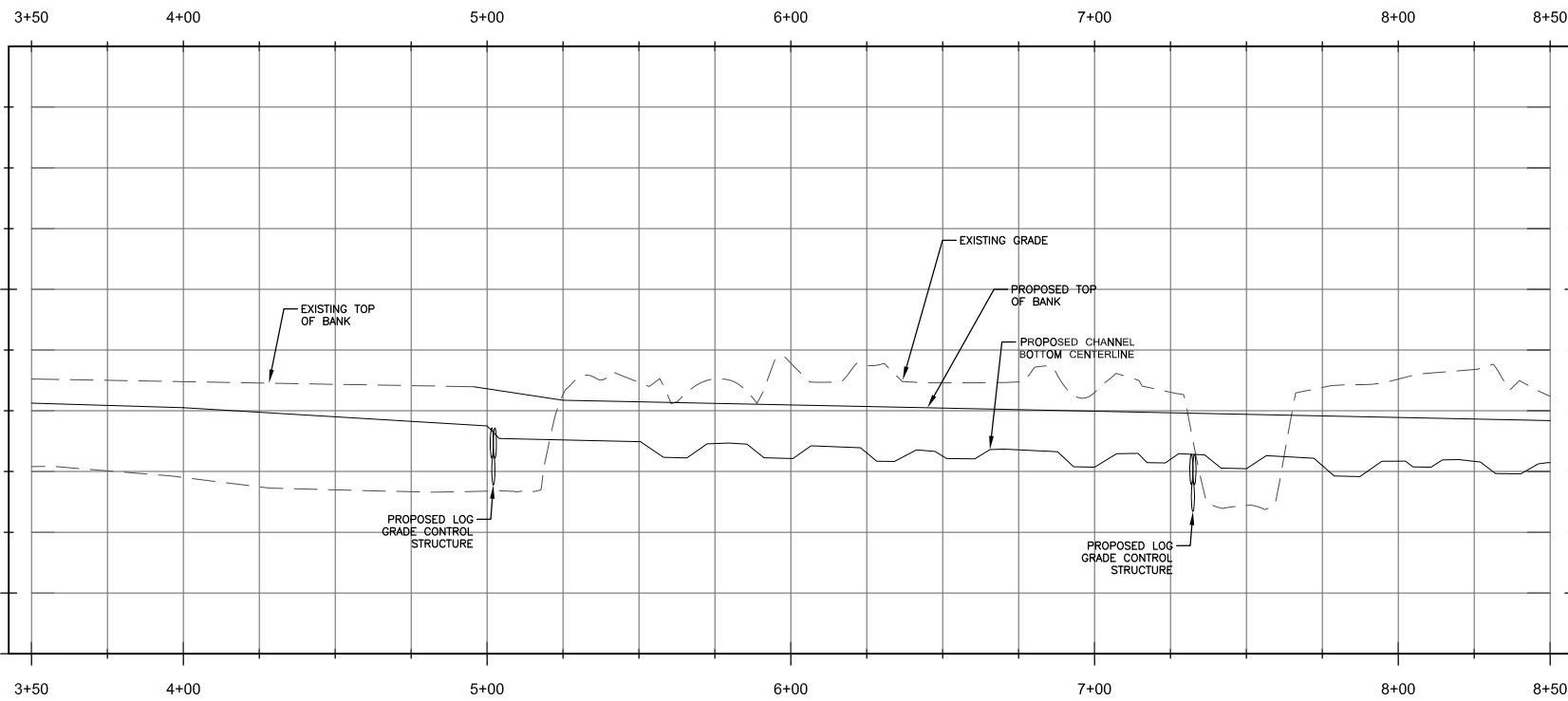
REACH 2 PROPOSED GRADING STA 4+00



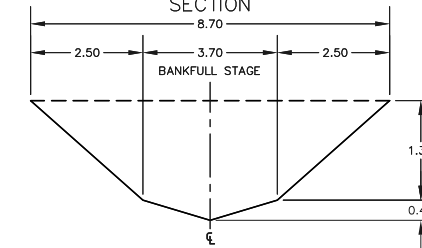
REACH 2 PROPOSED GRADING STA 5+00



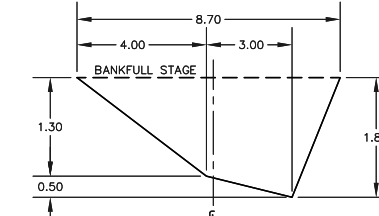
REACH 2 CROSS SECTIONS (VERTICAL SCALE 1"=3' HORIZONTAL SCALE 1"=10')



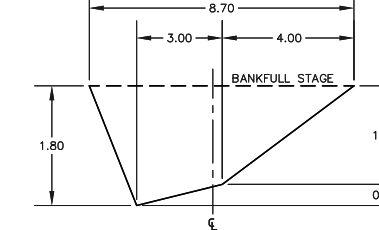
TYPICAL SHALLOW CROSS SECTION



TYPICAL POOL CROSS SECTION STRAIGHT REACH



TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION

TYP. SECTIONS STA 5+04 TO STA 18+73 (REACH 2)

NOTES:

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7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR -50
- EXISTING CONTOUR MINOR -46
- PROPOSED CONTOUR MAJOR 50
- PROPOSED CONTOUR MINOR 42
- PROPOSED SPOT SHOT x 49.32
- EXISTING TOP OF BANK TB
- EXISTING BOTTOM OF BANK
- PROPOSED CENTERLINE OF CHANNEL
- EXISTING FENCELINE
- EXISTING TREELINE
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT LCE
- LOG TOE PROTECTION (SEE DETAIL SHEET 39)
- LOG STRUCTURE (SEE DETAIL SHEET 41)
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)
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- WETLAND DEPRESSION
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- RAPTOR POLE (SEE DETAIL SHEET 42)
- LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)
- EXISTING TREE
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)
- BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)
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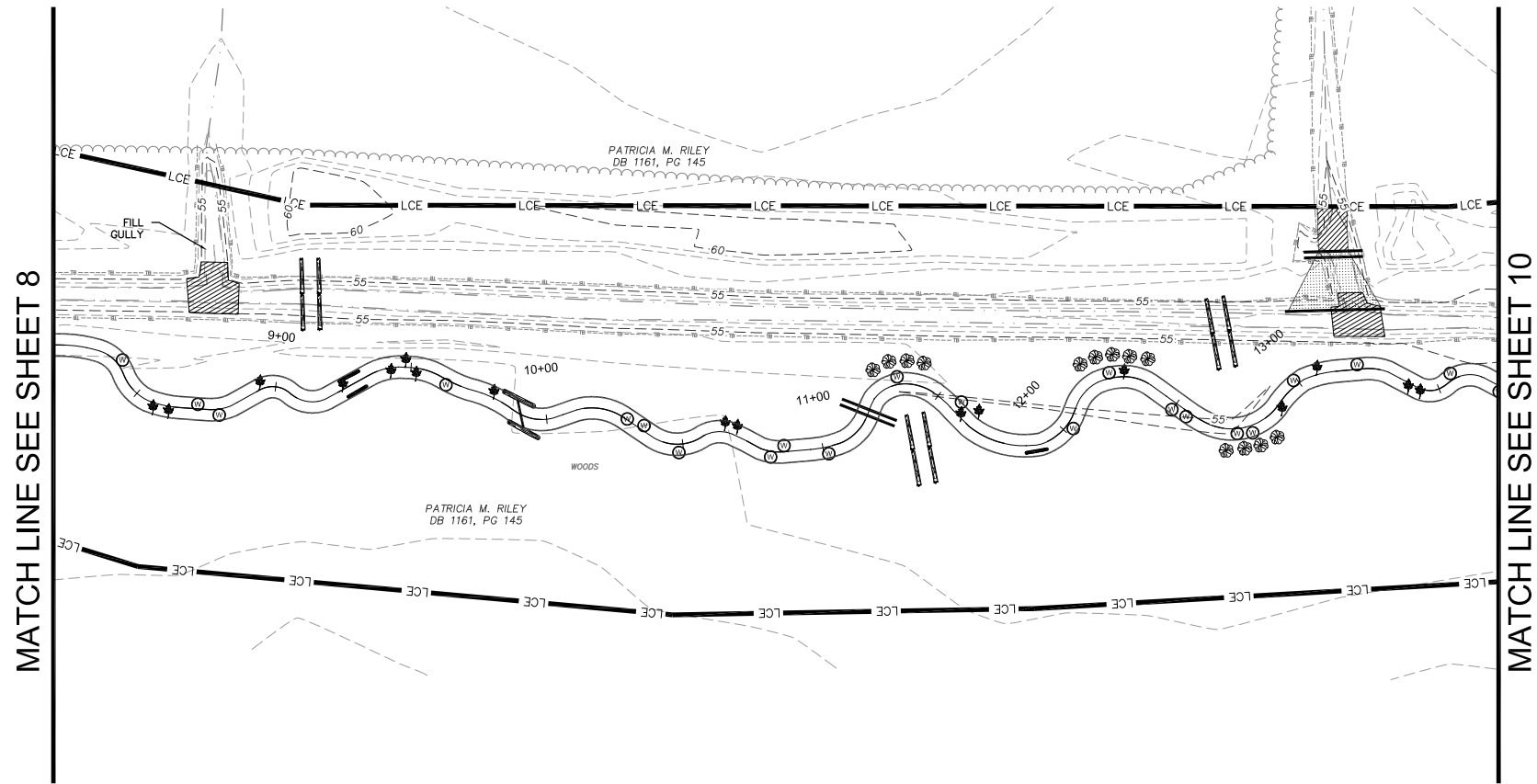
FULL SCALE: 1"=30 H, 1"=3 V
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

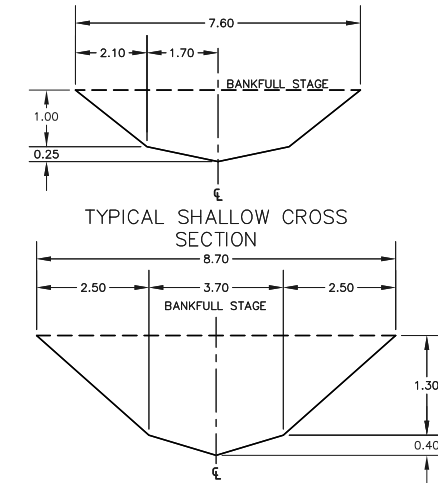
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 2
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
8
PROJ. NO.: 20120090.00.RA

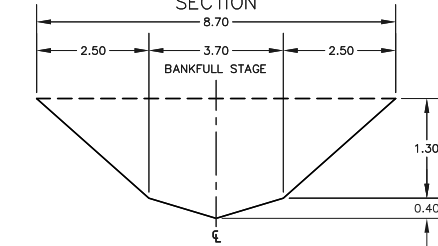


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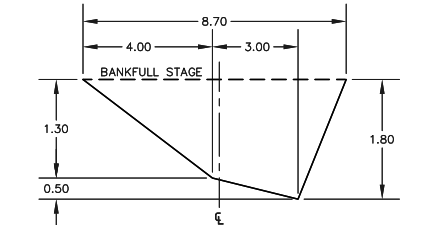
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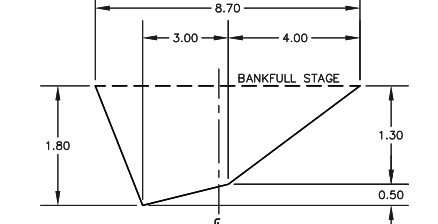
TYPICAL SHALLOW CROSS SECTION



TYPICAL POOL CROSS SECTION STRAIGHT REACH

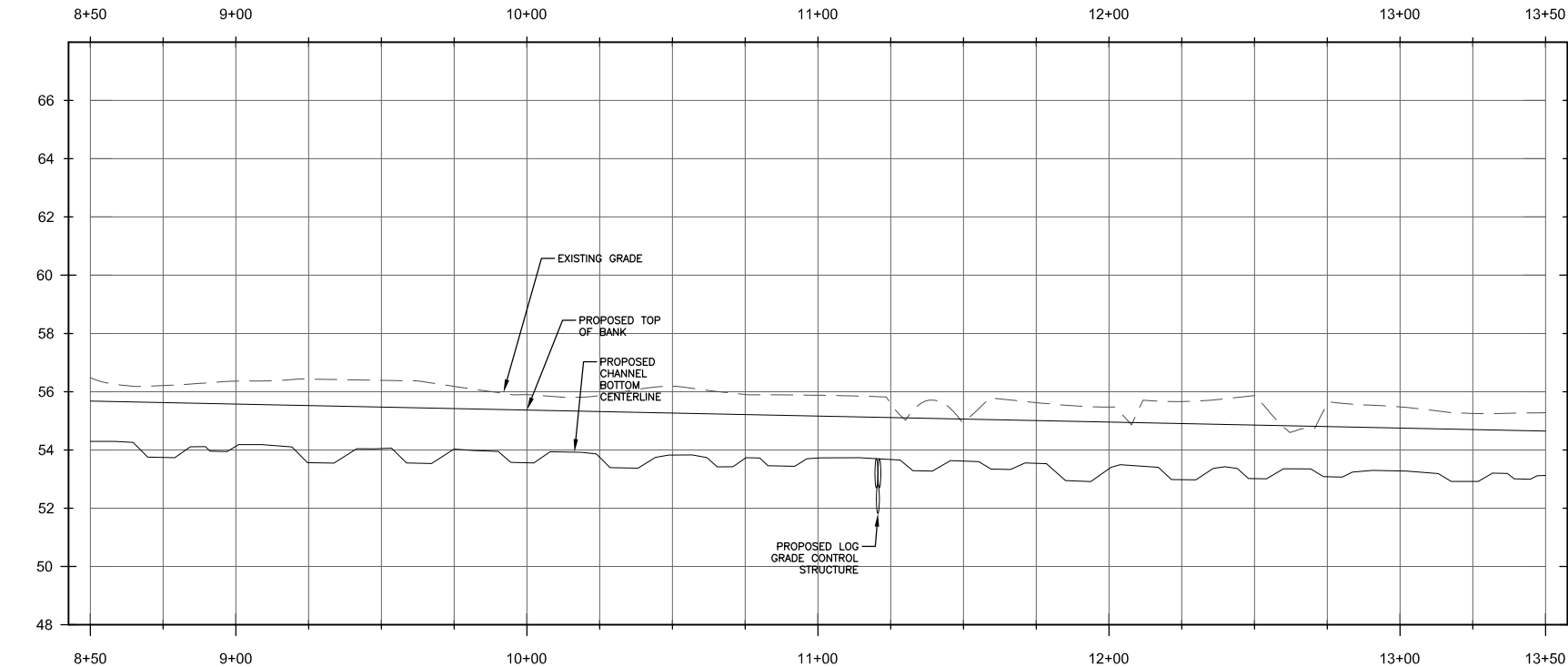


TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION

TYP. SECTIONS STA 5+04 TO STA 18+73 (REACH 2)



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LEGEND

- EXISTING CONTOUR MAJOR ---50---
- EXISTING CONTOUR MINOR ---46---
- PROPOSED CONTOUR MAJOR ---50---
- PROPOSED CONTOUR MINOR ---42---
- PROPOSED SPOT SHOT × 49.32
- EXISTING TOP OF BANK ---TB---
- EXISTING BOTTOM OF BANK ------
- PROPOSED CENTERLINE OF CHANNEL ---X-X---
- EXISTING FENCELINE ---X-X-X---
- EXISTING TREELINE ---|---|---
- PROPOSED CHANNEL BOTTOM ---|---|---
- PROPOSED TOP OF BANK ---|---|---
- LIMITS OF PROPOSED CONSERVATION EASEMENT ---LCE---
- LOG TOE PROTECTION (SEE DETAIL SHEET 39) ---|---|---
- LOG STRUCTURE (SEE DETAIL SHEET 41) ---|---|---
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39) ---|---|---
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- EXISTING TREE ---|---|---
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40) ---|---|---
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- FLOODPLAIN SILL (SEE DETAIL SHEET 41) ---|---|---
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LEGEND
FULL SCALE: 1"=30 H, 1"=3 V
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1" = HALF SCALE

MARK	DATE	DESCRIPTION

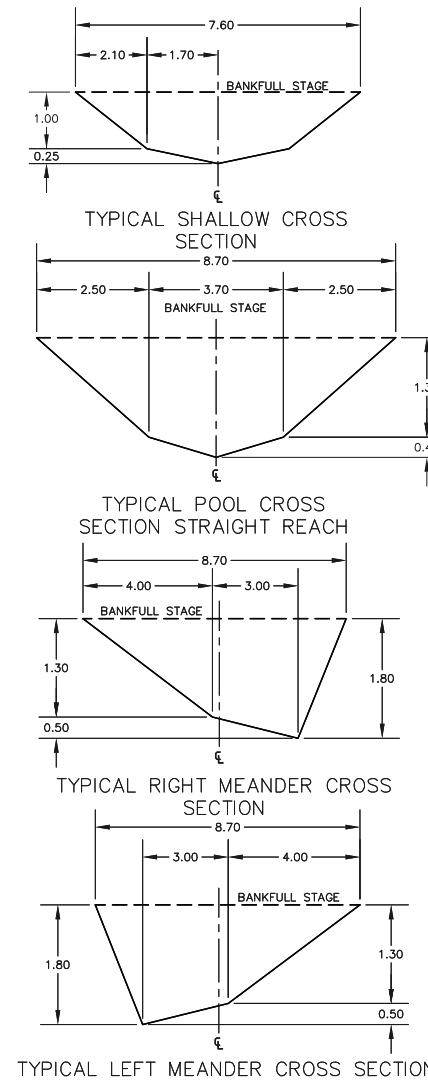
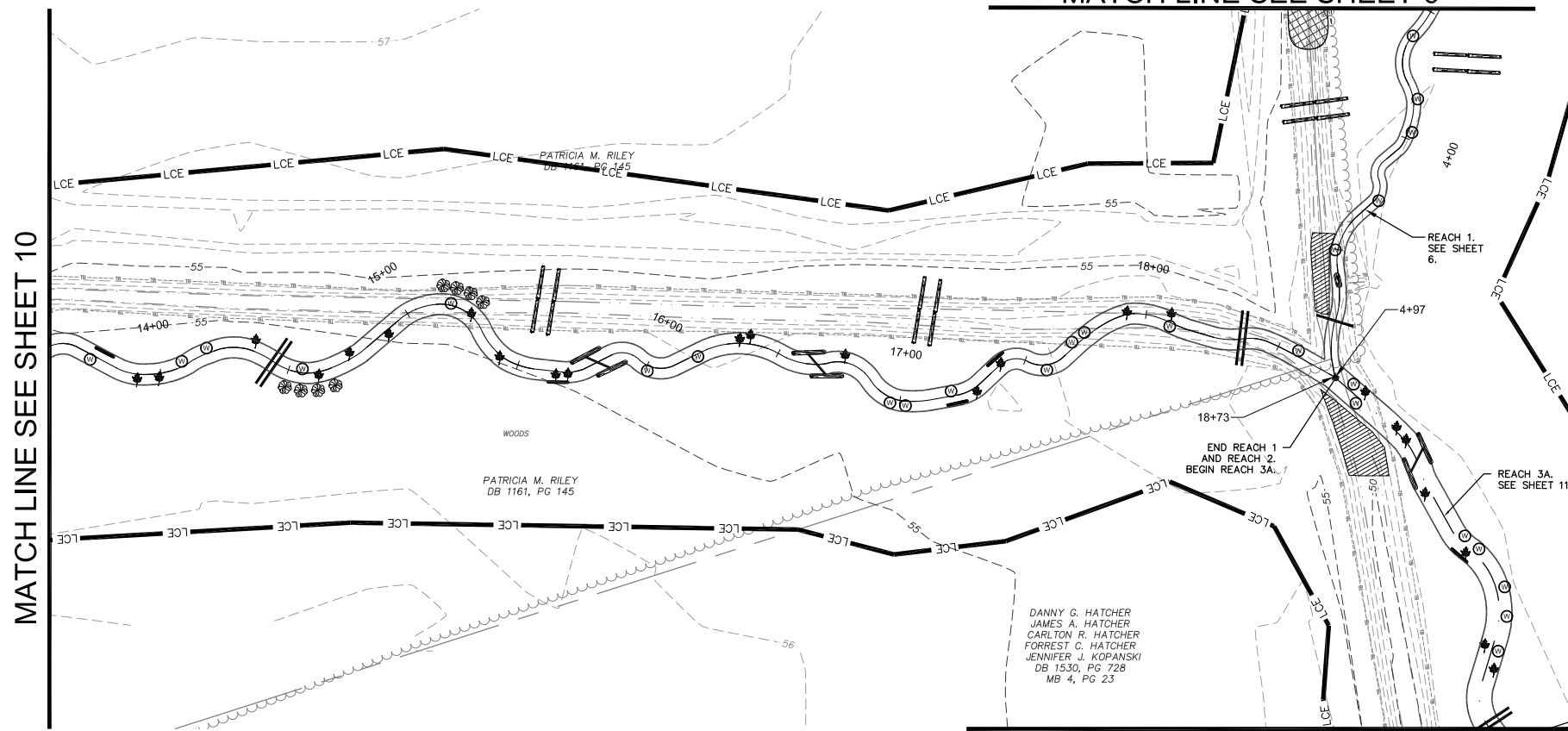
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 2
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
9
PROJ. NO.: 20120090.00.RA

MATCH LINE SEE SHEET 6

MATCH LINE SEE SHEET 11

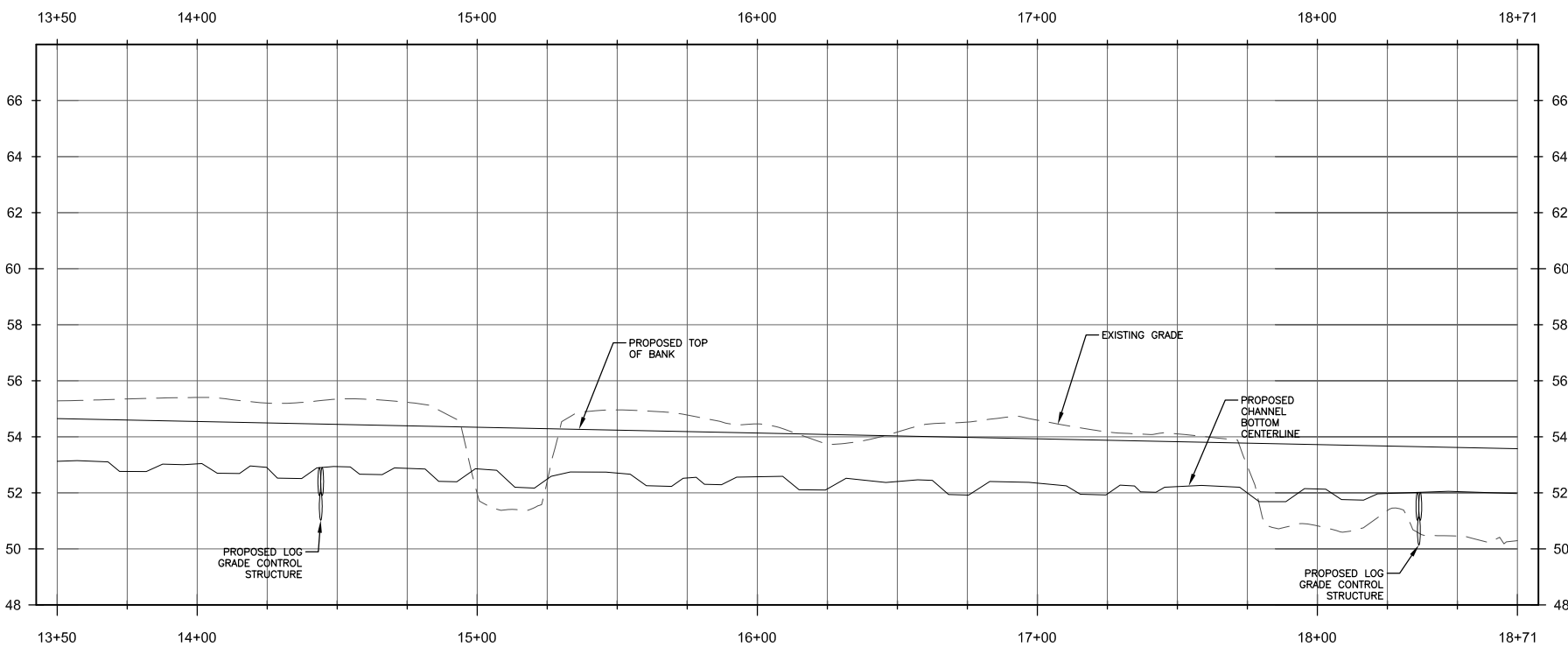


TYP. SECTIONS STA 5+04 TO STA 18+73 (REACH 2)

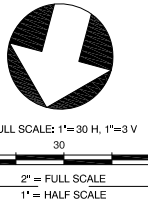
- NOTES:
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 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR -50
- EXISTING CONTOUR MINOR -46
- PROPOSED CONTOUR MAJOR -50
- PROPOSED CONTOUR MINOR -42
- PROPOSED SPOT SHOT x 49.32
- EXISTING TOP OF BANK TB
- EXISTING BOTTOM OF BANK
- PROPOSED CENTERLINE OF CHANNEL
- EXISTING FENCELINE
- EXISTING TREELINE
- PROPOSED CHANNEL BOTTOM
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- LOG TOE PROTECTION (SEE DETAIL SHEET 39)
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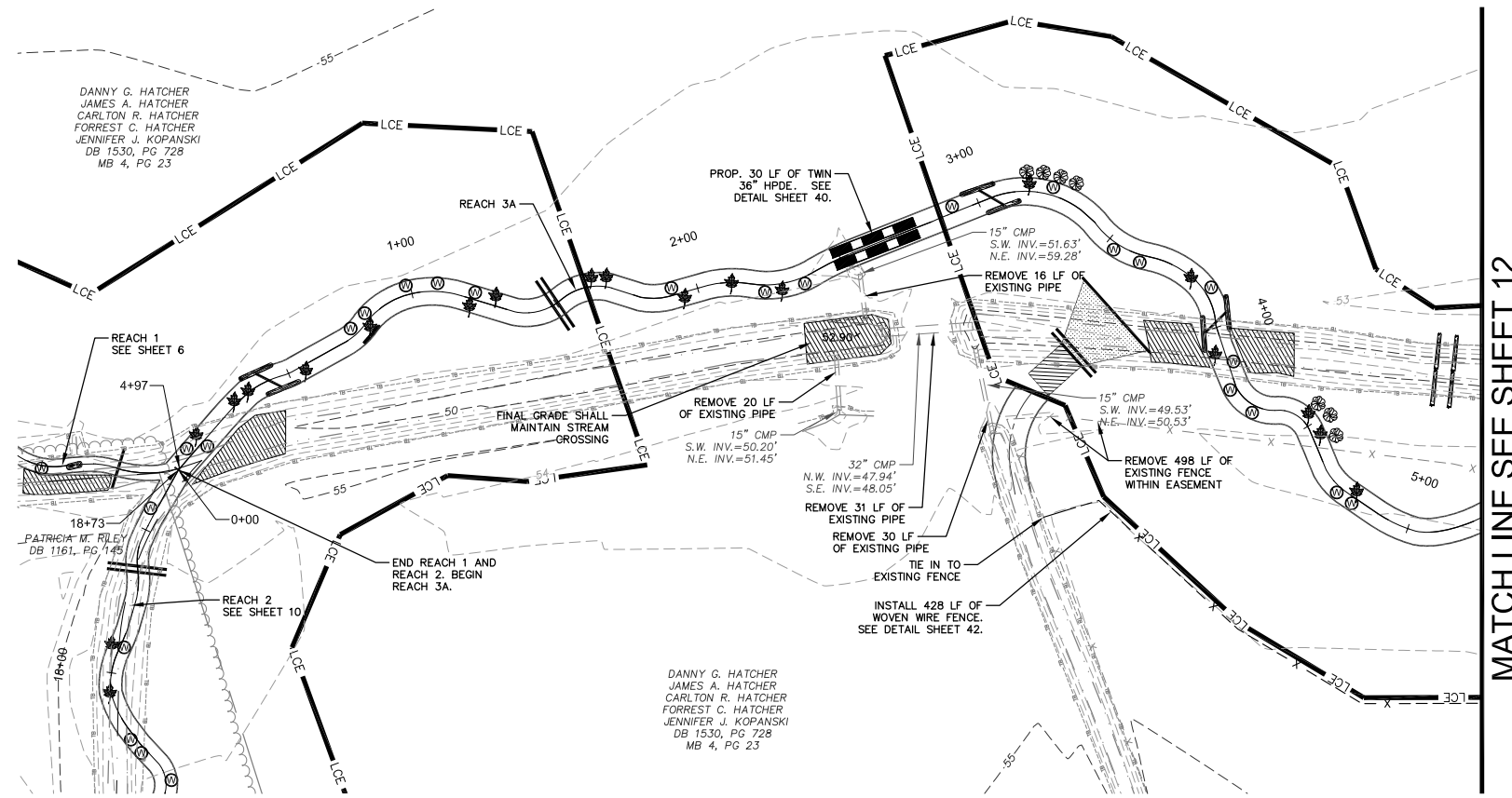


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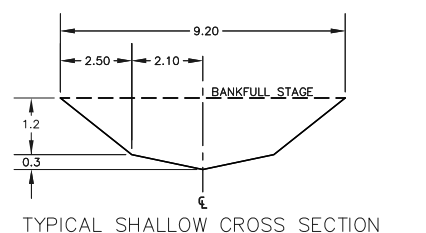
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 2
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

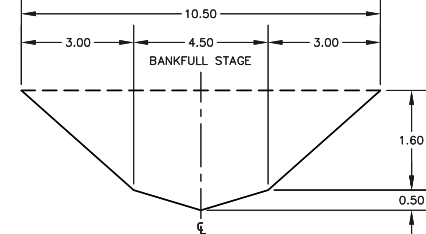
PROJ. DATE: OCT 2012
Q.C.: FM
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DRAWING NUMBER:
10
PROJ. NO.: 20120090.00.RA



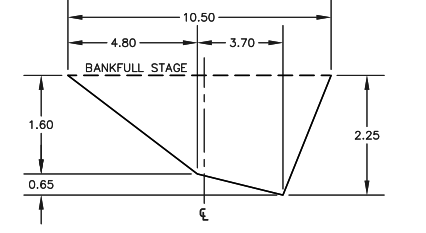
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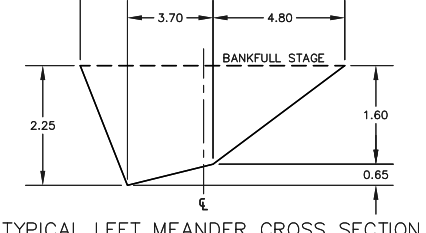
TYPICAL SHALLOW CROSS SECTION



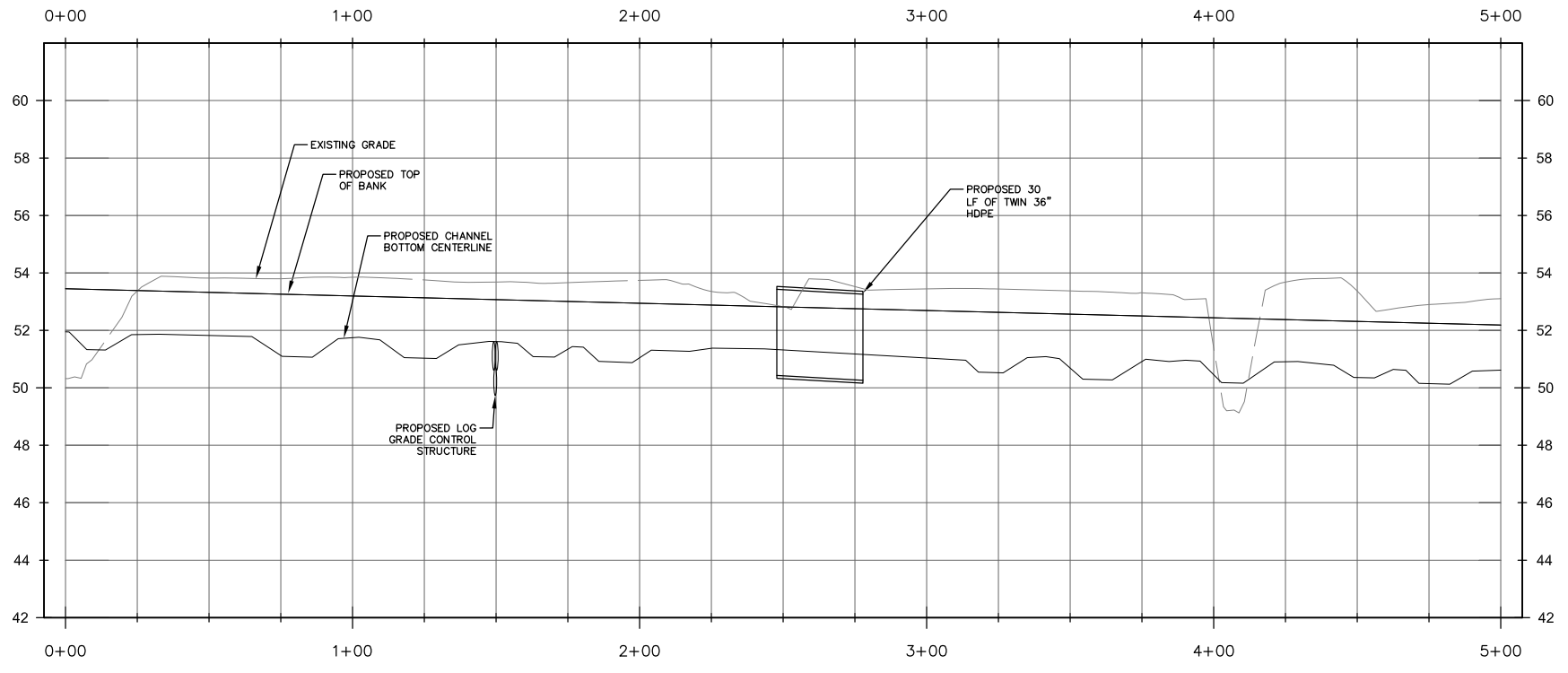
TYPICAL POOL CROSS SECTION STRAIGHT REACH



TYPICAL RIGHT MEANDER CROSS SECTION



TYP. SECTIONS STA 00+00 TO 18+15 (REACH 3A)



- NOTES:
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 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	-50-
EXISTING CONTOUR MINOR	-46-
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	—TB—
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	—x—x—x—
EXISTING TREELINE	—
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
LEAF PACK (SEE DETAIL SHEET 40)	—
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—

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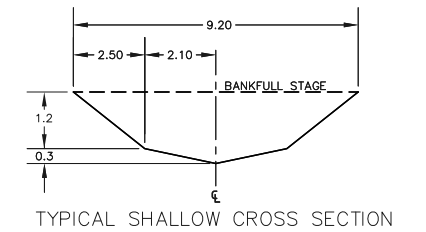
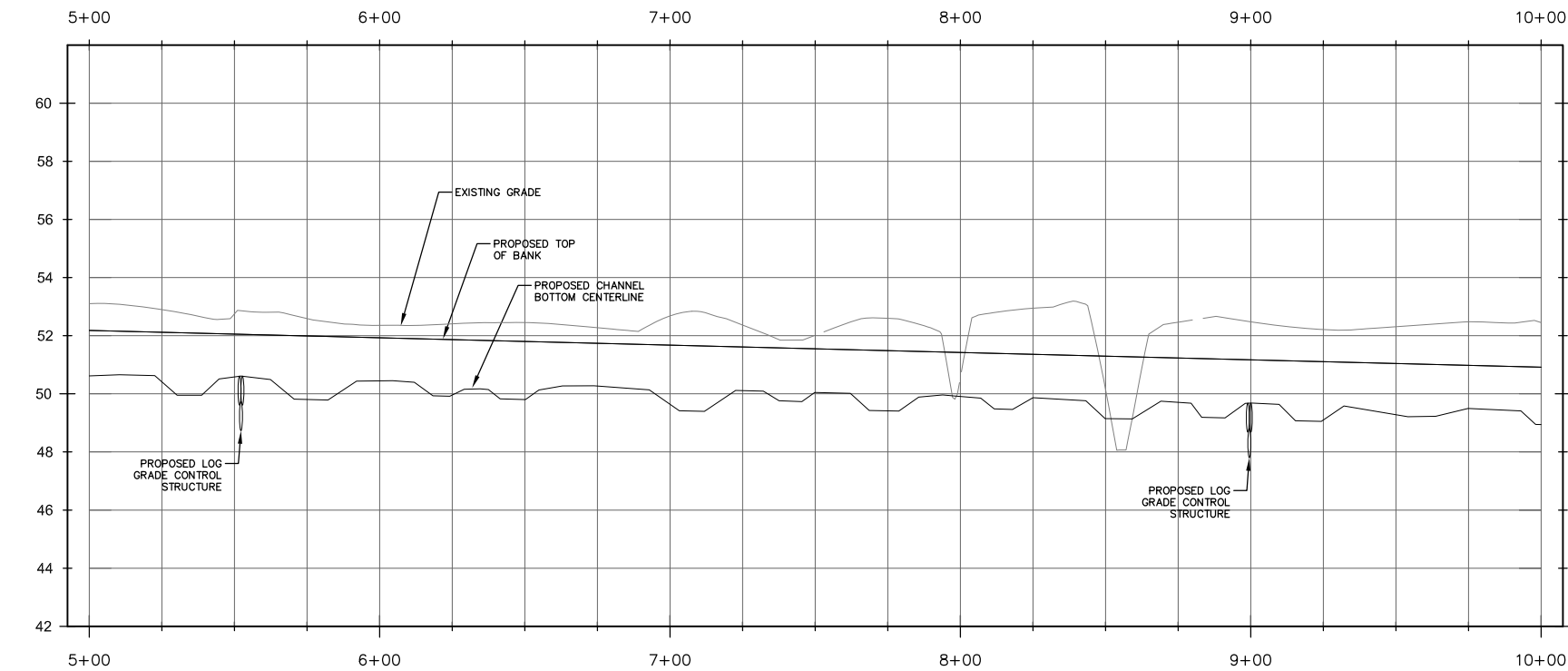
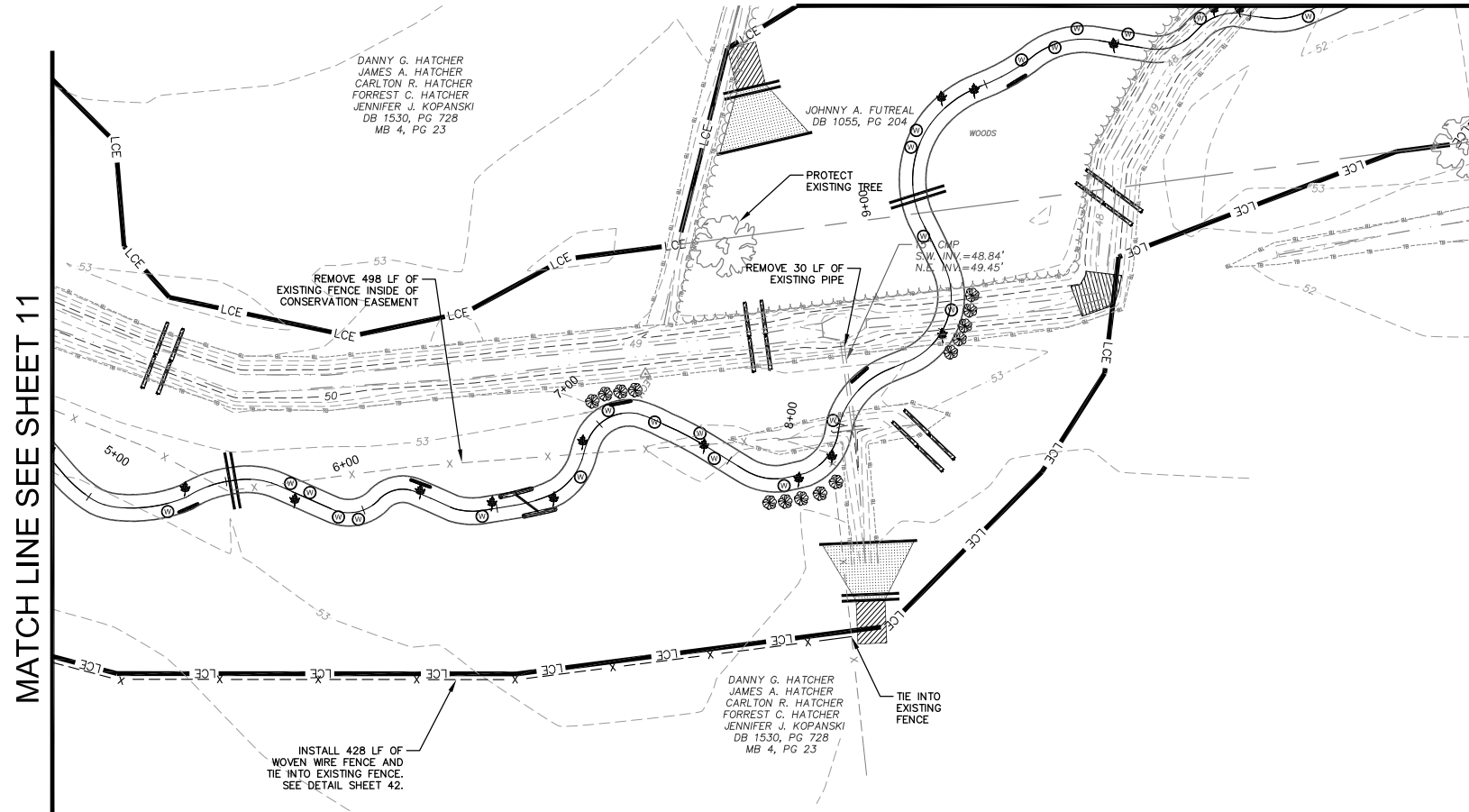
LEGEND
FULL SCALE: 1"=30 H, 1"=3 V
2"= FULL SCALE
1"= HALF SCALE

MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	PLOT DATE:
				PRELIMINARY - NOT FOR CONSTRUCTION	5/1/13

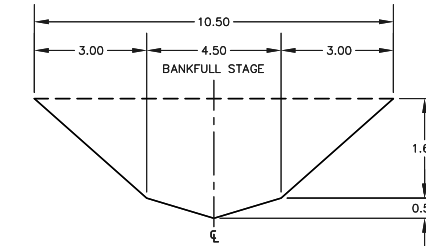
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3A
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
11
PROJ. NO.: 20120090.00.RA

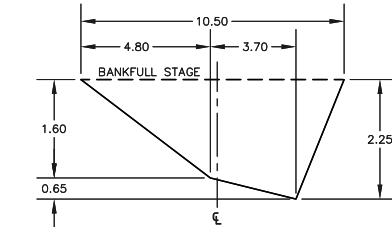
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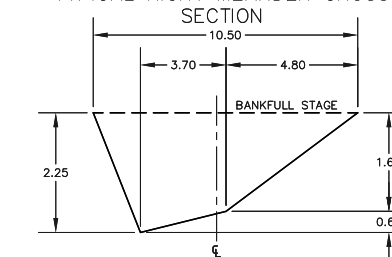
TYPICAL SHALLOW CROSS SECTION



TYPICAL POOL CROSS SECTION STRAIGHT REACH



TYPICAL RIGHT MEANDER CROSS SECTION



TYPICAL LEFT MEANDER CROSS SECTION

TYP. SECTIONS STA 00+00 TO 18+15 (REACH 3A)

NOTES:

1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
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7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR -50
- EXISTING CONTOUR MINOR -46
- PROPOSED CONTOUR MAJOR 50
- PROPOSED CONTOUR MINOR 42
- PROPOSED SPOT SHOT x 49.32
- EXISTING TOP OF BANK TB
- EXISTING BOTTOM OF BANK
- PROPOSED CENTERLINE OF CHANNEL
- EXISTING FENCELINE
- EXISTING TREELINE
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- LIMITS OF PROPOSED CONSERVATION EASEMENT LCE
- LOG TOE PROTECTION (SEE DETAIL SHEET 39)
- LOG STRUCTURE (SEE DETAIL SHEET 41)
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)
- VEGETATED SILL (SEE DETAIL SHEET 39)
- WETLAND DEPRESSION
- PROPOSED FILL AREA
- PROPOSED WETLAND
- PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)
- CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)
- LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)
- LEAF PACK (SEE DETAIL SHEET 40)
- SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)
- RAPTOR POLE (SEE DETAIL SHEET 42)
- LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)
- EXISTING TREE
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)
- BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)
- FLOODPLAIN SILL (SEE DETAIL SHEET 41)
- DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)



FULL SCALE: 1"=30 H, 1"=3 V
2"= FULL SCALE
1"= HALF SCALE

MARK	DATE	DESCRIPTION

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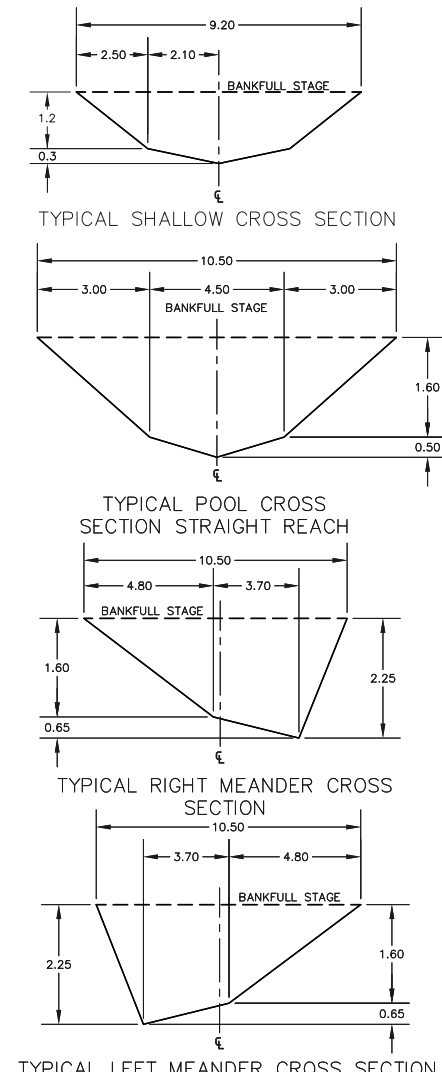
PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Plan And Profile - Reach 3A
 OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
12
 PROJ. NO.: 20120090.00.RA

MATCH LINE SEE SHEET 12

MATCH LINE SEE SHEET 14

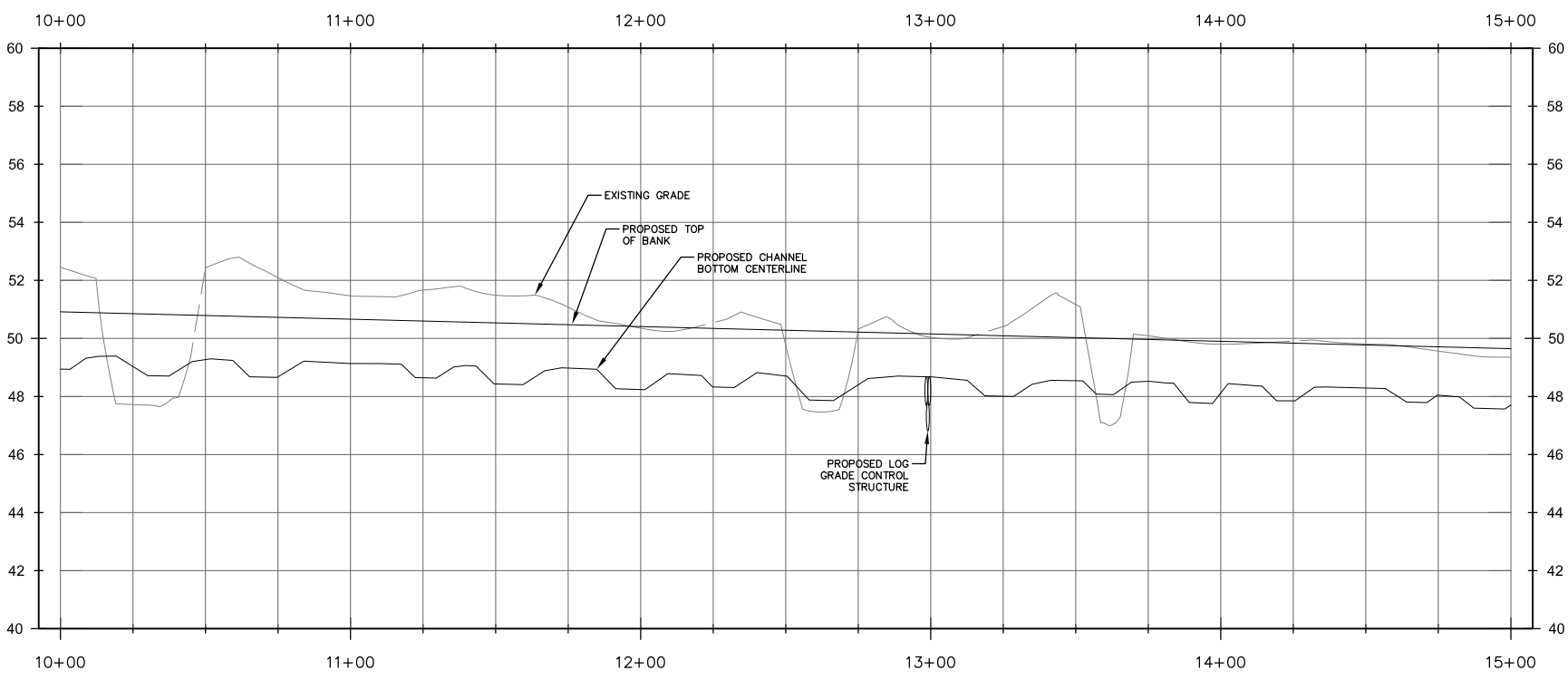


TYP. SECTIONS STA 00+00 TO 18+15 (REACH 3A)

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LEGEND

EXISTING CONTOUR MAJOR	-50
EXISTING CONTOUR MINOR	-46
PROPOSED CONTOUR MAJOR	50
PROPOSED CONTOUR MINOR	42
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	— x — x —
EXISTING TREELINE	—
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
LEAF PACK (SEE DETAIL SHEET 40)	—
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—



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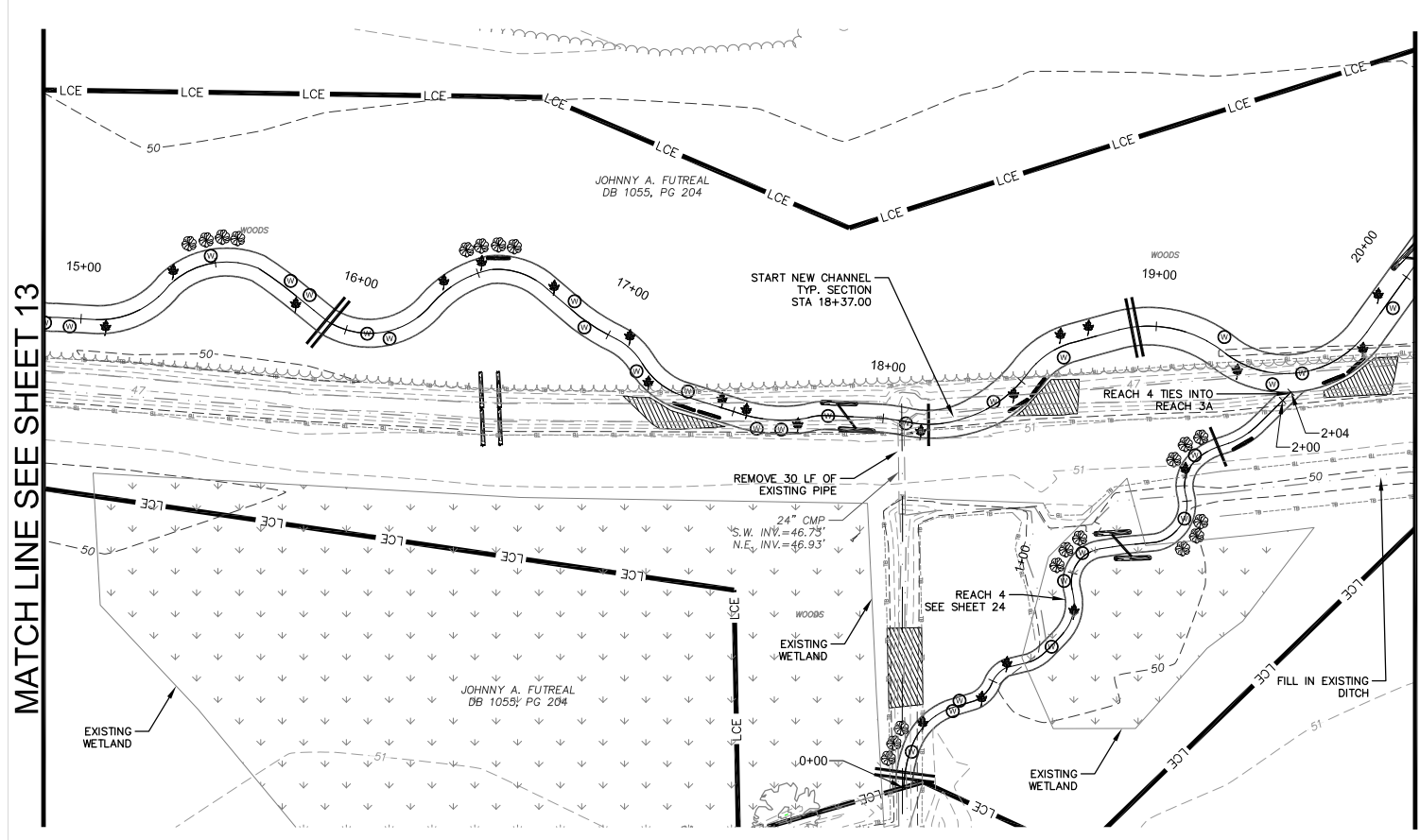


LEGEND
FULL SCALE: 1"=30 H, 1"=3 V
2" = FULL SCALE
1" = HALF SCALE

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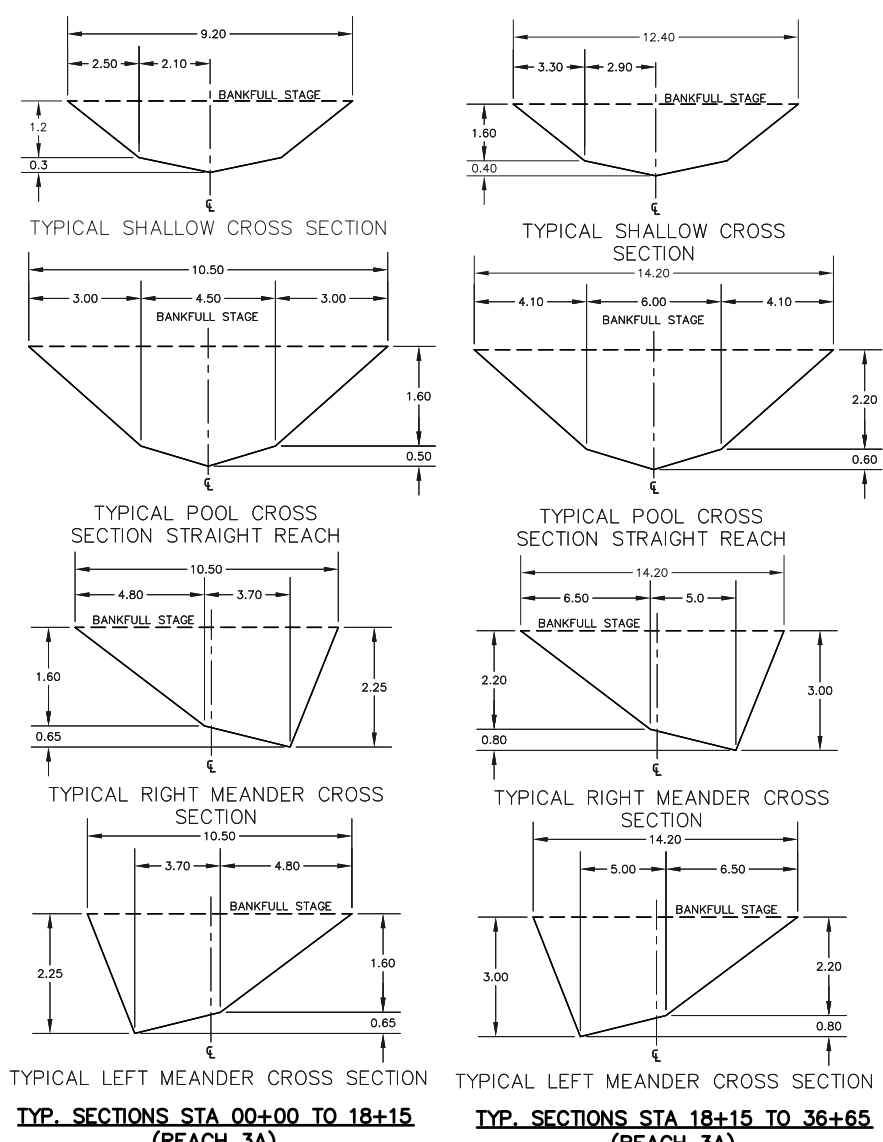
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3A
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
Q.C. DATE: FM 01-23-13
DRAWING NUMBER:
13
PROJ. NO.: 20120090.00.RA



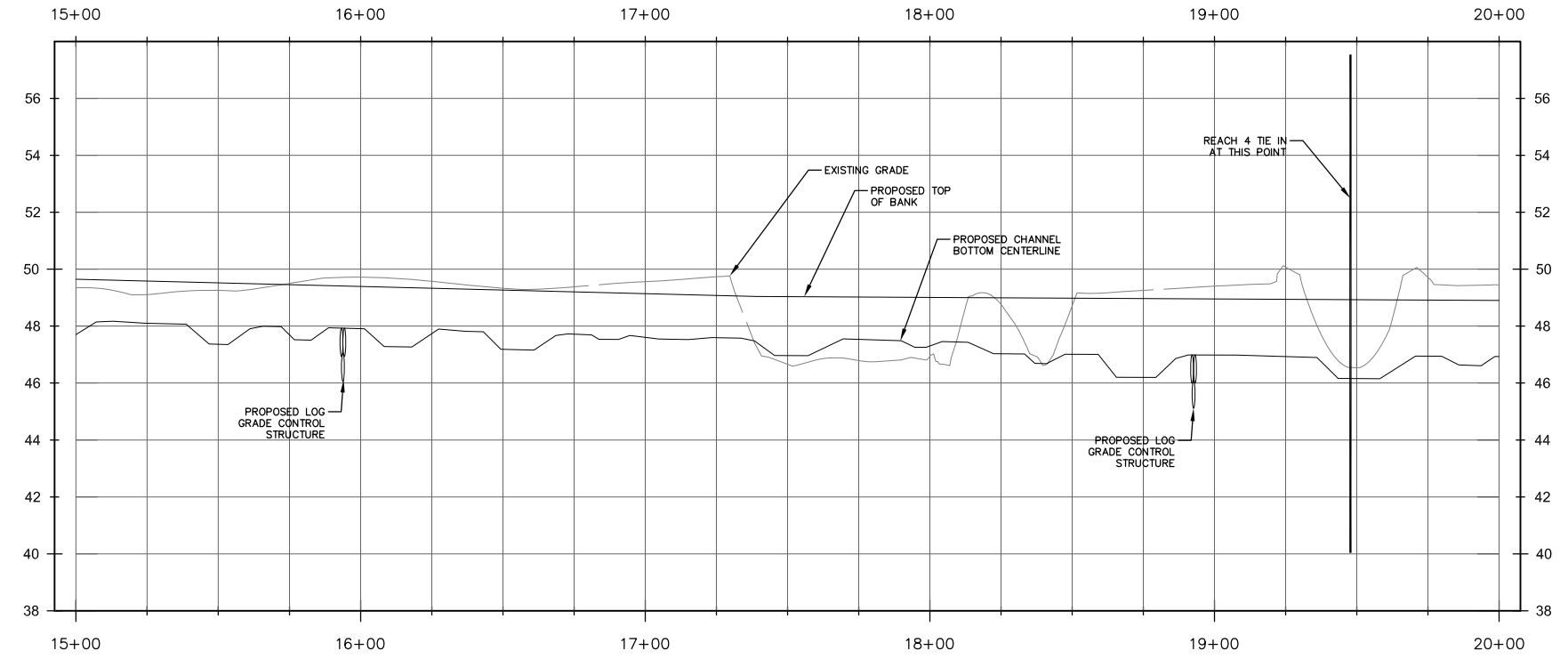
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MATCH LINE SEE SHEET 15



TYP. SECTIONS STA 00+00 TO 18+15 (REACH 3A)

TYP. SECTIONS STA 18+15 TO 36+65 (REACH 3A)

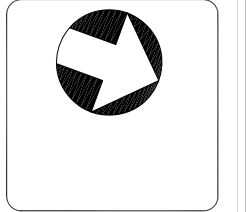


- NOTES:**
- IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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 - FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	- - - 50 - - -
EXISTING CONTOUR MINOR	- - - 46 - - -
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	----- TB -----
EXISTING BOTTOM OF BANK	----- TB -----
PROPOSED CENTERLINE OF CHANNEL	----- C -----
EXISTING FENCELINE	- x - x - x -
EXISTING TREELINE	~ ~ ~ ~ ~
PROPOSED CHANNEL BOTTOM	----- CB -----
PROPOSED TOP OF BANK	----- TP -----
LIMITS OF PROPOSED CONSERVATION EASEMENT	----- LCE -----
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	[Symbol]
LOG STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	[Symbol]
VEGETATED SILL (SEE DETAIL SHEET 39)	[Symbol]
WETLAND DEPRESSION	[Symbol]
PROPOSED FILL AREA	[Symbol]
PROPOSED WETLAND	[Symbol]
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	[Symbol]
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	[Symbol]
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	[Symbol]
LEAF PACK (SEE DETAIL SHEET 40)	[Symbol]
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	[Symbol]
RAPTOR POLE (SEE DETAIL SHEET 42)	[Symbol]
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	[Symbol]
EXISTING TREE	[Symbol]
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	[Symbol]
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]

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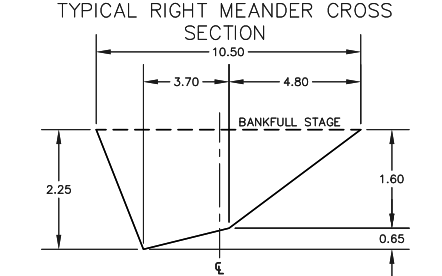
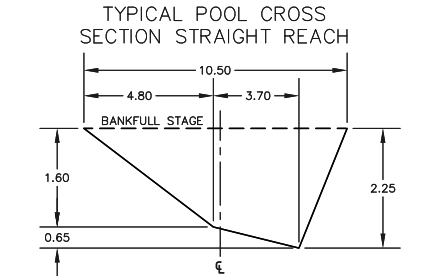
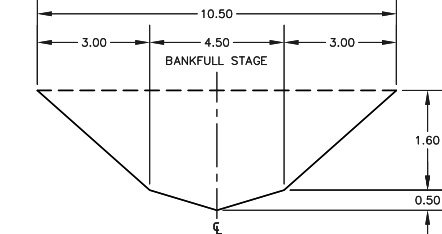
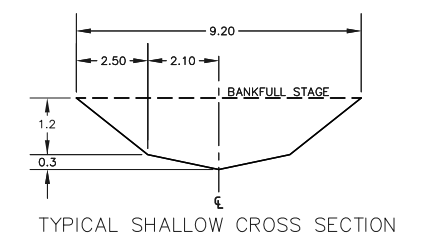
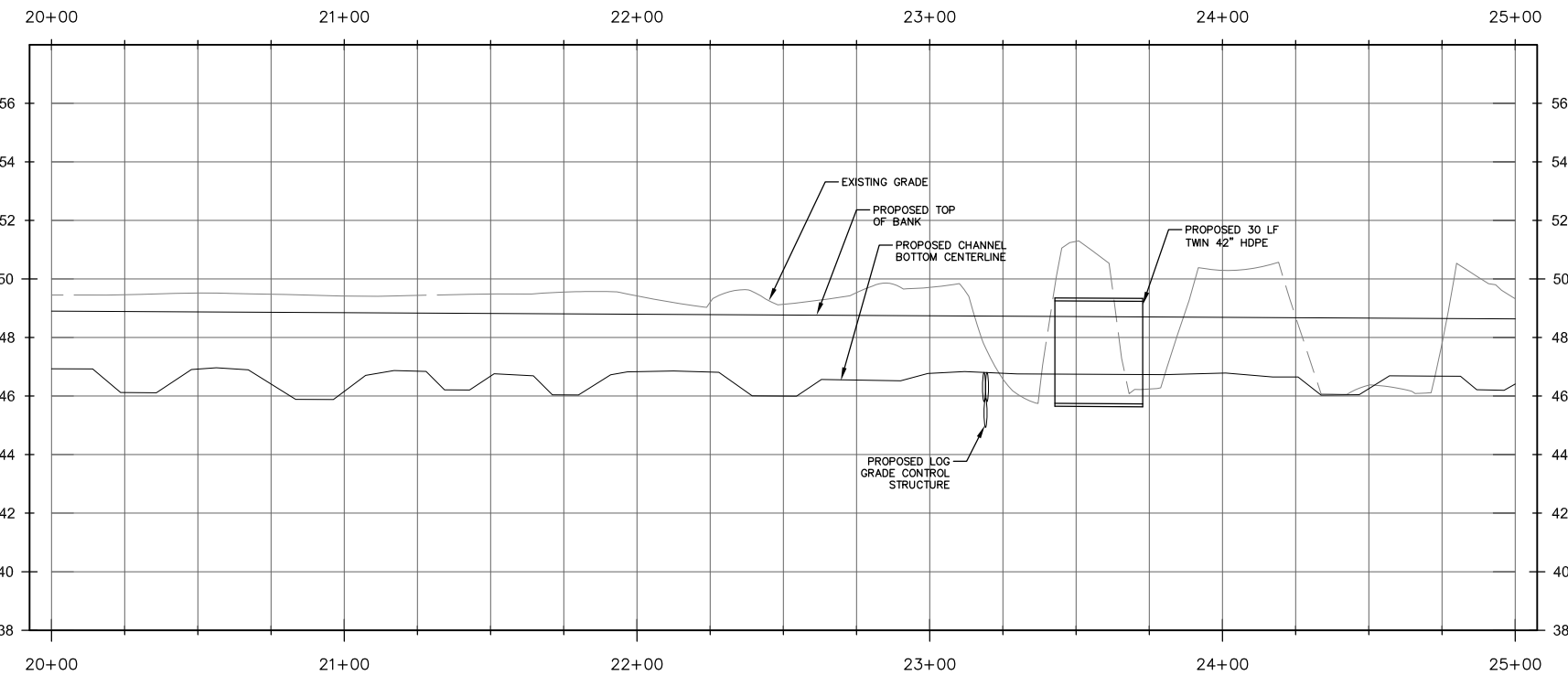
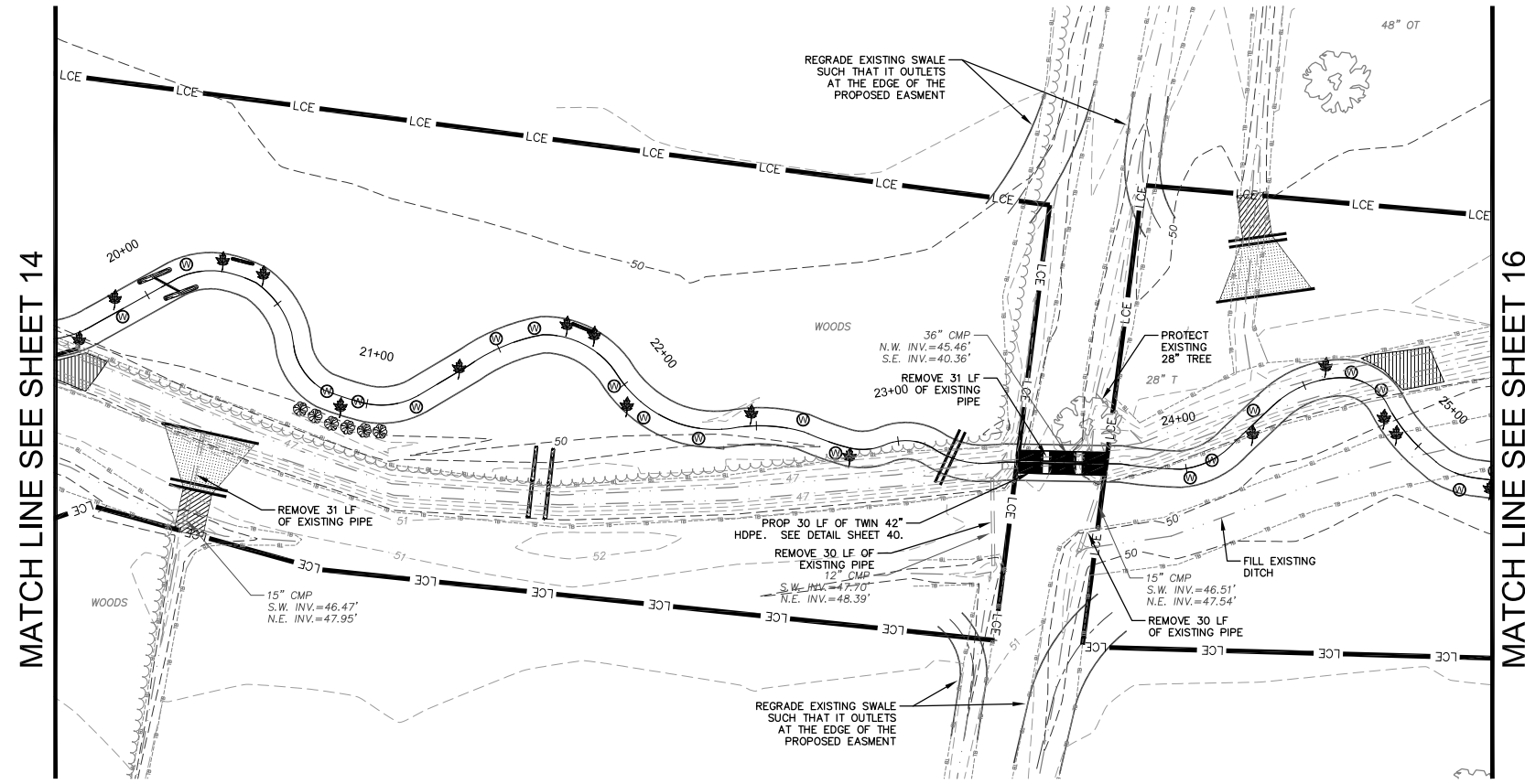
MARK	DATE	DESCRIPTION	REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3A
OWNER / 24 HR CONTACT: [Redacted]
ADDRESS: [Redacted]
PHONE: [Redacted]
MOBILE: [Redacted]

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
14
PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 18+15 TO 36+65 (REACH 3A)

- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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LEGEND

EXISTING CONTOUR MAJOR	---
EXISTING CONTOUR MINOR	- - - -
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	---TB---
EXISTING BOTTOM OF BANK	---
PROPOSED CENTERLINE OF CHANNEL	---
EXISTING FENCELINE	x-x-x-x
EXISTING TREE LINE	~ ~ ~ ~
PROPOSED CHANNEL BOTTOM	---
PROPOSED TOP OF BANK	---
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	■
PROPOSED FILL AREA	▨
PROPOSED WETLAND	▨
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	+
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	+
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	⊙
LEAF PACK (SEE DETAIL SHEET 40)	⊙
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	⊙
RAPTOR POLE (SEE DETAIL SHEET 42)	⊙
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	⊙
EXISTING TREE	⊙
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
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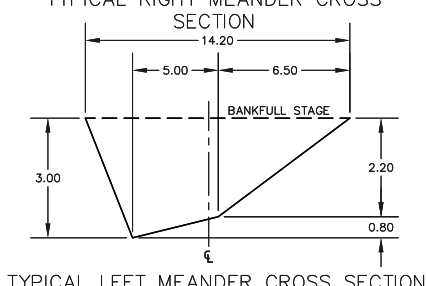
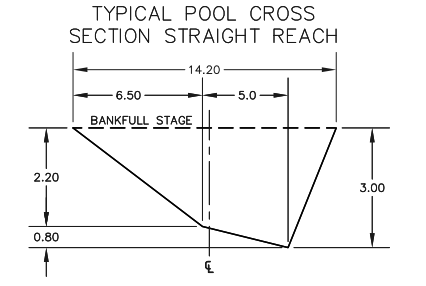
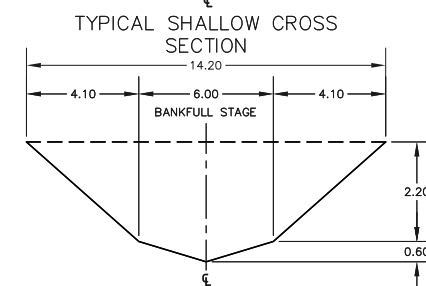
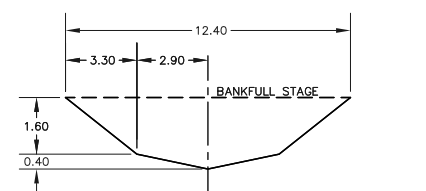
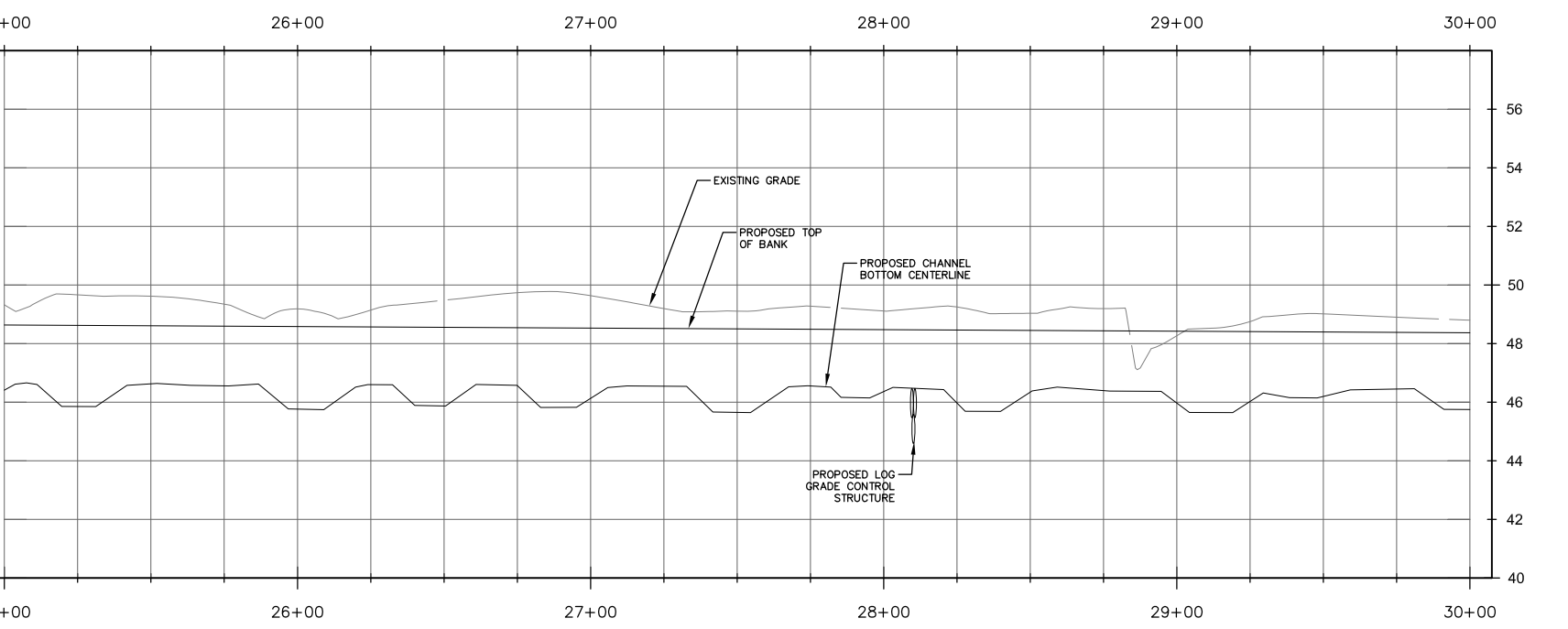
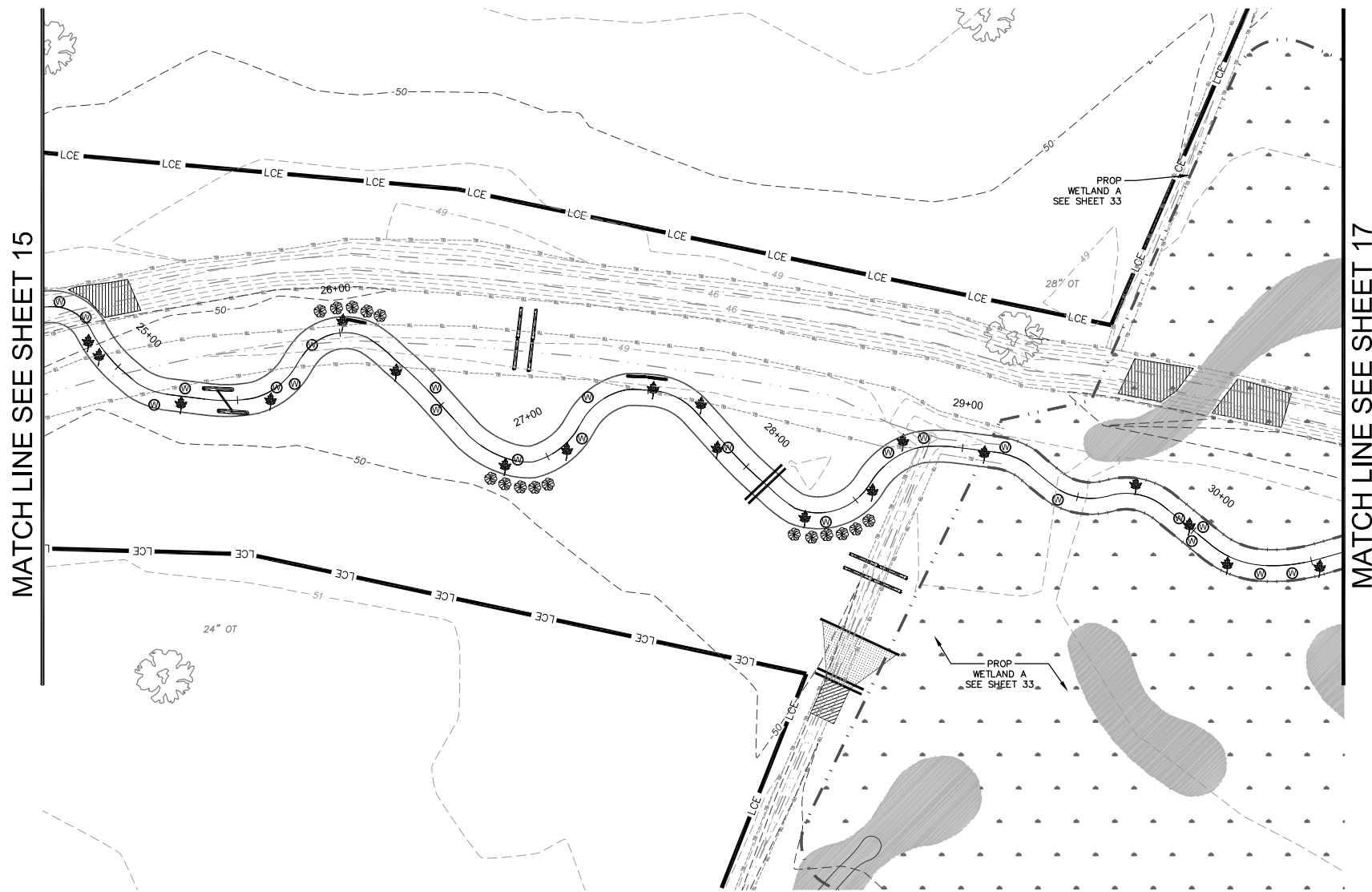


FULL SCALE: 1"=30 H, 1"=3 V
2" = FULL SCALE
1" = HALF SCALE

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TYP. SECTIONS STA 18+15 TO 36+65 (REACH 3A)

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 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MINIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 42 FOR DIMENSIONS.
 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	-50
EXISTING CONTOUR MINOR	-46
PROPOSED CONTOUR MAJOR	50
PROPOSED CONTOUR MINOR	42
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	— x — x — x —
EXISTING TREELINE	—
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
LEAF PACK (SEE DETAIL SHEET 40)	—
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—

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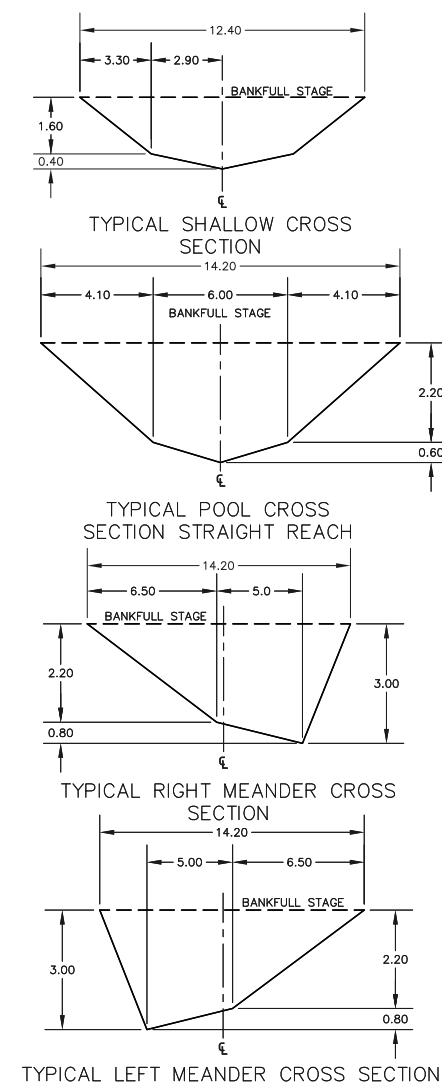
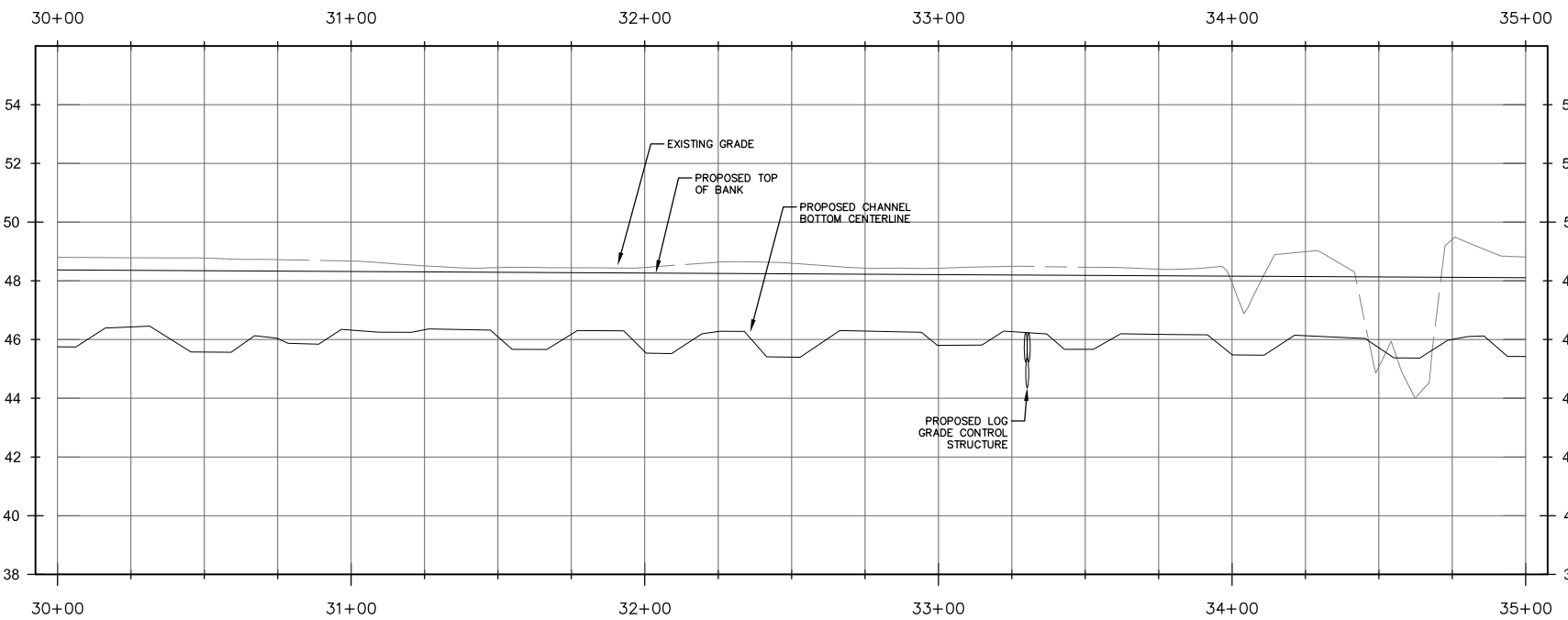
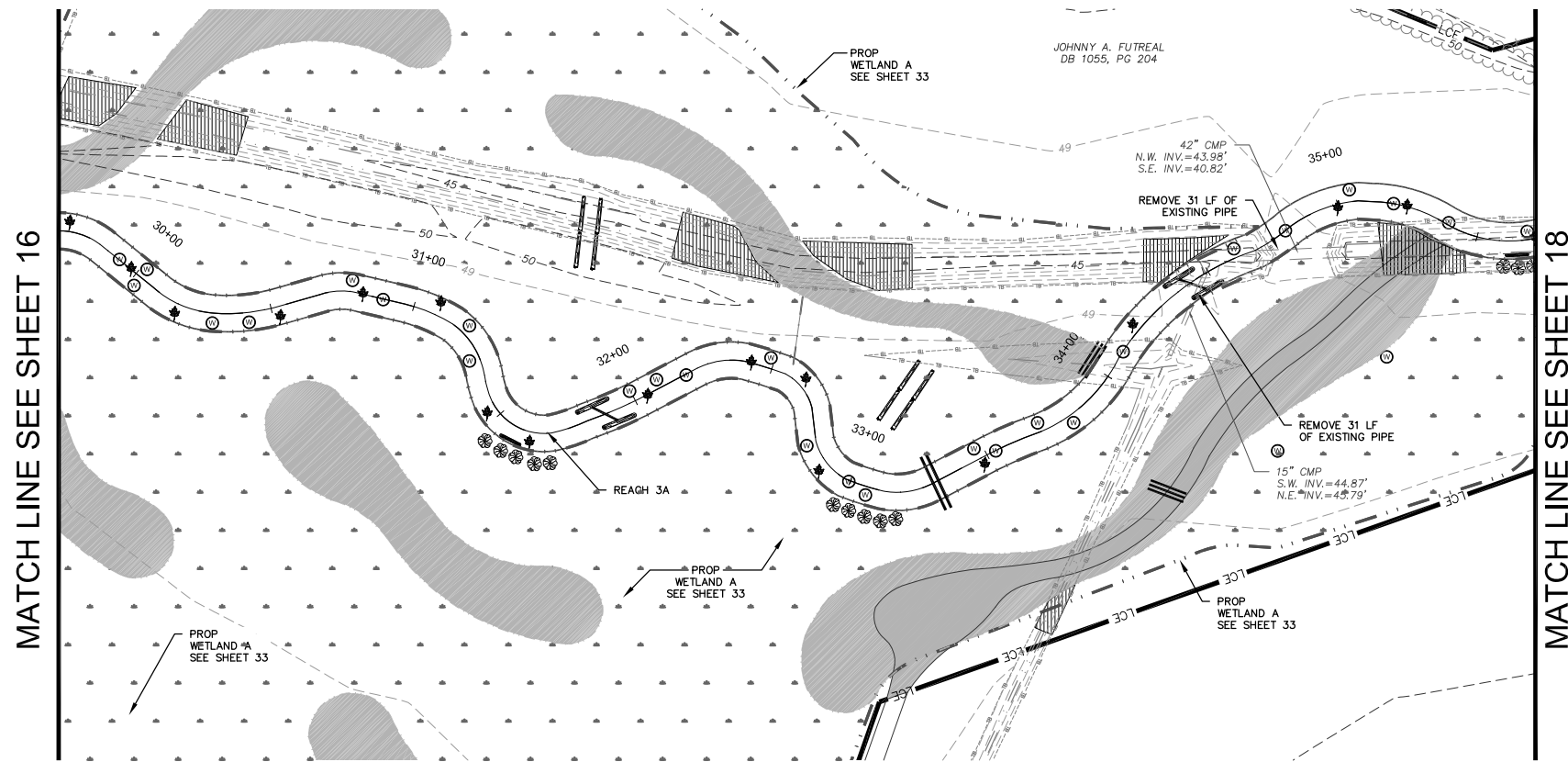
LEGEND
FULL SCALE: 1" = 30 H, 1" = 3 V
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3A
OWNER / 24 HR CONTACT: [Redacted]
ADDRESS: [Redacted]
PHONE: [Redacted]
MOBILE: [Redacted]

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
16
PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 18+15 TO 36+65 (REACH 3A)

- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MINIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 42 FOR DIMENSIONS.
 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	-50
EXISTING CONTOUR MINOR	-46
PROPOSED CONTOUR MAJOR	50
PROPOSED CONTOUR MINOR	42
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	TB
EXISTING BOTTOM OF BANK	
PROPOSED CENTERLINE OF CHANNEL	
EXISTING FENCELINE	
EXISTING TREELINE	
PROPOSED CHANNEL BOTTOM	
PROPOSED TOP OF BANK	
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	
LEAF PACK (SEE DETAIL SHEET 40)	
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	
RAPTOR POLE (SEE DETAIL SHEET 42)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	

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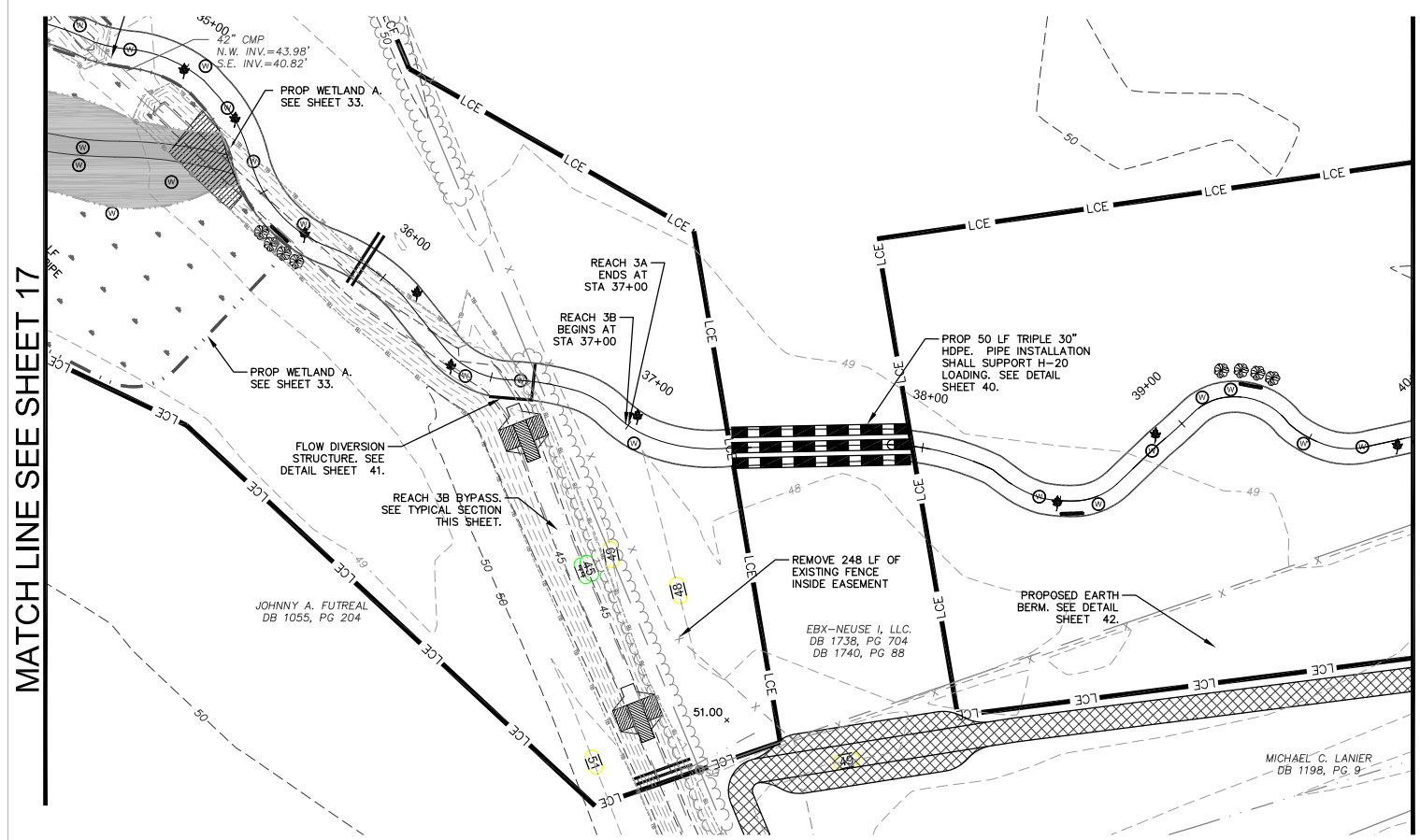
LEGEND
FULL SCALE: 1"=30 H, 1"=3 V
2"= FULL SCALE
1"= HALF SCALE

MARK	DATE	DESCRIPTION

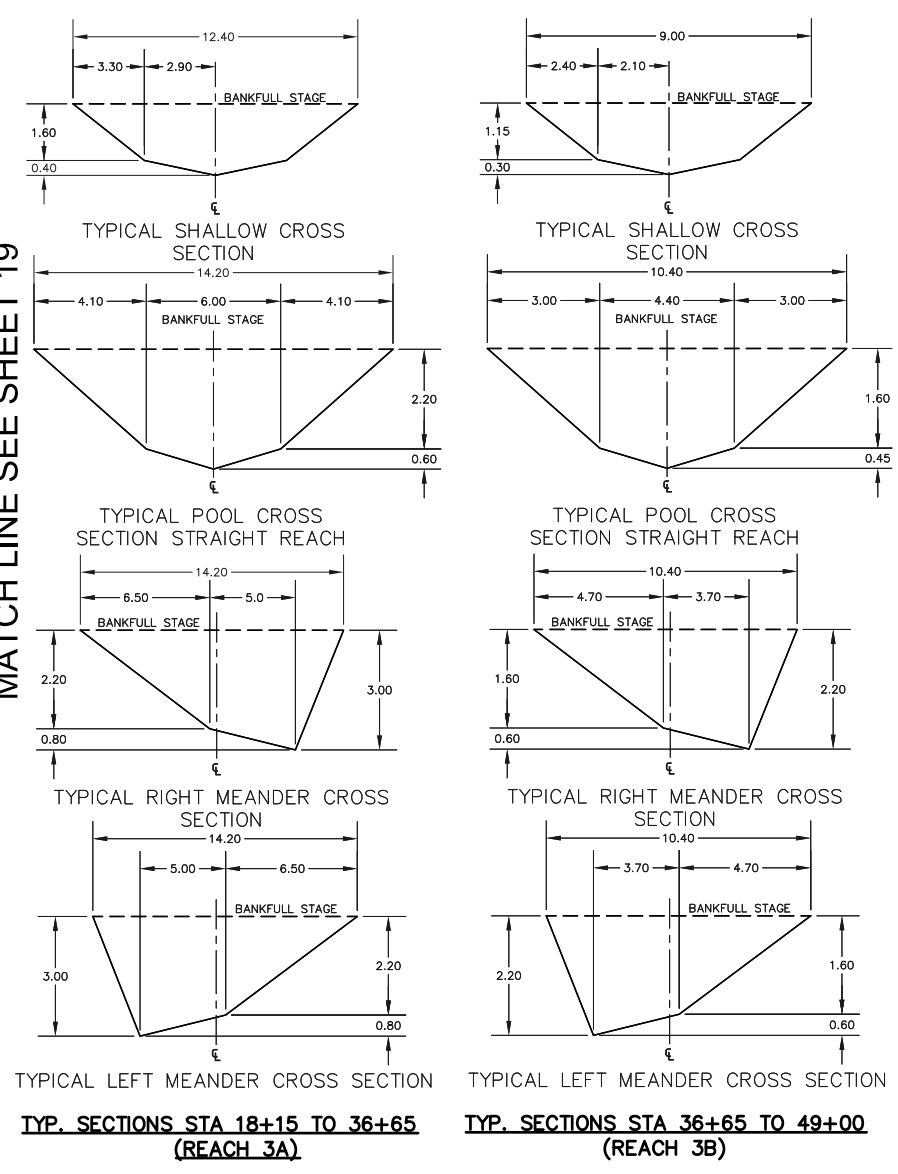
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3A
OWNER / 24 HR CONTACT: [Redacted]
ADDRESS: [Redacted]
PHONE: [Redacted]
MOBILE: [Redacted]

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
17
PROJ. NO.: 20120090.00.RA



MATCH LINE SEE SHEET 19

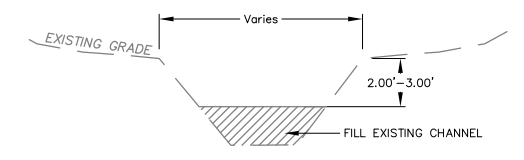
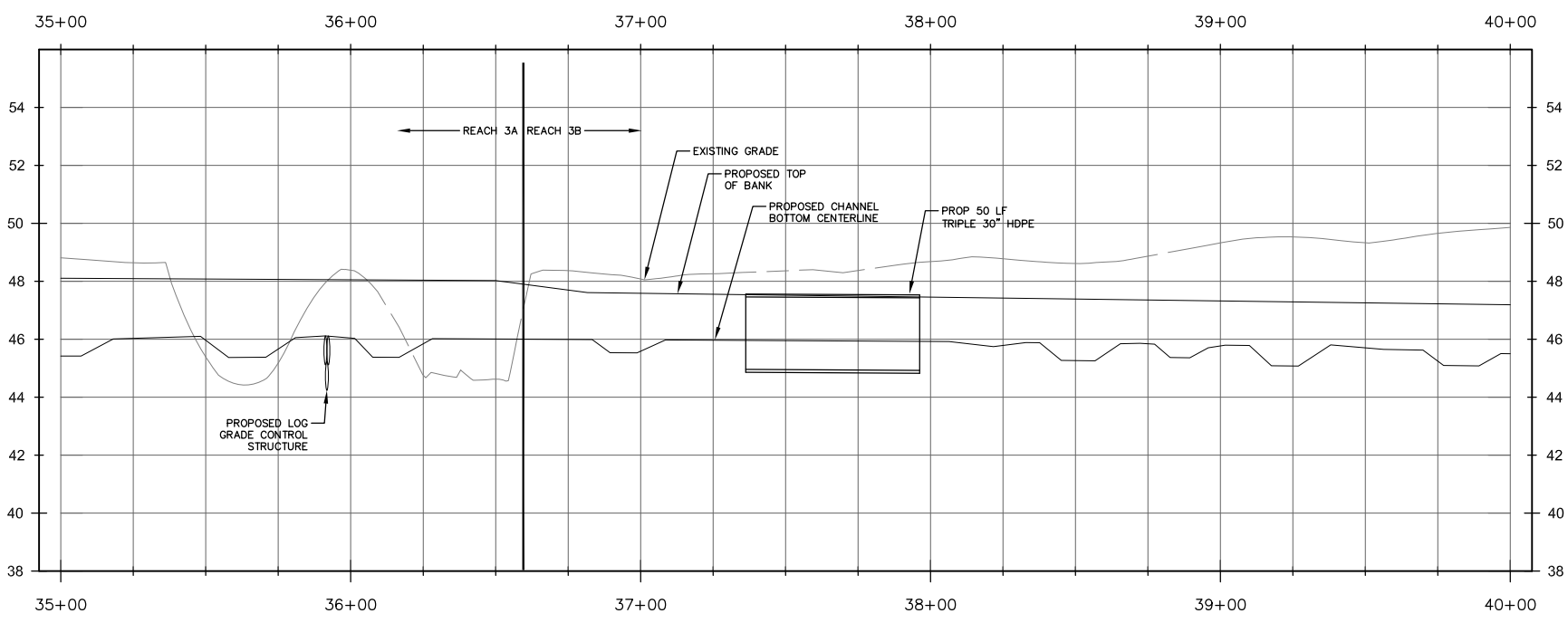


- NOTES:**
- IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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 - ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
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 - FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	- - - 50 - - -
EXISTING CONTOUR MINOR	- - - 46 - - -
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	— X — X — X —
EXISTING FENCELINE	— X — X — X —
EXISTING TREELINE	—
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
LEAF PACK (SEE DETAIL SHEET 40)	—
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—

TYP. SECTIONS STA 18+15 TO 36+65 (REACH 3A)
 TYP. SECTIONS STA 36+65 TO 49+00 (REACH 3B)



TYP. SECTION REACH 3B BYPASS

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 NC LICENSE NO. F-0374



LEGEND
 FULL SCALE: 1"=30 H, 1"=3 V
 2" = FULL SCALE
 1" = HALF SCALE

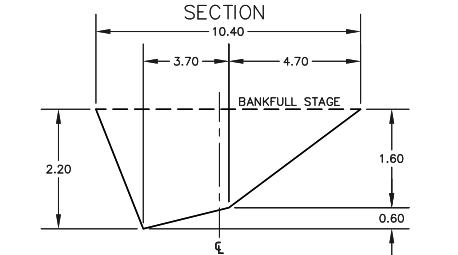
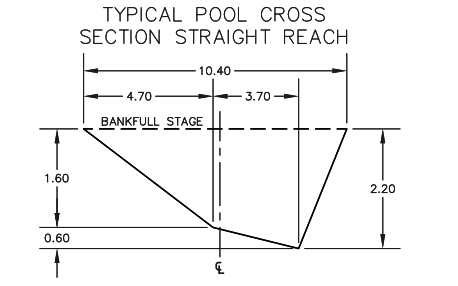
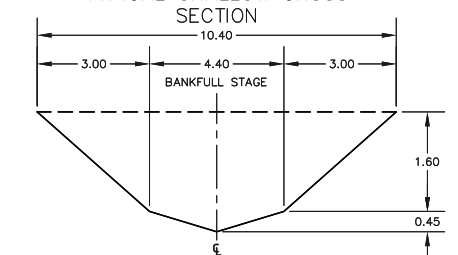
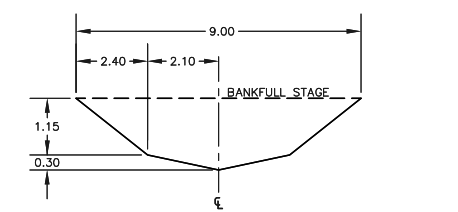
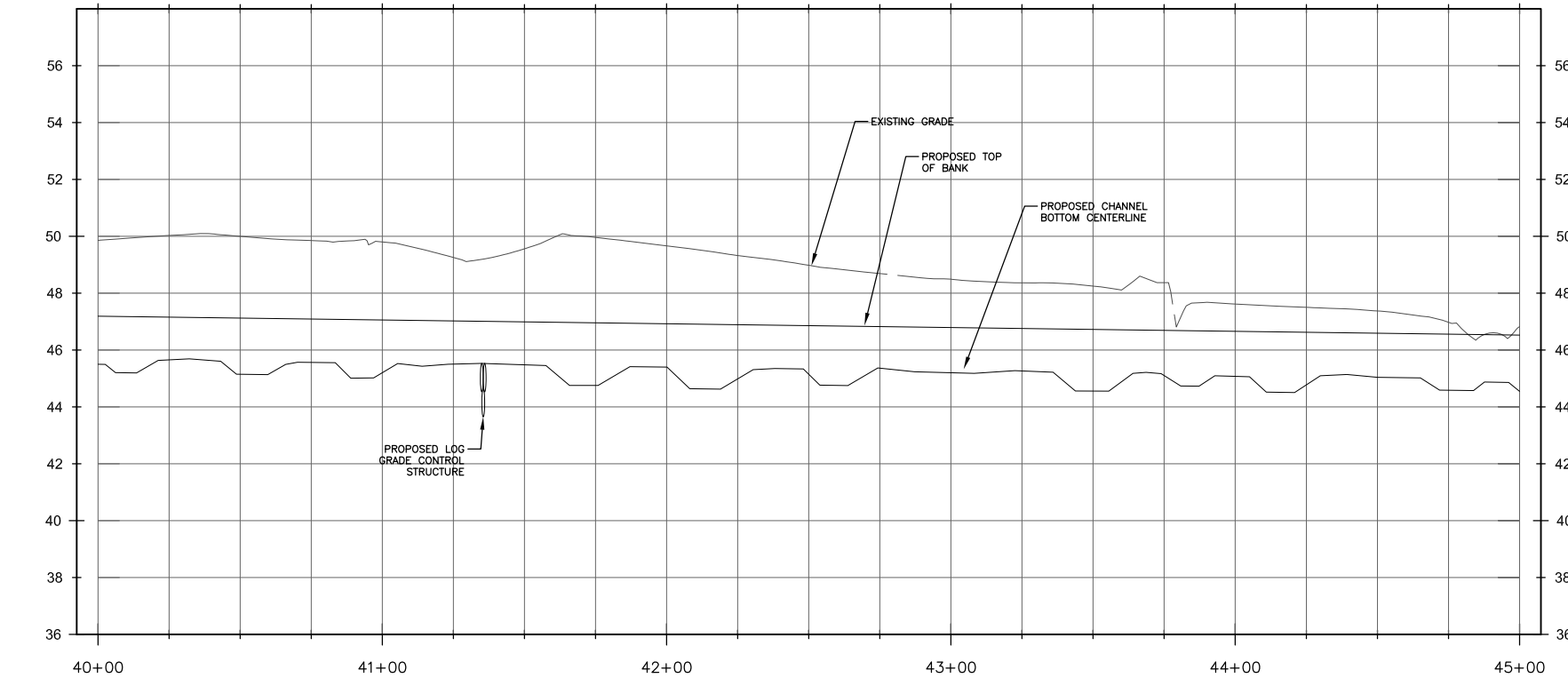
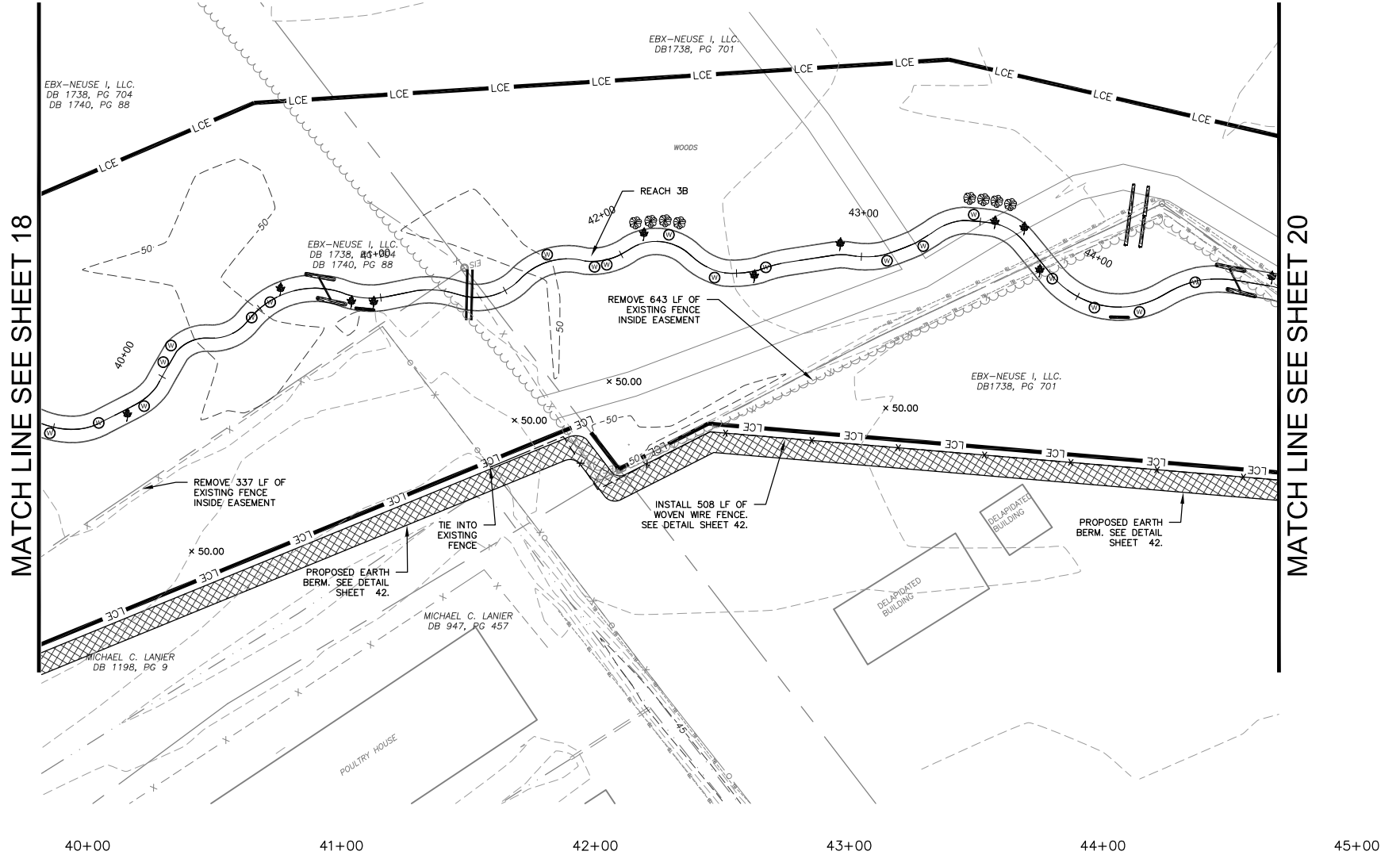
REVISIONS:

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
 PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANK & EXCHANGE, LLC
 DRAWING TITLE: Plan And Profile - Reach 3A & 3B
 OWNER / 24 HR CONTACT:
 ADDRESS:
 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C. DATE: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
18
 PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 36+65 TO 49+00 (REACH 3B)

- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
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 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	-50
EXISTING CONTOUR MINOR	-46
PROPOSED CONTOUR MAJOR	50
PROPOSED CONTOUR MINOR	42
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	TB
EXISTING BOTTOM OF BANK	
PROPOSED CENTERLINE OF CHANNEL	
EXISTING FENCELINE	
EXISTING TREELINE	
PROPOSED CHANNEL BOTTOM	
PROPOSED TOP OF BANK	
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	
LEAF PACK (SEE DETAIL SHEET 40)	
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	
RAPTOR POLE (SEE DETAIL SHEET 42)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	

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0 30
FULL SCALE: 1"=30'
2"= FULL SCALE
1"= HALF SCALE

REVISIONS:

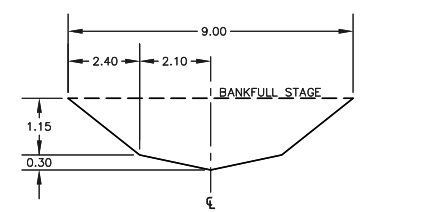
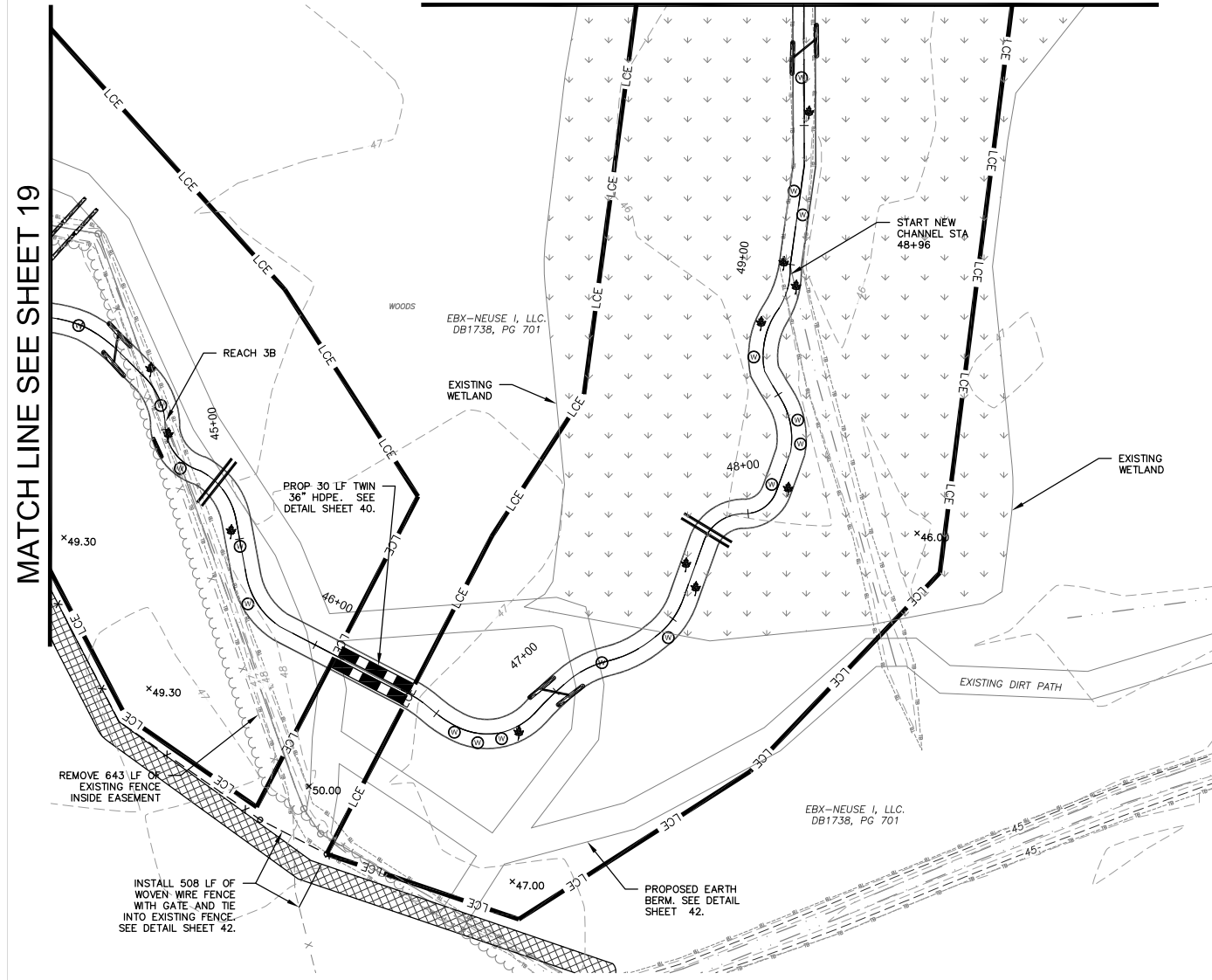
MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

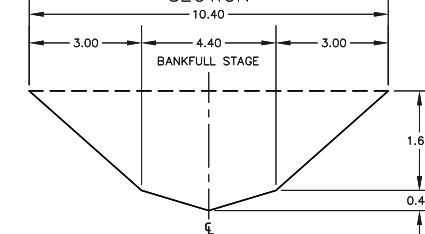
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3B
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
19
PROJ. NO.: 20120090.00.RA

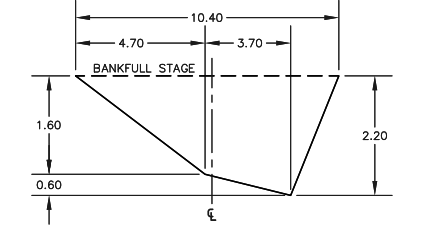
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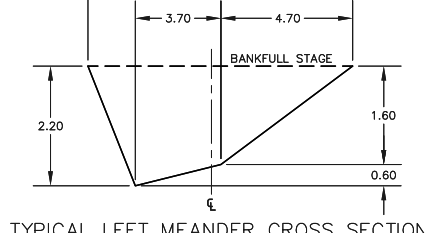
TYPICAL SHALLOW CROSS SECTION



TYPICAL POOL CROSS SECTION STRAIGHT REACH

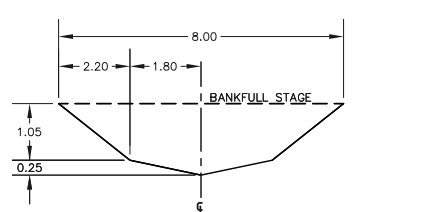


TYPICAL RIGHT MEANDER CROSS SECTION

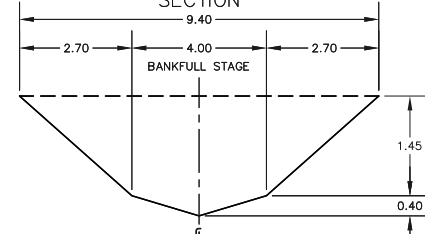


TYPICAL LEFT MEANDER CROSS SECTION

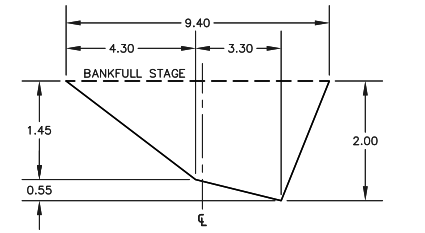
TYP. SECTIONS STA 36+65 TO 49+00 (REACH 3B)



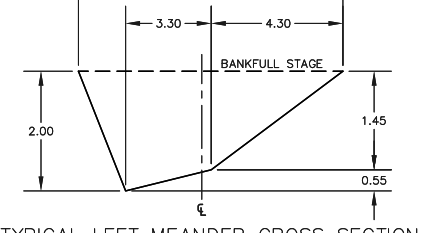
TYPICAL SHALLOW CROSS SECTION



TYPICAL POOL CROSS SECTION STRAIGHT REACH



TYPICAL RIGHT MEANDER CROSS SECTION



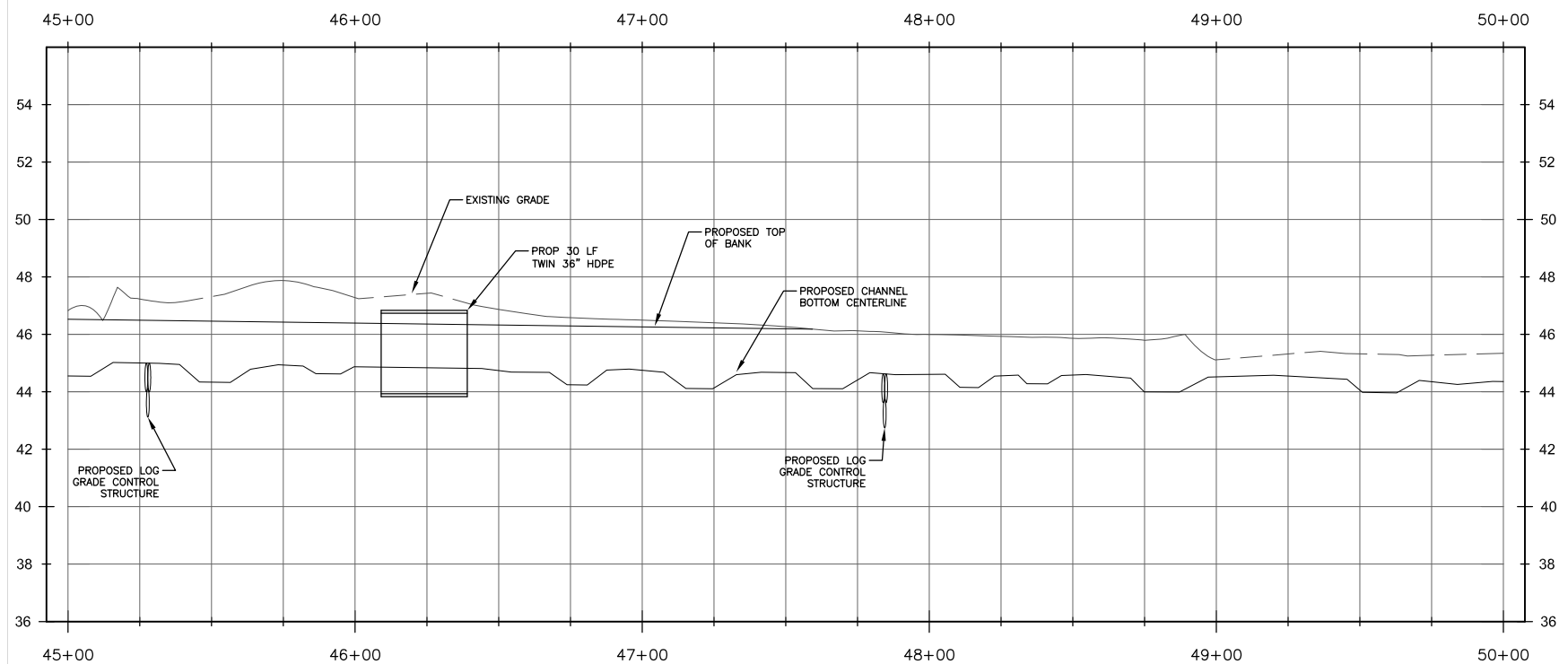
TYPICAL LEFT MEANDER CROSS SECTION

TYP. SECTIONS STA 49+00 TO 56+78 (REACH 3B)

- NOTES:
- IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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LEGEND

EXISTING CONTOUR MAJOR	- - - 50 - - -
EXISTING CONTOUR MINOR	- - - 46 - - -
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	— x — x — x —
EXISTING FENCELINE	— x — x — x —
EXISTING TREELINE	— x — x — x —
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
LEAF PACK (SEE DETAIL SHEET 40)	—
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—



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LEGEND
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2" = FULL SCALE
1" = HALF SCALE

MARK | DATE | DESCRIPTION

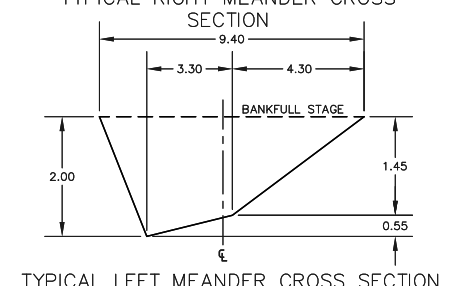
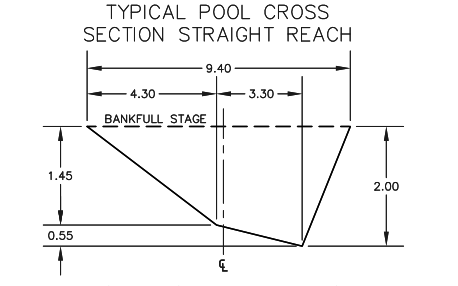
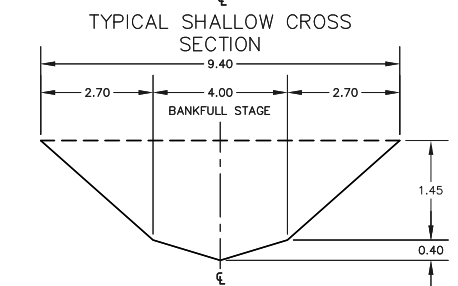
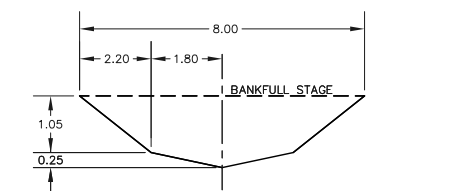
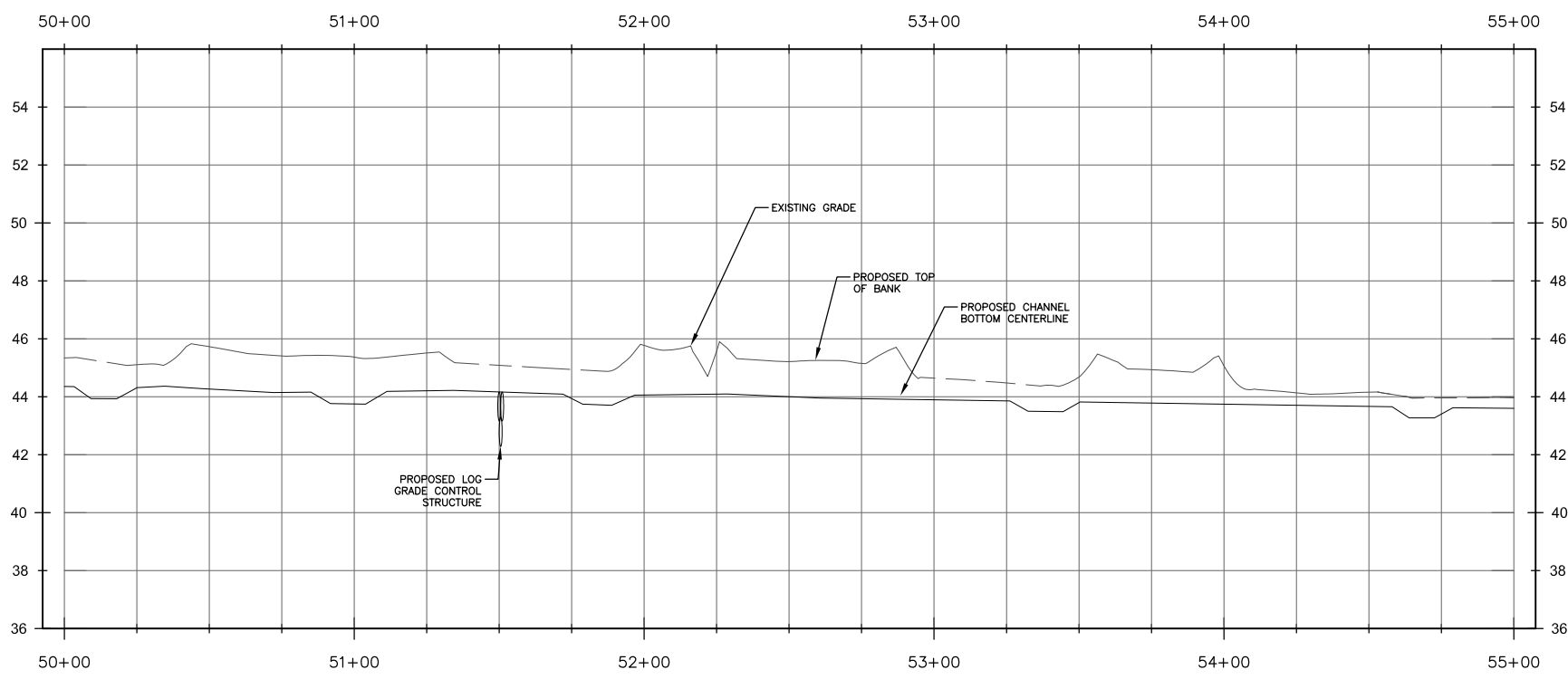
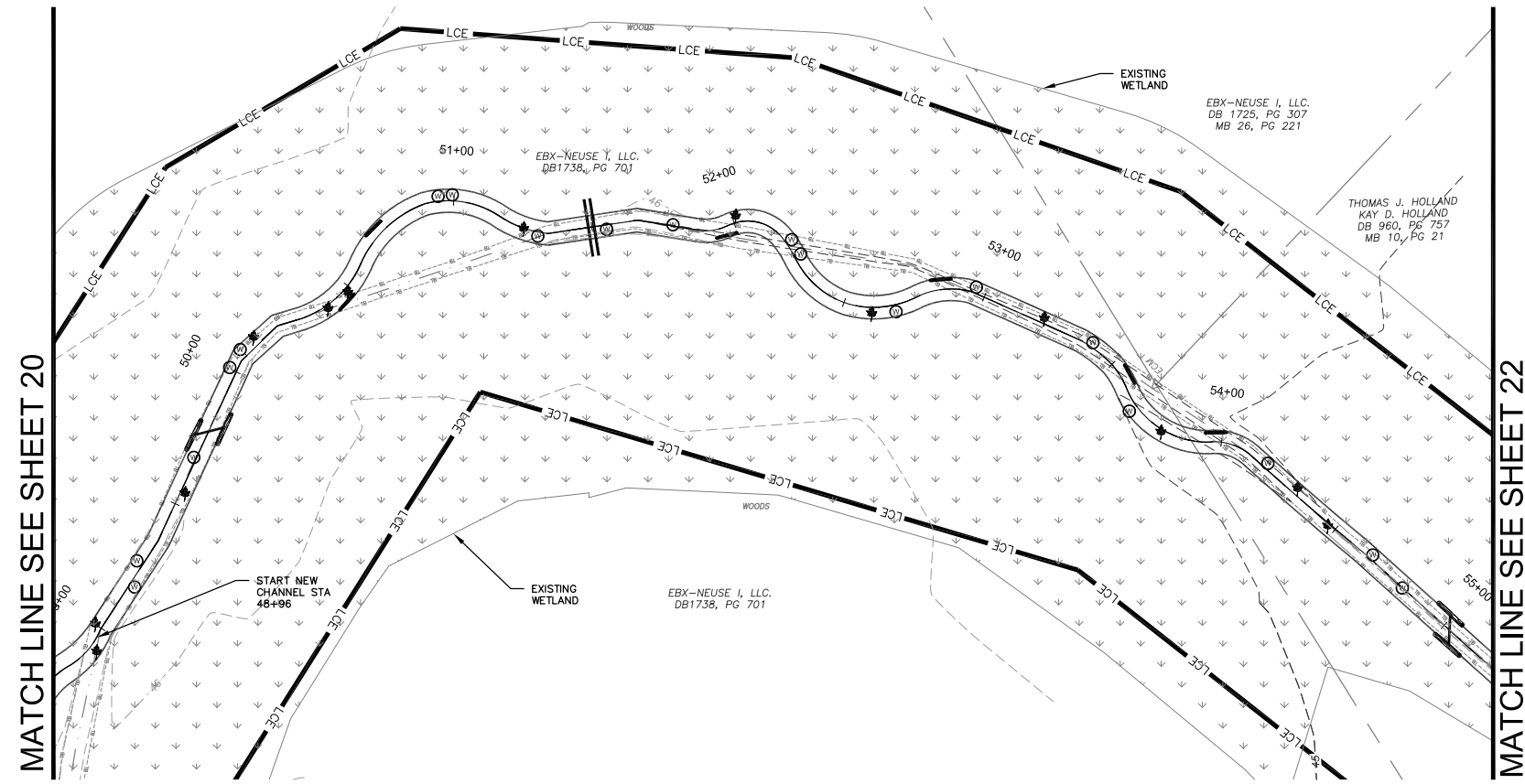
REVISIONS:

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3B
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
20
PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 49+00 TO 56+78 (REACH 3B)

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MINIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 42 FOR DIMENSIONS.
 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	- - - - -50-
EXISTING CONTOUR MINOR	- - - - -46-
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	— x — x —
EXISTING TREELINE	— x — x —
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	
LEAF PACK (SEE DETAIL SHEET 40)	
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	
RAPTOR POLE (SEE DETAIL SHEET 42)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	

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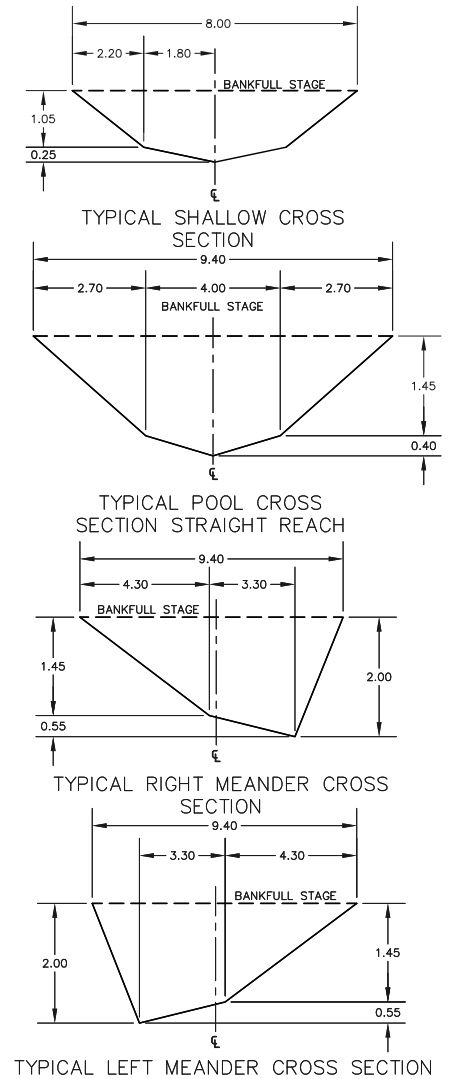
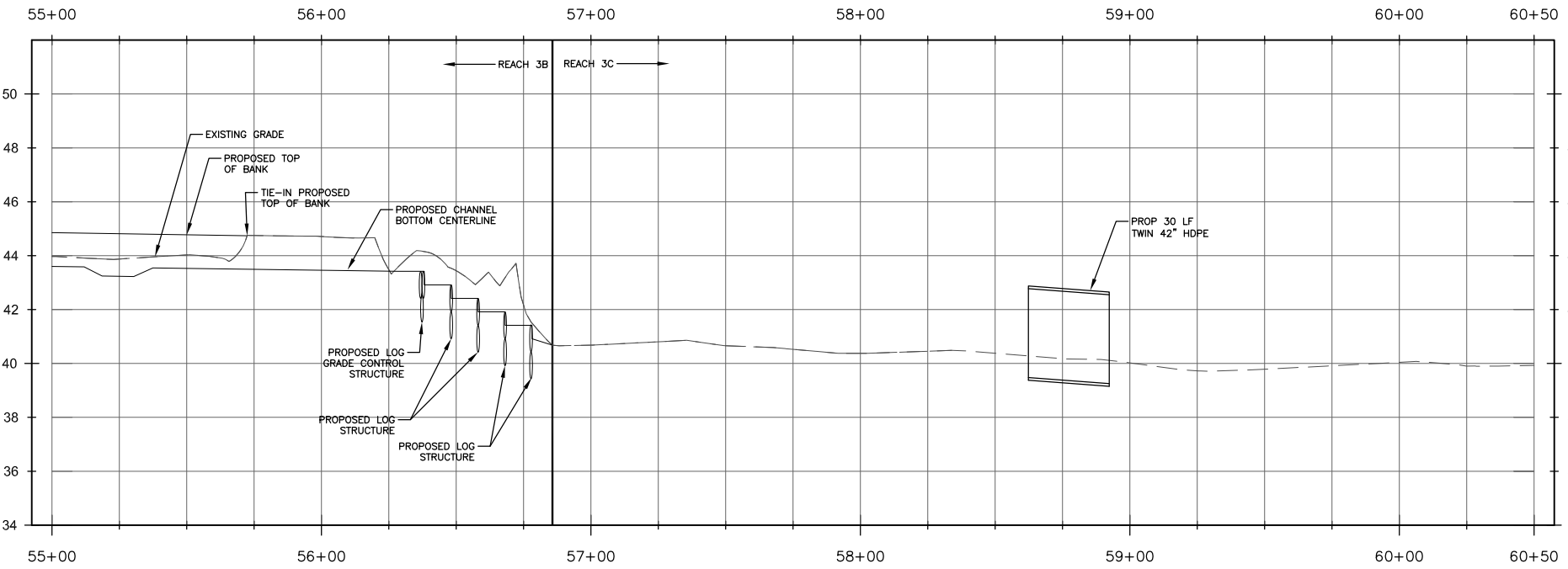
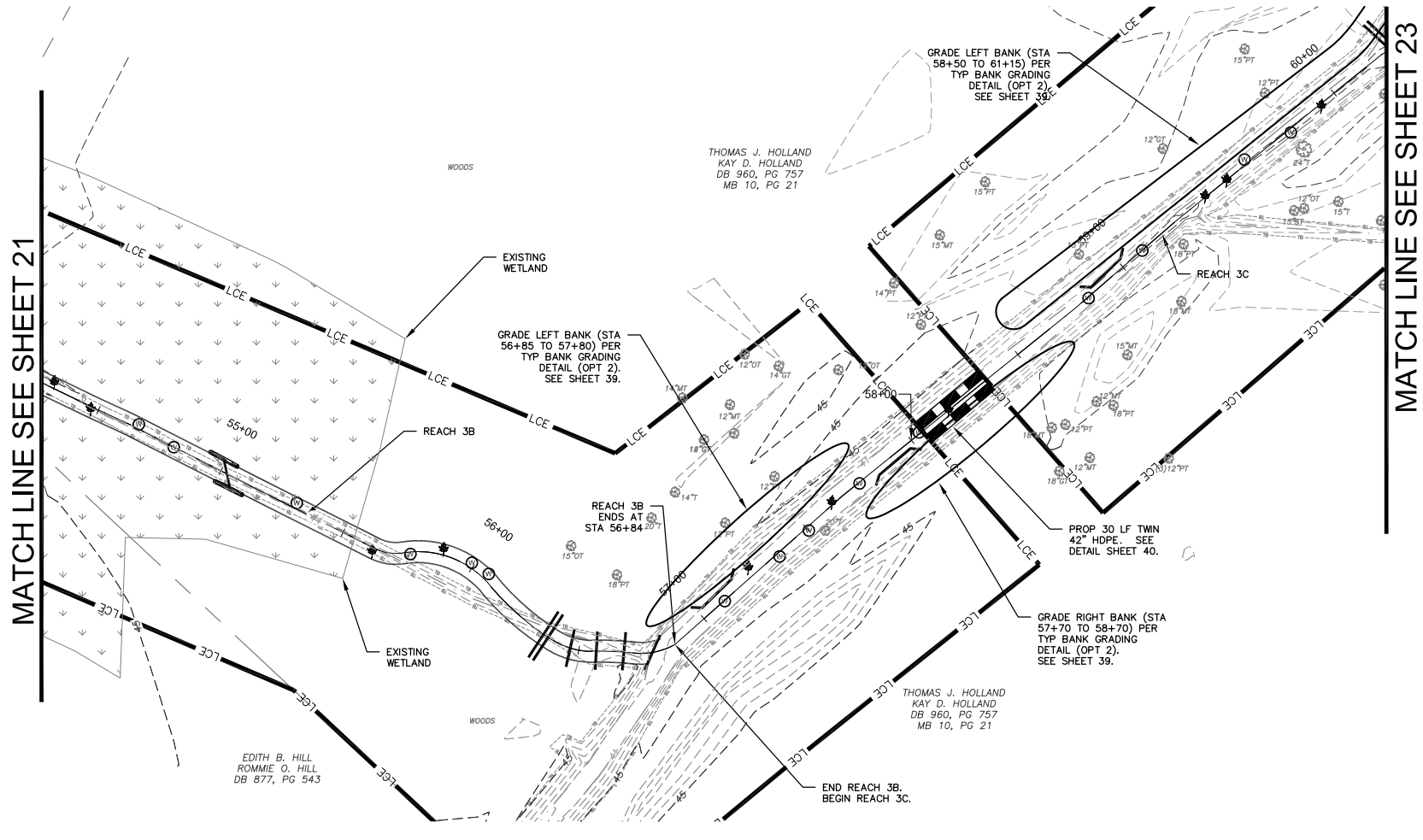


LEGEND
FULL SCALE: 1"=30'
2"= FULL SCALE
1"= HALF SCALE

MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	PLOT DATE:
					5/1/13
PRELIMINARY - NOT FOR CONSTRUCTION					

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3B
OWNER / 24 HR CONTACT: Plan And Profile - Reach 3B
ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
21
PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 49+00 TO 56+78 (REACH 3B)

REACH 3C NOTE:
 PROPOSED ENHANCEMENT AND FLOODPLAIN BENCH GRADING, PER LOCATIONS SHOWN IN TABLE BELOW. SEE TYPICAL BANK GRADING OPTION 2 DETAIL ON SHEET 42.

BANK GRADING	
BANK (FACING DOWNSTREAM)	STATION
LEFT	56+85 - 57+80
RIGHT	57+70 - 58+70
LEFT	58+50 - 61+15
RIGHT	61+15 - 61+70
LEFT	61+80 - 62+50
RIGHT	62+40 - 63+45
LEFT	63+45 - 64+10

- NOTES:**
- IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 - ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 - ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 - CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 - UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 - FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

- LEGEND**
- EXISTING CONTOUR MAJOR: -50-
 - EXISTING CONTOUR MINOR: -46-
 - PROPOSED CONTOUR MAJOR: (50)
 - PROPOSED CONTOUR MINOR: (42)
 - PROPOSED SPOT SHOT: x 49.32
 - EXISTING TOP OF BANK: TB
 - EXISTING BOTTOM OF BANK: TB
 - PROPOSED CENTERLINE OF CHANNEL: ---
 - EXISTING FENCELINE: ---x---
 - EXISTING TREELINE: ---x---
 - PROPOSED CHANNEL BOTTOM: ---
 - PROPOSED TOP OF BANK: ---
 - LIMITS OF PROPOSED CONSERVATION EASEMENT: LCE
 - LOG TOE PROTECTION (SEE DETAIL SHEET 39): [Symbol]
 - LOG STRUCTURE (SEE DETAIL SHEET 41): [Symbol]
 - LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39): [Symbol]
 - VEGETATED SILL (SEE DETAIL SHEET 39): [Symbol]
 - WETLAND DEPRESSION: [Symbol]
 - PROPOSED FILL AREA: [Symbol]
 - PROPOSED WETLAND: [Symbol]
 - PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39): [Symbol]
 - CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42): [Symbol]
 - LARGE WOODY DEBRIS (SEE DETAIL SHEET 41): [Symbol]
 - LEAF PACK (SEE DETAIL SHEET 40): [Symbol]
 - SMALL WOODY DEBRIS (SEE DETAIL SHEET 40): [Symbol]
 - RAPTOR POLE (SEE DETAIL SHEET 42): [Symbol]
 - LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40): [Symbol]
 - EXISTING TREE: [Symbol]
 - LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40): [Symbol]
 - BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40): [Symbol]
 - FLOODPLAIN SILL (SEE DETAIL SHEET 41): [Symbol]
 - DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41): [Symbol]

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LEGEND
 FULL SCALE: 1" = 30'
 2" = FULL SCALE
 1" = HALF SCALE

MARK | DATE | DESCRIPTION

REVISIONS:

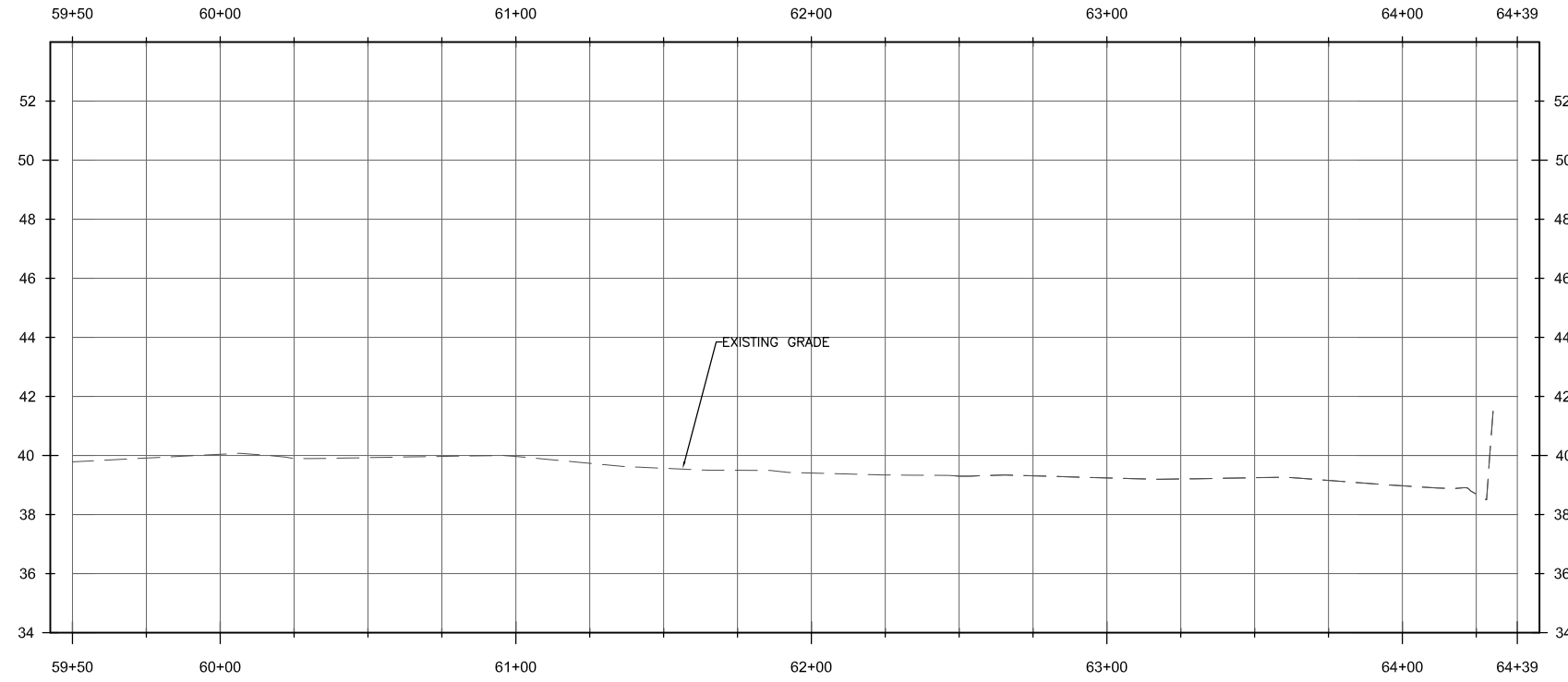
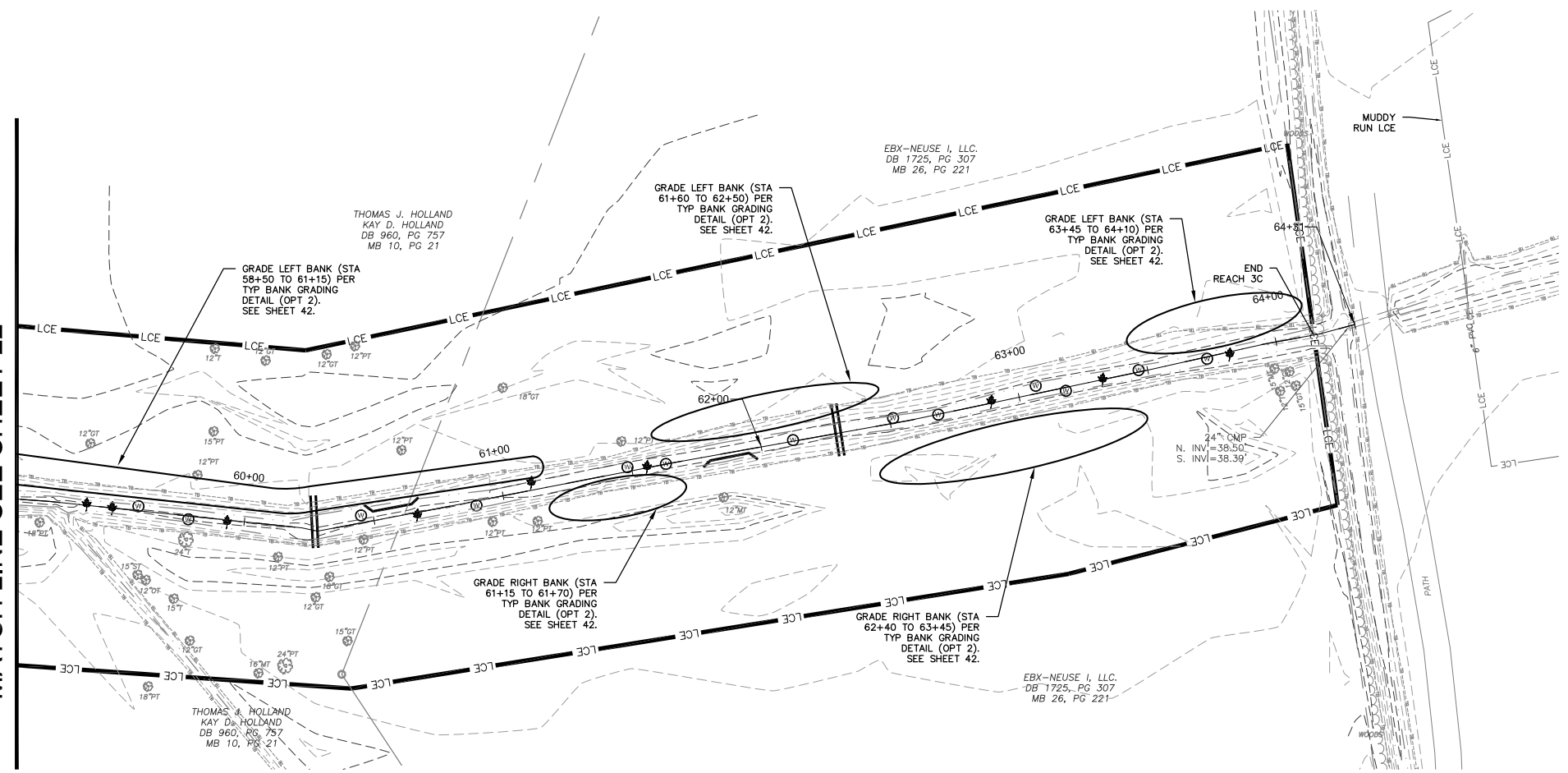
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
CLIENT: DUPLIN CO. NORTH CAROLINA
OWNER: ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 3B & 3C
OWNER / 24 HR CONTACT: [Redacted]
ADDRESS: [Redacted]
PHONE: [Redacted]
MOBILE: [Redacted]

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
22
PROJ. NO.: 20120090.00.RA

MATCH LINE SEE SHEET 22



REACH 3C NOTE:
 PROPOSED ENHANCEMENT AND FLOODPLAIN BENCH GRADING, PER LOCATIONS SHOWN IN TABLE BELOW. SEE TYPICAL BANK GRADING OPTION 2 DETAIL ON SHEET 42.

BANK GRADING	
BANK (FACING DOWNSTREAM)	STATION
LEFT	56+85 - 57+80
RIGHT	57+70 - 58+70
LEFT	58+50 - 61+15
RIGHT	61+15 - 61+70
LEFT	61+60 - 62+50
RIGHT	62+40 - 63+45
LEFT	63+45 - 64+10

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
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 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

- EXISTING CONTOUR MAJOR: -50
- EXISTING CONTOUR MINOR: -46
- PROPOSED CONTOUR MAJOR: (50)
- PROPOSED CONTOUR MINOR: (42)
- PROPOSED SPOT SHOT: x 49.32
- EXISTING TOP OF BANK: TB
- EXISTING BOTTOM OF BANK: TB
- PROPOSED CENTERLINE OF CHANNEL: ---
- EXISTING FENCELINE: ---
- EXISTING TREELINE: ---
- PROPOSED CHANNEL BOTTOM: ---
- PROPOSED TOP OF BANK: ---
- LIMITS OF PROPOSED CONSERVATION EASEMENT: LCE
- LOG TOE PROTECTION (SEE DETAIL SHEET 39): [Symbol]
- LOG STRUCTURE (SEE DETAIL SHEET 41): [Symbol]
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39): [Symbol]
- VEGETATED SILL (SEE DETAIL SHEET 39): [Symbol]
- WETLAND DEPRESSION: [Symbol]
- PROPOSED FILL AREA: [Symbol]
- PROPOSED WETLAND: [Symbol]
- PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39): [Symbol]
- CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42): [Symbol]
- LARGE WOODY DEBRIS (SEE DETAIL SHEET 41): [Symbol]
- LEAF PACK (SEE DETAIL SHEET 40): [Symbol]
- SMALL WOODY DEBRIS (SEE DETAIL SHEET 40): [Symbol]
- RAPTOR POLE (SEE DETAIL SHEET 42): [Symbol]
- LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40): [Symbol]
- EXISTING TREE: [Symbol]
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40): [Symbol]
- BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40): [Symbol]
- FLOODPLAIN SILL (SEE DETAIL SHEET 41): [Symbol]
- DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41): [Symbol]

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 720 Corporate Drive
 Raleigh, NC 27607
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 NC LICENSE NO. F-0374



LEGEND

- EXISTING CONTOUR MAJOR: -50
- EXISTING CONTOUR MINOR: -46
- PROPOSED CONTOUR MAJOR: (50)
- PROPOSED CONTOUR MINOR: (42)
- PROPOSED SPOT SHOT: x 49.32
- EXISTING TOP OF BANK: TB
- EXISTING BOTTOM OF BANK: TB
- PROPOSED CENTERLINE OF CHANNEL: ---
- EXISTING FENCELINE: ---
- EXISTING TREELINE: ---
- PROPOSED CHANNEL BOTTOM: ---
- PROPOSED TOP OF BANK: ---
- LIMITS OF PROPOSED CONSERVATION EASEMENT: LCE
- LOG TOE PROTECTION (SEE DETAIL SHEET 39): [Symbol]
- LOG STRUCTURE (SEE DETAIL SHEET 41): [Symbol]
- LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39): [Symbol]
- VEGETATED SILL (SEE DETAIL SHEET 39): [Symbol]
- WETLAND DEPRESSION: [Symbol]
- PROPOSED FILL AREA: [Symbol]
- PROPOSED WETLAND: [Symbol]
- PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39): [Symbol]
- CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42): [Symbol]
- LARGE WOODY DEBRIS (SEE DETAIL SHEET 41): [Symbol]
- LEAF PACK (SEE DETAIL SHEET 40): [Symbol]
- SMALL WOODY DEBRIS (SEE DETAIL SHEET 40): [Symbol]
- RAPTOR POLE (SEE DETAIL SHEET 42): [Symbol]
- LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40): [Symbol]
- EXISTING TREE: [Symbol]
- LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40): [Symbol]
- BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40): [Symbol]
- FLOODPLAIN SILL (SEE DETAIL SHEET 41): [Symbol]
- DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41): [Symbol]

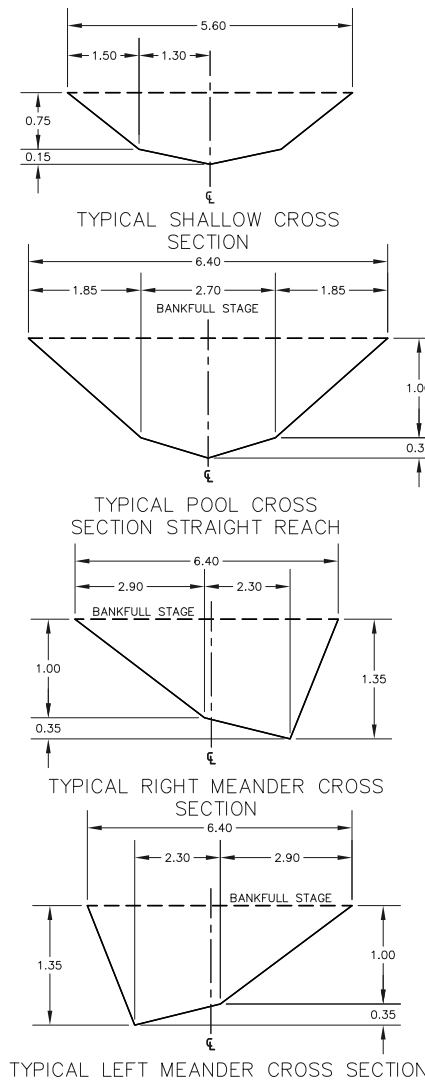
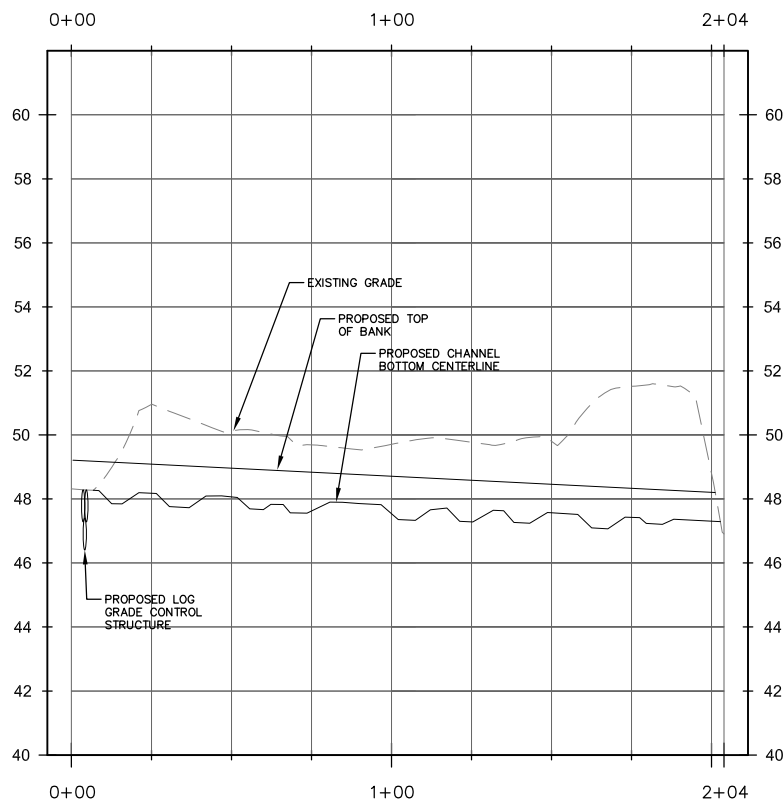
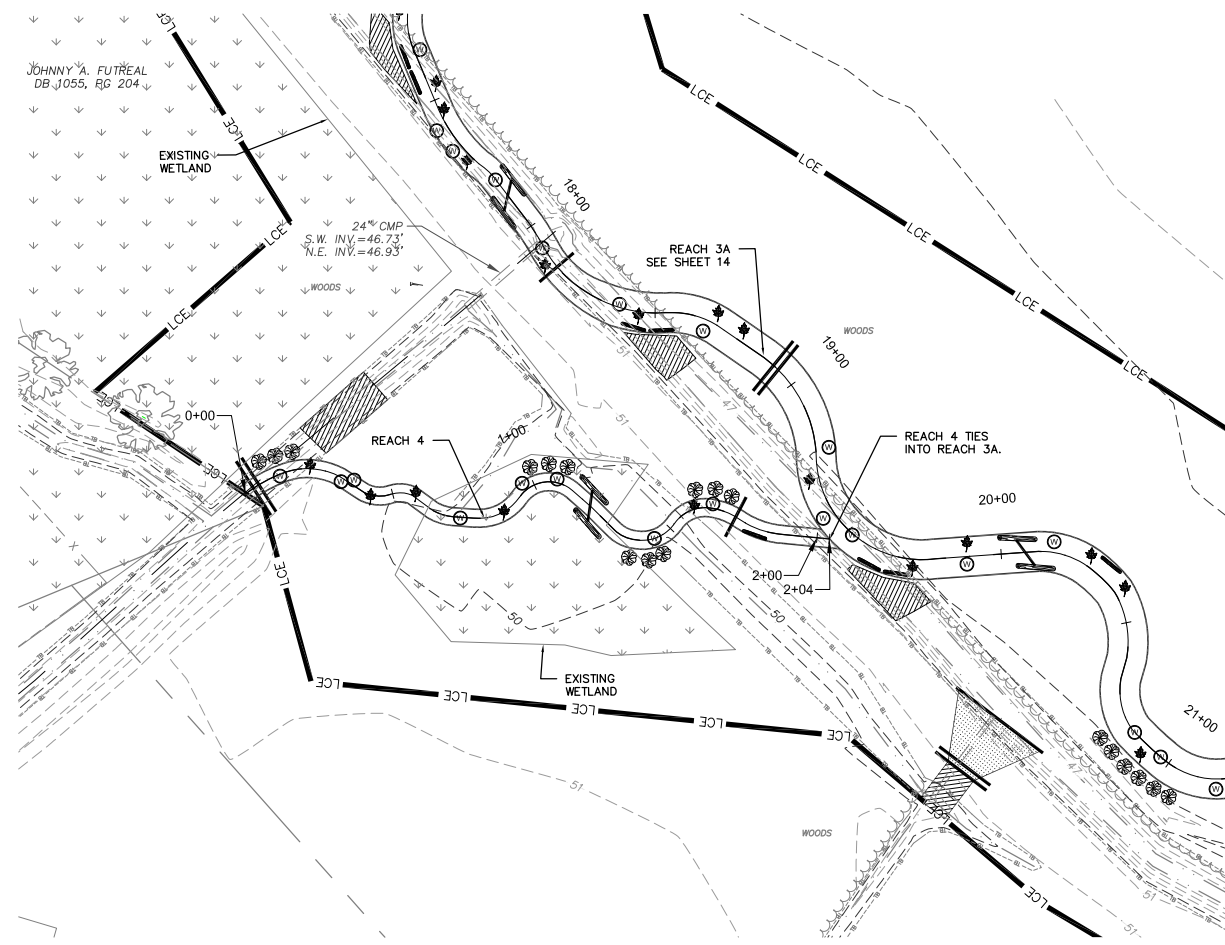
FULL SCALE: 1"=30 H, 1"=3 V
 2" = FULL SCALE
 1" = HALF SCALE

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
 PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Plan And Profile - Reach 3C
 OWNER / 24 HR CONTACT: [Blank]
 ADDRESS: [Blank]
 PHONE: [Blank]
 MOBILE: [Blank]

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
23
 PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 00+00 TO 2+04 (REACH 4)

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
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 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	---	50
EXISTING CONTOUR MINOR	---	46
PROPOSED CONTOUR MAJOR	---	50
PROPOSED CONTOUR MINOR	---	42
PROPOSED SPOT SHOT		× 49.32
EXISTING TOP OF BANK	---	TB
EXISTING BOTTOM OF BANK	---	
PROPOSED CENTERLINE OF CHANNEL	---	
EXISTING FENCELINE	---	
EXISTING TREELINE	---	
PROPOSED CHANNEL BOTTOM	---	
PROPOSED TOP OF BANK	---	
LIMITS OF PROPOSED CONSERVATION EASEMENT	---	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	---	
LOG STRUCTURE (SEE DETAIL SHEET 41)	---	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	---	
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PROPOSED WETLAND	---	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	---	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	---	
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	---	
LEAF PACK (SEE DETAIL SHEET 40)	---	
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	---	
RAPTOR POLE (SEE DETAIL SHEET 42)	---	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	---	
EXISTING TREE	---	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	---	
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	---	
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	---	
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	---	

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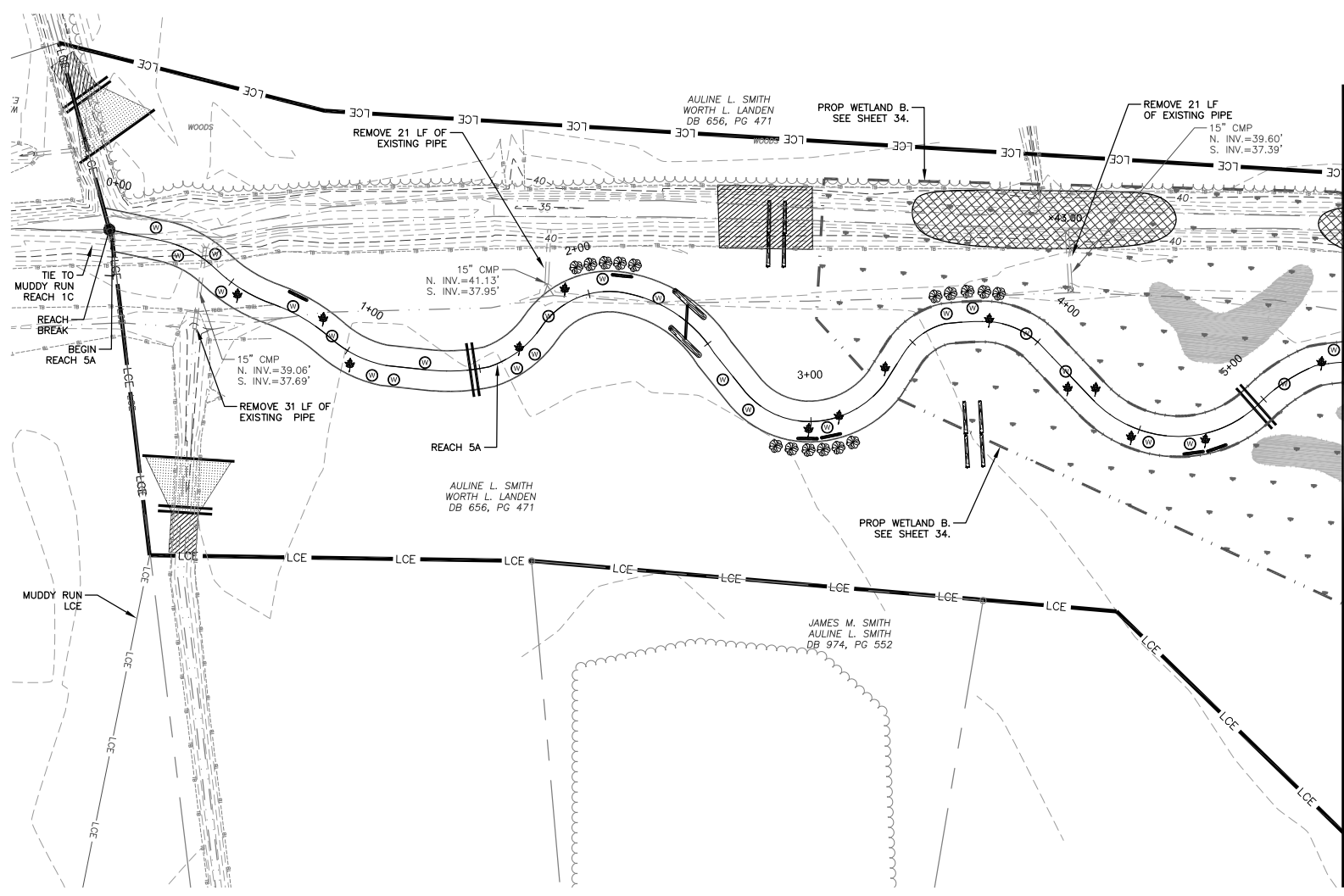
LEGEND
FULL SCALE: 1"=30 H, 1"=3 V
2"= FULL SCALE
1"= HALF SCALE

MARK	DATE	DESCRIPTION	REVISIONS:

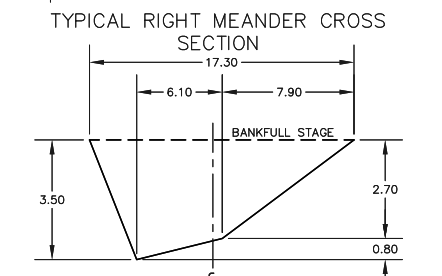
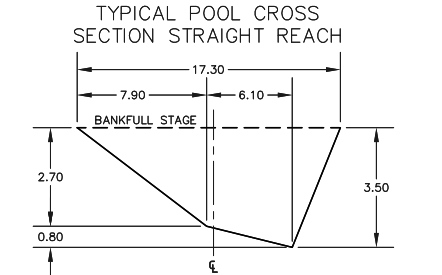
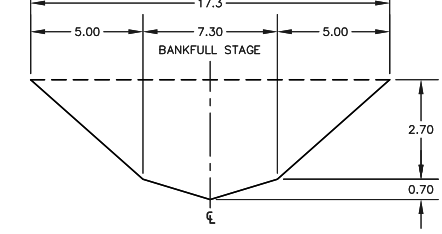
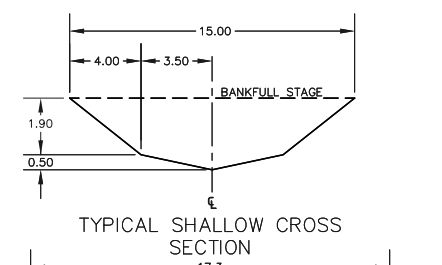
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 4
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
24
PROJ. NO.: 20120090.00.RA



MATCH LINE SEE SHEET 26

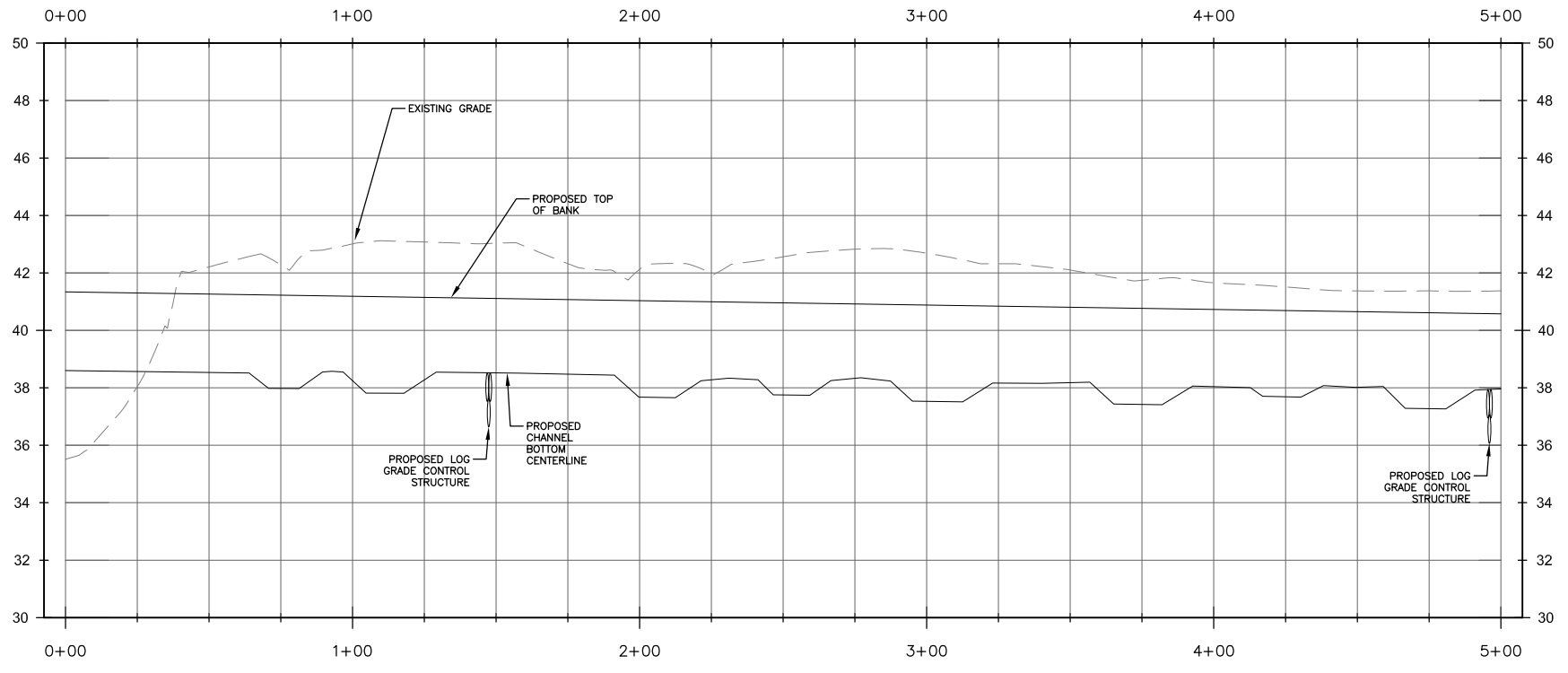


TYP. SECTIONS STA 00+00 TO 18+20 (REACH 5A)

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
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 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	- - - 50 - - -
EXISTING CONTOUR MINOR	- - - 46 - - -
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	- x - x - x -
EXISTING TREELINE	~ ~ ~
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	
LEAF PACK (SEE DETAIL SHEET 40)	
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	
RAPTOR POLE (SEE DETAIL SHEET 42)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	



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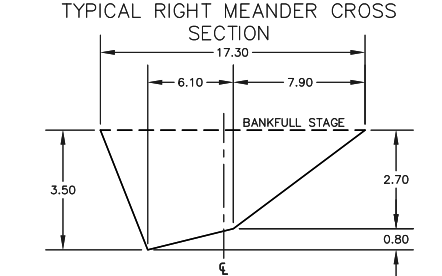
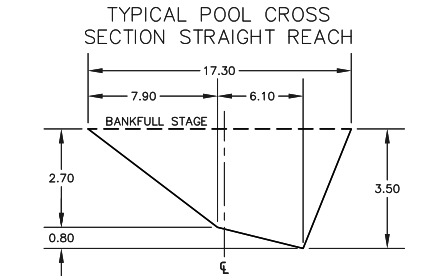
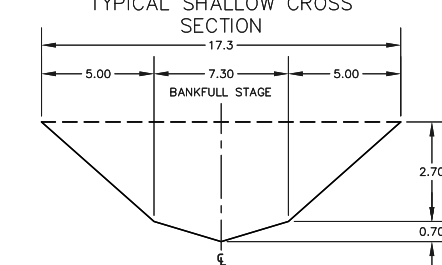
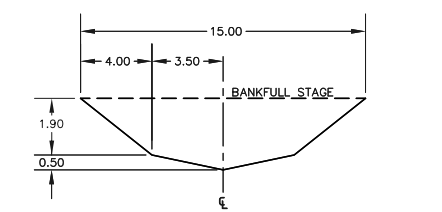
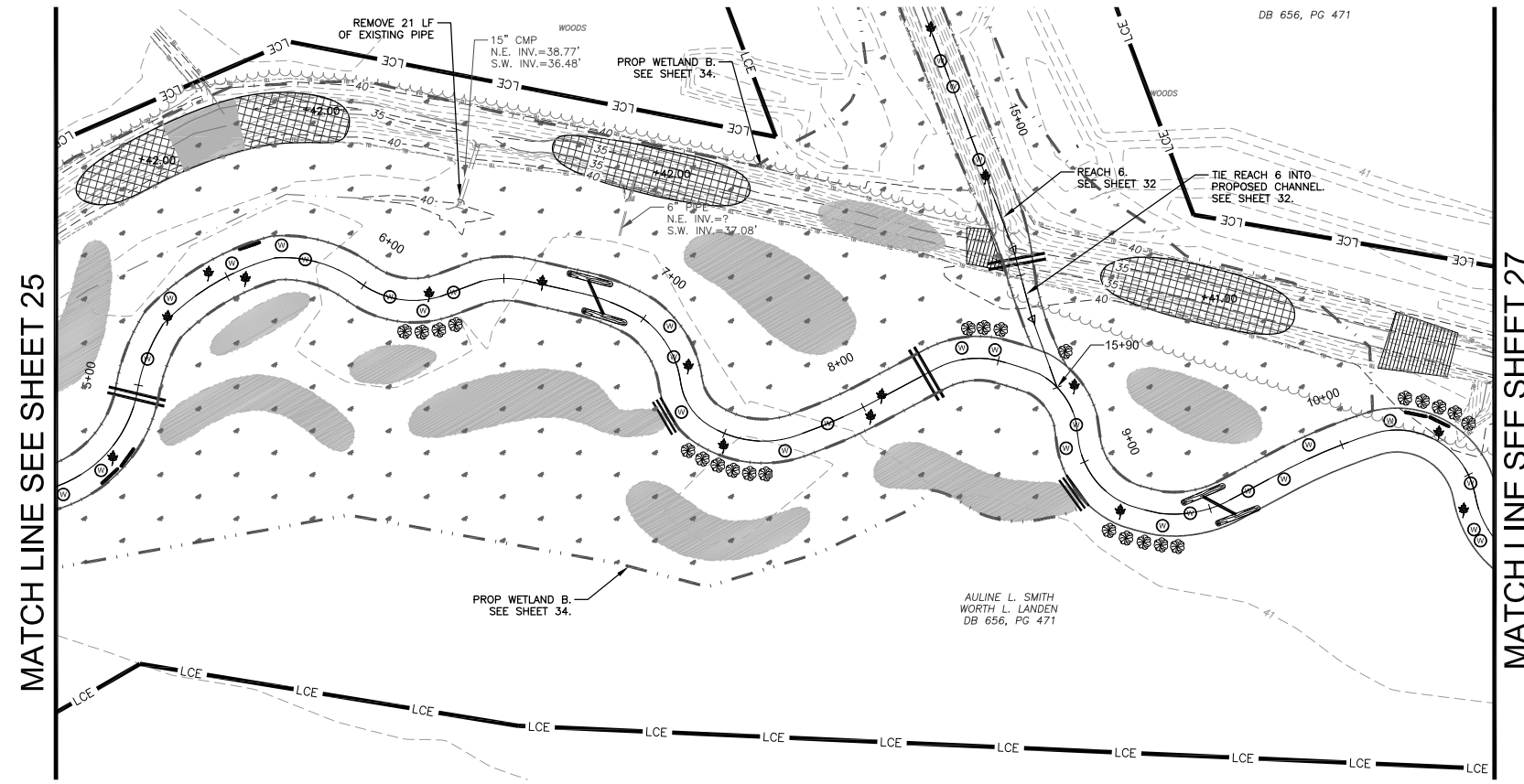


FULL SCALE: 1"=30 H, 1"=3 V
2"= FULL SCALE
1"= HALF SCALE

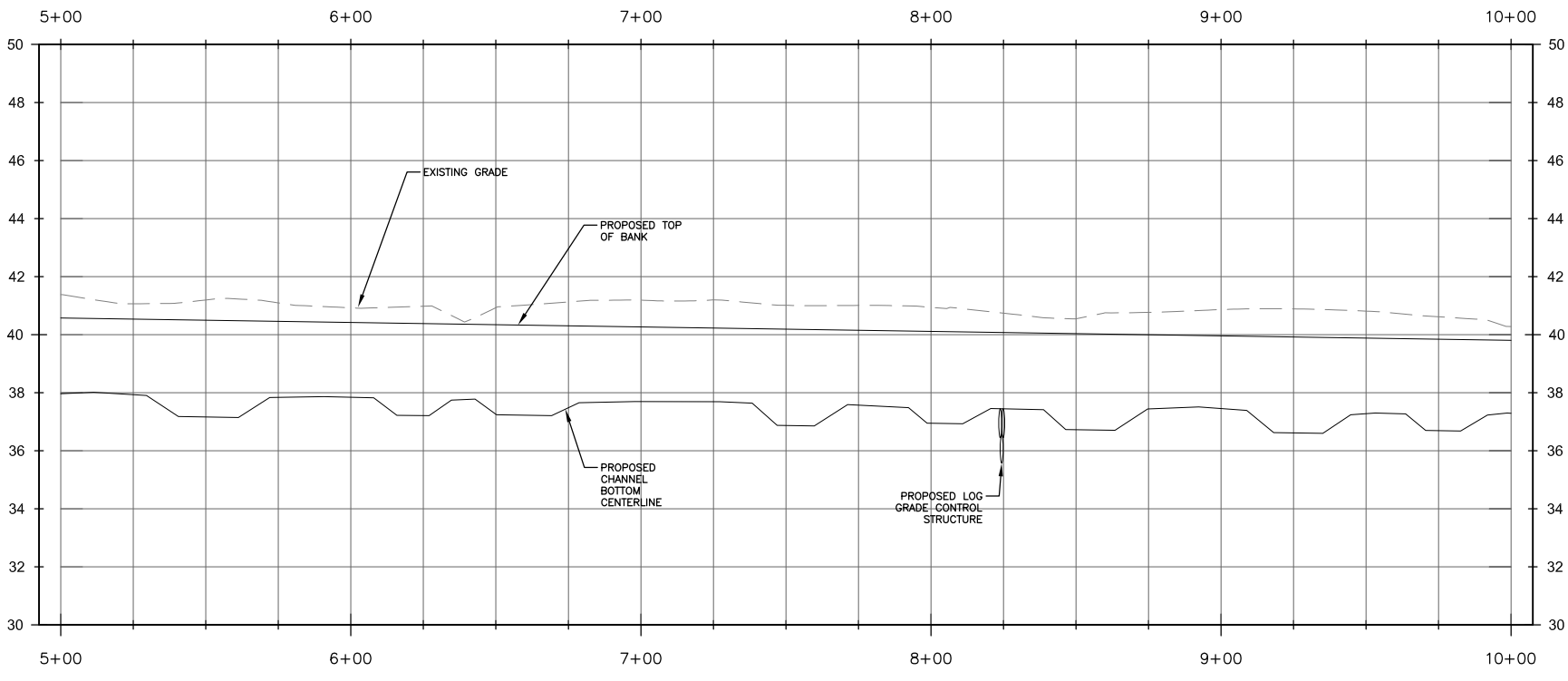
MARK	DATE	DESCRIPTION	PLOT DATE: 6/12/13
REVISIONS:			
RELEASED FOR:			PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 5A
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
25
PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 00+00 TO 18+20 (REACH 5A)



- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
 5. THE PROPOSED CROSS-SECTIONS SHALL TIE INTO EXISTING GRADE AT A MINIMUM SLOPE OF 5H:1V. FOR ALL AREAS WHERE THE PROPOSED TOP OF BANK ELEVATION IS GREATER THAN 0.75' BELOW EXISTING GRADE, A BANKFULL BENCH MUST BE CONSTRUCTED. SEE TYPICAL CROSS SECTION GRADING DETAIL ON SHEET 42 FOR DIMENSIONS.
 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	- - - - -50
EXISTING CONTOUR MINOR	- - - - -46
PROPOSED CONTOUR MAJOR	— (50) —
PROPOSED CONTOUR MINOR	— (42) —
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	— TB —
PROPOSED CENTERLINE OF CHANNEL	— C —
EXISTING FENCELINE	— X — X — X —
EXISTING TREELINE	— T —
PROPOSED CHANNEL BOTTOM	— C —
PROPOSED TOP OF BANK	— L —
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
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SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	
RAPTOR POLE (SEE DETAIL SHEET 42)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
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DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	

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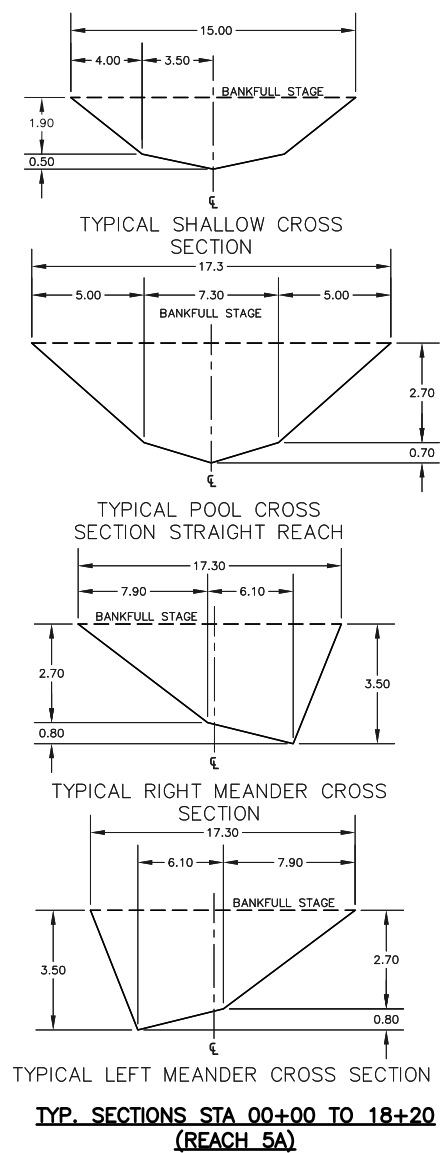
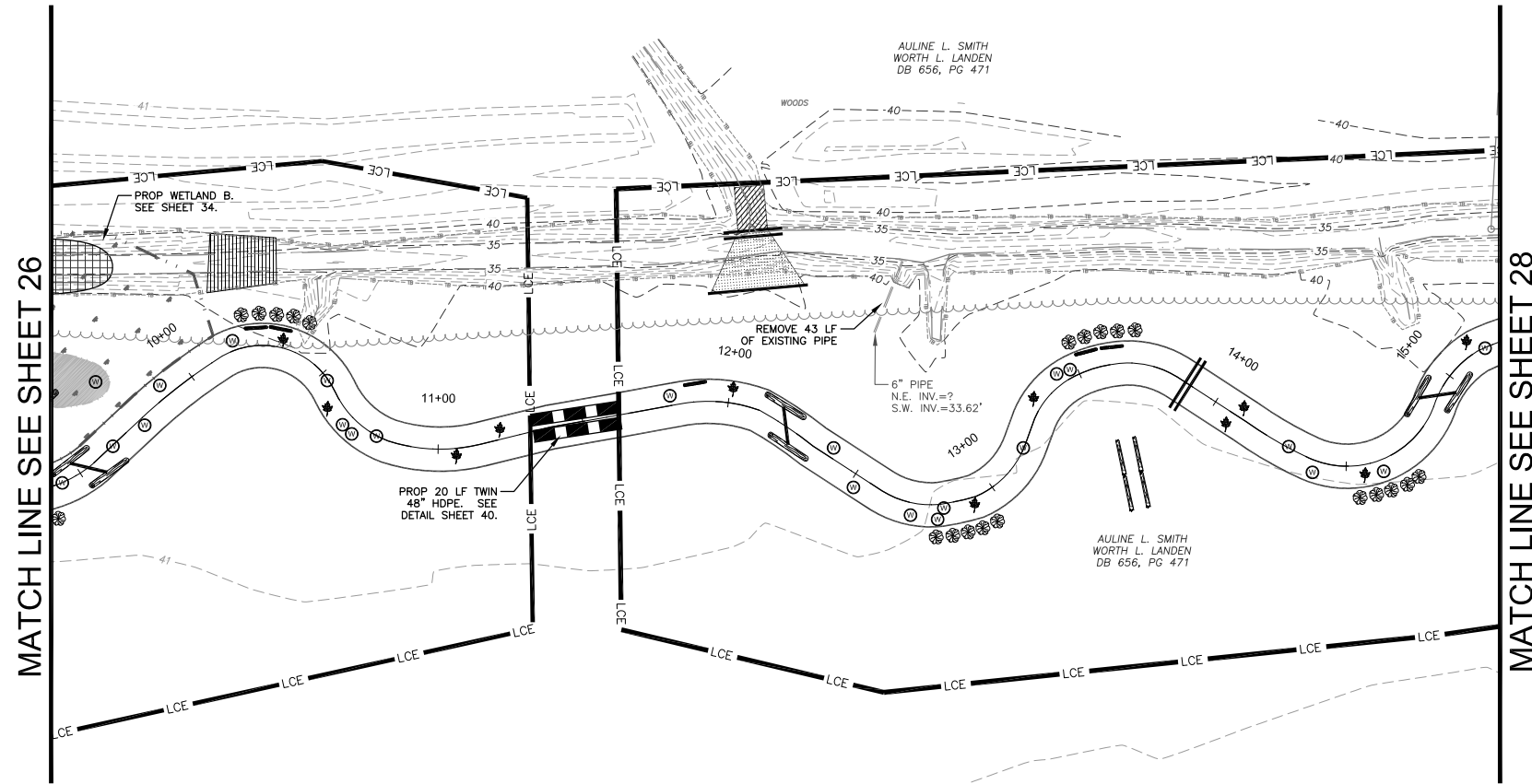
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1"= HALF SCALE

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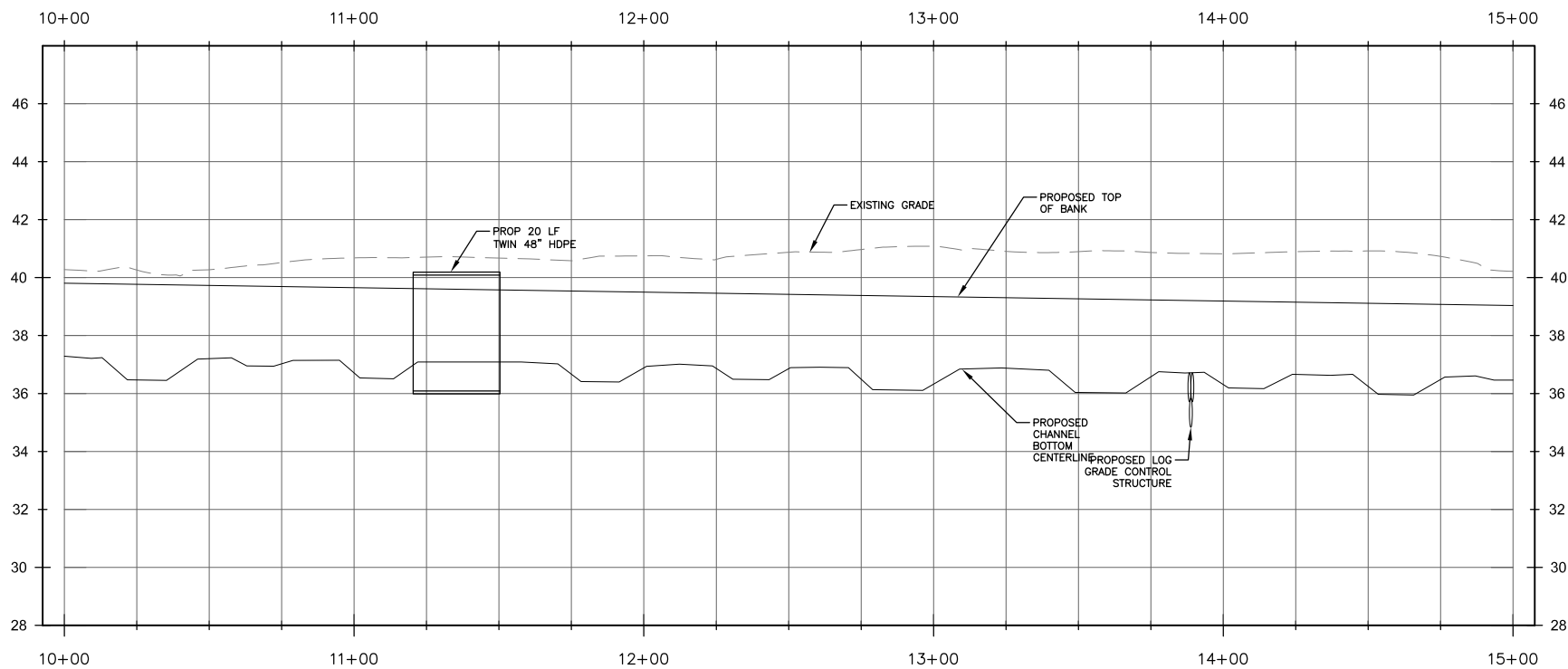
RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 6/12/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 5A
OWNER / 24 HR CONTACT: [Redacted]
ADDRESS: [Redacted]
PHONE: [Redacted]
MOBILE: [Redacted]

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
26
PROJ. NO.: 20120090.00.RA



TYP. SECTIONS STA 00+00 TO 18+20 (REACH 5A)



- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
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LEGEND

EXISTING CONTOUR MAJOR	- - - - -50-
EXISTING CONTOUR MINOR	- - - - -46-
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	- x - x - x -
EXISTING TREELINE	—
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	— LCE —
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
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SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—

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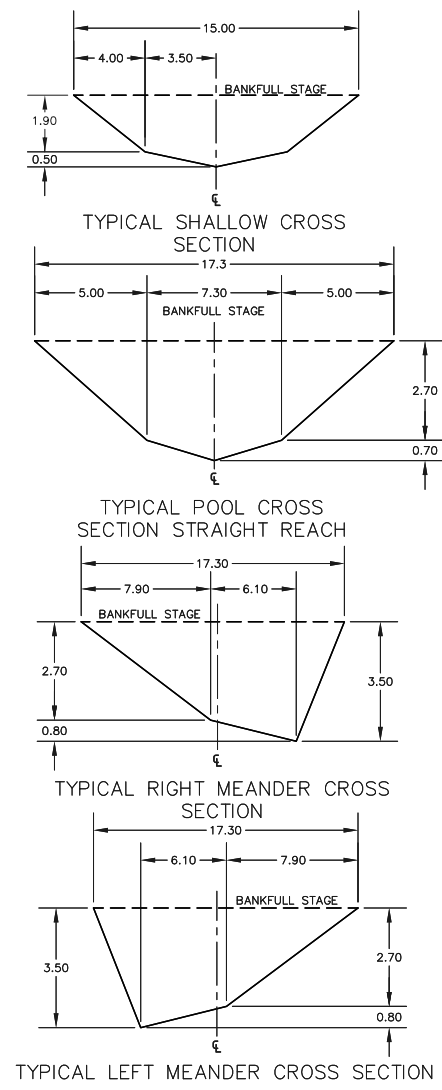
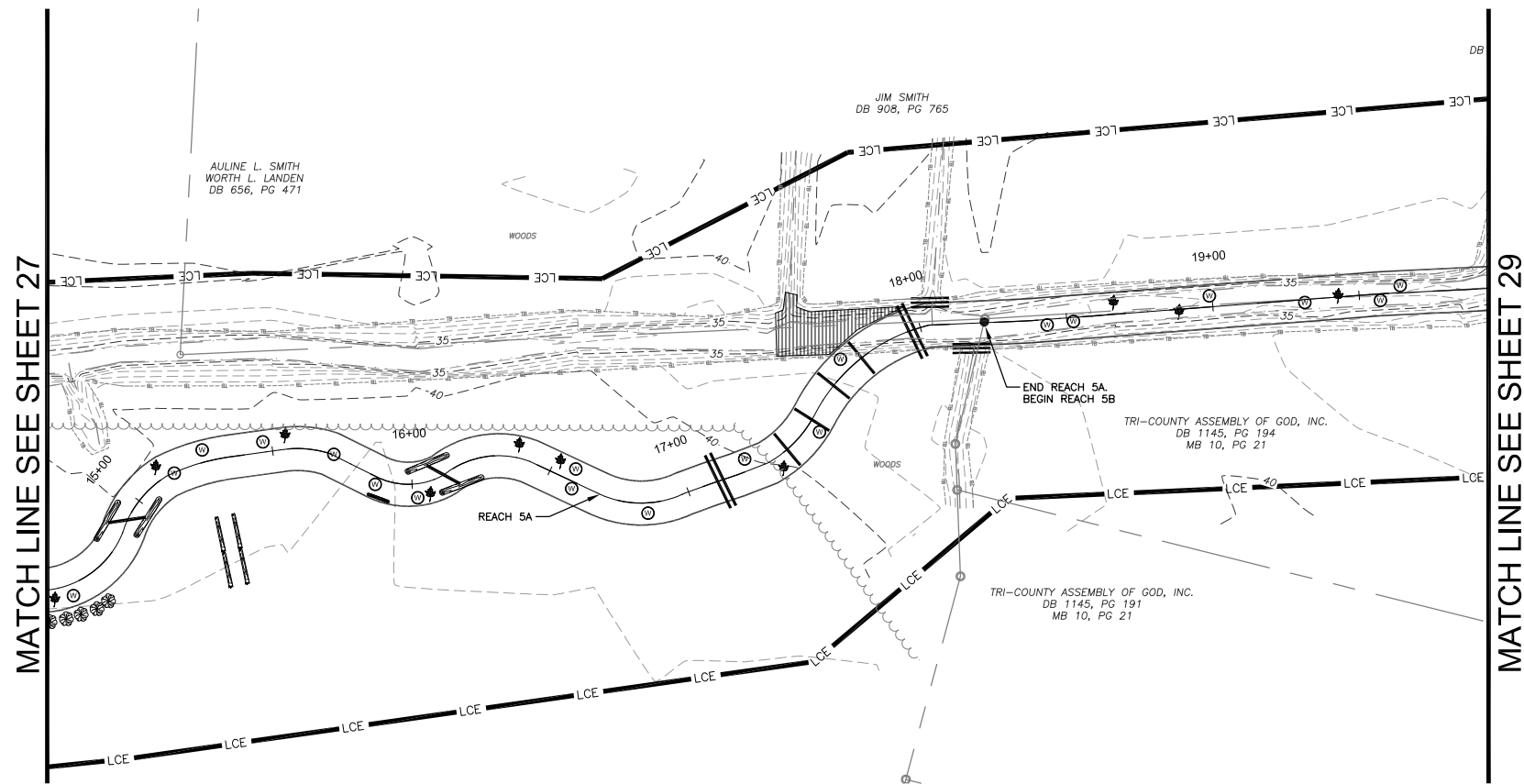
FULL SCALE: 1" = 30 H, 1" = 3 V
2" = FULL SCALE
1" = HALF SCALE

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
PLOT DATE: 6/12/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 5A
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
27
PROJ. NO.: 20120090.00.RA



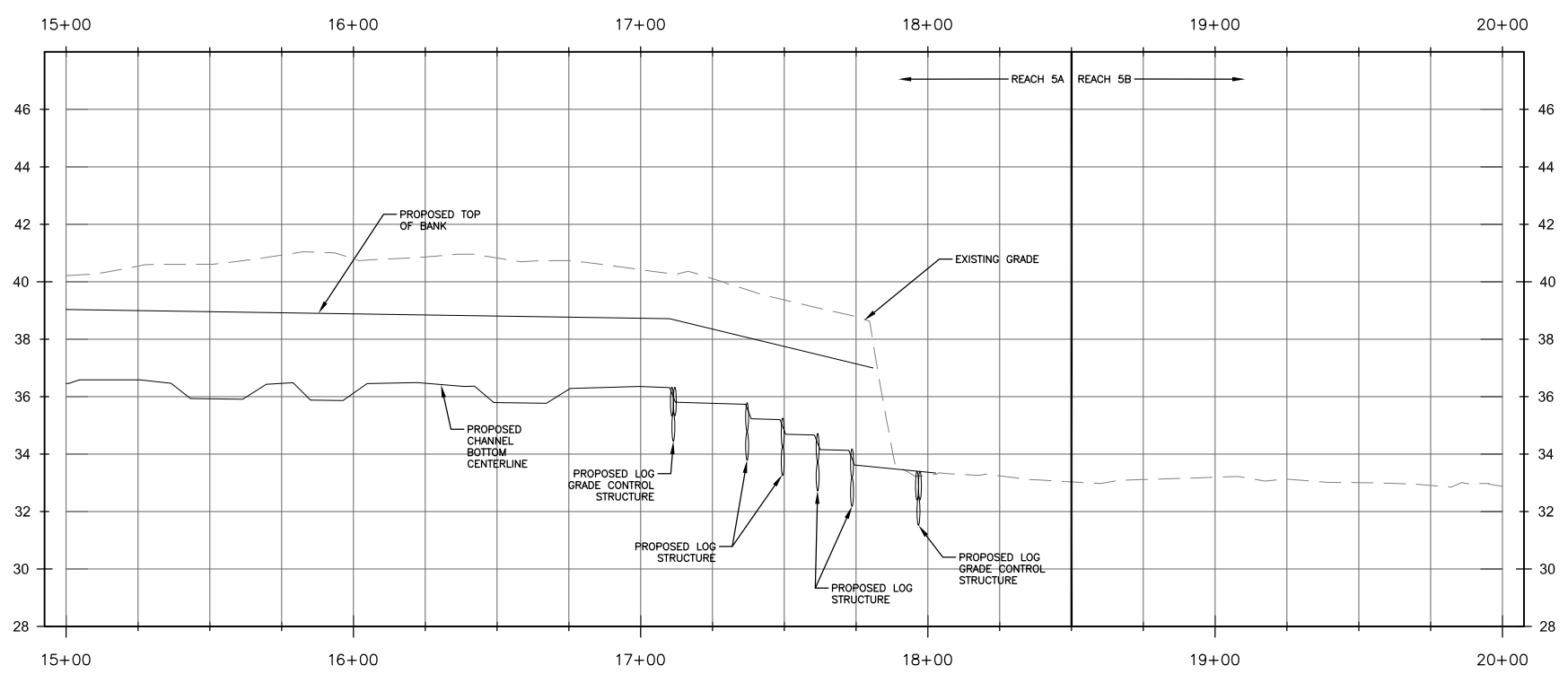
TYP. SECTIONS STA 00+00 TO 18+20 (REACH 5A)

REACH 5B NOTE:
 PROPOSED ENHANCEMENT AND FLOODPLAIN GRADING. LAY BACK RIGHT BANK PER TYPICAL BANK GRADING (OPTION 1) DETAIL ON SHEET 42, FROM STA 18+20 TO STA 22+28.

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
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 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	-50-
EXISTING CONTOUR MINOR	-46-
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	—TB—
EXISTING BOTTOM OF BANK	—
PROPOSED CENTERLINE OF CHANNEL	—
EXISTING FENCELINE	—x—x—x—
EXISTING TREELINE	—
PROPOSED CHANNEL BOTTOM	—
PROPOSED TOP OF BANK	—LCE—
LIMITS OF PROPOSED CONSERVATION EASEMENT	—LCE—
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	—
LOG STRUCTURE (SEE DETAIL SHEET 41)	—
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	—
VEGETATED SILL (SEE DETAIL SHEET 39)	—
WETLAND DEPRESSION	—
PROPOSED FILL AREA	—
PROPOSED WETLAND	—
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	—
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	—
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	—
LEAF PACK (SEE DETAIL SHEET 40)	—
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	—
RAPTOR POLE (SEE DETAIL SHEET 42)	—
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	—
EXISTING TREE	—
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	—
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	—
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	—
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	—



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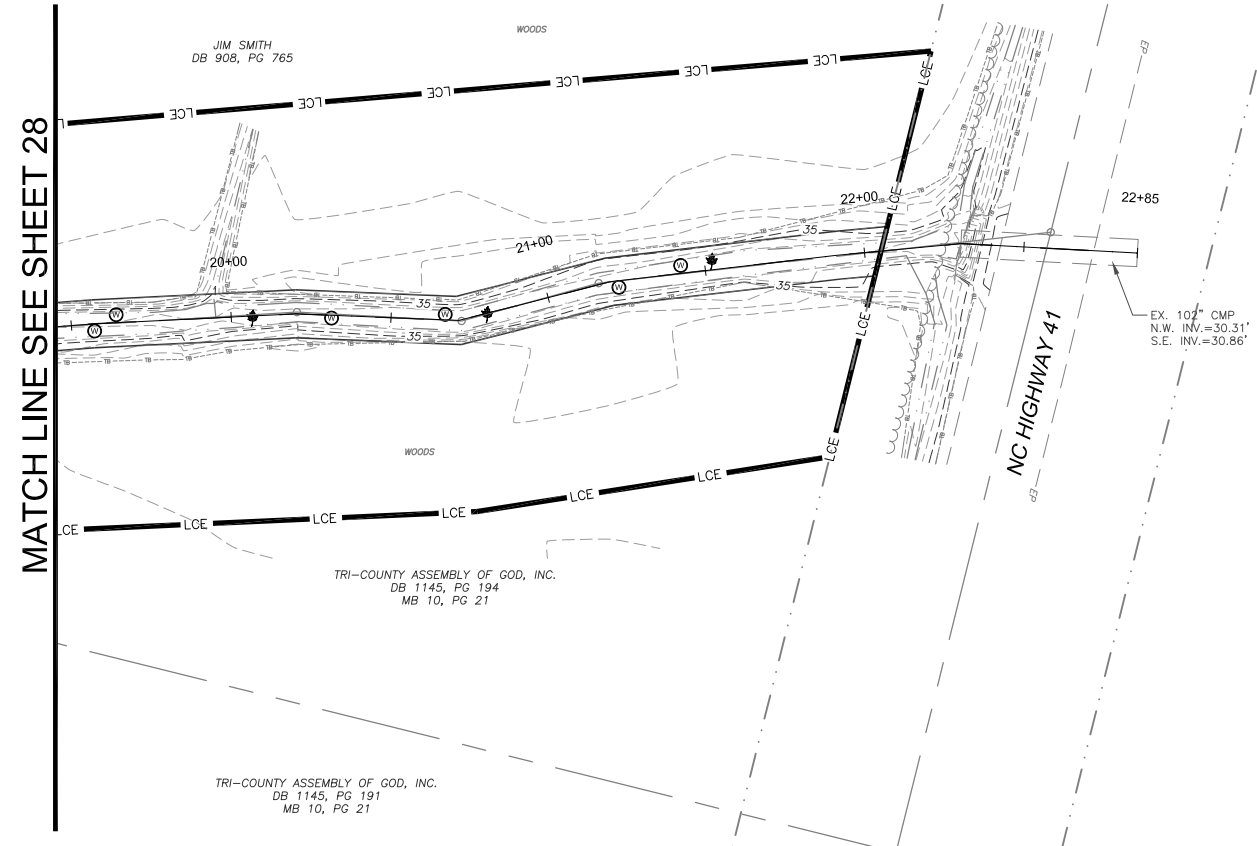
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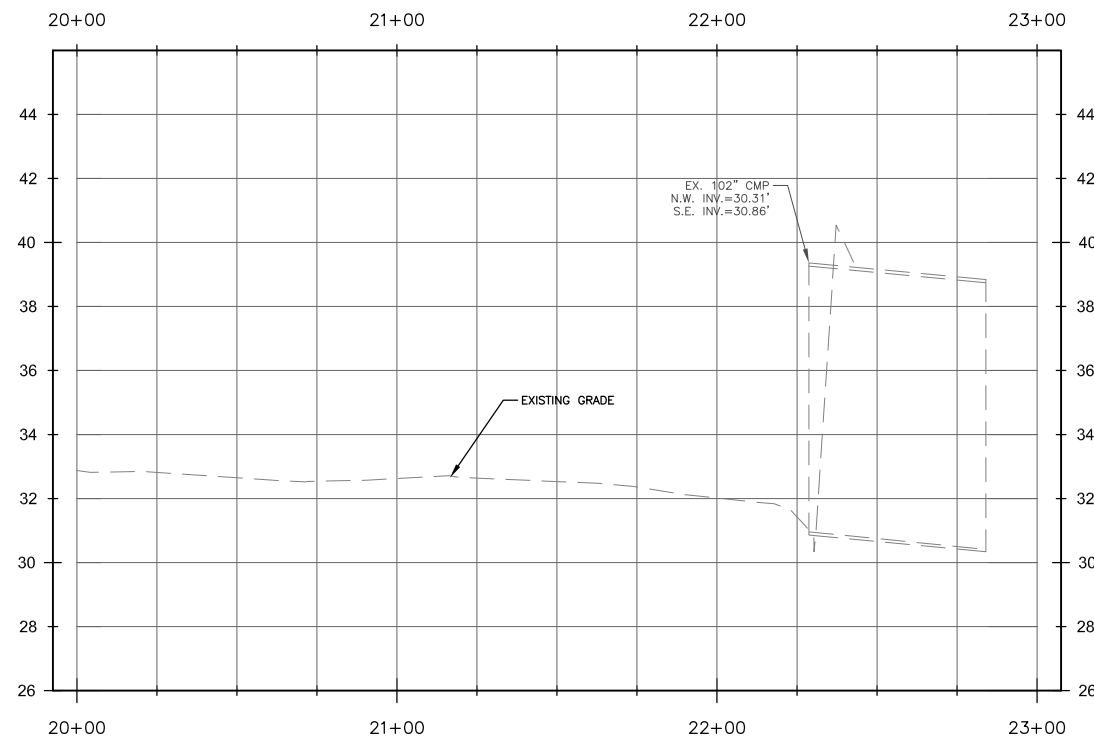
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
OWNER: DUPLIN CO. NORTH CAROLINA ENVIRONMENTAL BANK & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 5A
OWNER / 24 HR CONTACT: _____
ADDRESS: _____
PHONE: _____
MOBILE: _____

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
28
PROJ. NO.: 20120090.00.RA



MATCH LINE SEE SHEET 28

REACH 5B NOTE:
 PROPOSED ENHANCEMENT AND FLOODPLAIN GRADING. LAY BACK RIGHT BANK PER TYPICAL BANK GRADING (OPTION 1) DETAIL ON SHEET 42, FROM STA 18+20 TO STA 22+28.



- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
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 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	---	-50
EXISTING CONTOUR MINOR	---	-46
PROPOSED CONTOUR MAJOR	---	50
PROPOSED CONTOUR MINOR	---	42
PROPOSED SPOT SHOT		x 49.32
EXISTING TOP OF BANK	---	TB
EXISTING BOTTOM OF BANK	---	
PROPOSED CENTERLINE OF CHANNEL	---	
EXISTING FENCELINE	---	x-x-x-x
EXISTING TREELINE	---	~ ~ ~ ~
PROPOSED CHANNEL BOTTOM	---	
PROPOSED TOP OF BANK	---	
LIMITS OF PROPOSED CONSERVATION EASEMENT	---	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)		
LOG STRUCTURE (SEE DETAIL SHEET 41)		
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)		
VEGETATED SILL (SEE DETAIL SHEET 39)		
WETLAND DEPRESSION		
PROPOSED FILL AREA		
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PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)		
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)		
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)		
LEAF PACK (SEE DETAIL SHEET 40)		
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)		
RAPTOR POLE (SEE DETAIL SHEET 42)		
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)		
EXISTING TREE		
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)		
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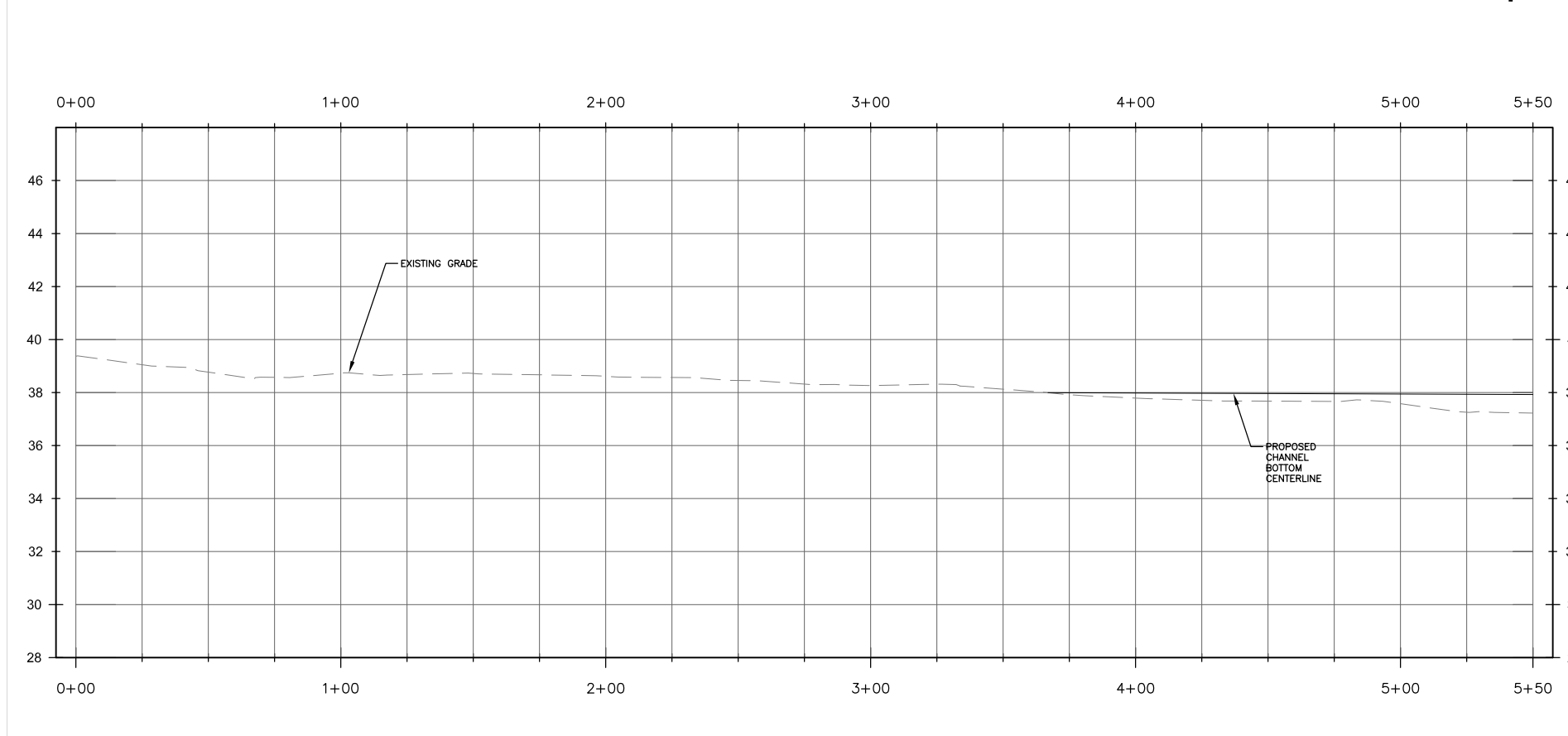
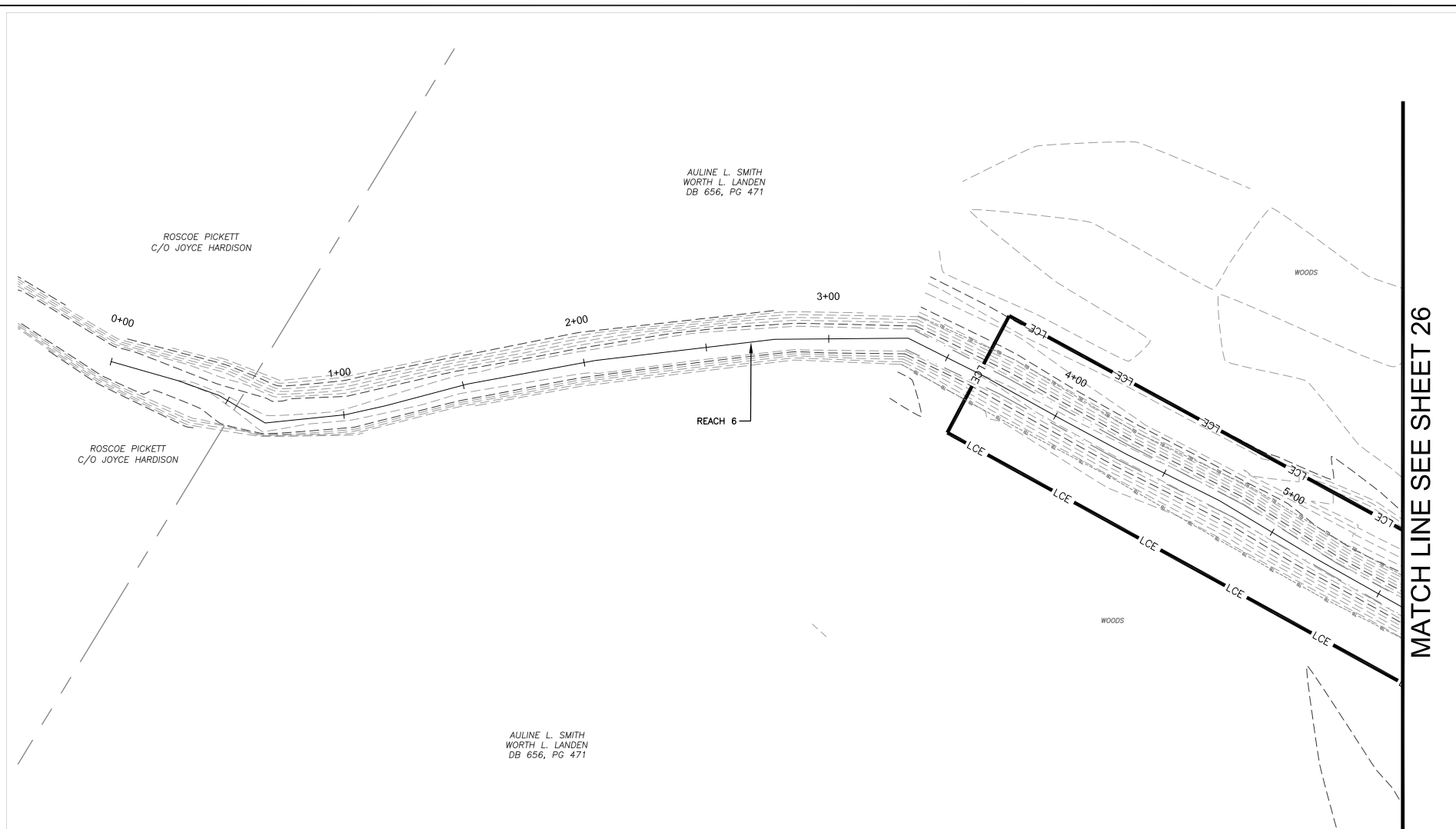
FULL SCALE: 1"=30 H, 1"=3 V
 0 30
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PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Plan And Profile - Reach 5B
 OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
29
 PROJ. NO.: 20120090.00.RA



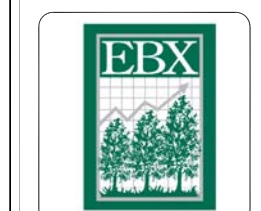
REACH 6 NOTE:
 FILL CHANNEL FROM STA 3+65 TO STA 15+77 TO PROPOSED ELEVATIONS SHOWN IN PROFILE. USE EXISTING SPOIL ADJACENT TO CHANNEL AS FILL MATERIAL. SEE TYPICAL BANK GRADING OPTION 1 DETAIL ON SHEET 42.

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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LEGEND

EXISTING CONTOUR MAJOR	- - - - -50
EXISTING CONTOUR MINOR	- - - - -46
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	TB
EXISTING BOTTOM OF BANK	---
PROPOSED CENTERLINE OF CHANNEL	---
EXISTING FENCELINE	-x-x-x-
EXISTING TREELINE	~ ~ ~ ~ ~
PROPOSED CHANNEL BOTTOM	---
PROPOSED TOP OF BANK	---
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	[Symbol]
LOG STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	[Symbol]
VEGETATED SILL (SEE DETAIL SHEET 39)	[Symbol]
WETLAND DEPRESSION	[Symbol]
PROPOSED FILL AREA	[Symbol]
PROPOSED WETLAND	[Symbol]
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	[Symbol]
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	[Symbol]
LARGE WOODY DEBRIS (SEE DETAIL SHEET 41)	[Symbol]
LEAF PACK (SEE DETAIL SHEET 40)	[Symbol]
SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	[Symbol]
RAPTOR POLE (SEE DETAIL SHEET 42)	[Symbol]
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	[Symbol]
EXISTING TREE	[Symbol]
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
BEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	[Symbol]
DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]

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Scale and Orientation
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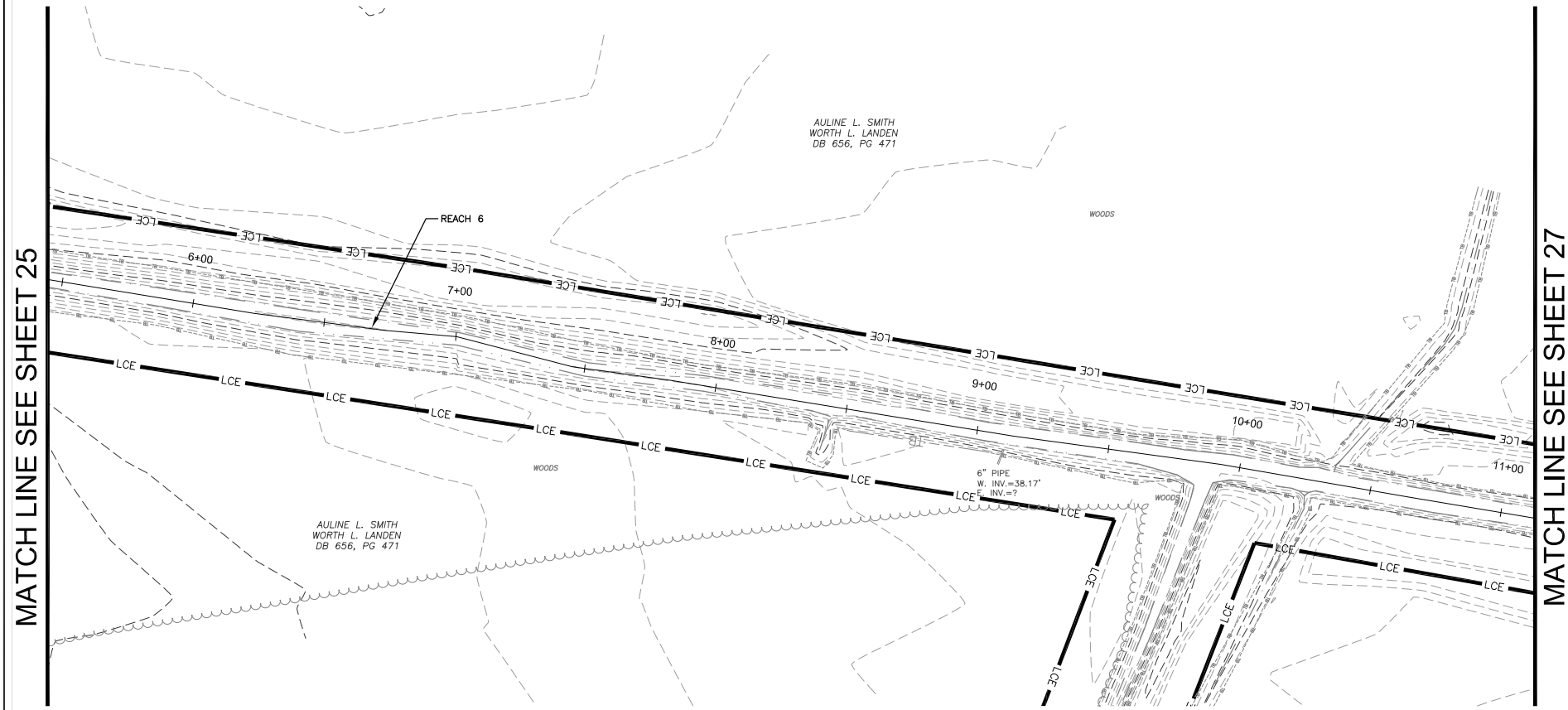
Revisions Table

MARK	DATE	DESCRIPTION

RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION
 PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Plan And Profile - Reach 6
OWNER / 24 HR CONTACT: [Blank]
ADDRESS: [Blank]
PHONE: [Blank]
MOBILE: [Blank]

PROJ. DATE: OCT 2012
Q.C.: FM
Q.C. DATE: 01-23-13
DRAWING NUMBER:
30
PROJ. NO.: 20120090.00.RA



MATCH LINE SEE SHEET 25

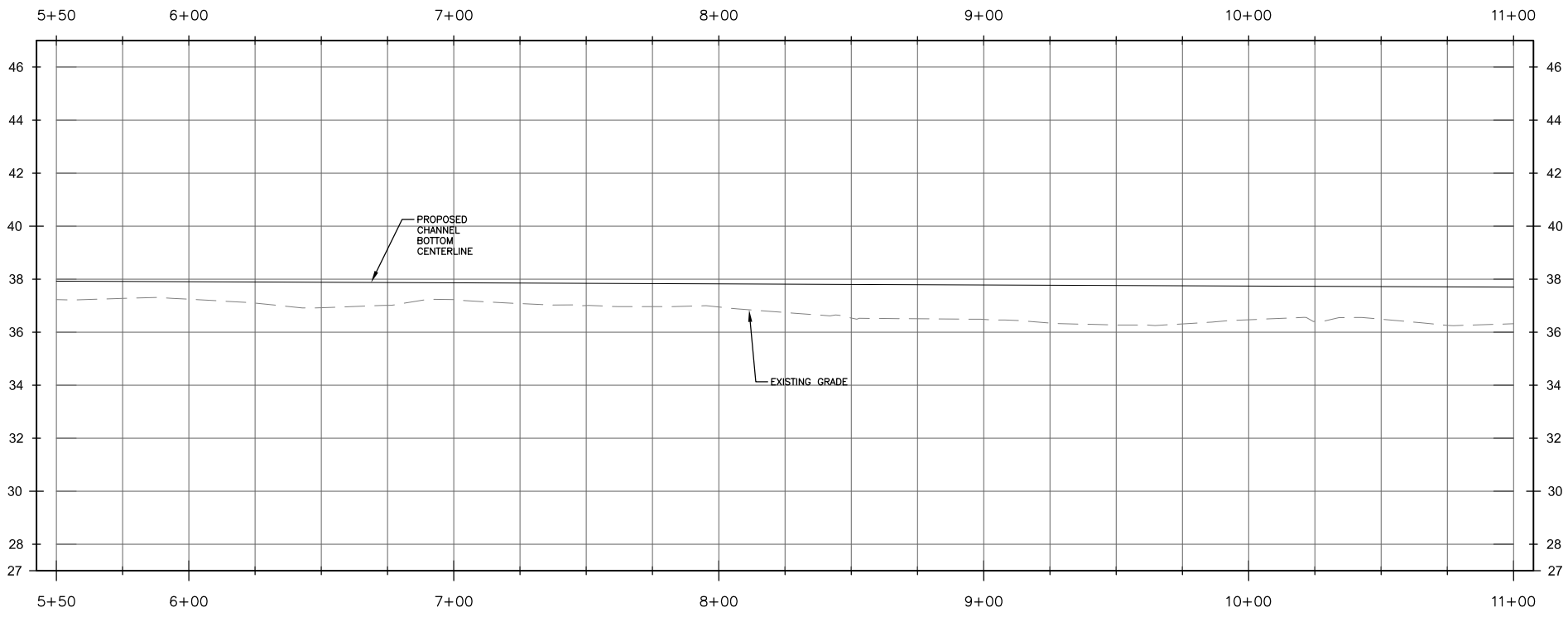
MATCH LINE SEE SHEET 27

REACH 6 NOTE:
 FILL CHANNEL FROM STA 3+65 TO STA 15+77 TO PROPOSED ELEVATIONS SHOWN IN PROFILE. USE EXISTING SPOIL ADJACENT TO CHANNEL AS FILL MATERIAL. SEE TYPICAL BANK GRADING OPTION 1 DETAIL ON SHEET 42.

- NOTES:**
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
 2. ALL EXCAVATED MATERIAL MUST BE PLACED WITHIN DESIGNATED STOCKPILE AREAS.
 3. ALL IMPERVIOUS DIKES AND BYPASS PUMPING EQUIPMENT SHALL BE MODIFIED AT THE END OF EACH DAY TO RESTORE NORMAL FLOW BACK TO THE CHANNEL.
 4. CONTRACTOR SHALL NOT COMPACT SOIL AROUND ROOTS OR TREES TO REMAIN, AND SHALL NOT DAMAGE SUCH TREES IN ANY WAY. EXCAVATED OR OTHER MATERIAL SHALL NOT BE PLACED, PILED OR STORED WITHIN THE CRITICAL ROOT ZONE AREA OF THE TREES TO BE SAVED.
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 6. UNLESS NOTED OTHERWISE, FILL MATERIAL GENERATED FROM CHANNEL EXCAVATION AND STABILIZATION SHALL BE PLACED INSIDE THE EXISTING CHANNEL TO BE ABANDONED AT AN ELEVATION THAT PROVIDES POSITIVE DRAINAGE TOWARDS THE PROPOSED CHANNEL.
 7. FILL ALL ABANDONED DITCHES WITHIN THE PROPOSED EASEMENT PER CHANNEL BACKFILL DETAIL SHOWN ON SHEET 39 UNLESS DIRECTED OTHERWISE BY THE ENGINEER.

LEGEND

EXISTING CONTOUR MAJOR	-50
EXISTING CONTOUR MINOR	-46
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	TB
EXISTING BOTTOM OF BANK	
PROPOSED CENTERLINE OF CHANNEL	
EXISTING FENCELINE	x x x x
EXISTING TREELINE	~ ~ ~ ~
PROPOSED CHANNEL BOTTOM	
PROPOSED TOP OF BANK	
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	
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SMALL WOODY DEBRIS (SEE DETAIL SHEET 40)	
RAPTOR POLE (SEE DETAIL SHEET 42)	
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	
EXISTING TREE	
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
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DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	



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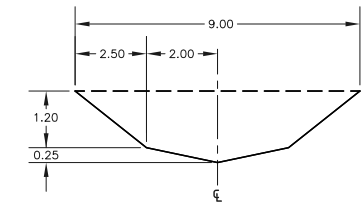
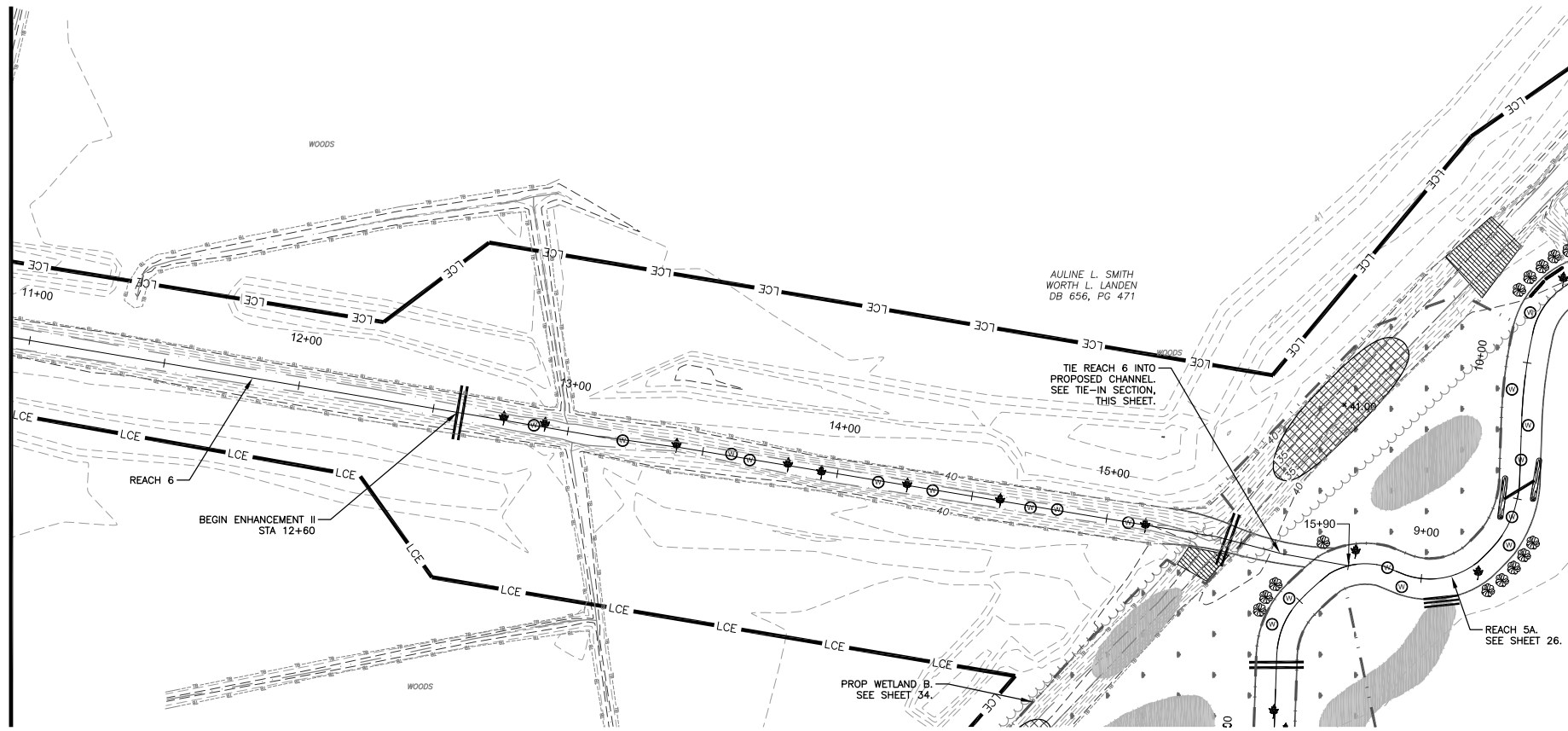
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PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Plan And Profile - Reach 6
 OWNER / 24 HR CONTACT: [Redacted]
 ADDRESS: [Redacted]
 PHONE: [Redacted]
 MOBILE: [Redacted]

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
31
 PROJ. NO.: 20120090.00.RA

MATCH LINE SEE SHEET 25



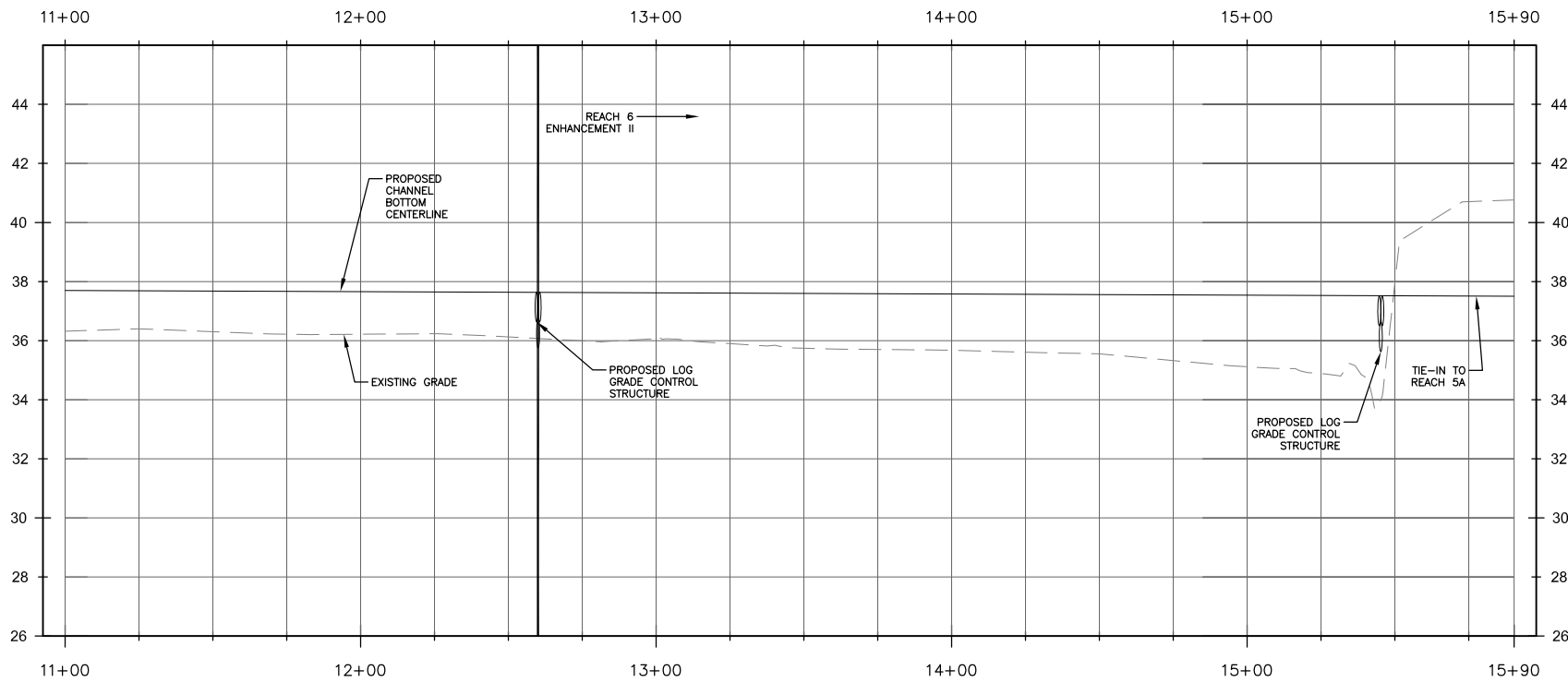
CHANNEL TIE-IN TYPICAL CROSS SECTION
(STA 15+50 TO 15+77)

- NOTES:
1. IN GENERAL, STREAM CONSTRUCTION SHALL PROCEED FROM AN UPSTREAM TO DOWNSTREAM DIRECTION.
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LEGEND

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EXISTING CONTOUR MINOR	- - - - -46
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	TB
EXISTING BOTTOM OF BANK	---
PROPOSED CENTERLINE OF CHANNEL	---
EXISTING FENCELINE	-x-x-x-
EXISTING TREELINE	~ ~ ~
PROPOSED CHANNEL BOTTOM	---
PROPOSED TOP OF BANK	---
LIMITS OF PROPOSED CONSERVATION EASEMENT	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	[Symbol]
LOG STRUCTURE (SEE DETAIL SHEET 41)	[Symbol]
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EXISTING TREE	[Symbol]
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	[Symbol]
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MARK	DATE	DESCRIPTION

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PLOT DATE: 5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC

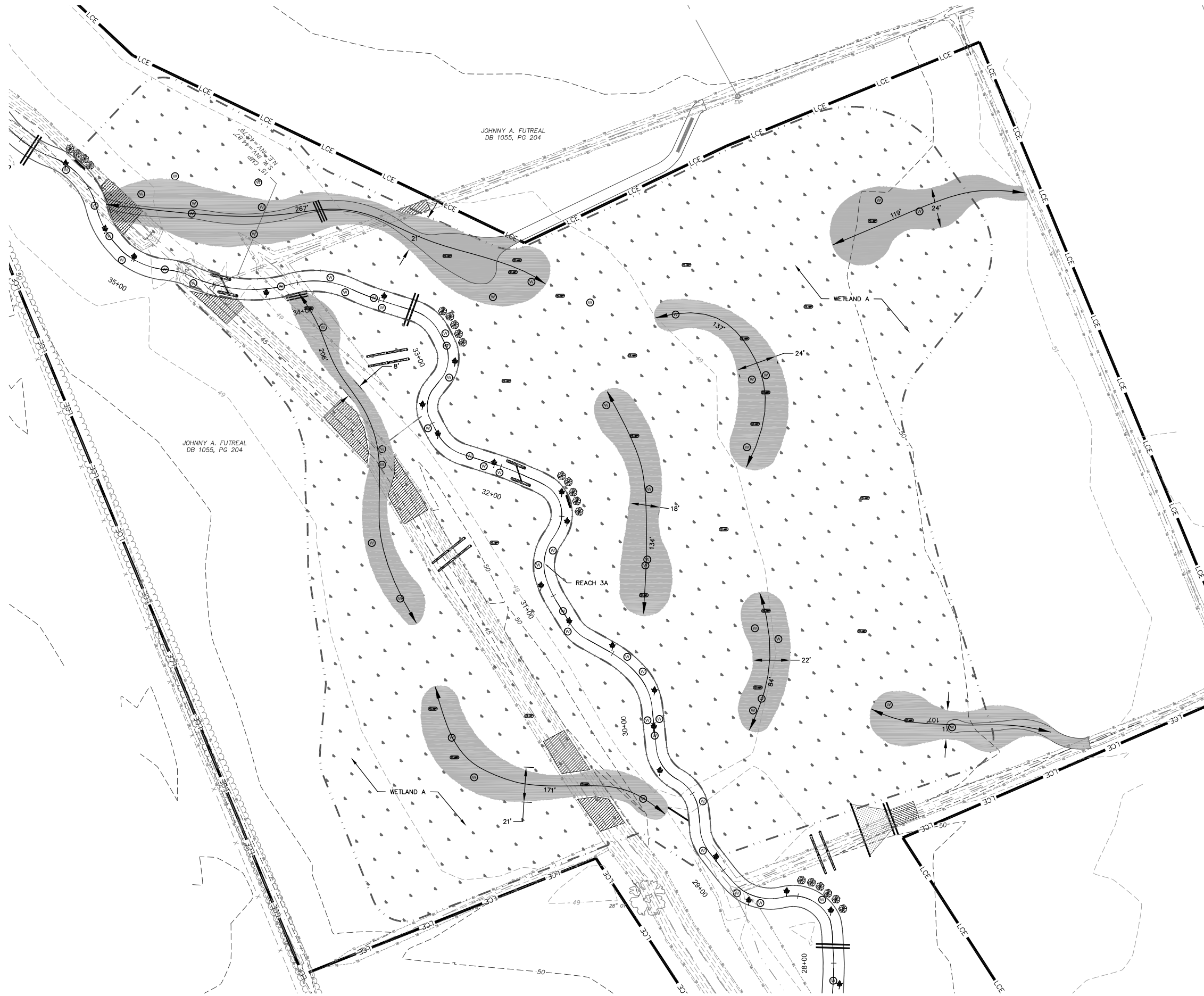
DRAWING TITLE: Plan And Profile - Reach 6

OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13

DRAWING NUMBER:
32

PROJ. NO.: 20120090.00.RA



NOTES:

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LEGEND

EXISTING CONTOUR MAJOR	- - - 50 - - -
EXISTING CONTOUR MINOR	- - - 46 - - -
PROPOSED CONTOUR MAJOR	(50)
PROPOSED CONTOUR MINOR	(42)
PROPOSED SPOT SHOT	x 49.32
EXISTING TOP OF BANK	— TB —
EXISTING BOTTOM OF BANK	— TB —
PROPOSED CENTERLINE OF CHANNEL	— C —
EXISTING FENCELINE	— X — X — X —
EXISTING TREELINE	— T —
PROPOSED CHANNEL BOTTOM	— B —
PROPOSED TOP OF BANK	— T —
LIMITS OF PROPOSED CONSERVATION EASEMENT	— LCE —
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	
LOG STRUCTURE (SEE DETAIL SHEET 41)	
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	
VEGETATED SILL (SEE DETAIL SHEET 39)	
WETLAND DEPRESSION	
PROPOSED FILL AREA	
PROPOSED WETLAND	
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	
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LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	
EMBEDDED LOG STRUCTURE (SEE DETAIL SHEET 40)	
FLOODPLAIN SILL (SEE DETAIL SHEET 41)	
LOW FLOW STRUCTURE (SEE DETAIL SHEET 41)	

WETLAND NOTES:

1. ALL WETLAND DEPRESSIONS TO BE CONSTRUCTED AT A MAXIMUM DEPTH OF 0.50' BELOW EXISTING GRADE.
2. SEE SHEET 36 FOR PLANTING PLAN.

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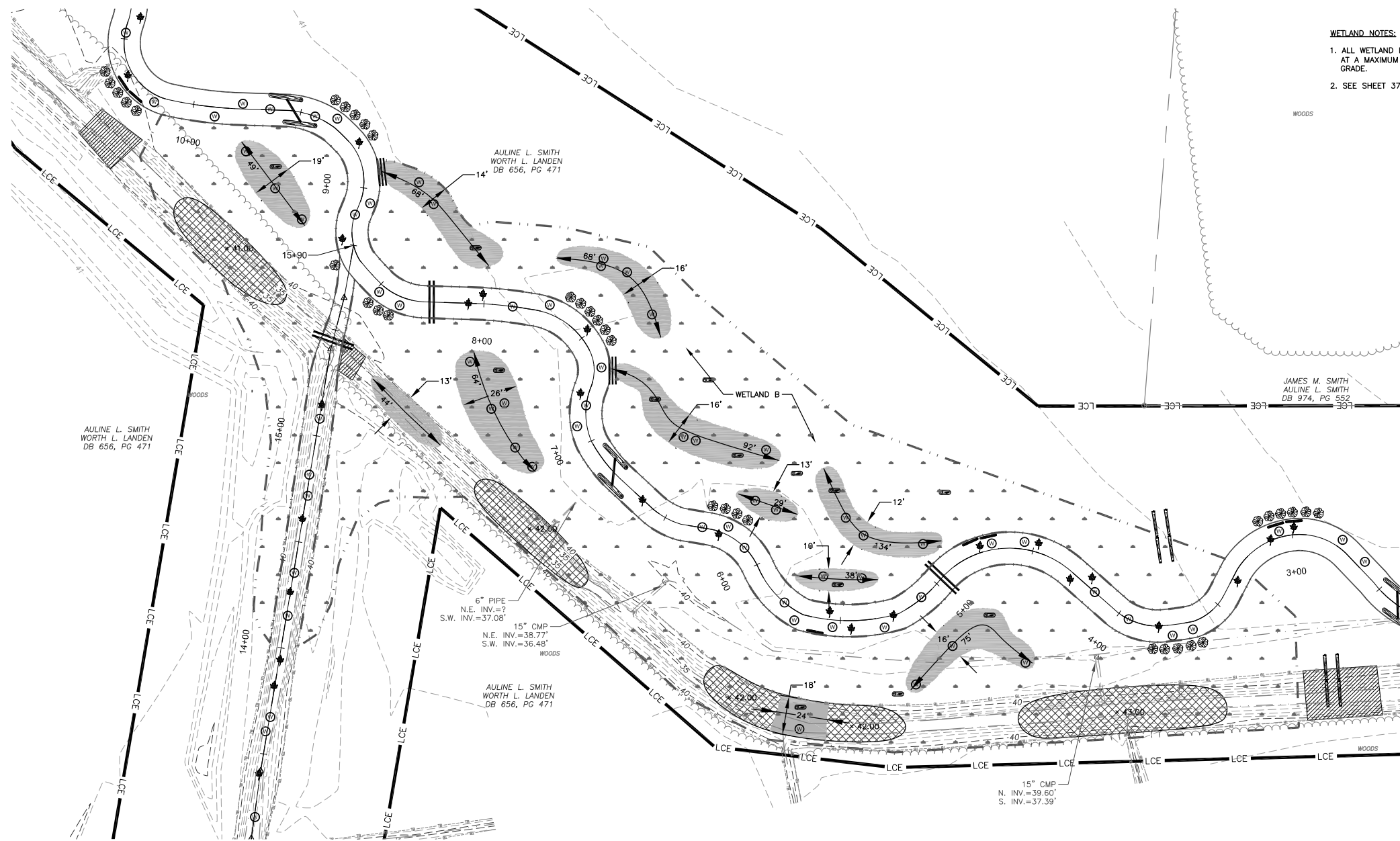
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MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	PLOT DATE:
					5/1/13

PRELIMINARY - NOT FOR CONSTRUCTION

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Wetland A
 OWNER / 24 HR CONTACT: Wetland A
 ADDRESS:
 PHONE:
 MOBILE:
 RELEASED FOR: PRELIMINARY - NOT FOR CONSTRUCTION

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
33
 PROJ. NO.: 20120090.00.RA



WETLAND NOTES:

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2. SEE SHEET 37 FOR PLANTING PLAN.

NOTES:

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LEGEND

EXISTING CONTOUR MAJOR	---	50
EXISTING CONTOUR MINOR	---	46
PROPOSED CONTOUR MAJOR	---	50
PROPOSED CONTOUR MINOR	---	42
PROPOSED SPOT SHOT	---	x 49.32
EXISTING TOP OF BANK	---	TB
EXISTING BOTTOM OF BANK	---	---
PROPOSED CENTERLINE OF CHANNEL	---	---
EXISTING FENCELINE	---	---
EXISTING TREELINE	---	---
PROPOSED CHANNEL BOTTOM	---	---
PROPOSED TOP OF BANK	---	---
LIMITS OF PROPOSED CONSERVATION EASEMENT	---	LCE
LOG TOE PROTECTION (SEE DETAIL SHEET 39)	---	---
LOG STRUCTURE (SEE DETAIL SHEET 41)	---	---
LOG GRADE CONTROL STRUCTURE (SEE DETAIL SHEET 39)	---	---
VEGETATED SILL (SEE DETAIL SHEET 39)	---	---
WETLAND DEPRESSION	---	---
PROPOSED FILL AREA	---	---
PROPOSED WETLAND	---	---
PROPOSED CHANNEL PLUG (SEE DETAIL SHEET 39)	---	---
CHANNEL PLUG W/ OVERFLOW SPILLWAY (SEE SHEET 42)	---	---
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RAPTOR POLE (SEE DETAIL SHEET 42)	---	---
LIVE CUTTINGS BUNDLE (SEE DETAIL SHEET 40)	---	---
EXISTING TREE	---	---
LOG OUTLET STRUCTURE (SEE DETAIL SHEET 40)	---	---
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DIFFUSE FLOW STRUCTURE (SEE DETAIL SHEET 41)	---	---

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 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC
 DRAWING TITLE: Wetland B
 OWNER / 24 HR CONTACT: Wetland B
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 PHONE:
 MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13
 DRAWING NUMBER:
34
 PROJ. NO.: 20120090.00.RA

MATCH LINE
SEE SHEET 36

JOHNNY A. FUTREAL
DB 1055, PG 204

JOHNNY ADRAIN FUTREAL
TERRY ROSE FUTREAL
DB 1142, PG 501

REACH 4

REACH 3A

DANNY G. HATCHER
JAMES A. HATCHER
CARLTON R. HATCHER
FORREST C. HATCHER
JENNIFER J. KOPANSKI
DB 1530, PG 728
MB 4, PG 23

JOHNNY A. FUTREAL
DB 1055, PG 204

PROPOSED
PLANTING AREA
(SEE PLANTING
TABLE THIS SHEET)

PATRICIA M. RILEY
DB 1161, PG 145

REACH 2

DANNY G. HATCHER
JAMES A. HATCHER
CARLTON R. HATCHER
FORREST C. HATCHER
JENNIFER J. KOPANSKI
DB 1530, PG 728
MB 4, PG 23

PATRICIA M. RILEY
DB 1161, PG 145

REACH 1

MARION D. BROWN, JR.
VIVIAN B. BROWN
DB 1127, PG 96
MB 9, PG 20
MB 13, PG 37

PLANTING TABLE

Zone 2		
Common Name	Scientific Name	Percent Composition
River birch	<i>Betula nigra</i>	15%
Green ash	<i>Fraxinus pennsylvanica</i>	20%
Swamp tupelo	<i>Nyssa biflora</i>	10%
Laurel oak	<i>Quercus laurifolia</i>	15%
Overcup oak	<i>Quercus lyrata</i>	20%
Bald cypress	<i>Taxodium distichum</i>	20%

Zone 3		
Common Name	Scientific Name	Percent Composition
Green ash	<i>Fraxinus pennsylvanica</i>	20%
Swamp tupelo	<i>Nyssa biflora</i>	20%
Laurel oak	<i>Quercus laurifolia</i>	20%
Overcup oak	<i>Quercus lyrata</i>	20%
Bald cypress	<i>Taxodium distichum</i>	20%

Live Staking and Live Cuttings Bundle Tree Species		
Common Name	Scientific Name	Stakes/LF
Silky dogwood	<i>Cornus amomum</i>	1
Silky willow	<i>Salix sericea</i>	1
Black willow	<i>Salix nigra</i>	1


Permanent Riparian Seed Mix		
Common Name	Scientific Name	Percent Composition
Bushy Bluestem	<i>Andropogon glomeratus</i>	15%
Sedge, Fringed	<i>Carex crinita</i>	10%
Sedge, Tussock	<i>Carex stricta</i>	5%
Virginia Wildrye	<i>Elymus virginicus</i>	15%
Purple Lovegrass	<i>Eragrostis spectabilis</i>	10%
Switchgrass	<i>Panicum virgatum</i>	20%
Little Blue Stem	<i>Schizachyrium scoparium</i>	20%
Eastern Gamagrass	<i>Tripsacum dactyloides</i>	5%


- NOTES:**
- Bare root planting is proposed for all areas within the easement not designated for live staking or live cuttings bundles.
 - Bare root planting density is approximately 680 stems per acre.
 - Live cuttings bundles are proposed along the outside of meander bends, adjacent to pools.
 - Live cuttings bundle species shall include silky willows or black willows.
 - Live stakes are proposed along both banks of straight reaches adjacent to pools.
 - Permanent riparian seed mix shall be applied to all disturbed areas within the conservation easement at a rate of 25 lbs/acre.


PLANTING NOTES

- ALL PLANTING AREAS:**
- EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
 - DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
 - ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
 - COIR FABRIC MATERIALS SHALL NOT BE CUT WITH PLANTING IMPLEMENTS. THE SMALLEST OPENING NECESSARY TO ACCOMMODATE EACH PLANT SHALL BE CUT INTO COIR FABRIC USING A SHARP KNIFE OR SHEARS. NO HOLES LARGER THAN 12 INCHES SHALL BE MADE.
 - SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
 - BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 42. LIVE CUTTING BUNDLES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 40. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 39.

PLANTING LEGEND


ZONE 1: RIPARIAN PLANTING 

ZONE 2: WETLAND 

ZONE 3: WETLAND DEPRESSION 

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2" = FULL SCALE
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MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	PRELIMINARY - NOT FOR CONSTRUCTION	PLOT DATE:
						5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Planting Plan
OWNER / 24 HR CONTACT:
ADDRESS:
PHONE:
MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
35
PROJ. NO.:
20120090.00.RA

PLANTING TABLE

Zone 2		
Common Name	Scientific Name	Percent Composition
River birch	<i>Betula nigra</i>	15%
Green ash	<i>Fraxinus pennsylvanica</i>	20%
Swamp tupelo	<i>Nyssa biflora</i>	10%
Laurel oak	<i>Quercus laurifolia</i>	15%
Overcup oak	<i>Quercus lyrata</i>	20%
Bald cypress	<i>Taxodium distichum</i>	20%

Zone 3		
Common Name	Scientific Name	Percent Composition
Green ash	<i>Fraxinus pennsylvanica</i>	20%
Swamp tupelo	<i>Nyssa biflora</i>	20%
Laurel oak	<i>Quercus laurifolia</i>	20%
Overcup oak	<i>Quercus lyrata</i>	20%
Bald cypress	<i>Taxodium distichum</i>	20%

Live Staking and Live Cuttings Bundle Tree Species		
Common Name	Scientific Name	Stakes/LF
Silky dogwood	<i>Cornus amomum</i>	1
Silky willow	<i>Salix sericea</i>	1
Black willow	<i>Salix nigra</i>	1

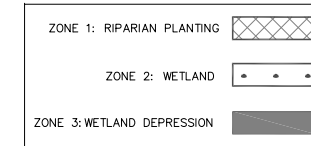
Permanent Riparian Seed Mix		
Common Name	Scientific Name	Percent Composition
Bushy Bluestem	<i>Andropogon glomeratus</i>	15%
Sedge, Fringed	<i>Carex crinita</i>	10%
Sedge, Tussock	<i>Carex stricta</i>	5%
Virginia Wildrye	<i>Elymus virginicus</i>	15%
Purple Lovegrass	<i>Eragrostis spectabilis</i>	10%
Switchgrass	<i>Panicum virgatum</i>	20%
Little Blue Stem	<i>Schizachyrium scoparium</i>	20%
Eastern Gamagrass	<i>Tripsacum dactyloides</i>	5%

- NOTES:**
1. Bare root planting is proposed for all areas within the easement not designated for live staking or live cuttings bundles.
 2. Bare root planting density is approximately 680 stems per acre.
 3. Live cuttings bundles are proposed along the outside of meander bends, adjacent to pools.
 4. Live cuttings bundle species shall include silky willows or black willows.
 5. Live stakes are proposed along both banks of straight reaches adjacent to pools.
 6. Permanent riparian seed mix shall be applied to all disturbed areas within the conservation easement at a rate of 25 lbs/acre.

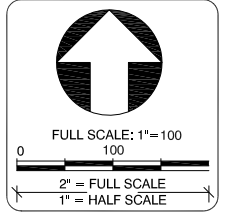
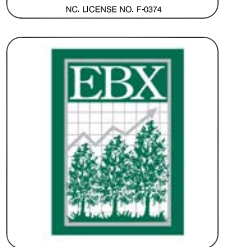
PLANTING NOTES

- ALL PLANTING AREAS:**
EROSION CONTROL MEASURES SHALL BE PROPERLY MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED. THE CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES AT THE END OF EACH WORKING DAY TO ENSURE MEASURES ARE FUNCTIONING PROPERLY.
1. DISTURBED AREAS NOT AT FINAL GRADE SHALL BE TEMPORARILY VEGETATED WITHIN 10 WORKING DAYS. UPON COMPLETION OF FINAL GRADING, PERMANENT VEGETATION SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 10 WORKING DAYS. SEEDING SHALL BE IN ACCORDANCE WITH EROSION CONTROL PLAN.
 2. ALL DISTURBED AREAS SHALL BE PREPARED PRIOR TO PLANTING BY DISC OR SPRING-TOOTH CHISEL PLOW TO MINIMUM DEPTH OF 12 INCHES. MULTIPLE PASSES SHALL BE MADE ACROSS PLANTING AREAS WITH THE IMPLEMENT AND THE FINAL PASS SHALL FOLLOW TOPOGRAPHIC CONTOURS.
 3. COIR FABRIC MATERIALS SHALL NOT BE CUT WITH PLANTING IMPLEMENTS. THE SMALLEST OPENING NECESSARY TO ACCOMMODATE EACH PLANT SHALL BE CUT INTO COIR FABRIC USING A SHARP KNIFE OR SHEARS. NO HOLES LARGER THAN 12 INCHES SHALL BE MADE.
 4. SPECIES SHALL BE DISTRIBUTED SUCH THAT 3 TO 6 PLANTS OF THE SAME SPECIES ARE GROUPED TOGETHER.
 5. BARE ROOT PLANTINGS SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 42. LIVE CUTTING BUNDLES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 40. LIVE STAKES SHALL BE PLANTED ACCORDING TO DETAIL SHOWN ON SHEET 39.

PLANTING LEGEND



community infrastructure consultants
 Transportation + Water Resources
 Urban Development + Geomatics
 720 Corporate Drive
 Raleigh, NC 27607
 (v) 919.782.0495
 (f) 919.782.9672
 www.wkdickson.com



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 DUPLIN CO. NORTH CAROLINA
 ENVIRONMENTAL BANC & EXCHANGE, LLC

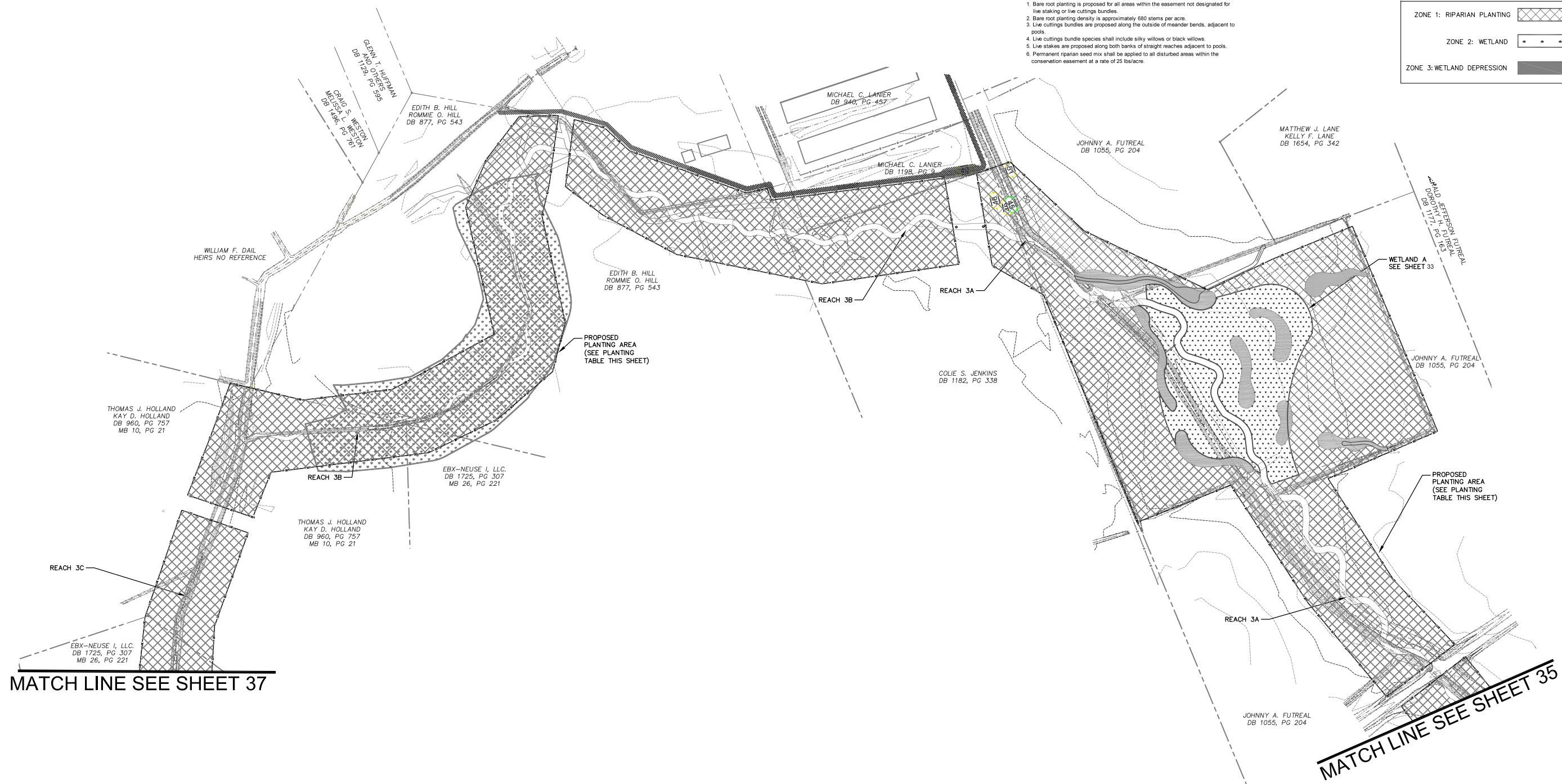
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 Q.C.: FM
 Q.C. DATE: 01-23-13

DRAWING NUMBER:
36

PROJ. NO.: 20120090.00.RA



PLANTING TABLE

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Common Name	Scientific Name	Percent Composition
River birch	<i>Betula nigra</i>	15%
Green ash	<i>Fraxinus pennsylvanica</i>	20%
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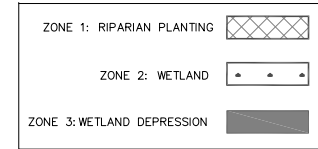
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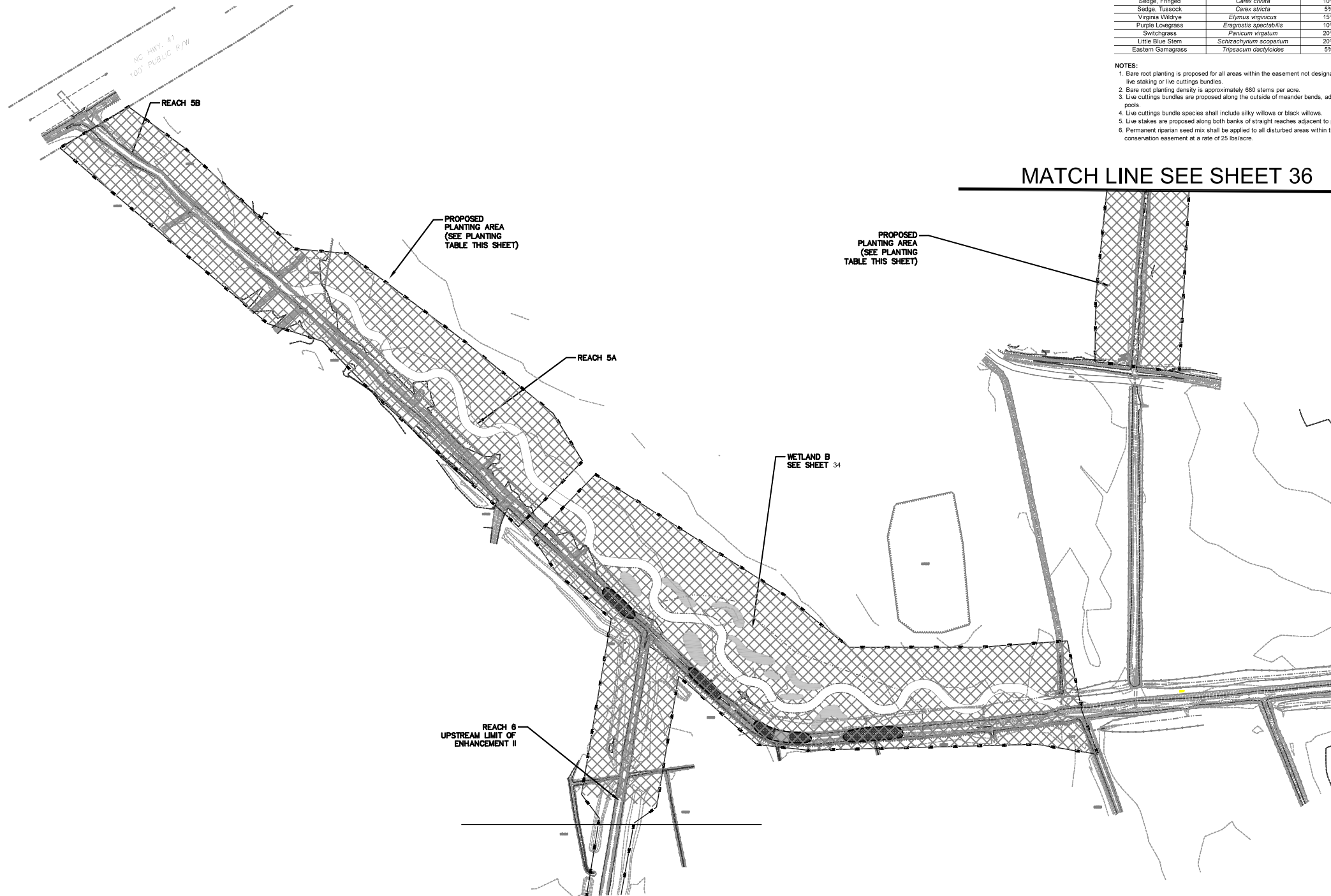
PLANTING NOTES

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PLANTING LEGEND



MATCH LINE SEE SHEET 36



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0 100
 FULL SCALE: 1"=100
 2" = FULL SCALE
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WHEN AND WHERE TO USE IT
SILT FENCE IS APPLICABLE IN AREAS:

WHERE THE MAXIMUM SHEET OR OVERLAND FLOW PATH LENGTH TO THE FENCE IS 100- FEET.
WHERE THE MAXIMUM SLOPE STEEPNESS (NORMAL [PERPENDICULAR] TO FENCE LINE) IS 2H:1V.
THAT DO NOT RECEIVE CONCENTRATED FLOWS GREATER THAN 0.5 CFS.

DO NOT PLACE SILT FENCE ACROSS CHANNELS OR USE IT AS A VELOCITY CONTROL BMP.

CONSTRUCTION SPECIFICATIONS:

- USE A SYNTHETIC FILTER FABRIC OF AT LEAST 95% BY WEIGHT OF POLYOLEFINS OR POLYESTER, WHICH IS CERTIFIED BY THE MANUFACTURER OR SUPPLIER AS CONFORMING TO THE REQUIREMENTS IN ASTM D 6461. SYNTHETIC FILTER FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE. AT A TEMPERATURE RANGE OF 0° TO 120° F.
- ENSURE THAT POSTS FOR SEDIMENT FENCES ARE 1.33 LB/LINEAR FT STEEL WITH A MINIMUM LENGTH OF 5 FEET. MAKE SURE THAT STEEL POSTS HAVE PROJECTIONS TO FACILITATE FASTENING THE FABRIC.

CONSTRUCTION:

- CONSTRUCT THE SEDIMENT BARRIER OF EXTRA STRENGTH SYNTHETIC FILTER FABRICS.
- ENSURE THAT THE HEIGHT OF THE SEDIMENT FENCE DOES NOT EXCEED 24 INCHES ABOVE THE GROUND SURFACE. (HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.)
- CONSTRUCT THE FILTER FABRIC FROM A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID JOINTS. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FILTER CLOTH ONLY AT A SUPPORT POST WITH 4 FEET MINIMUM OVERLAP TO THE NEXT POST.
- EXTRA STRENGTH FILTER FABRIC WITH 6 FEET POST SPACING DOES NOT REQUIRE WIRE MESH SUPPORT FENCE. SECURELY FASTEN THE FILTER FABRIC DIRECTLY TO POSTS. WIRE OR PLASTIC ZIP TIES SHOULD HAVE MINIMUM 50 POUND TENSILE STRENGTH.
- EXCAVATE A TRENCH APPROXIMATELY 4 INCHES WIDE AND 8 INCHES DEEP ALONG THE PROPOSED LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
- PLACE 12 INCHES OF THE FABRIC ALONG THE BOTTOM AND SIDE OF THE TRENCH.
- BACKFILL THE TRENCH WITH SOIL PLACED OVER THE FILTER FABRIC AND COMPACT. THOROUGH COMPACTION OF THE BACKFILL IS CRITICAL TO SILT FENCE PERFORMANCE.
- DO NOT ATTACH FILTER FABRIC TO EXISTING TREES.

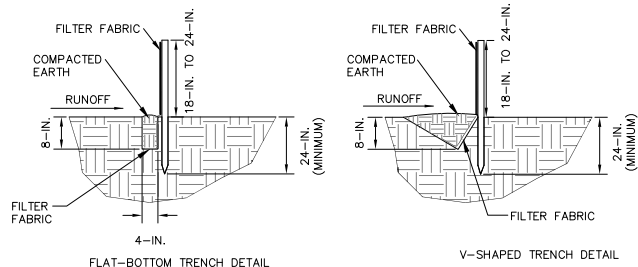
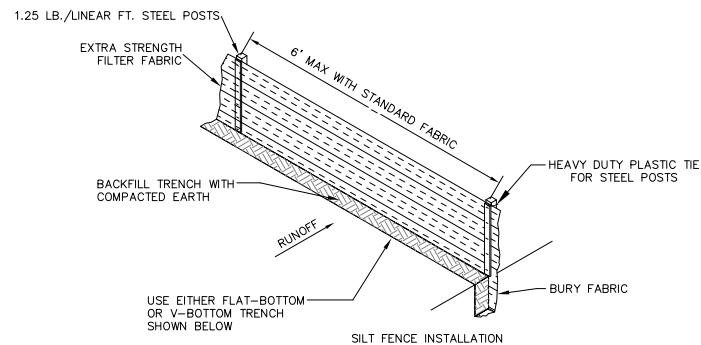
MAINTENANCE:

INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.

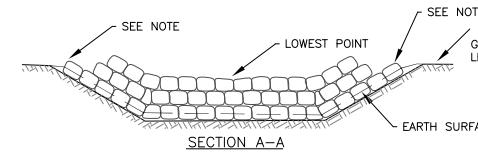
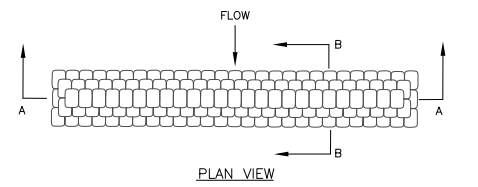
SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.

REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

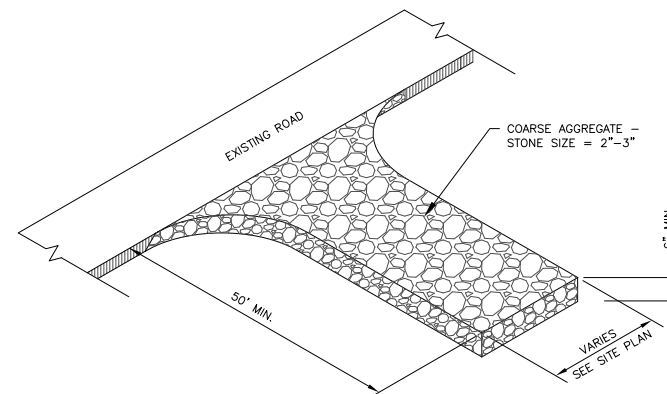


TEMPORARY SILT FENCE
NTS



SANDBAG BARRIERS SHALL BE CONSTRUCTED OF THREE LAYERS OF SANDBAGS. THE BOTTOM LAYER SHALL CONSIST OF 3 ROWS OF BAGS, THE MIDDLE LAYER SHALL CONSIST OF 2 ROWS OF BAGS AND THE TOP LAYER SHALL CONSIST OF 1 ROW OF BAGS. THE RECOMMENDED DIMENSION OF A FILLED SANDBAG SHALL BE APPROXIMATELY 0.5 FT X 0.5 FT X 1.5 FT.

SANDBAG IMPERVIOUS DIKE
NTS



PURPOSE:

STABILIZED CONSTRUCTION ENTRANCES SHOULD BE USED AT ALL POINTS WHERE TRAFFIC WILL BE LEAVING A CONSTRUCTION SITE AND MOVING DIRECTLY ONTO A PUBLIC ROAD.

CONSTRUCTION SPECIFICATIONS:

- CLEAR THE ENTRANCE AND EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL AND PROPERLY GRADE IT.
- PLACE THE GRAVEL TO THE SPECIFIC GRADE AND DIMENSIONS SHOWN ON THE DETAIL, AND SMOOTH IT.
- PROVIDE DRAINAGE TO CARRY WATER TO A SEDIMENT TRAP OR OTHER SUITABLE OUTLET.
- USE GEOTEXTILE FABRICS BECAUSE THEY IMPROVE STABILITY OF THE FOUNDATION IN LOCATIONS SUBJECT TO SEEPAGE OR HIGH WATER TABLE.

MAINTENANCE:

MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH 2-INCH STONE. AFTER EACH RAINFALL, INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT AND CLEAN IT OUT AS NECESSARY. IMMEDIATELY REMOVE ALL OBJECTIONABLE MATERIALS SPILLED, WASHED, OR TRACKED ONTO PUBLIC ROADWAYS, OR AIRFIELD PAVEMENTS.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
NTS

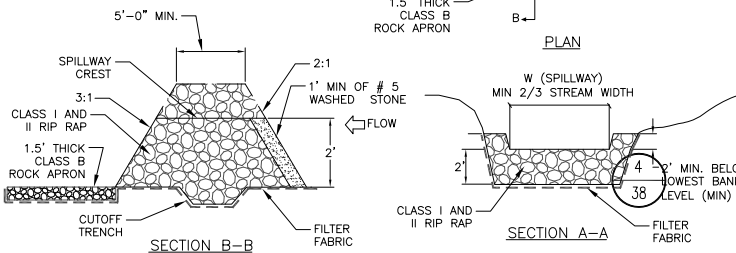
GENERAL NOTES:

- CONSTRUCT DAM ACCORDING TO NCDENR EROSION CONTROL MANUAL.
- ROCK DAM RIPRAP SHALL BE 50/50 MIX OF CLASS I AND II.
- PLACE ROCK DAM AS SHOWN ON PLANS. EXTEND CLASS B RIP RAP ROCK APRON 5 FEET DOWNSTREAM FROM TOE OF ROCK DAM.

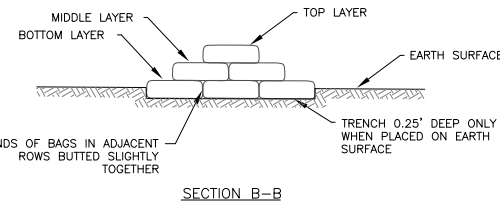
EROSION CONTROL MATTING MUST MEET OR EXCEED THE FOLLOWING REQUIREMENTS:

- 100% COCONUT FIBER (COIR) TWINE WOVEN INTO A HIGH STRENGTH MATRIX.
- THICKNESS - 0.35 IN. MINIMUM.
- TENSILE STRENGTH - 1740 LB/FT MINIMUM.
- SHEAR STRESS - 4.5 LBS/SQFT.
- FLOW VELOCITY - OBSERVED 12 FT/SEC.
- WEIGHT - 23 OZ/SY.
- SIZE - 9.84FT X 165 FT (180 SY).
- C FACTOR - 0.002.
- OPEN AREA (MEASURED) - 48%.
- SLOPES - UP TO A MAXIMUM OF 1:1.

EROSION CONTROL MATTING
NTS

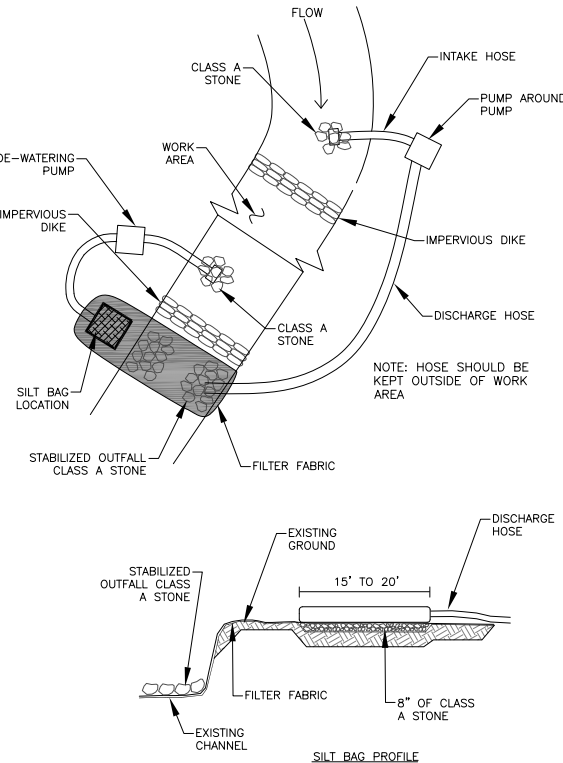


TEMPORARY ROCK CHECK DAM
NTS

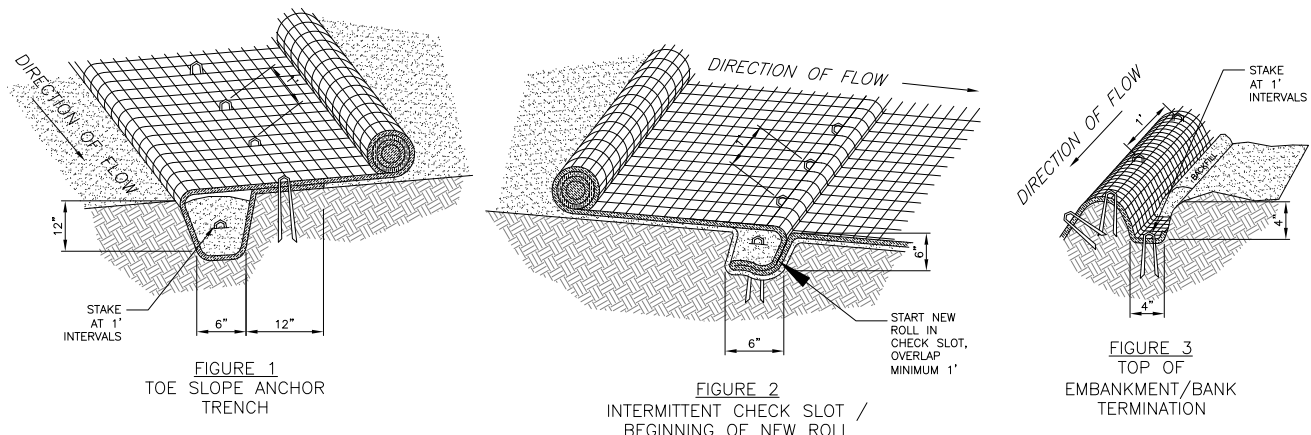


NOTES:

- EXCAVATION SHALL BE PERFORMED ONLY IN DRY AND/OR ISOLATED SECTIONS OF CHANNEL.
 - IMPERVIOUS DIKES SHOULD BE USED TO ISOLATE WORK AREAS FROM STREAM FLOW.
 - THE CONTRACTOR SHALL NOT DISTURB MORE AREA THAN CAN BE STABILIZED IN ONE WORKING DAY. A MAXIMUM OF 200 FEET MAY BE DISTURBED AT ANY ONE TIME.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING PUMP SIZE SUFFICIENT TO PUMP BASE FLOW.
 - DIKE MUST BE CONSTRUCTED OF NON-ERODIBLE MATERIALS SUCH AS SANDBAGS.
- SEQUENCE OF CONSTRUCTION FOR TYPICAL PUMP AROUND**
- INSTALL STILLING BASIN AND STABILIZED OUTFALL USING CLASS A RIP RAP AT THE DOWNSTREAM END OF THE DESIGNATED PROJECT WORKING AREA.
 - THE CONTRACTOR SHALL INSTALL THE PUMP AROUND PUMP AND THE TEMPORARY PIPING THAT WILL CONVEY THE BASE FLOW FROM UPSTREAM OF THE WORK AREA TO THE STABILIZED OUTFALL.
 - INSTALL UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
 - INSTALL THE DOWNSTREAM IMPERVIOUS DIKE AND DEWATERING PUMPING APPARATUS IF NEEDED TO DEWATER THE ENTRAPPED AREA. THE PUMP AND HOSE FOR THIS PURPOSE SHALL BE OF SUFFICIENT SIZE TO DEWATER THE WORK AREA. THIS WATER WILL ALSO BE PUMPED TO AN OUTFALL STABILIZED WITH CLASS A RIP RAP.
 - THE CONTRACTOR SHALL EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF THE IMPERVIOUS DIKE. WHEN DEWATERING AREA, ALL DIRTY WATER MUST BE PUMPED THROUGH A SILT BAG. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE/PIPING STARTING WITH THE DOWNSTREAM DIKE FIRST.
 - ONCE THE WORKING AREA IS COMPLETED, REMOVE ALL RIP RAP AND IMPERVIOUS DIKES AND STABILIZE DISTURBED AREAS WITH SEED AND MULCH.
 - ALL WORK IN CHANNEL MUST BE COMPLETED BEFORE REMOVING IMPERVIOUS DIKE.



PUMP AROUND & DEWATERING DETAIL
NTS



INSTALLATION NOTES:

SITE PREPARATION

GRADE AND COMPACT AREA.

REMOVE ALL ROCKS, CLODS, VEGETATION, AND OBSTRUCTIONS SO THAT MATTING WILL HAVE DIRECT CONTACT WITH THE SOIL.

PREPARE SEEDBED BY LOOSENING 3 TO 4 INCHES OF TOPSOIL ABOVE FINAL GRADE.

TEST SOILS FOR ANY NUTRIENT DEFICIENCIES AND SUBMIT SOIL TEST RESULTS TO THE ENGINEER. APPLY ANY TREATMENT SUCH AS LIME OR FERTILIZERS TO THE SOIL IF NEEDED.

DO NOT MULCH AREAS WHERE MAT IS TO BE INSTALLED.

SEEDING

SEE SHEET 24 FOR SEEDING REQUIREMENTS.

APPLY SEED TO SOIL BEFORE PLACING MATTING.

INSTALLATION - STREAM BANK

SEE GRADING NOTES ON SHEET XX FOR INFORMATION REGARDING WHAT AREAS ARE TO RECEIVE EROSION CONTROL MATTING.

OVERLAP ADJACENT MATS 3" AND ANCHOR EVERY 12" ACROSS THE OVERLAP. THE HIGHER ELEVATION MAT SHOULD BE PLACED OVER THE LOWER ELEVATION MAT.

EDGES SHOULD BE SHINGLED AWAY FROM THE FLOW OF WATER.

LAY MAT LOOSE TO ALLOW CONTACT WITH SOIL.

DO NOT STRETCH TIGHT.

ANCHOR MAT USING BIODEGRADABLE STAKES OR PINS.

EXCAVATE INITIAL ANCHOR TRENCH 12"x6" ACROSS TOE OF BANK

AT THE LOWER END OF EACH AREA TO RECEIVE EROSION CONTROL MATTING, ANCHOR TRENCH TO BE A MINIMUM OF 1' OFF OF TOE OF BANK. SEE FIGURE 1 FOR TOE SLOPE ANCHOR TRENCH.

PLACE 6" x 6" CHECK SLOTS AT 30' INTERVALS ALONG THE BANK. SEE FIGURE 2.

CUT 4" x 4" TRENCH ALONG TOP OF BANK FOR MAT TERMINATION AS SHOWN IN FIGURE 3. EXTEND MAT 3 FEET PAST TOP OF BANK.

BEGINNING AT THE DOWNSTREAM END OF THE AREA TO BE LINED, PLACE THE END OF THE ROLL IN TOE SLOPE ANCHOR TRENCH AND SECURE WITH BIODEGRADABLE STAKES OR PINS. SEE FIGURE 1.

PLACE ADJACENT ROLLS IN THE ANCHOR TRENCH WITH A MINIMUM OF 3" OVERLAP. SECURE WITH BIODEGRADABLE STAKES OR PINS, BACKFILL ANCHOR TRENCH, AND COMPACT SOIL.

UNROLL MAT OVER COMPACTED ANCHOR TRENCH, STOP AT NEXT CHECK SLOT OR TERMINAL ANCHOR.

UNROLL ADJACENT ROLLS IN SAME MANNER, WITH A MINIMUM OF 3" OF OVERLAP.

STAPLE AT 12" INTERVALS ALONG OVERLAP.

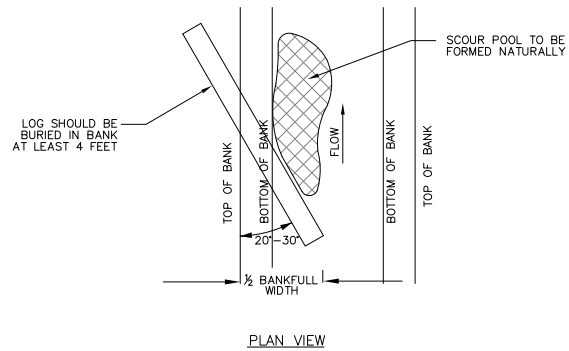
FOLD AND SECURE MAT ROLLS TIGHTLY INTO CHECK SLOTS. LAY MAT IN CHECK SLOT, FOLD BACK AGAINST ITSELF, ANCHOR THROUGH BOTH LAYERS, BACKFILL AND COMPACT SOIL, CONTINUE ROLLING MAT UPSTREAM. SEE FIGURE 2.

BEGIN NEW ROLLS IN CHECK SLOT, AND OVERLAP ENDS MINIMUM OF 1'.

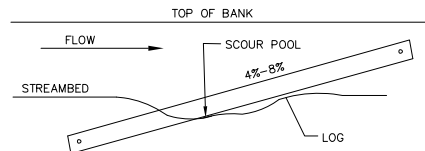
STREAM BANK MATTING TO BE INSTALLED FROM TOE OF BANK TO TOP OF BANK. SEE FIGURE 3 FOR TERMINATION AT TOP OF BANK AND FIGURE 1 FOR INITIAL ANCHOR TRENCH AT TOE OF BANK.

SEE FIGURE 3 FOR TERMINATION AT UPSTREAM END.





PLAN VIEW

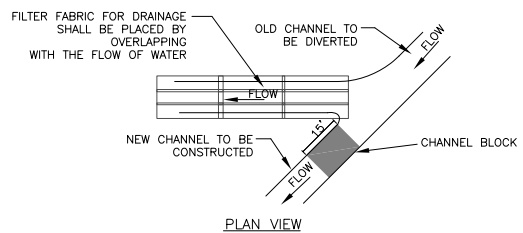


PROFILE VIEW

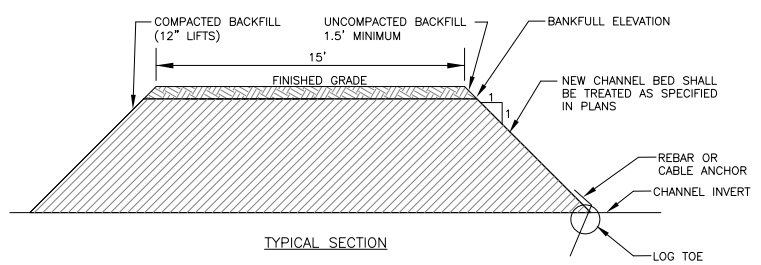
- NOTES:
- LOGS SHOULD BE AT LEAST 8 INCHES IN DIAMETER, 20 FEET LONG, RELATIVELY STRAIGHT, AND HARDWOOD.
 - VANE LOG ARMS SHOULD BE BURIED INTO THE BANK AND BED A MINIMUM OF 4 FEET.
 - SET ELEVATION OF TOP OF LOG CROSS PIECES TO DESIRED ELEVATION OF STREAMBED.
 - REBAR (5/8" MINIMUM DIAMETER 3' MIN. LENGTH TYPICAL) SHOULD BE PLACED 1' TO 3' FROM END OF LOG. ADDITIONAL REBAR TO BE PLACED AT 5' OFFSETS. LAST REBAR SHOULD BE PLACED 1' TO 3' FROM END OF LOG. DUCK BILL ANCHORS MAY BE USED AS A SUBSTITUTION FOR REBAR.
 - PRE-DRILL HOLES FOR REBAR WITH 5/8" DRILL BIT.
 - DRIVE REBAR THROUGH LOGS AND BEND ENDS AS SHOWN.

LOG VANE

NTS



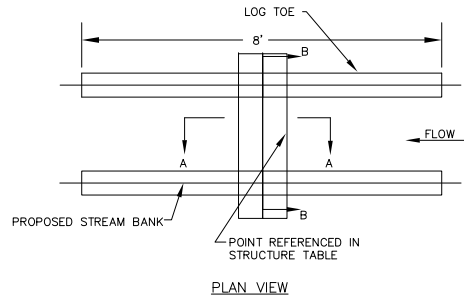
PLAN VIEW



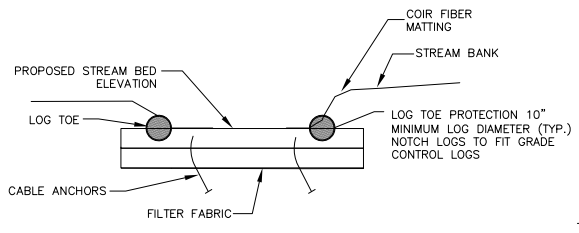
TYPICAL SECTION

CHANNEL PLUG

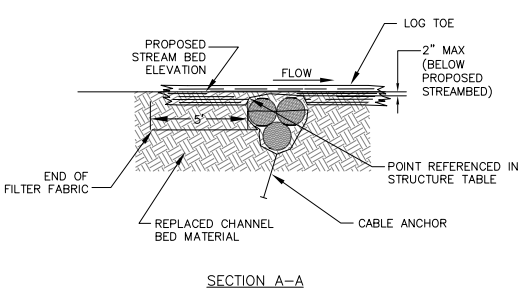
NTS



PLAN VIEW



GRADE CONTROL STRUCTURE SECTION B-B

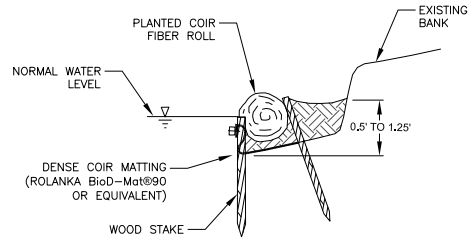


SECTION A-A

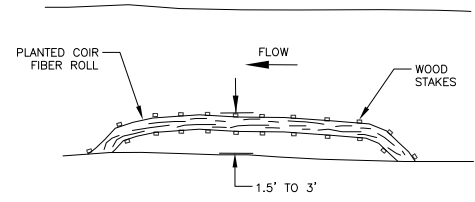
- LOGS SHOULD BE AT LEAST 8 TO 10 INCHES IN DIAMETER, A MINIMUM OF 15 FEET IN LENGTH (UNLESS OTHERWISE NOTED), AND RELATIVELY STRAIGHT.
- NAIL FILTER FABRIC USING 3" 100 GALVANIZED COMMON NAIL EVERY 2" ALONG THE LOG.
- FILTER FABRIC USED SHALL BE NCDOT TYPE 2 ENGINEERING FABRIC OR EQUIVALENT.

LOG GRADE CONTROL

NTS



SECTION VIEW

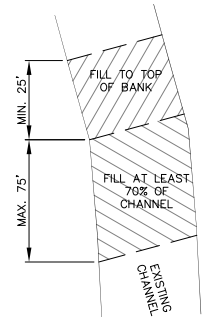


PLAN VIEW

- NOTES:
- DESIGNER TO MARK LOCATIONS AND DIMENSIONS OF SILLS IN THE FIELD PRIOR TO CONSTRUCTION.

VEGETATED SILL DEFLECTOR

NTS

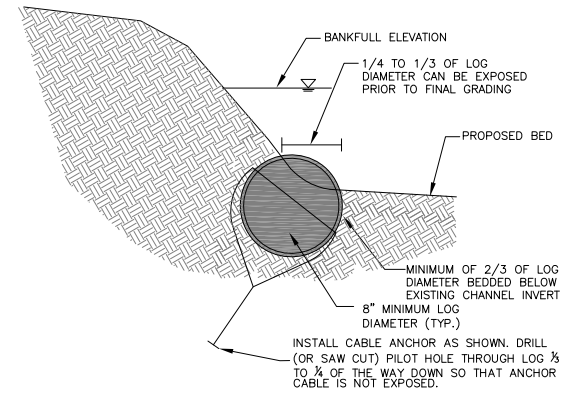


- NOTES:
- FILL EXISTING CHANNEL TO BANKFULL ELEVATION WHEN POSSIBLE.
 - IF CHANNEL CANNOT BE COMPLETELY FILLED TO BANKFULL, FILL TO BANKFULL EVERY 75' FOR AT LEAST 25'.

CHANNEL BACKFILL

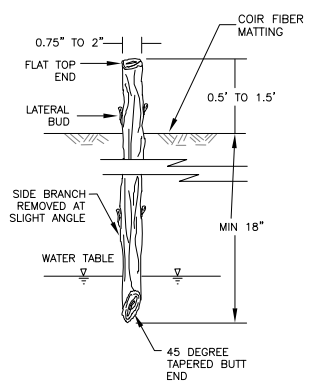
NTS

- NOTES:
- LOGS SHOULD BE AT LEAST 10 INCHES IN DIAMETER, 6-10 FEET LONG, RELATIVELY STRAIGHT, AND HARDWOOD.
 - CABLE ANCHORS SHOULD BE PLACED 1' TO 3' FROM EACH END OF LOG. REBAR (5/8" MINIMUM DIAMETER 3' MIN. LENGTH TYPICAL) MAY BE USED AS A SUBSTITUTION FOR CABLE ANCHORS PER DIRECTION OF ENGINEER.
 - IF REBAR IS USED, PRE-DRILL HOLES WITH 5/8" DRILL BIT.



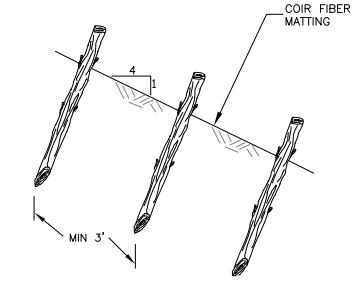
LOG TOE PROTECTION

NTS



- DETAIL:
- LIVE STAKES SHOULD BE LONG ENOUGH TO REACH BELOW THE GROUNDWATER TABLE. (GENERALLY, A LENGTH OF 2 TO 3 FEET IS SUFFICIENT.) ADDITIONALLY, THE STAKES SHOULD HAVE A DIAMETER IN THE RANGE OF 0.75 TO 2 INCHES.

- NOTE:
- ACCEPTABLE SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA), SILKY WILLOW (SALIX SERICEA) AND SILKY DOGWOOD (CORNUS AMMOMUM).
 - LIVE STAKES SHALL BE PLANTED IN AN AREA EXTENDING 3 FEET OUT FROM TOP OF BANK TO JUST BELOW BANKFULL.



LIVE STAKE

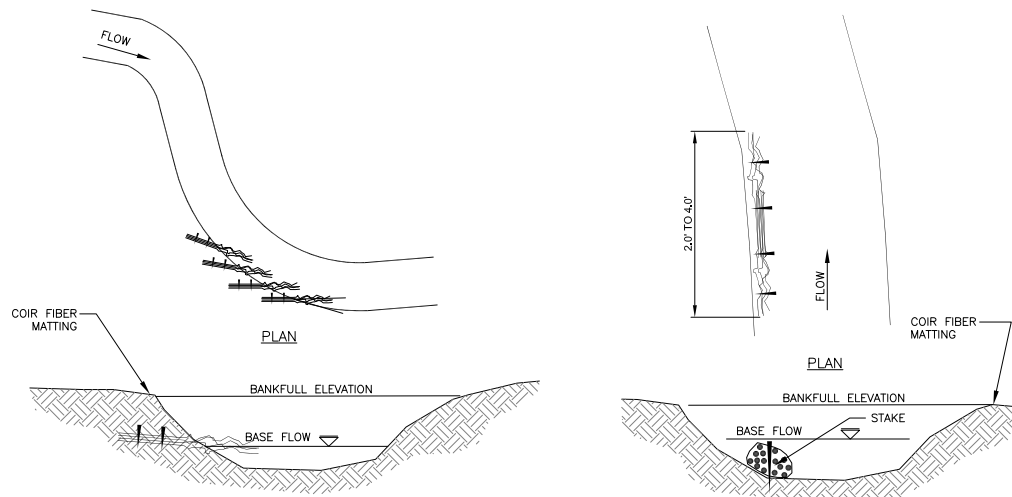
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MARK	DATE	DESCRIPTION	REVISIONS:	RELEASED FOR:	PLOT DATE:
				PRELIMINARY - NOT FOR CONSTRUCTION	5/1/13

PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANC & EXCHANGE, LLC
DRAWING TITLE: Detail 2
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

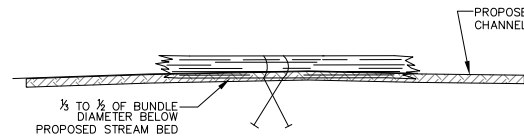
PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
39
PROJ. NO.: 20120090.00.RA



TYPICAL SECTION

NOTE: WATTLES ARE TO BE INSTALLED 4' O.C. BY CUTTING AN APPROXIMATELY 4" WIDE TRENCH PERPENDICULAR TO THE STREAM BANK JUST ABOVE BASEFLOW ELEVATION. INSERT THE WATTLES, ANCHORING WITH STAKES, AND TIGHTLY BACKFILL WITH TOPSOIL. WATTLES SHALL CONSIST OF 5 TO 10 STEMS, 0.25" TO 0.5" IN DIAMETER. MINIMUM LENGTH IS 4.5 FEET, AT LEAST 3.0 FEET SHALL BE INSTALLED WITHIN THE BANK. WATTLES SHOULD BE INSTALLED AT AN ANGLE OF 20° TO 30° TO THE STREAM BANK AND SHOULD POINT DOWNSTREAM. FILL VOIDS OF EXPOSED PORTION OF WATTLE WITH PINE STRAW (IF READILY AVAILABLE ON-SITE).

WATTLE



USE STICKS AND LOGS OF VARYING SIZES 1"-4" DIAMETER AND 1'-4" LONG. WOODY DEBRIS SHALL BE HELD IN PLACE USING TWINE AND WOODEN STAKES AND SHALL BE PLACED ACCORDING TO DESIGN PLANS AND AS DIRECTED BY ENGINEER.

WOODY DEBRIS BUNDLE

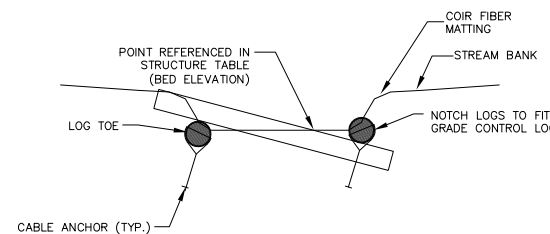
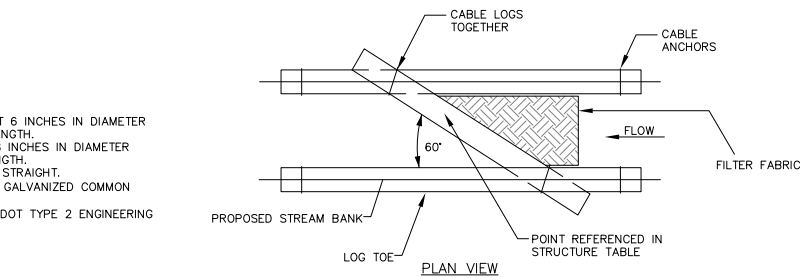
NOTE: WHEN INSTALLING SMALL WOODY DEBRIS STRUCTURES AS LOCATED ON THE PLAN SHEETS, CONTRACTOR SHALL ALTERNATE BETWEEN WATTLE, SMALL LOG, AND DEAD BRUSH STRUCTURES BASED ON READILY AVAILABLE MATERIALS AND PER DIRECTION OF THE ENGINEER.

SMALL WOODY DEBRIS & HABITAT STRUCTURES

NTS

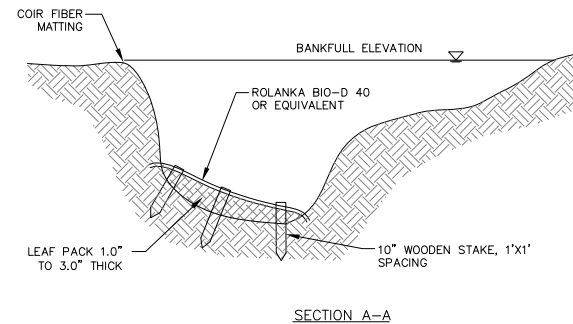
NOTES:

- CROSS LOGS SHOULD BE AT LEAST 6 INCHES IN DIAMETER AND A MINIMUM OF 20 FEET IN LENGTH.
- LOG TOES SHOULD BE AT LEAST 8 INCHES IN DIAMETER AND A MINIMUM OF 8 FEET IN LENGTH.
- ALL LOGS SHOULD BE RELATIVELY STRAIGHT.
- NAIL FILTER FABRIC USING 3" 100 GALVANIZED COMMON NAIL EVERY 2' ALONG THE LOG.
- FILTER FABRIC USED SHALL BE NCDOT TYPE 2 ENGINEERING FABRIC OR EQUIVALENT.

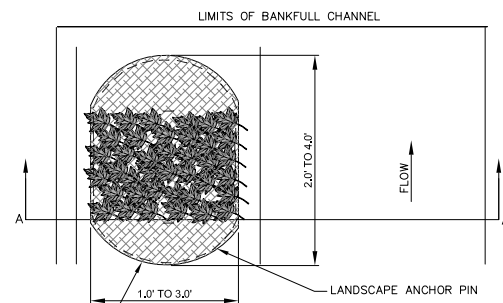


BEDDED LOG STRUCTURE

NTS



SECTION A-A

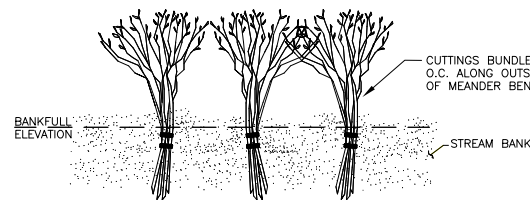


PLAN VIEW OF LEAF PACK

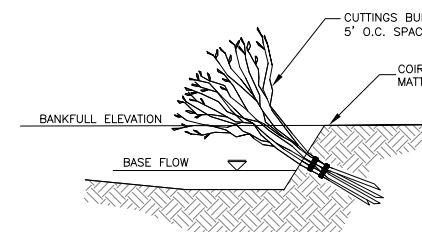
KEY UPSTREAM EDGES OF FABRIC INTO STREAM BED. COMPACT DISTURBED STREAM BED.

LEAF PACK

NTS



LIVE CUTTINGS BUNDLE TYPICAL PROFILE

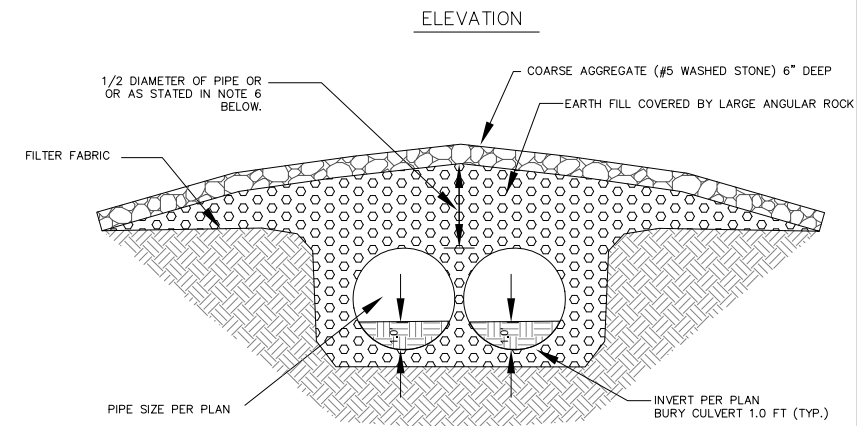


LIVE CUTTINGS BUNDLE TYPICAL SECTION

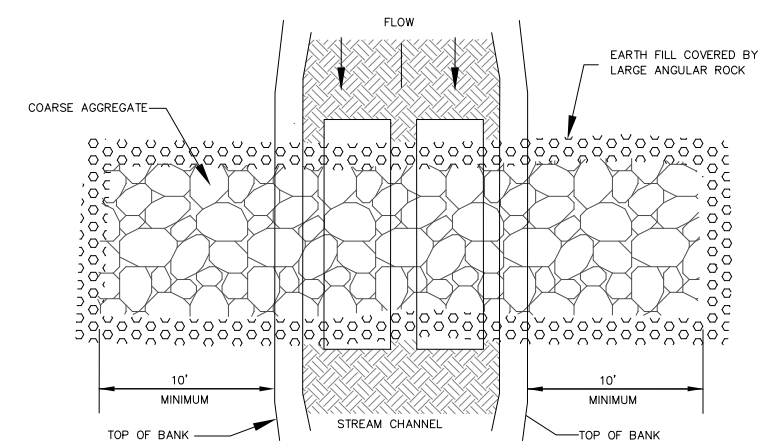
NOTE: ACCEPTABLE SPECIES INCLUDE BLACK WILLOW (SALIX NIGRA) AND SILKY WILLOW (SALIX SERICEA). CUTTINGS BUNDLES ARE TO BE INSTALLED (AFTER SOD MAT HAS BEEN PLACED) BY DRILLING AN APPROXIMATE 4" DIAMETER HOLE INTO THE STREAM BANK FROM AN ELEVATION SLIGHTLY ABOVE BANKFULL ELEVATION, INSERTING THE CUTTINGS AND TIGHTLY BACKFILLING WITH TOPSOIL. WILLOW CUTTINGS SHOULD BE RISED AT CUTTING POINT TO ALLOW BETTER ROOTING. ALDER TRANSPLANTS CAN BE SUBSTITUTED FOR CUTTINGS BUNDLES WITH APPROVAL OF ENGINEER

LIVE CUTTINGS BUNDLE

NTS



PLAN

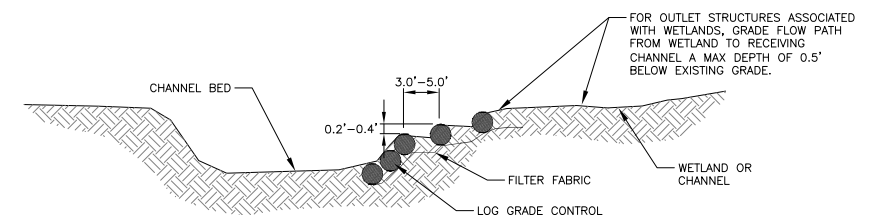


NOTES:

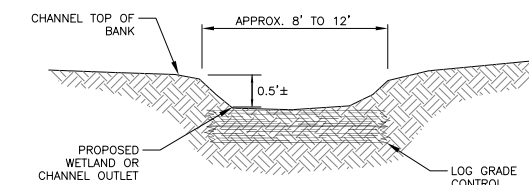
- CONSTRUCT STREAM CROSSING WHEN FLOW IS LOW.
- INSTALL STREAM CROSSING PERPENDICULAR TO FLOW.
- CONTRACTOR TO COORDINATE APPROPRIATE BEDDING MATERIAL WITH MANUFACTURER.
- FILTER FABRIC USED SHALL BE NCDOT TYPE 2 ENGINEERING FABRIC OR EQUIVALENT.
- WIDTH OF TYPICAL FARM CROSSINGS SHALL BE PER PLAN OR A MINIMUM OF 12'.
- WHEN REQUIRED, CONTRACTOR TO ENSURE PIPE MATERIAL AND COVER MEET H-20 LOADING REQUIREMENTS.

PROPOSED CULVERT CROSSING

NTS



PROFILE VIEW



SECTION VIEW

LOG OUTLET STRUCTURE

NTS



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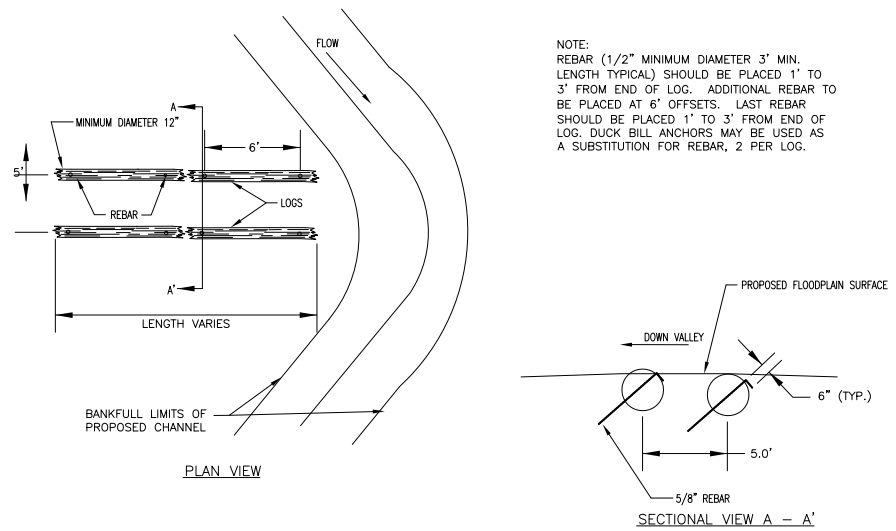
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO., NORTH CAROLINA
ENVIRONMENTAL BANK & EXCHANGE, LLC
DRAWING TITLE: Detail 3
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13

DRAWING NUMBER:

40

PROJ. NO.: 20120090.00.RA



NOTE:
REBAR (1/2" MINIMUM DIAMETER 3' MIN. LENGTH TYPICAL) SHOULD BE PLACED 1' TO 3' FROM END OF LOG. ADDITIONAL REBAR TO BE PLACED AT 6" OFFSETS. LAST REBAR SHOULD BE PLACED 1' TO 3' FROM END OF LOG. DUCK BILL ANCHORS MAY BE USED AS A SUBSTITUTION FOR REBAR, 2 PER LOG.

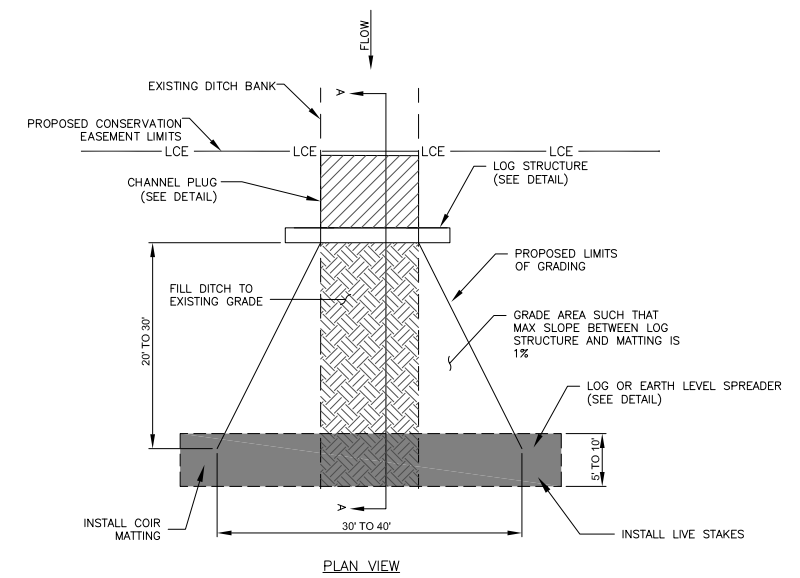
FLOODPLAIN SILL
NTS



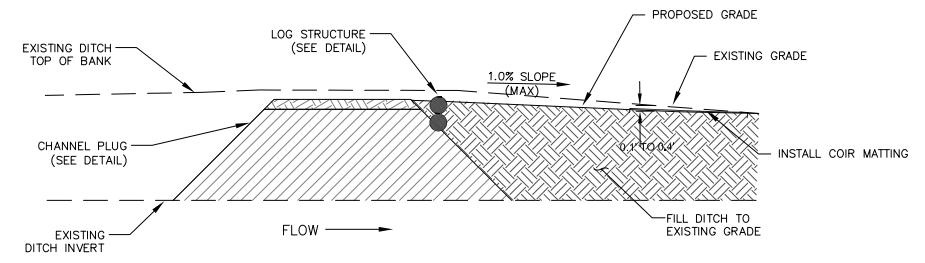
SIGN SPECIFICATIONS:
 • MATERIAL: ALUMINUM
 • GAUGE: .032
 • SIZE: 6" X 8"
 • BACKGROUND COLOR: COATED CHROME YELLOW
 • PRINT COLOR: BLACK
 • MOUNTING HOLES: 2 HOLES CENTER TOP AND BOTTOM 3/8" DIAMETER 6" ON CENTER AND 2 HOLES CENTER TOP AND BOTTOM 3/16" DIAMETER 7 3/8" ON CENTER
 • ROUND CORNERS: 1/4" RADIUS

NOTES:
 1. CONSERVATION AREA SIGNS SHALL BE ATTACHED TO A TREE, T-POST, U-CHANNEL POST, OR SQUARE STEEL POST.
 2. ALL POSTS MUST HAVE A LENGTH OF 6.0 FEET AND BE BURIED TO A DEPTH OF 2.0 FEET.
 3. SIGNS SHALL BE INSTALLED ON POSTS USING 3/8" ALUMINUM DRIVE RIVETS.
 4. THE TOP 0.5 FEET OF T-POSTS OR U-CHANNEL POSTS SHALL BE PAINTED YELLOW.
 5. USE 3/2" ALUMINUM NAILS TO INSTALL SIGN ON TREES, LEAVING 1/2" OF THE NAIL EXPOSED.

CONSERVATION EASEMENT SIGN
NTS



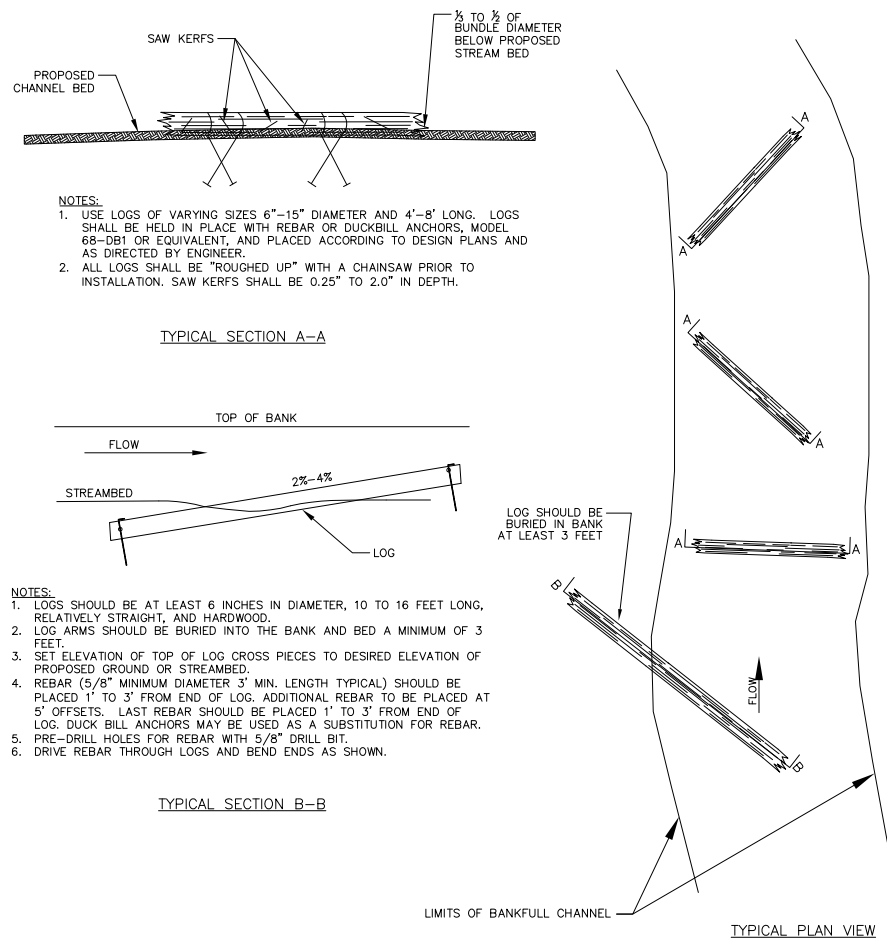
PLAN VIEW



SECTION A-A

NOTES:
 1. LOGS SHOULD BE AT LEAST 10'-20' LONG AND AT LEAST 8 INCHES IN DIAMETER, AND HARDWOOD.

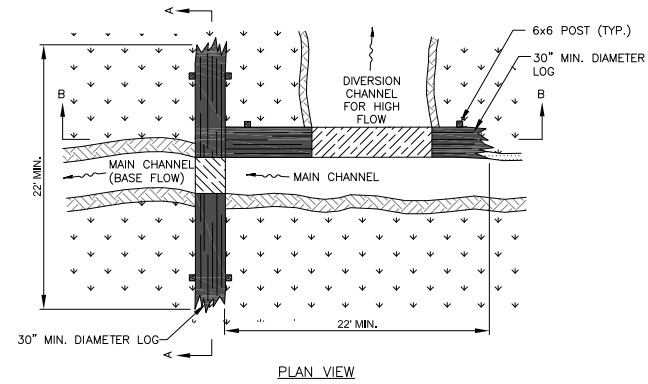
DIFFUSE FLOW STRUCTURE
NTS



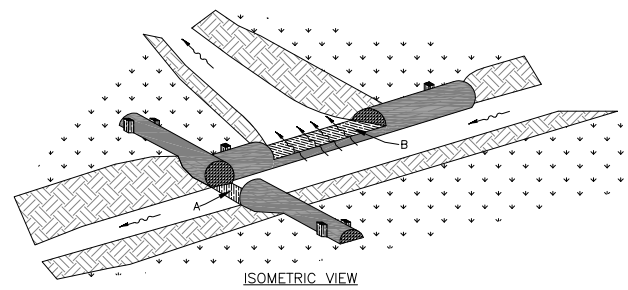
NOTES:
 1. USE LOGS OF VARYING SIZES 6"-15" DIAMETER AND 4'-8" LONG. LOGS SHALL BE HELD IN PLACE WITH REBAR OR DUCKBILL ANCHORS, MODEL 68-081 OR EQUIVALENT, AND PLACED ACCORDING TO DESIGN PLANS AND AS DIRECTED BY ENGINEER.
 2. ALL LOGS SHALL BE "ROUGHED UP" WITH A CHAINSAW PRIOR TO INSTALLATION. SAW KERFS SHALL BE 0.25" TO 2.0" IN DEPTH.

NOTES:
 1. LOGS SHOULD BE AT LEAST 6 INCHES IN DIAMETER, 10 TO 16 FEET LONG, RELATIVELY STRAIGHT, AND HARDWOOD.
 2. LOG ARMS SHOULD BE BURIED INTO THE BANK AND BED A MINIMUM OF 3 FEET.
 3. SET ELEVATION OF TOP OF LOG CROSS PIECES TO DESIRED ELEVATION OF PROPOSED GROUND OR STREAMBED.
 4. REBAR (5/8" MINIMUM DIAMETER 3' MIN. LENGTH TYPICAL) SHOULD BE PLACED 1' TO 3' FROM END OF LOG. ADDITIONAL REBAR TO BE PLACED AT 5" OFFSETS. LAST REBAR SHOULD BE PLACED 1' TO 3' FROM END OF LOG. DUCK BILL ANCHORS MAY BE USED AS A SUBSTITUTION FOR REBAR.
 5. PRE-DRILL HOLES FOR REBAR WITH 5/8" DRILL BIT.
 6. DRIVE REBAR THROUGH LOGS AND BEND ENDS AS SHOWN.

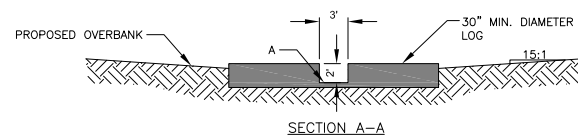
LARGE WOODY DEBRIS
NTS



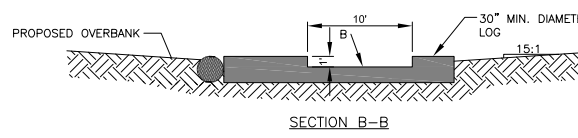
PLAN VIEW



ISOMETRIC VIEW



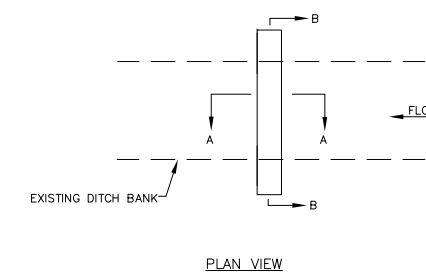
SECTION A-A



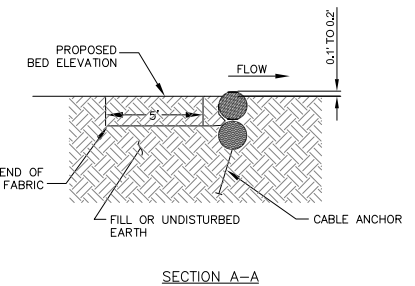
SECTION B-B

1. LOGS SHOULD BE AT LEAST 30 INCHES IN DIAMETER, HARDWOOD SPECIES (EXCLUDING TULIP POPLAR AND SWEET GUM), A MINIMUM OF 22 FEET IN LENGTH, AND RELATIVELY STRAIGHT.
 2. ELEVATION OF WEIR B SHOULD BE 1 FOOT HIGHER THAN THE ELEVATION OF WEIR A.

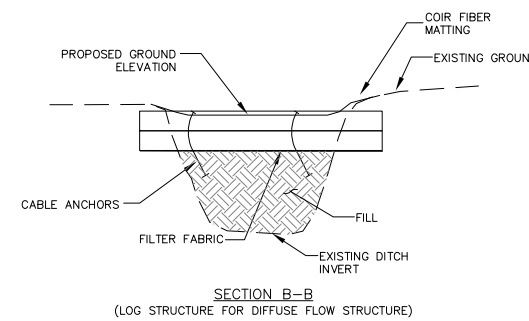
FLOW DIVERSION STRUCTURE
NTS



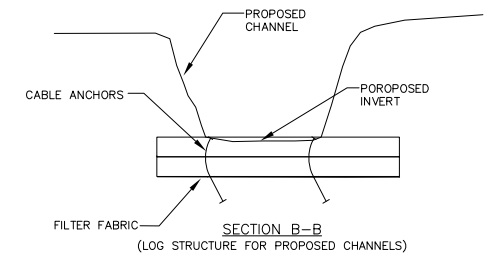
PLAN VIEW



SECTION A-A



SECTION B-B (LOG STRUCTURE FOR DIFFUSE FLOW STRUCTURE)



SECTION B-B (LOG STRUCTURE FOR PROPOSED CHANNELS)

1. LOGS SHOULD BE AT LEAST 12 INCHES IN DIAMETER, HARDWOOD SPECIES (EXCLUDING TULIP POPLAR AND SWEET GUM), A MINIMUM OF 10 TO 20 FEET IN LENGTH (UNLESS OTHERWISE NOTED), AND RELATIVELY STRAIGHT.
 2. NAIL FILTER FABRIC USING 3" 10D GALVANIZED COMMON NAIL EVERY 3' ALONG THE LOG.
 3. FILTER FABRIC USED SHALL BE NCDOT TYPE 2 ENGINEERING FABRIC OR EQUIVALENT.

LOG STRUCTURE
NTS



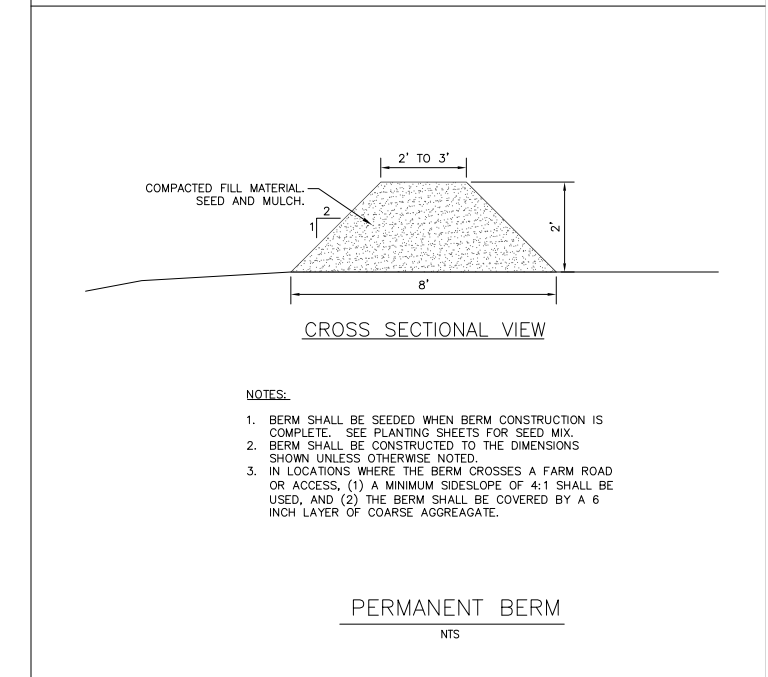
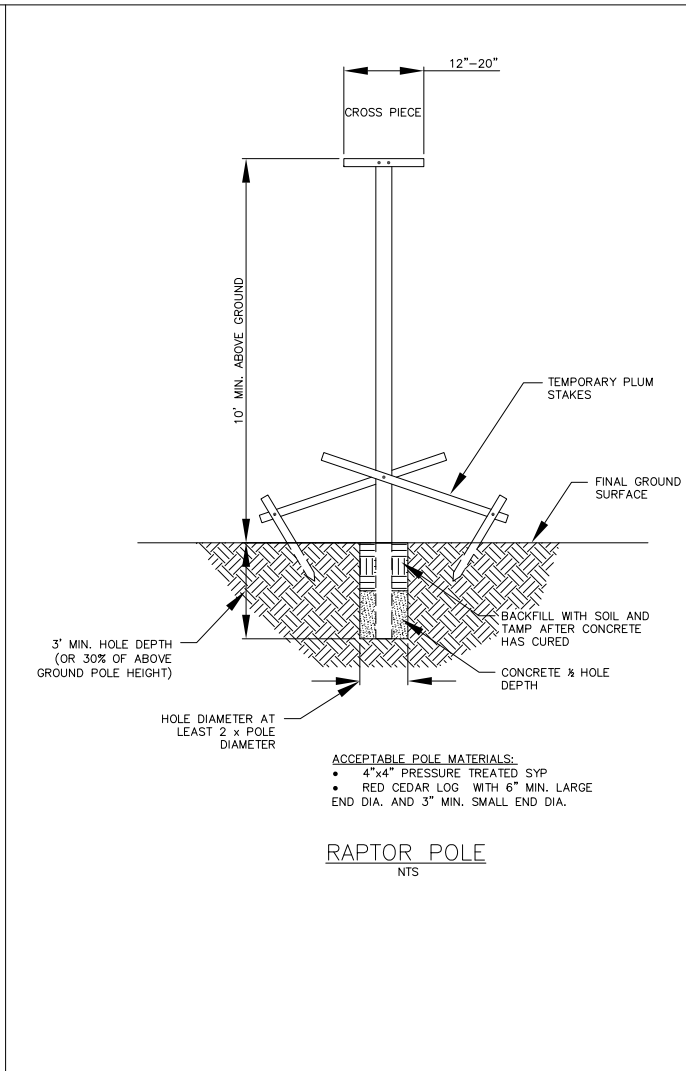
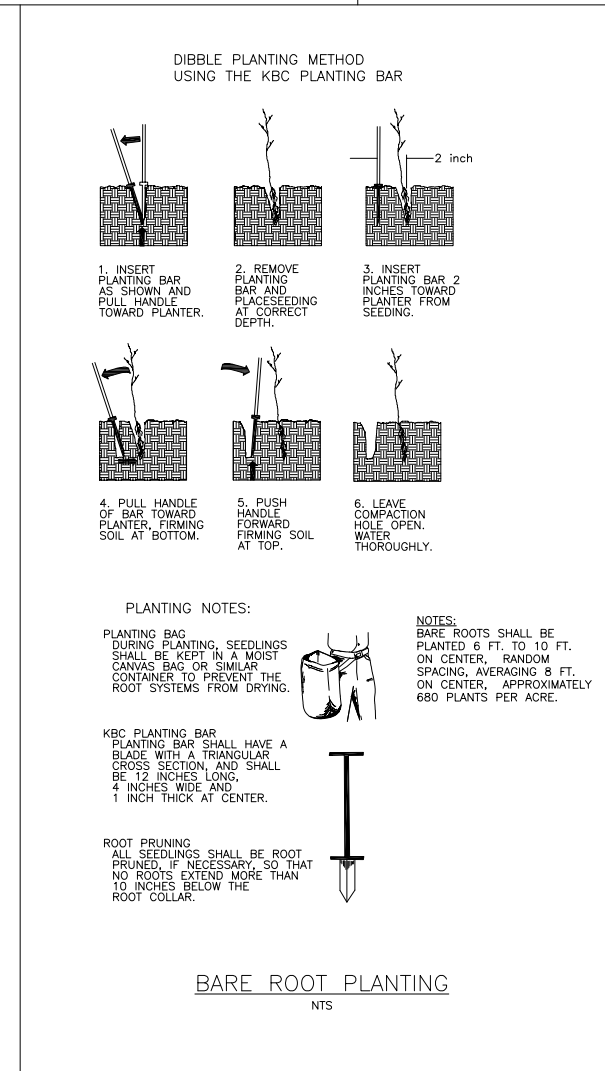
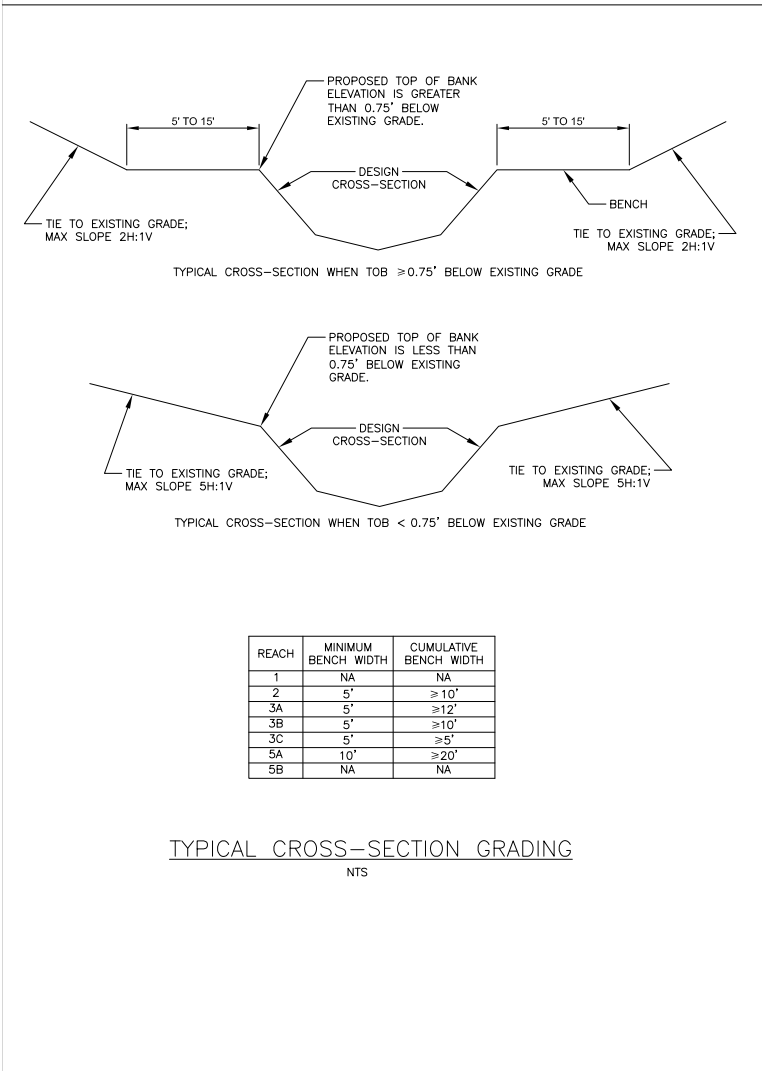
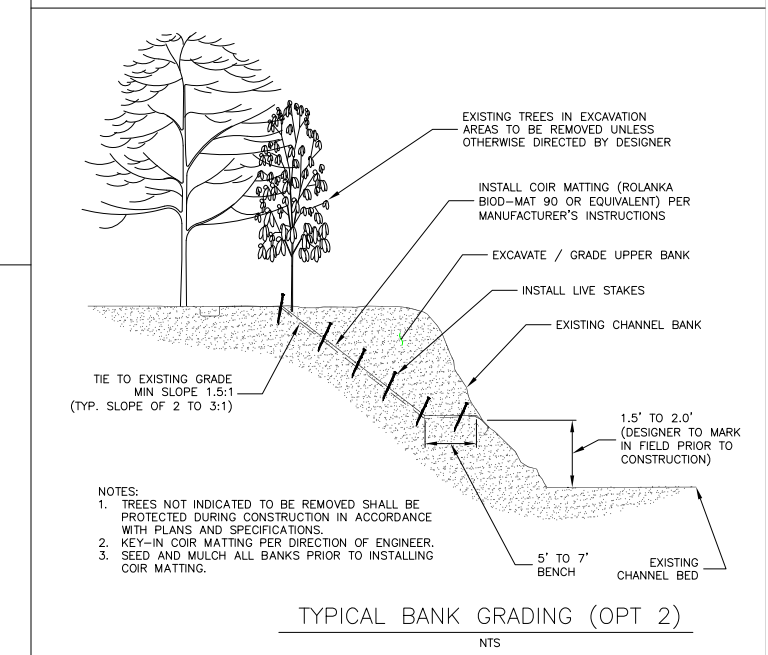
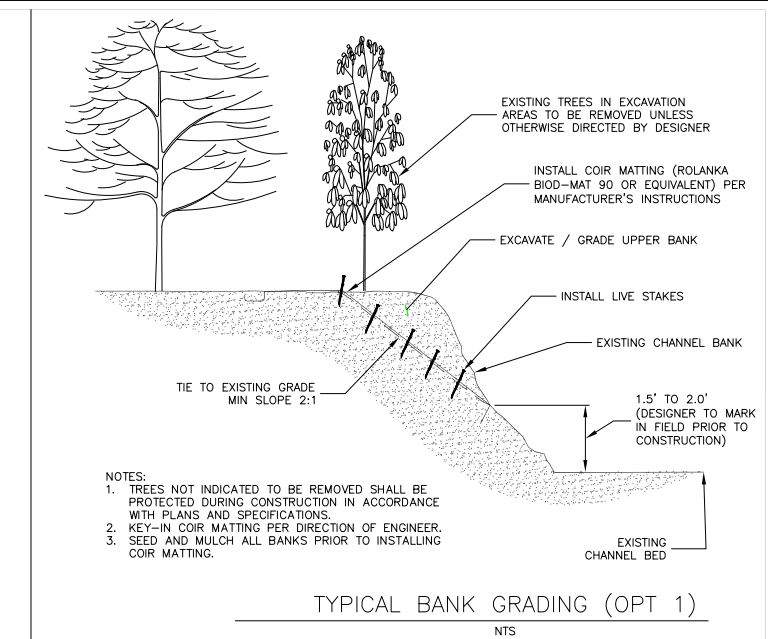
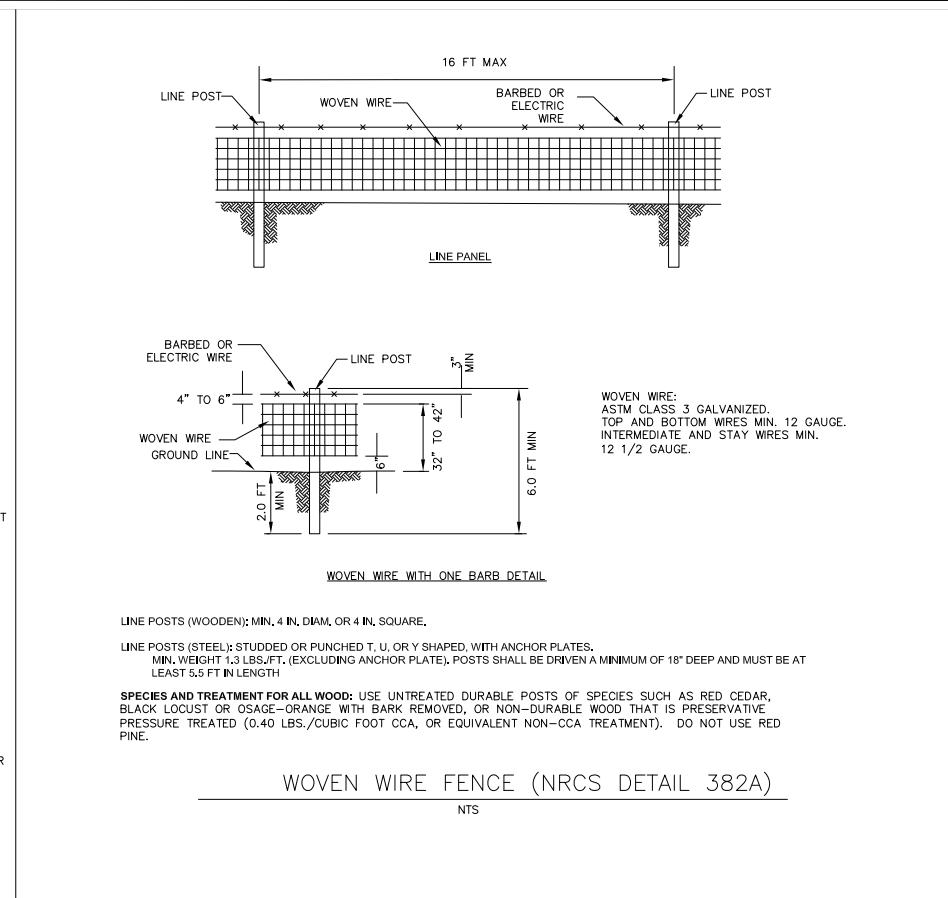
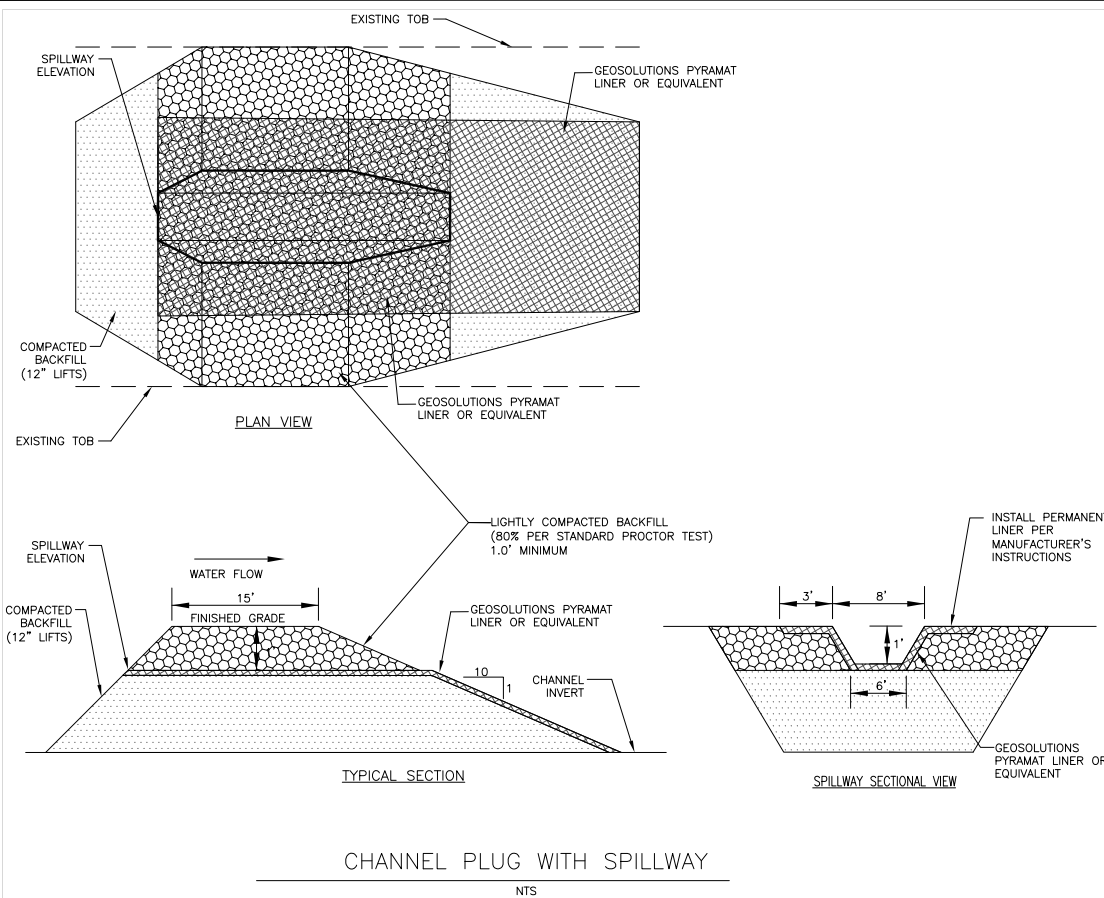
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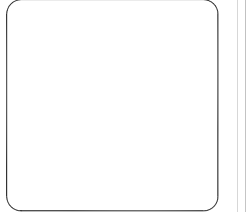
PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
 DUPLIN CO., NORTH CAROLINA
 ENVIRONMENTAL BANK & EXCHANGE, LLC
 DRAWING TITLE: Detail 4
 OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
 Q.C.: FM
 Q.C. DATE: 01-23-13

DRAWING NUMBER:
41
 PROJ. NO.: 20120090.00.RA



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PROJECT NAME: MUDDY RUN II STREAM MITIGATION PROJECT
DUPLIN CO. NORTH CAROLINA
ENVIRONMENTAL BANK & EXCHANGE, LLC
DRAWING TITLE: Detail 5
OWNER / 24 HR CONTACT: ADDRESS: PHONE: MOBILE:

PROJ. DATE: OCT 2012
O.C.: FM
O.C. DATE: 01-23-13
DRAWING NUMBER:
42
PROJ. NO.: 20120090.00.RA