UT to JUMPING RUN CREEK STREAM & WETLAND RESTORATION
MONITORING REPORT (YEAR 3 OF 5)

Cumberland County, North Carolina
EEP Project Number 92345
Monitoring Contract Number D09085S

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Draft
Construction Completed: 2010
Data Collected: 2012
Submission Date: November 2012

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1.0Executive Summary / Project Abstract

The overall goal of the UT to Jumping Run Creek Restoration Project was to restore a Coastal Plain headwater stream and wetlands, a Coastal Plain Small Stream Swamp, and nonriparian wetlands. The objectives of the project were to restore wetland hydrology to small stream swamp wetlands, restore stream stability and improve aquatic habitats, restore historic flow paths and flooding processes, improve floodplain functionality, establish native vegetation within the permanent conservation easement, and investigate the ecological benefits of installing larger containerized trees in select smaller designated areas.

The Monitoring Year 3 (MY3) stem counts within each of the vegetative monitoring plots are included in Tables 7 and 9 in Appendix C. Both planted and total stem counts are included in Table 9. Six of the plots have over 320 planted stems per acre (the interim success criteria for MY3) while six of the plots have less than 320 planted stems per acre. When volunteers are included in the stem count, nine of twelve plots have over 320 total stems per acre. Four of the five random transects monitored had over 320 total stems per acre. A few areas of cattails (*Typha latifolia*) were noted last year, especially in the depressions left by the old channel on the left bank. These areas have grown in extent and are marked on the map as a minor vegetation problem area. This area will continue to be monitored to ensure there is no further encroachment on the planted vegetation. Minor areas of *Murdannia keisak* were observed in the stream channel along the downstream portion of UT1B and also the upstream portion of UT1C. Currently, these areas do not pose a threat to native vegetation establishment or stream stability, but they will continue to be monitored during future field visits to document any changes. Additional planting of approximately 15,000 bare root plants occurred during the winter of 2011/2012 to meet the original planting warranty.

The stream surveys performed in monitoring years 1 and 2 did not have enough flow in the stream channel to gather water surface data for a majority of the stream reaches. The opposite was the case during monitoring year 3 when approximately 0.34 inches of precipitation was recorded within the vicinity of the project site on October 8, 2012, the day before the stream survey was performed. The project stream, being a headwater system, is subject to extremely low flows during dry periods and experiences flashy water levels following precipitation events. These fluctuations in water levels have caused drastic differences in measurements of riffle and pool slopes and lengths. Essentially, as the water level rises, water surface slope moves toward an average, or bankfull, water surface slope, and masks the individual stream facets, which are defined by water surface slope.

The upstream braided reach (UT1A) is stable and appears to be functioning as designed. There are signs that water is flowing through the multiple braids and collecting in the shallow pool areas. The UT to Jumping Run single thread restoration reach (UT1B) was observed to be in generally stable condition. Over the approximately 3600 linear feet of channel restoration, the channel's profile and cross-section has only adjusted minimally from baseline conditions. Two small areas of aggradation reported in 2011, at Station 52+50 and Station 55+50, were observed again in 2012. The total length is approximately 60 feet and *Typha latifolia* has moved into these aggraded areas of the channel. An exposed structure, also observed in 2011, near Station 51+00 was no longer exposed as the upstream section of UT1B had flow in the channel. Currently, these issues are not significant and they are not predicted to affect the stability of the restored channel. Both areas will continue to be monitored during future field visits to document

any changes. The enhancement reach UT1C appears to be stable, with bank pin surveys showing no aggradation or degradation.

No beaver dams were observed on the restoration reaches. A second crest gauge was installed on-site, approximately 200 feet upstream of the road crossing on UT1B. After three years of monitoring there is no evidence of a bankfull event at either crest gauge along reach UT1B. However, backwater was observed overbank around groundwater well 15 along the right bank towards the lower section of UT1B at the time of the stream survey. Reach UT1A has shown visual evidence of water accessing the floodplain from the braided channel throughout Monitoring Year 3.

The reference well met the success criteria, with a 40-day consecutive period of soil saturation within 12 inches of the ground surface. This 40-day period comprises 16% of the growing season. Eleven of the 15 groundwater monitoring wells onsite met the success criteria. Four wells did not meet the success criteria, and the water tables measured at two (GW 4 and GW 6) of the wells were not within 12 inches of the ground surface at any time during the 2012 growing season. Monthly precipitation totals for 2012 fell between the 30th and 70th percentiles during the growing season in March, May, June, July, August, September, and October. April and November were the only months that precipitation fell below the 30th percentile.

Summary information, data, and statistics related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 Methodology

Channel stability, vegetation survival, and viability of wetland function were monitored on the project site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success. The Monitoring Year 3 stream survey was completed using survey grade GPS on October 9, 2012. The vegetation monitoring was conducted on September 20, 2012.

2.1 MORPHOLOGIC PARAMETERS AND CHANNEL STABILITY

2.1.1 Dimension

Reaches UT1A and UT1C involved restoration techniques to restore historic flow patterns and flooding functions. Monitoring efforts for reaches UT1A and UT1C focus on visual documentation of stability. Dimensional characteristics obtained from cross-sectional surveying of 10 permanent cross-sections on UT1B were compared to baseline conditions. All monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type. Natural variability is expected, however the system should not experience trends toward excessive increasing bank erosion, channel degradation, or channel aggradation.

2.1.2 Pattern and Profile

The entire longitudinal profile of reach UT1B was surveyed (3,661 lf). Stationing from the as-built survey was used. The longitudinal profiles should show that the bedform features are remaining stable. The pools should remain deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools.

2.1.3 Substrate

Since the streams throughout the project site are dominated by sand-size particles, pebble count procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore, as per NCEEP guidance, bed material analyses will not be undertaken for this project.

2.2 VEGETATION

The Carolina Vegetation Survey (CVS) Level 2 methodology was utilized to sample vegetation in September of 2012. Twelve 100m^2 plots have been established throughout the project site. In each plot, four plot corners have been permanently located with conduit or rebar. Additionally, five random transect plots (2m x 50m (100m^2)) were monitored for surviving species count. The location of the transect plots were selected at random, but stratified to be spread across the different planting zones. These plots are aimed at providing a more thorough account of the vegetation condition across the site outside the permanent vegetation plots.

As per the as-built and baseline monitoring report, the vegetative success criteria are based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003). The final vegetative success

criteria will be the survival of 260 5-year old planted trees per acre at the end of the year 5 monitoring period. Interim measures of vegetation planting success will be the survival of at least 320 planted trees per acre at the end of the 3-year monitoring period and 280 planted trees per acre at the end of the 4-year monitoring period. As planted versus volunteer stems cannot be differentiated for the random transect plots, the stem counts for the random transects include both planted and volunteer woody stems.

2.3 HYDROLOGY

2.3.1 Streams

Two crest gauges are used to monitor bankfull events along reach UT1B. One crest gauge has been installed onsite following construction and is located just downstream from cross-section 2. The second crest gauge was installed during the winter of 2012, and is located downstream of the first crest gauge between cross-sections 7 and 8. Each visit to the site includes documentation of the highest stage for the monitoring interval and a reset of the device. Other indications of bankfull flow including the presence of wrack lines, sediment, or flooding are recorded and documented photographically. Refer to Figure 2 in Appendix B for the location of the crest gauge. The headwater stream reach (Reach UT1A) is visually assessed during each monitoring visit to evaluate indicators that the braided channel is exhibiting flow. A visual assessment form was created for this purpose by NCEEP and is included in Appendix B.

2.3.2 Wetlands

Fifteen automated groundwater monitoring gauges have been installed across the project area to document the hydrologic conditions of the site. Refer to Figure 2 in Appendix B for the location of the groundwater monitoring gauges. Eleven gauges have been installed in the riparian areas and four have been installed in the non-riparian areas of the site. Groundwater gauges will be downloaded on at least a bi-monthly basis during the growing season. A reference well is located in the existing wetlands onsite in the northeast corner of the property and is depicted on Figure 2 in Appendix B. The success criteria for the hydrology monitoring in the wetlands is for the site to be saturated within 12 inches of the soil surface consecutively for at least 6% of the growing season in the riparian wetlands, and 9% of the growing season in the non-riparian wetlands.

Two additional automated groundwater monitoring gauges were installed by NCEEP during the summer of 2012. One well was placed northwest of groundwater well 6 and the other well was placed northeast of groundwater well 6. These additional wells were installed to investigate the lack of hydrologic success exhibited in groundwater well 6. The two additional wells are located within the riparian area of the site shown on Figure 2 in Appendix B.

3.0References

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

NCEEP. 2010. Procedural Guidance and Content Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.3, January 15, 2010.

NCEEP. 2008. Mitigation Plan Document – Format Data Requirements, and Content Guidelines. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 2.0, March 27, 2008.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

Schafale, M.P. and A.S. Weakley, 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDEHNR, Raleigh, North Carolina.

United States Army Corps of Engineers – Wilmington District, North Carolina Division of Water Quality, United States Environmental Protection Agency – Region IV, Natural Resources Conservation Service, North Carolina Wildlife Resources Commission. 2003. Stream Mitigation Guidelines.

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4.0 Appendices

Appendix A – Project Vicinity Map and Background Tables

Appendix B – Visual Assessment Data

Appendix C – Vegetation Plot Data

Appendix D – Stream Survey Data

Appendix E – Hydrologic Data

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Appendix A. Project Vicinity Map and Background Tables

Figure 1 – Vicinity Map and Directions
Table 1a.b. – Project Restoration Components
Table 2 – Project Activity and Reporting History
Table 3 – Project Contacts
Table 4 – Project Attribute

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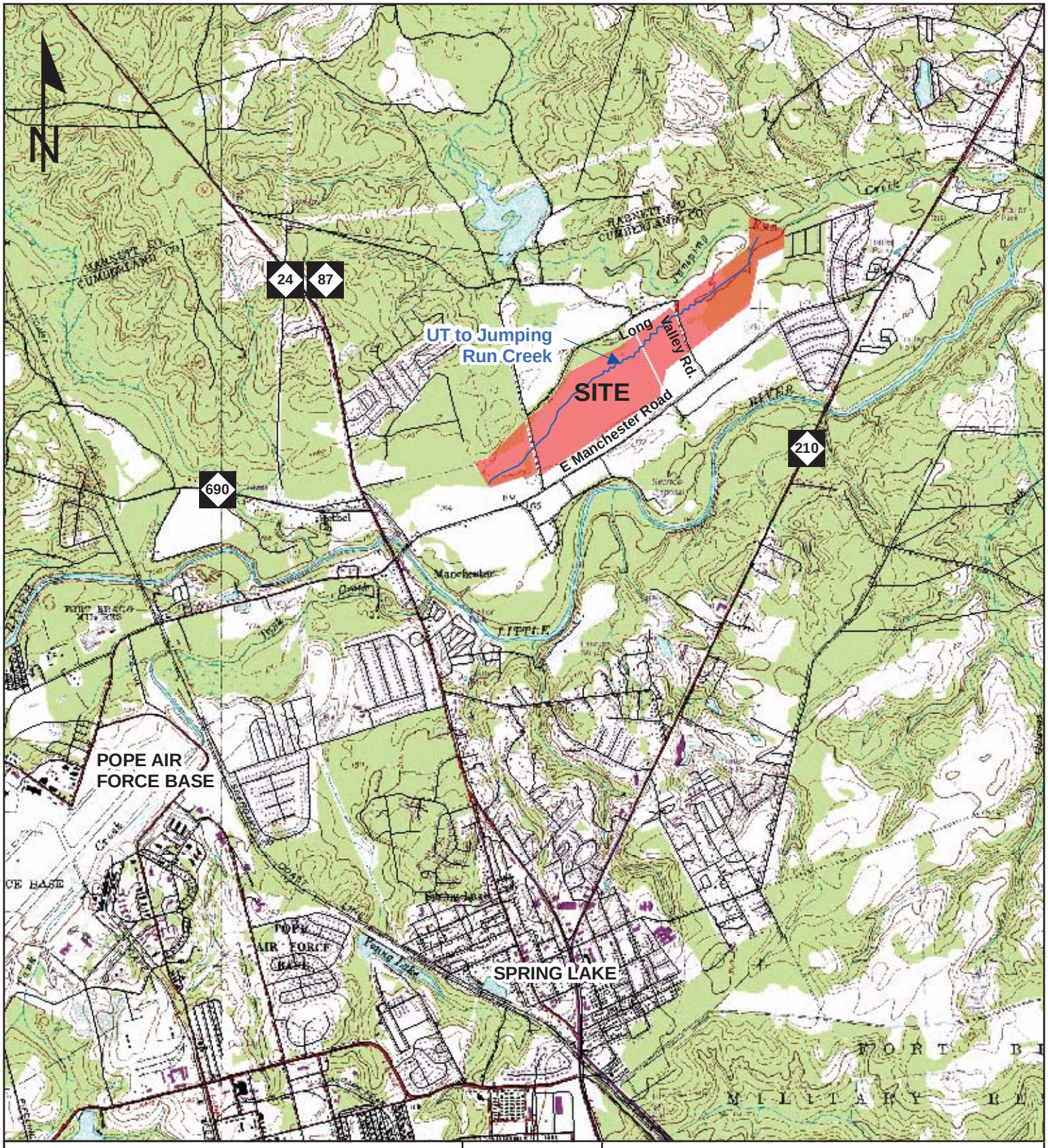

Directions to the site: From Raleigh, head south on US 1. In Sanford take the NC 87 S / US 421 S / N Horner Blvd exit and turn right at the end of the exit ramp to go south through Sanford. In approximately 5 miles, veer right to stay on NC 87 at the NC 87 / US 421 split. Approximately 1.6 miles past the Cumberland County line turn left onto East Manchester Road. Go another 1.6 miles and turn left on Long Valley Road to access the site. Gate access can be obtained from NC State Parks (Janet Pearson 910-692-2167)

0 1,500 3,000 6,000 9,000 Feet

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Figure 1. Vicinity Map

UT to Jumping Run Creek
Stream and Wetland Restoration Project
EEP #: 92345
Cumberland County, North Carolina

Table 1a. Project Components									
UT Jumping Run Creek Restoration Project/EEP Project No. 92345									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements[1]**	**Comment**
UT1A	9,026 lf	R	CP Headwater	3,657*	10+00 to 47+29	1:1	3,657		Restoration consists of filling the channelized portions of stream and restoring valley topography. The system will be allowed to form on its own, either as a single or braided channel headwater stream within the valley (DA stream type).
UT1B		R	PI	3,661	47+29 to 82+19	1:1	3,661		Restoration follows a Rosgen Priority Level I approach. A new meandering channel was constructed across the abandoned floodplain. The old stream channel and drainange ditches were filled.
UT1C	1,935 lf	E	EI	1,935	82+19 to 101+54	1.5:1	1,290		Stream enhancement occurred in the area of existing forest on the eastern side of the project. Flows from the restoration reaches were routed into the existing channel that currently flows through this wooded area, with minimal disturbance to the existing vegetation. The existing channel is relatively stable, and restoring the historic stream flow would enhance the functions of the stream reach.
Riparian Wetland Restoration - field areas along UT1A and UT1B	n/a	R		78.7	~10+00 to 82+39	1:1	78.7		Restoration of wetland hydrology to drained areas of hydric soil. Drainage ditches were filled, microtopography reintroduced, planting of native wetland vegetation, and overbank flooding regimes restored.
Riparian Wetland Enhancement - along UT1a and UT1B (existing jurisdictional wetland pockets)	3.4 ac	E		3.4	~16+00 to 60+00	2:1	1.7		Existing jurisdictional wetlands within the farm fields enhanced by raising the local water table, restoring an overbank flooding regime, and planting of native wetland vegetation.
Non-riparian Wetland Restoration	n/a	R		17.3	~24+00 to 91+00	1:1	17.3		Existing drained hydric soil areas within the farm fields restored by raising the local water table and planting of native wetland vegetation.

*Footage is based on valley length for this braided system

1 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other
CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table 1b. Component Summations UT Jumping Run Creek Restoration Project/EEP Project No. 92345							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	7318	78.7		17.3			
Enhancement		3.4					
Enhancement I	1935						
Enhancement II							
Creation							
Preservation					125.9		
HQ Preservation							
Totals (Feet/Acres)	**9253**	**82.1**		**17.3**			
MU Totals	**8608**	**80.4**		**17.3**			

Non-Applicable

Table 2. Project Activity and Reporting History UT Jumping Run Creek Restoration Project/EEP Project No. 92345		
Elapsed Time Since Grading Complete:	**2 year 6 months**	
Elapsed Time Since Planting Complete:	**2 year 5 months**	
Number of Reporting Years[1]:	**3**	
	Data Collection	**Completion or**
Activity or Deliverable	**Complete**	**Delivery**
Mitigation Plan	Nov 2007	July 2008
Final Design – Construction Plans	n/a	March 2009
Construction	n/a	April 2010
Seeding	n/a	March 2010
Planting	n/a	April 2010
As-built (Year 0 Monitoring – baseline)	May 2010	Dec 2010
Year 1 Monitoring	Sept 2010	Dec 2010
Year 2 Monitoring	Oct 2011	Nov 2011
Supplemental Planting	n/a	Winter 2011/2012
Year 3 Monitoring	Oct 2012	Nov 2012
Year 4 Monitoring	n/a	n/a
Year 5 Monitoring	n/a	n/a

1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table	
UT Jumping Run Creek Restoration Project/EEP Project No. 92345	
Designer	Michael Baker Engineering, Inc.
	8000 Regency Pkwy, Ste 200, Cary, NC 27518
Primary project design POC	Kayne Van Stell (919)463-5488
Construction Contractor	Backwater Environmental
	P.O. Box 1654, Pittsboro, NC 27312
Construction contractor POC	Wes Newell (919) 523-4375
Survey Contractor	Turner Land Surveying, PLLC
	3201 Glenridge Drive, Rlaiegh, NC 27604
Survey contractor POC	L Turner (919) 875-1378
Planting Contractor	Carolina Silvics, Inc.
	Indian Trail Rd, Endenton, NC 27932
Planting contractor POC	Mary-Margaret McKinney (252) 482-8491
Seeding Contractor	Unknown
	Unknown
Contractor point of contact	Unknown
Seed Mix Sources	Unknown
	Unknown
Nursery Stock Suppliers	ArborGen, Coastal Plain, Native Roots, Superior Trees, NCDFR
Monitoring Performers	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Stream Monitoring POC	Tim Taylor (980) 297-7669
Vegetation Monitoring POC	Amber Coleman (919)865-7399
Wetland Monitoring POC	Amber Coleman (919)865-7399

Table 4. Project Attribute Table						
UT Jumping Run Creek Restoration Project / EEP Project No. 92345						
Project County	Cumberland					
Physiographic Region	Coastal Plain					
Ecoregion	Sandhills					
Project River Basin	Cape Fear					
USGS HUC for Project (14 digit)	03030004090010					
NCDWQ Sub-basin for Project	03-06-14					
Within extent of EEP Watershed Plan?	No					
WRC Hab Class (Warm, Cool, Cold)	Warm					
% of project easement fenced or demarcated	100%					
Beaver activity observed during design phase?	Yes					
Restoration Component Attribute Table						
	UT1A	UT1B	UT1C	RW Restoration	RW Enhancement	NRW Restoration
Drainage area	1.2 sq mi			N/A	N/A	N/A
Stream order	1	1	1	N/A	N/A	N/A
Restored length (feet)	3,657	3,661	1,935	N/A	N/A	N/A
Perennial or Intermittent	I	P	P	N/A	N/A	N/A
Watershed type (Rural, Urban, Developing etc.)	Rural	Rural	Rural	N/A	N/A	N/A
Watershed LULC Distribution (e.g.)						
Residential	25%			N/A	N/A	N/A
Ag-Livestock	45%			N/A	N/A	N/A
Forested	30%			N/A	N/A	N/A
Watershed impervious cover (%)	<5%			N/A	N/A	N/A
NCDWQ AU/Index number	N/A	N/A	N/A	N/A	N/A	N/A
NCDWQ classification	C	C	C	N/A	N/A	N/A
303d listed?	No	No	No	N/A	N/A	N/A
Upstream of a 303d listed segment?	Yes	Yes	Yes	N/A	N/A	N/A
Reasons for 303d listing or stressor	DO, FC, metals, pH			N/A	N/A	N/A
Total acreage of easement	225.3					
Total vegetated acreage within the easement	225.3					
Total planted acreage as part of the restoration	153.8					
Rosgen classification of pre-existing	F5	F5	F5	N/A	N/A	N/A
Rosgen classification of As-built	DA	C	E/C/DA	N/A	N/A	N/A
Valley type	X	X	X	N/A	N/A	N/A
Valley slope	-	0.0011	0.003	N/A	N/A	N/A
Valley side slope range (e.g. 2-3.%)	-	-	-	N/A	N/A	N/A
Valley toe slope range (e.g. 2-3.%)	-	-	-	N/A	N/A	N/A
Cowardin classification	N/A	N/A	N/A	Palustrine	Palustrine	Palustrine
Trout waters designation	N/A	N/A	N/A	N/A	N/A	N/A
Species of concern, endangered etc.? (Y/N)	No	No	No	No	No	No
Dominant soil series and characteristics						
Series	Deloss	Deloss	Deloss	Deloss	Deloss	Tarboro
Depth (to water table)	+1-1.0ft	+1-1.0ft	+1-1.0ft	+1-1.0ft	+1-1.0ft	>6ft
Clay%	3-35%	3-35%	3-35%	3-35%	3-35%	2-12%
K	0.24	0.24	0.24	0.24	0.24	0.1
T	5	5	5	5	5	5

Use N/A for items that may not apply. Use "-" for items that are unavailable and "U" for items that are unknown
RW = Riparian wetland, NRW = Non-riparian wetland

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Appendix B. Visual Assessment

Figure 2 – Current Condition Plan View (4 Sheets)
Table 5 – Visual Stream Morphology Stability Assessment
Table 6 – Vegetation Condition Assessment
Form – Headwater Stream Visual Assessment Form
Photos – Stream Stations (B1-B13)
Photos – Vegetation Plots (B14-B42)

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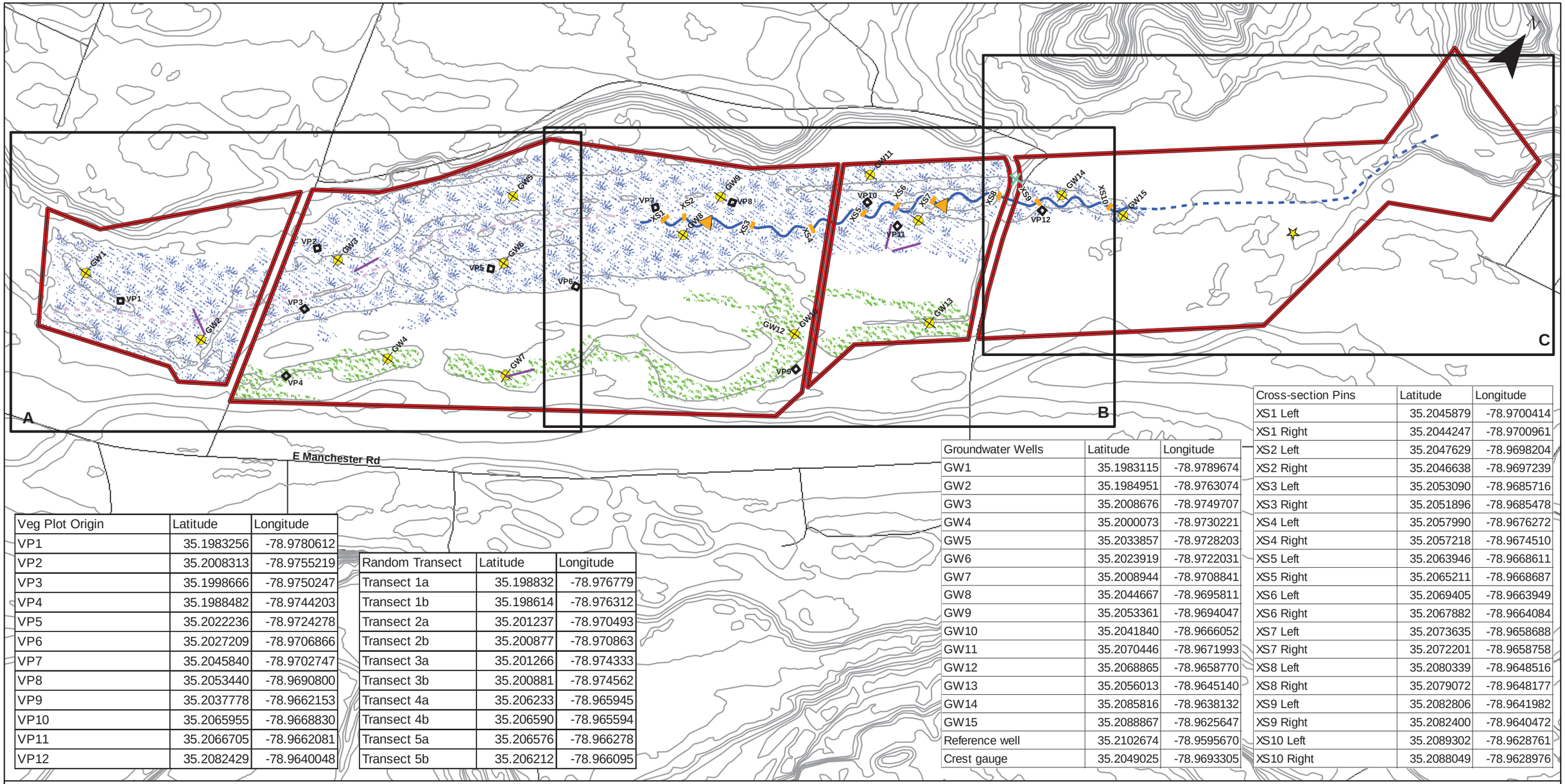

Veg Plot Origin	Latitude	Longitude
VP1	35.1983256	-78.9780612
VP2	35.2008313	-78.9755219
VP3	35.1998666	-78.9750247
VP4	35.1988482	-78.9744203
VP5	35.2022236	-78.9724278
VP6	35.2027209	-78.9706866
VP7	35.2045840	-78.9702747
VP8	35.2053440	-78.9690800
VP9	35.2037778	-78.9662153
VP10	35.2065955	-78.9668830
VP11	35.2066705	-78.9662081
VP12	35.2082429	-78.9640048

Random Transect	Latitude	Longitude
Transect 1a	35.198832	-78.976779
Transect 1b	35.198614	-78.976312
Transect 2a	35.201237	-78.970493
Transect 2b	35.200877	-78.970863
Transect 3a	35.201266	-78.974333
Transect 3b	35.200881	-78.974562
Transect 4a	35.206233	-78.965945
Transect 4b	35.206590	-78.965594
Transect 5a	35.206576	-78.966278
Transect 5b	35.206212	-78.966095

Groundwater Wells	Latitude	Longitude
GW1	35.1983115	-78.9789674
GW2	35.1984951	-78.9763074
GW3	35.2008676	-78.9749707
GW4	35.2000073	-78.9730221
GW5	35.2033857	-78.9728203
GW6	35.2023919	-78.9722031
GW7	35.2008944	-78.9708841
GW8	35.2044667	-78.9695811
GW9	35.2053361	-78.9694047
GW10	35.2041840	-78.9666052
GW11	35.2070446	-78.9671993
GW12	35.2068865	-78.9658770
GW13	35.2056013	-78.9645140
GW14	35.2085816	-78.9638132
GW15	35.2088867	-78.9625647
Reference well	35.2102674	-78.9595670
Crest gauge	35.2049025	-78.9693305

Cross-section Pins	Latitude	Longitude
XS1 Left	35.2045879	-78.9700414
XS1 Right	35.2044247	-78.9700961
XS2 Left	35.2047629	-78.9698204
XS2 Right	35.2046638	-78.9697239
XS3 Left	35.2053090	-78.9685716
XS3 Right	35.2051896	-78.9685478
XS4 Left	35.2057990	-78.9676272
XS4 Right	35.2057218	-78.9674510
XS5 Left	35.2063946	-78.9668611
XS5 Right	35.2065211	-78.9668687
XS6 Left	35.2069405	-78.9663949
XS6 Right	35.2067882	-78.9664084
XS7 Left	35.2073635	-78.9658688
XS7 Right	35.2072201	-78.9658758
XS8 Left	35.2080339	-78.9648516
XS8 Right	35.2079072	-78.9648177
XS9 Left	35.2082806	-78.9641982
XS9 Right	35.2082400	-78.9640472
XS10 Left	35.2089302	-78.9628761
XS10 Right	35.2088049	-78.9628976

Figure 2. Current Condition Plan View

UT to Jumping Run Creek
Stream and Wetland Restoration Project
EEP #: 92345
Cumberland County, North Carolina
November 2012

- Precipitation gage
- Crest gauge
- Groundwater wells (GW 1-15)
- Reference well
- Vegetation Plots (VP 1-12)
- Random transects (Transects 1-5)
- Cross-sections (XS 1-10)
- Stream centerline (UT1B)
- Design headwater system (UT1A)
- Stream enhancement (UT1C)

Proposed wetland features
- Non-riparian wetland
- Riparian wetland
- Easement boundary
- 2 ft contours

0 500 1,000 Feet

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A

N

GW1
GW2
GW3
GW4
GW5
GW6
GW7
VP1
V1,V2
VP2
V3,V4
VP3
V5,V6
VP4
V7,V8
VP5
V9,V10
VP6
V11,V12
S11
S12
RT1 (243)
RT2 (3117)
RT3 (810)
RT1 MY1
RT1 MY2
RT2 MY1
RT2 MY2
RT3 MY1
RT3 MY2
10+00
15+00
20+00
25+00
30+00
35+00
40+00

Aerial photo:
2010 Orthoimagery

Figure 2a. Current Condition Plan View MY3

UT to Jumping Run Creek
Stream and Wetland Restoration Project
EEP #: 92345
Cumberland County, North Carolina
November 2012

Groundwater Wells (GW 1-15)
- Successful for MY3
- Not successful for MY3
- Reference well

Vegetation Plots (VP 1-12)
- > 320 stems/acre
- < 320 stems/acre

Random Transects MY3 (RT1-5)
- >320 stems/acre
- <320 stems/acre

- Random Transects MY0-MY2
- Cross-sections (XS 1-10)
- TOB MY3 (UT1B)
- Stream centerline MY3 (UT1B)
- Stream centerline MY0 (UT1B)
- Design headwater system (UT1A)
- Stream Enhancement (UT1C)
- 2 ft contours

- Precipitation gauge
- Crest gauge
- Photo points (Veg=V, Stream=S)

Designed wetland features
- Non-riparian wetland
- Riparian wetland
- Easement boundary

0 100 200 400 Feet

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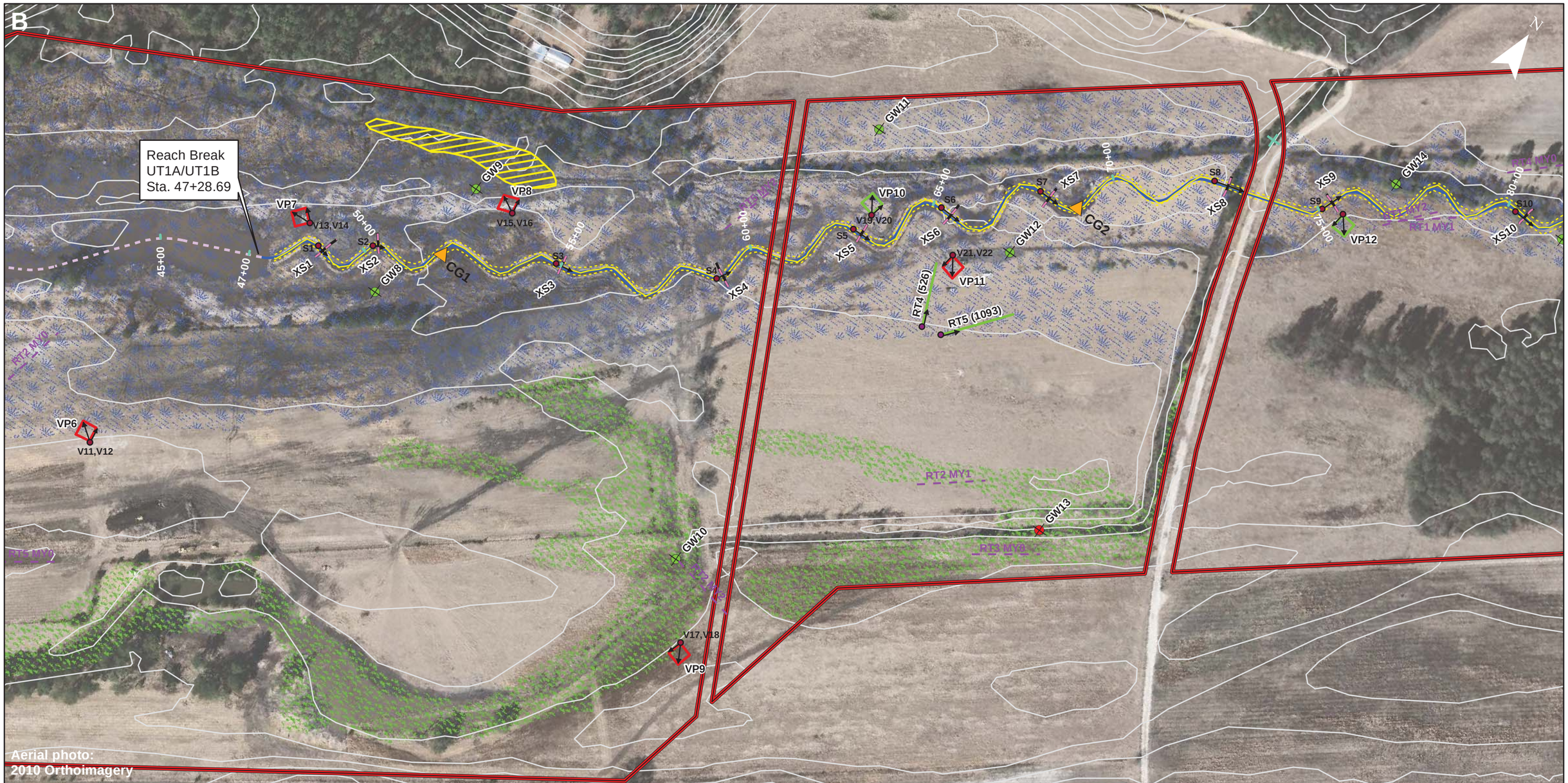

Figure 2b. Current Condition
Plan View MY3

UT to Jumping Run Creek
Stream and Wetland Restoration Project
EEP #: 92345
Cumberland County, North Carolina
November 2012

Groundwater wells (GW 1-15)
- Successful for MY3
- Not successful for MY3
- Reference well

Vegetation Plots (VP 1-12)
- > 320 stems/acre
- < 320 stems/acre

Random Transects MY3 (RT1-5)
- >320 stems/acre
- <320 stems/acre

- Random Transects MY0-MY2
- Cross-sections (XS 1-10)
- TOB MY3 (UT1B)
- Stream centerline MY3 (UT1B)
- Stream centerline MY0 (UT1B)
- Design headwater system (UT1A)
- Stream Enhancement (UT1C)
- 2 ft contours

- Precipitation gauge
- Crest gauge
- Photo points (Veg=V, Stream=S)
- Minor veg problem area (Typha)

Designed wetland features
- Non-riparian wetland
- Riparian wetland
- Easement boundary

0 100 200 400 Feet

Ecosystem Enhancement Program

Stantec

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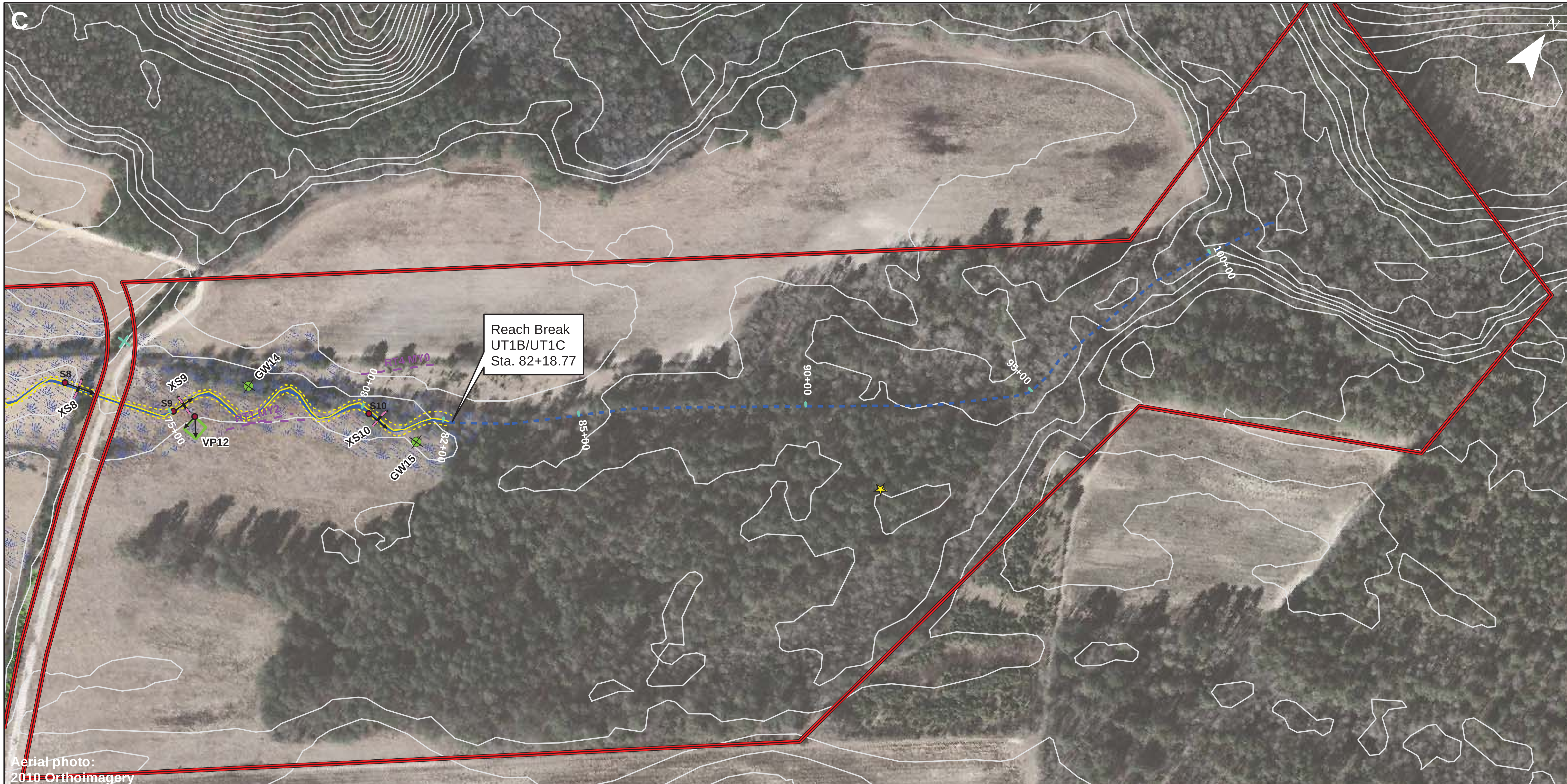

Figure 2c. Current Condition Plan View MY3

UT to Jumping Run Creek
Stream and Wetland Restoration Project
EEP #: 92345
Cumberland County, North Carolina
November 2012

Groundwater wells (GW 1-15)
- Successful for MY3
- Not successful for MY3
- Reference well

Vegetation Plots (VP 1-12)
- > 320 stems/acre
- < 320 stems/acre

Random Transects MY3 (RT1-5)
- >320 stems/acre
- <320 stems/acre

- Random Transects MY0-MY2
- Cross-sections (XS 1-10)
- TOB MY3 (UT1B)
- Stream centerline MY3 (UT1B)
- Stream centerline MY0 (UT1B)
- Design headwater system (UT1A)
- Stream Enhancement (UT1C)
- 2 ft contours

- Precipitation gauge
- Crest gauge
- Photo points (Veg=V, Stream=S)

Designed wetland features
- Non-riparian wetland
- Riparian wetland
- Easement boundary

0 100 200 400 Feet

Ecosystem Enhancement Program
Stantec

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Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **UT1b**
Assessed Length (lf) **3300**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			2	80	98%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	32	32			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	32	32			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	32	32			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	32	32			100%			
		2. Thalweg centering at downstream of meander (Glide)	32	32			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	75	75			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	75	75			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	75	75			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	75	75			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	75	75			100%			

Table 6. Vegetation Condition Assessment						
UT Jumping Run Creek Restoration Project / EEP Project No. 92345						
Planted acreage	145					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas (previously mowed areas)	Very limited cover of both woody and herbaceous material	0.1 acres	None	0	0	0.0%
2. Low Stem Density Areas	Woody stem densities below target levels based on MY3, 4, or 5 stem count criteria	0.1 acres	None	0	0	0.0%
			Total	0	0	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	0.25 acres	None	0	0	0.0%
			Total	0	0	0.0%
Easement acreage	225.3					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive areas of concern	*Typha latifolia*	1000 SF	Yellow hatching	1	0.49	0.2%
5. Easement encroachment areas		none	None	0	0	0.0%

Headwater Stream Visual Assessment Form

Project Name: UT to Jumping Run Creek **Date:** 10-9-2012

Observation Team: Alex Baldwin & Tim Taylor

Recent Weather: Rained ~0.3" on 10-8-2012 **Station:** Consistent throughout 27+00

Indicators of Flow *(check if present today, and photodocument)*

- ☐ Water flowing downstream;
- ☒ A natural line impressed on the bank;
- ☐ Shelving;
- ☐ Changes in soil characteristics (explain below);
- ☐ Destruction of terrestrial vegetation;
- ☐ Presence of litter and debris;
- ☒ Wracking;
- ☒ Vegetation matted down, bent or absent;
- ☐ Sediment sorting;
- ☐ Leaf litter disturbed or washed away;
- ☐ Scour;
- ☐ Deposition;
- ☐ Bed and bank formation;
- ☐ Water staining;
- ☒ Change in plant community.

Additional notes:

Stream Station Photos

Photo B1 – (Photo Station 1) Cross-section 1 looking downstream at Station 48+81 (10/9/2012 Year 3)

Photo B2 – (Photo Station 2) Cross-section 2 looking downstream at Station 50+30 (10/9/2012 Year 3)

Photo B3 – (Photo Station 3) Cross-section 3 looking downstream at Station 54+98 (10/9/2012 Year 3)

Photo B4 – (Photo Station S4) Cross-section 4 looking downstream at Station 59+09 (10/9/2012 Year 3)

Photo B5 – (Photo Station S5) Cross-section 5 looking downstream at Station 62+87 (10/9/2012 Year 3)

Photo B6 – (Photo Station S6) Cross-section 6 looking downstream at Station 65+44 (10/9/2012 Year 3)

Photo B7 – (Photo Station S7) Cross-section 7 looking downstream at Station 68+24 (10/9/2012 Year 3)

Photo B8 – (Photo Station S8) Cross-section 8 looking downstream at Station 72+84 (10/9/2012 Year 3)

Photo B9 – (Photo Station S9) Cross-section 9 looking downstream at Station 75+30 (10/9/2012 Year 3)

Photo B10 – (Photo Station S10) Cross-section 10 looking downstream at Station 80+45 (10/9/2012 Year 3)

Photo B11 – (Photo Station S11) – Stream channel looking downstream at upper road crossing (10/9/2012 Year 3)

Photo B12 – (Photo Station S12) Stream channel looking upstream at upper road crossing (10/9/2012 Year 3)

Photo B13 – Flow observed in headwater system UT1A (10/9/2012 Year 3)

Vegetation Plot Photos

Photo B14 – (Photo Station V1) Veg Plot 1 looking west (9/19/2012 Year 3)

Photo B15 – (Photo Station V2) Veg Plot 1 looking southwest (9/19/2012 Year 3)

Photo B16 - (Photo Station V3) Veg Plot 2 looking south (9/19/2012 Year 3)

Photo B17 – (Photo Station V4) Veg Plot 2 looking southeast (9/19/2012 Year 3)

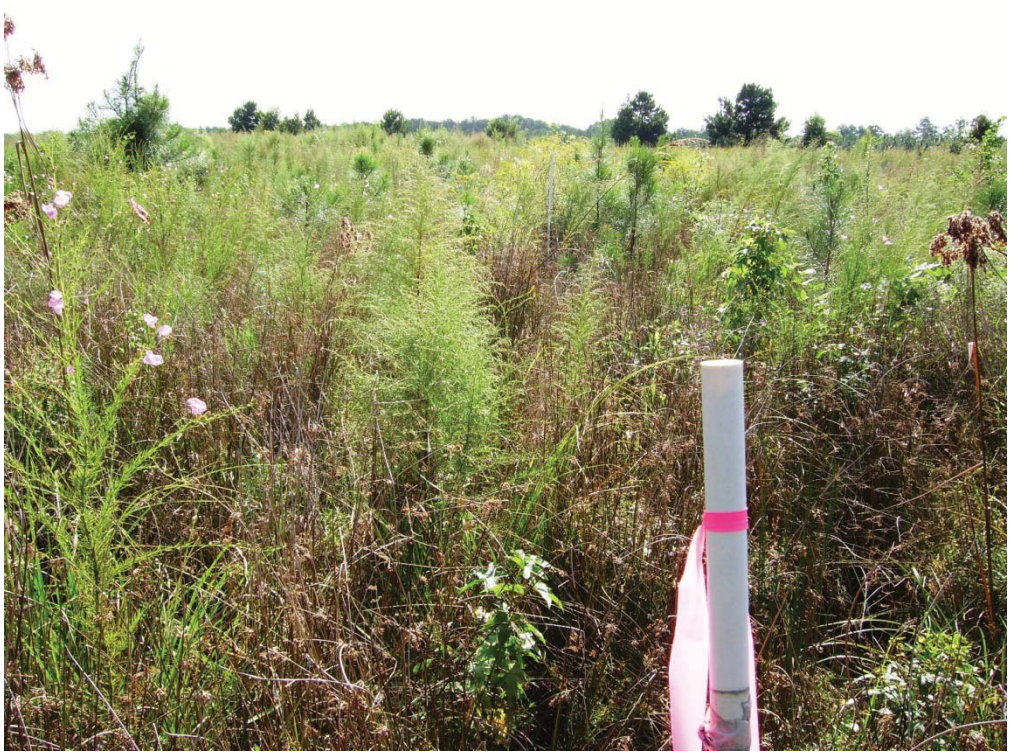

Photo B18 – (Photo Station V5) Veg Plot 3 looking southeast (9/19/2012 Year 3)

Photo B19 – (Photo Station V6) Veg Plot 3 looking east (9/19/2012 Year 3)

Photo B20 – (Photo Station V7) Veg Plot 4 looking northwest (9/19/2012 Year 3)

Photo B21 – (Photo Station V8) Veg Plot 4 looking west (9/19/2012 Year 3)

Photo B22 – (Photo Station V9) Veg plot 5 looking southwest (9/19/2012 Year 3)

Photo B23 – (Photo Station V10) Veg plot 5 looking south (9/19/2012 Year 3)

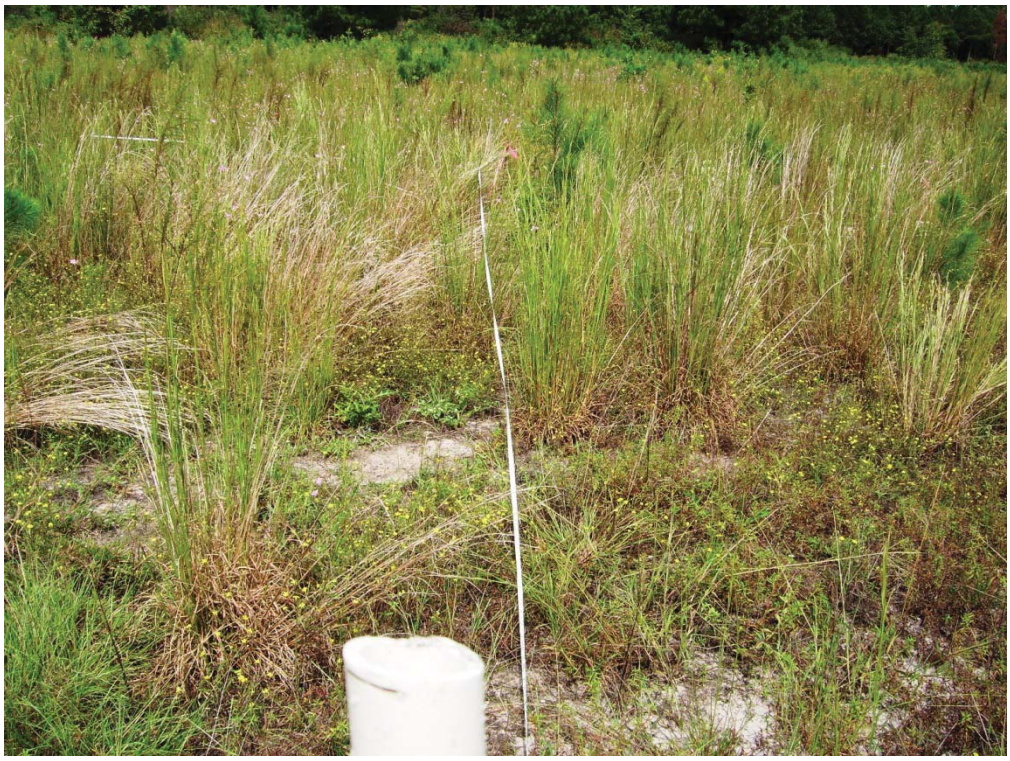

Photo B24 – (Photo Station V11) Veg plot 6 looking northeast (9/19/2012 Year 3)

Photo B25 – (Photo Station V12) Veg plot 6 looking north (9/19/2012 Year 3)

Photo B26 – (Photo Station V13) Veg plot 7 looking north (9/19/2012 Year 3)

Photo B27 – (Photo Station V14) Veg plot 7 looking northwest (9/19/2012 Year 3)

Photo B28 – (Photo Station V15) Veg plot 8 looking northwest (9/19/2012 Year 3)

Photo B29 – (Photo Station V16) Veg plot 8 looking west (9/19/2012 Year 3)

Photo B30 – (Photo Station V17) Veg plot 9 looking south (9/19/2012 Year 3)

Photo B31 – (Photo Station V18) Veg Plot 9 looking southeast (9/19/2012 Year 3)

Photo B32 – (Photo Station V19) Veg plot 10 looking northeast (9/19/2012 Year 3)

Photo B33 – (Photo Station V20) Veg plot 10 looking north (9/19/2012 Year 3)

Photo B34 – (Photo Station V21) Veg plot 11 looking southwest (9/19/2012 Year 3)

Photo B35 – (Photo Station V22) Veg plot 11 looking south (9/19/2012 Year 3)

Photo B36 – (Photo Station V23) Veg plot 12 looking southwest (9/19/2012 Year 3)

Photo B37 – (Photo Station V24) Veg plot 12 looking south (9/19/2012 Year 3)

Photo B38 – (Photo Station RT1) Random transect 1 looking southeast (9/19/2012 Year 3)

Photo B39 – (Photo Station RT2) Random transect 2 looking northeast (9/19/2012 Year 3)

Photo B40 – (Photo Station RT3) Random transect 3 looking north (9/19/2012 Year 3)

Photo B41 – (Photo Station RT4) Random transect 4 looking north (9/19/2012 Year 3)

Photo B42 – (Photo Station RT5) Random transect 5 looking northwest (9/19/2012 Year 3)

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Appendix C. Vegetation Plot Data

Table 7 – Vegetation Plot Mitigation Success Summary
Table 8 – CVS Vegetation Metadata
Table 9 a – CVS Stem Count Total and Planted by Plot and Species
Table 9b – Stem Count Total and Planted by Plot and Species for Random Transects

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Table 7. UT to Jumping Run Creek (#92345)

Year 3 (20-Sep-2012)

Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems[1]	Stream/ Wetland Stems[2]	Live Stakes	Invasives	Volunteers[3]	Total[4]	Unknown Growth Form
0001	n/a	10	0	0	3	**13**	0
0002	n/a	8	0	0	236	**244**	0
0003	n/a	10	0	0	26	**36**	0
0004	n/a	6	0	0	8	**14**	0
0005	n/a	12	0	0	0	**12**	0
0006	n/a	6	0	0	0	**6**	0
0007	n/a	4	0	0	3	**7**	0
0008	n/a	4	0	0	13	**17**	0
0009	n/a	4	0	0	0	**4**	0
0010	n/a	8	0	0	7	**15**	0
0011	n/a	7	0	0	27	**34**	0
0012	n/a	12	0	0	2	**14**	0

Wetland/Stream Vegetation Totals

(per acre)

Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
0001	405	121	526	Yes
0002	324	9551	9874	Yes, barely
0003	405	1052	1457	Yes
0004	243	324	567	No
0005	486	0	486	Yes
0006	243	0	243	No
0007	162	121	283	No
0008	162	526	688	No
0009	162	0	162	No
0010	324	283	607	Yes, barely
0011	283	1093	1376	No
0012	486	81	567	Yes
Project Avg	**307**	**1096**	**1403**	**No, but close**

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Table 8. CVS Vegetation Plot Metadata	
UT to Jumping Run Creek Restoration - EEP#92345	
Report Prepared By	Alex Baldwin
Date Prepared	10/31/2012 14:27
database name	Stantec_UTJRC2012_cvs-eep-entrytool-v2.3.1.mdb
database location	U:\175613003\UT_Jumping_Run\project\site_data\monitoring\vegetation
computer name	BALDWINA-SP1
file size	58716160
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	92345
project Name	UT to Jumping Run Creek
Description	stream and wetland restoration
River Basin	Cape Fear
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	12

Table 9a - CVS Stem Count Total and Planted by Plot and Species

EEP Project Code 92345. Project Name: UT to Jumping Run Creek

			Current Plot Data (MY3 2012)																													Annual Means											
			E92345-01-0001			E92345-01-0002			E92345-02-0003			E92345-02-0004			E92345-02-0005			E92345-02-0006			E92345-02-0007			E92345-02-0008			E92345-02-0009			E92345-02-0010			E92345-02-0011			E92345-02-0012			MY3 (2012)			MY2 (2011)			MY1 (2010)			MY0 (2010)		
Scientific Name	**Common Name**	**Species Type**	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree						3			7																											10			8								
Aronia arbutifolia	Red Chokeberry	Shrub	1	1	1																															1	1	1	1	1	1	2	2	2	2	2	2
Baccharis	baccharis	Shrub			2						1															5				1								9			3							
Chamaecyparis thyoides	Atlantic white cedar	Tree	1	1	1	2	2	2	2	2	2																									5	5	5	6	6	6	5	5	5	12	12	12
Diospyros virginiana	common persimmon	Tree			1			9						1																							11	1	1	19	4	4	4	5	5	5
Fraxinus pennsylvanica	green ash	Tree							1	1	1				6	6	6										4	4	4							11	11	11	11	11	11	11	11	11	11	11	11
Liquidambar styraciflua	sweetgum	Tree						13			7			7										2						1								30			16							
Liriodendron tulipifera	tuliptree	Tree				1	1	1										1	1	1										3	3	3				1	1	1	6	6	6	7	7	9	7	7	7	12	12	12
Magnolia virginiana	sweetbay	Tree				3	3	3	2	2	2																											5	5	5	6	6	6	9	9	9	12	12	12
Nyssa	tupelo	Tree																																		1	1	1	1	1	1	2	2	2			
Nyssa biflora	swamp tupelo	Tree	3	3	3	1	1	1	1	1	1	1	1	1	2	2	2				3	3	3	3	3	3				1	1	1	3	3	3				18	18	18	17	17	17	20	20	20	19	19	19
Persea borbonia	redbay	tree																																								1	1	1	1	1	1			
Persea palustris	swamp bay	tree																																		1	1	1	1	1	1	2	2	2	3	3	3
Pinus palustris	longleaf pine	Tree																																							1	1	1	5	5	5			
Pinus taeda	loblolly pine	Tree																																				31										
Quercus	oak	Tree										2	2	2																						1	1	1				3	3	3	2	2	4	5	5	5	14	14	14
Quercus falcata	southern red oak	Tree	1	1	1	1	1	2										2	2	2																					4	4	5	4	4	4	3	3	3	2	2	2
Quercus lyrata	overcup oak	Tree	4	4	4										1	1	1				1	1	1	1	1	1										2	2	2	9	9	9	7	7	7	7	7	7	4	4	4
Quercus nigra	water oak	Tree							1	1	1				1	1	1																			1	1	1	3	3	3	1	1	2	1	1	1	1	1	1
Quercus phellos	willow oak	Tree							2	2	2	3	3	3	2	2	2													3	3	3	1	1	1	5	5	5	16	16	16	15	15	17	14	14	14	12	12	12
Quercus stellata	post oak	Tree							1	1	1																														1	1	1	1	1	1	1	1	1			
Rhus copallinum	flameleaf sumac	shrub						210			11																			4								226			280								
Salix nigra	black willow	Tree																					3			6							26						35			6								
Smilax	greenbrier																																									12								
Taxodium distichum	bald cypress	Tree																3	3	3										1	1	1	1	1	1	1	1	1	6	6	6	7	7	7	7	7	7	7	7	7
Toxicodendron radicans	eastern poison ivy	Vine																																							1								
Unknown		Shrub or Tree																												1			1			3			5						1	1	1
		Stem count	10	10	13	8	8	244	10	10	36	6	6	14	12	12	12	6	6	6	4	4	7	4	4	17	4	4	4	8	8	15	7	7	34	12	12	14	91	91	416	87	87	474	100	100	100	123	123	123
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			1			12			12			12			12		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.30			0.30			0.30			0.30		
		Species count	5	5	7	5	5	9	7	7	11	3	3	5	5	5	5	3	3	3	2	2	3	2	2	5	1	1	1	4	4	8	5	5	7	7	7	9	15	15	22	15	15	24	17	17	17	17	17	17
		Stems per ACRE	404.7	404.7	526.1	323.7	323.7	9874	404.7	404.7	1457	242.8	242.8	566.6	485.6	485.6	485.6	242.8	242.8	242.8	161.9	161.9	283.3	161.9	161.9	688	161.9	161.9	161.9	323.7	323.7	607	283.3	283.3	1376	485.6	485.6	566.6	306.9	306.9	1403	293.4	293.4	1599	337.2	337.2	337.2	414.8	414.8	414.8

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

			Table 9b. Stem Count Total and Planted by Plot and Species for Random Transects				
			UT to Jumping Run Creek - EEP Project No. 92345				
			Current Plot Data (MY3 2012)				
Scientific Name	**Common Name**	**Species Type**	**Random Transect 1**	**Random Transect 2**	**Random Transect 3**	**Random Transect 4**	**Random Transect 5**
Pinus taeda	Loblolly Pine	Tree		63	2	2	16
Acer rubrum	Red Maple	Tree			13		
Liquidambar styraciflua	Sweetgum	Tree		1			
Quercus nigra	Water Oak	Tree	1	5	1		
Taxodium distichum	Bald Cypress	Tree				6	1
Salix nigra	Black Willow	Tree					2
Quercus phellos	Willow Oak	Tree					1
Magnolia virginiana	Sweetbay	Shrub Tree	1		1	3	2
Diospyros virginiana	Persimmon	Tree		7			
Fraxinus pennsylvanica	Green Ash	Tree		1	1		
Quercus falcata	Southern Red Oak	Tree	1				
Quercus rubra	Northern Red Oak	Tree			1		
Quercus lyrata	Overcup Oak	Tree	1				
Nyssa biflora	Swamp Tupelo	Tree	2		1	2	3
Unknown		Shrub					2
		Stem Count	6	77	20	13	27
		size (ares)	1	1	1	1	1
		size (ACRES)	0.02	0.02	0.02	0.02	0.02
		Species count	5	5	7	4	7
		Stems per ACRE	242.9	3117.4	809.7	526.3	1093.1

Appendix D. Stream Survey Data

Figures 3a-j – Cross-Sections with Annual Overlays
Figure 4 – Longitudinal Profiles with Annual Overlays
Table 10a,b. – Baseline – Stream Data Summary
Table 11a. – Monitoring – Cross-section Morphology Data
Table 11b. – Monitoring – Stream Reach Morphology Data

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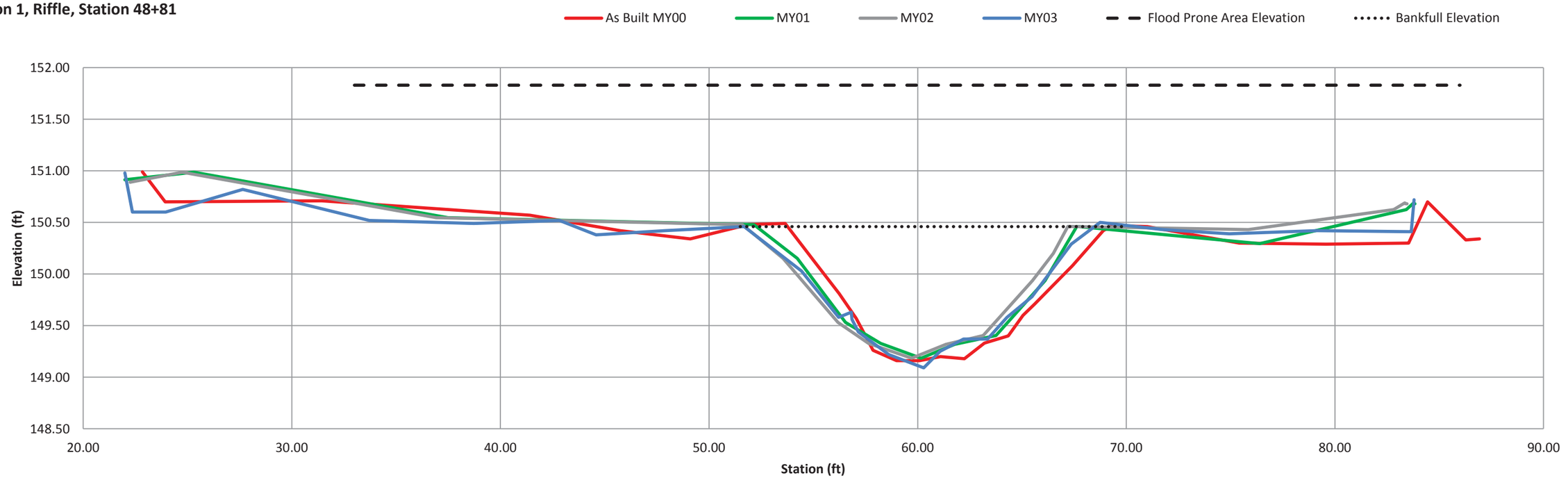
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-1, Riffle, STA 48+81
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
22.84	150.99	22.00	150.91	22.25	150.89	22.00	150.98
23.93	150.70	25.31	150.99	24.75	150.99	22.36	150.60
31.43	150.71	37.48	150.55	36.92	150.55	23.96	150.60
41.41	150.57	52.15	150.48	51.60	150.48	27.65	150.82
45.73	150.42	54.23	150.15	53.55	150.15	33.72	150.52
49.10	150.34	56.54	149.53	56.18	149.53	38.73	150.49
51.90	150.48	58.23	149.33	57.65	149.33	42.83	150.52
53.65	150.49	60.16	149.18	59.71	149.18	44.59	150.38
55.09	150.11	61.78	149.32	61.36	149.32	47.90	150.42
56.24	149.81	63.75	149.40	63.14	149.40	51.68	150.46
57.05	149.57	66.11	149.94	65.50	149.94	54.43	150.03
57.45	149.42	67.63	150.46	66.50	150.20	56.21	149.58
57.86	149.26	76.40	150.30	67.20	150.46	56.82	149.63
58.99	149.16	83.42	150.63	75.85	150.43	56.85	149.56
60.10	149.16	83.78	150.69	82.82	150.63	57.15	149.44
61.10	149.20	83.84	150.68	83.35	150.69	58.61	149.22
62.24	149.18			83.40	150.68	60.29	149.09
63.20	149.33			83.46	150.68	61.07	149.25
64.34	149.40					62.20	149.37
65.05	149.60					63.35	149.37
65.61	149.71					64.28	149.58
67.42	150.08					65.48	149.78

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	150.47	150.46	150.48	150.46
Bankfull Cross-Sectional Area	12.9	13.16	12.52	12.74
Bankfull Width	15.6	15.35	15.6	16.99
Flood Prone Area Elevation	151.78	151.74	151.78	151.83
Flood Prone Width	200	200	200	200
Max Depth at Bankfull	1.31	1.28	1.3	1.37
Mean Depth at Bankfull	0.83	0.79	0.8	0.75
W/D Ratio	18.73	19.43	19.50	22.65
Entrenchment Ratio	12.86	13.03	12.82	11.77
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C

UT to Jumping Run Creek, Reach UT1B
X-Section 1, Riffle, Station 48+81



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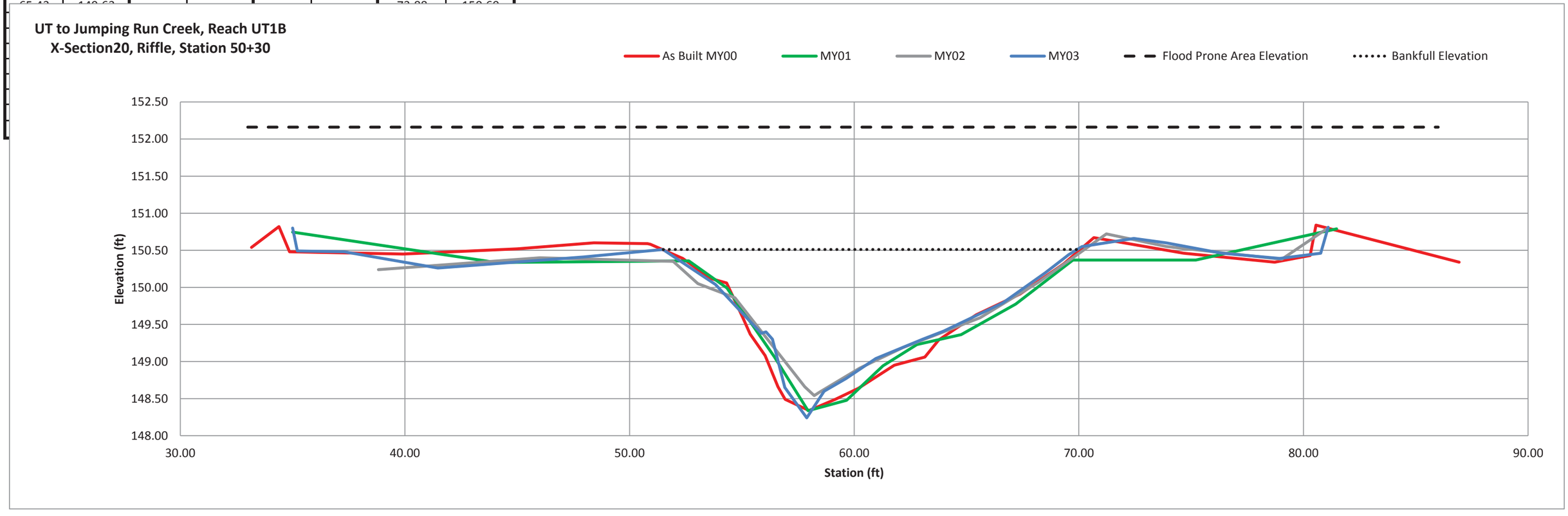
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-2, Pool, STA 50+30
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
33.17	150.54	35.00	150.75	38.82	150.24	35.00	150.80
34.39	150.82	44.07	150.34	46.01	150.40	35.21	150.49
34.86	150.48	52.64	150.36	51.94	150.35	37.29	150.48
39.92	150.45	54.34	149.99	53.04	150.05	41.47	150.26
45.00	150.52	56.45	149.06	54.69	149.86	47.95	150.41
48.41	150.60	57.95	148.34	57.80	148.66	51.49	150.51
50.80	150.59	59.66	148.48	58.22	148.54	53.82	150.04
50.93	150.58	61.28	148.94	58.48	148.59	55.86	149.38
52.37	150.39	62.79	149.23	60.25	148.91	56.07	149.40
53.59	150.12	64.76	149.36	62.18	149.19	56.36	149.30
54.32	150.06	67.19	149.78	65.61	149.59	56.91	148.65
55.03	149.60	69.74	150.37	68.21	150.07	57.89	148.24
55.37	149.37	75.21	150.37	71.23	150.72	58.66	148.60
56.04	149.08	81.48	150.79	73.91	150.55	59.64	148.77
56.61	148.66			79.03	150.38	60.96	149.04
56.93	148.49			81.09	150.80	63.05	149.30
57.99	148.34					63.99	149.41
59.16	148.49					66.61	149.79
60.19	148.64					68.52	150.20
61.79	148.95					69.55	150.44
63.15	149.06					70.14	150.55
63.76	149.29					72.45	150.66

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	150.58	150.36	150.35	150.51
Bankfull Cross-Sectional Area	21.57	17.26	15.57	18.60
Bankfull Width	19.33	17.30	17.56	18.53
Flood Prone Area Elevation	152.82	152.38	152.16	152.78
Flood Prone Width	200	200	200	200
Max Depth at Bankfull	2.25	2.02	1.81	2.27
Mean Depth at Bankfull	1.12	1.01	0.89	1.00
W/D Ratio	17.26	17.13	17.13	18.53
Entrenchment Ratio	10.35	11.56	11.56	10.79
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C



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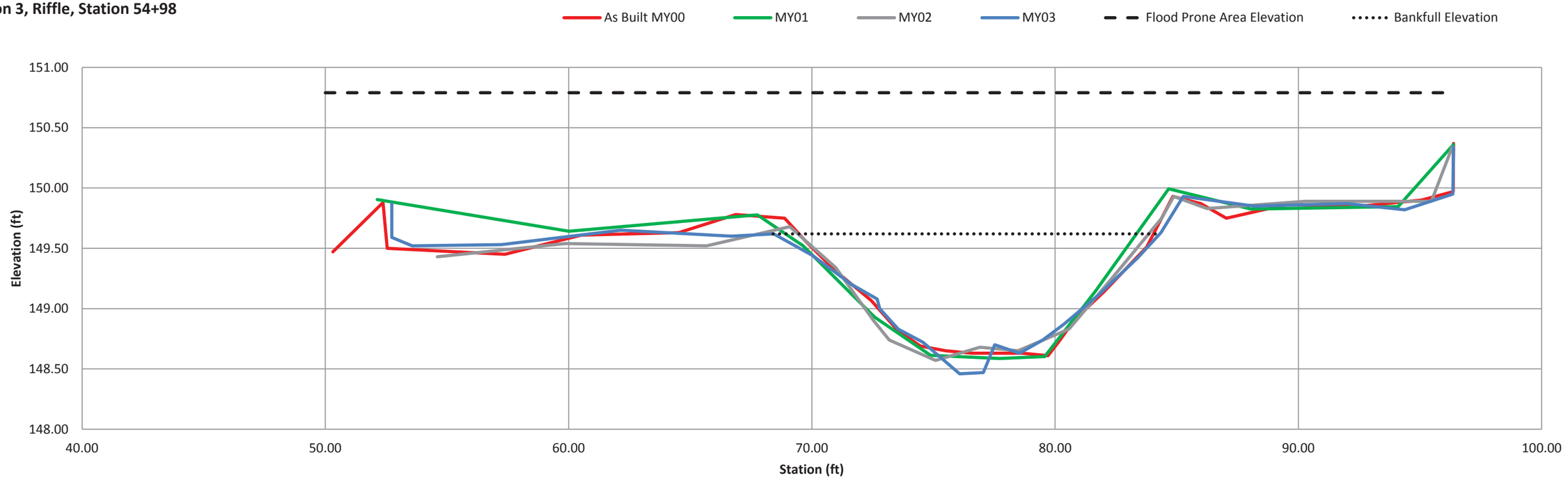
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-3, Riffle, STA 54+98
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
50.31	149.47	52.13	149.90	54.60	149.43	52.73	149.87
52.37	149.88	60.01	149.64	59.86	149.54	52.73	149.59
52.54	149.50	67.76	149.78	65.67	149.52	53.57	149.52
57.38	149.45	69.63	149.52	69.09	149.68	57.24	149.53
60.52	149.61	72.58	148.93	70.98	149.34	62.14	149.65
64.53	149.63	74.88	148.61	72.54	148.90	66.69	149.60
66.87	149.78	77.71	148.59	73.18	148.74	68.43	149.62
68.88	149.75	79.57	148.60	75.08	148.57	70.03	149.44
69.74	149.56	81.66	149.15	76.91	148.68	71.64	149.20
70.98	149.31	84.67	149.99	78.47	148.65	72.68	149.08
72.43	149.07	88.05	149.83	80.57	148.83	72.79	149.00
73.48	148.83	94.10	149.85	82.33	149.25	73.55	148.83
74.45	148.69	96.38	150.36	84.38	149.75	74.57	148.72
75.49	148.65			84.88	149.93	76.07	148.46
76.56	148.63			86.24	149.83	77.05	148.47
77.68	148.63			90.28	149.89	77.52	148.70
78.65	148.63			95.47	149.89	78.54	148.63
79.71	148.61			96.33	150.34	79.49	148.74
80.16	148.73					80.35	148.87
80.81	148.91					81.77	149.11
82.01	149.14					83.39	149.42
83.76	149.51					84.35	149.63

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	149.75	149.78	149.68	149.62
Bankfull Cross-Sectional Area	11.71	13.91	10.69	9.88
Bankfull Width	15.50	16.16	15.00	15.90
Flood Prone Area Elevation	150.89	150.97	150.79	150.78
Flood Prone Width	200	200	200	200
Max Depth at Bankfull	1.14	1.19	1.11	1.16
Mean Depth at Bankfull	0.76	0.76	0.71	0.62
W/D Ratio	20.90	21.26	21.13	25.65
Entrenchment Ratio	12.91	12.38	13.33	12.58
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C

UT to Jumping Run Creek, Reach UT1B
X-Section 3, Riffle, Station 54+98



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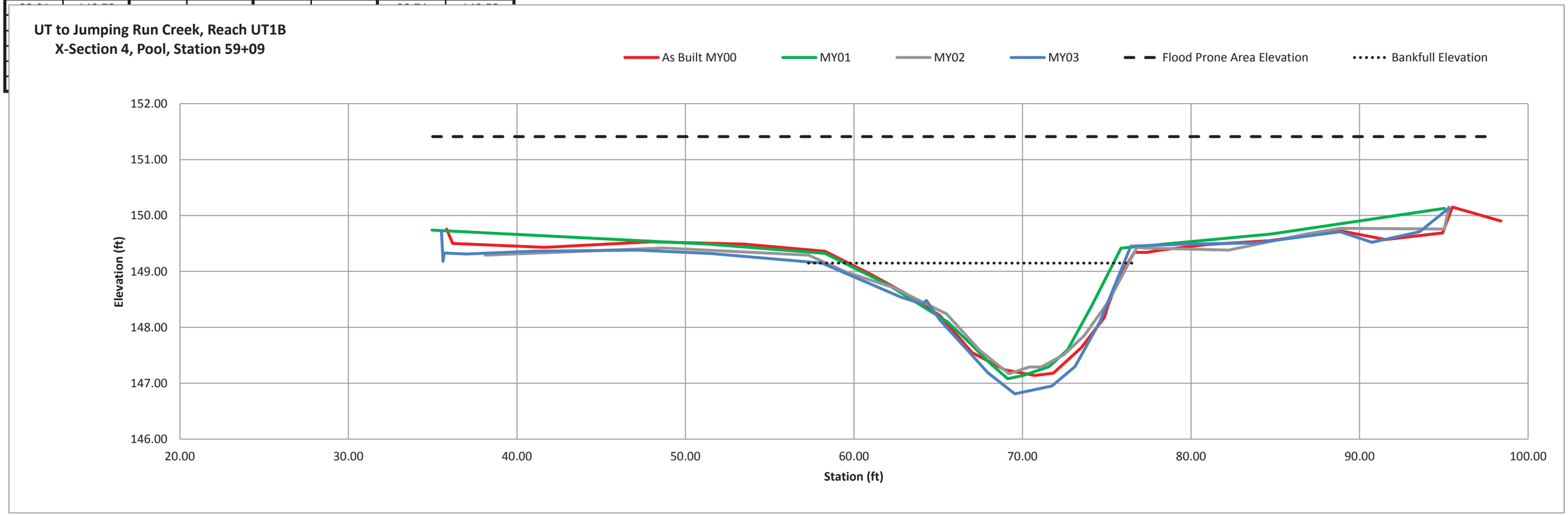
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-4, Pool, STA 59+09
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
35.83	149.76	34.96	149.74	38.12	149.29	35.52	149.72
36.19	149.50	51.33	149.49	48.68	149.42	35.62	149.18
41.66	149.43	58.28	149.32	57.30	149.29	35.69	149.33
47.94	149.53	62.04	148.76	59.53	148.99	37.01	149.31
53.48	149.49	65.56	148.10	62.35	148.71	40.89	149.36
58.28	149.36	66.97	147.69	65.50	148.24	47.11	149.38
60.99	148.95	68.00	147.38	67.46	147.59	51.50	149.32
63.04	148.61	69.12	147.08	69.20	147.17	58.10	149.15
65.10	148.21	70.02	147.14	70.40	147.29	62.80	148.54
67.01	147.55	71.57	147.30	71.12	147.29	64.05	148.42
68.95	147.24	72.68	147.60	72.46	147.51	64.30	148.48
70.73	147.14	74.11	148.39	73.66	147.85	65.10	148.13
71.83	147.18	75.85	149.42	75.13	148.47	66.64	147.62
73.50	147.64	84.75	149.67	76.79	149.43	67.95	147.19
74.87	148.18	95.04	150.13	77.13	149.42	69.55	146.81
75.08	148.39			82.24	149.38	71.74	146.95
75.70	148.87			86.84	149.67	73.12	147.30
76.63	149.34			88.87	149.77	74.60	148.10
77.37	149.34			95.04	149.76	76.43	149.45
78.21	149.38			95.30	150.15	79.61	149.49
80.92	149.48					83.81	149.51
84.67	149.55					88.85	149.71

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	149.34	149.32	149.29	149.15
Bankfull Cross-Sectional Area	22.42	20.32	20.78	21.47
Bankfull Width	18.22	17.38	19.25	17.92
Flood Prone Area Elevation	151.54	151.56	151.41	151.49
Flood Prone Width	200	200	200	200
Max Depth at Bankfull	2.20	2.24	2.12	2.34
Mean Depth at Bankfull	1.23	1.17	1.08	1.20
W/D Ratio	14.81	14.85	17.82	14.93
Entrenchment Ratio	10.98	11.51	10.39	11.16
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C



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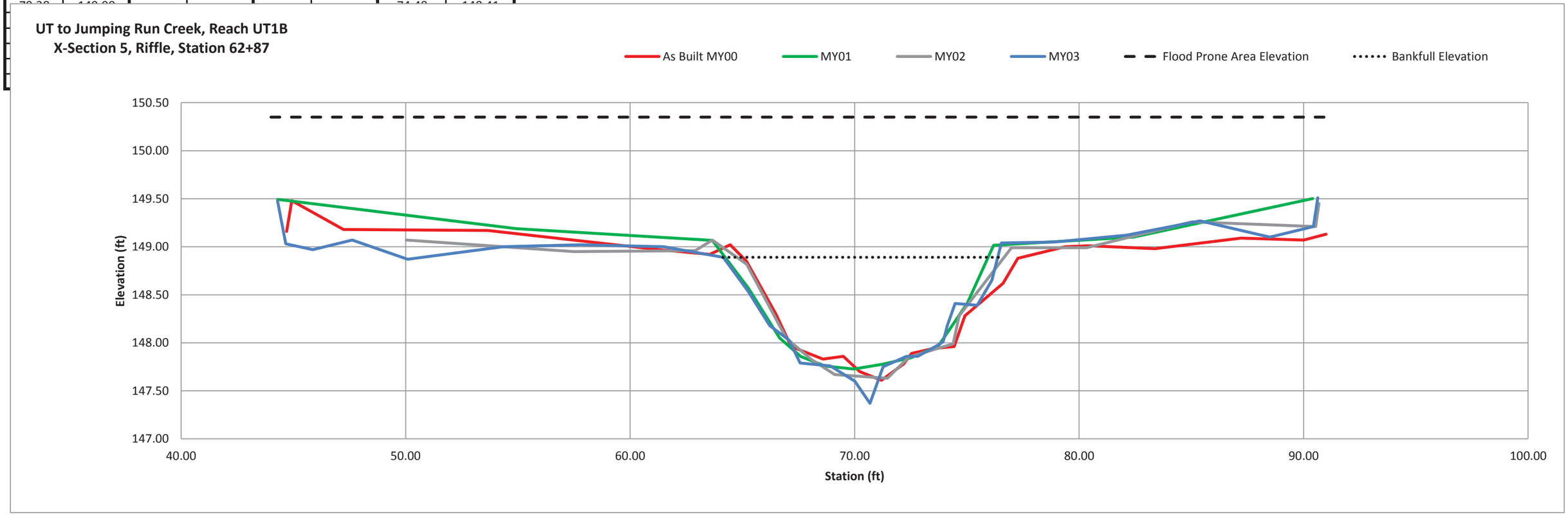
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-5, Riffle, STA 62+87
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
44.70	149.16	44.30	149.49	50.03	149.07	44.29	149.48
44.93	149.48	54.94	149.19	57.50	148.95	44.66	149.03
47.23	149.18	63.66	149.07	62.90	148.96	45.86	148.97
53.66	149.17	65.27	148.57	63.66	149.07	47.62	149.07
58.24	149.05	66.66	148.05	65.19	148.82	50.09	148.87
61.29	148.97	67.60	147.86	66.95	148.05	54.34	149.00
63.55	148.92	68.69	147.76	68.05	147.83	57.78	149.02
64.46	149.02	69.97	147.73	69.11	147.67	61.49	149.00
65.18	148.85	71.23	147.78	71.46	147.63	64.15	148.89
66.49	148.30	72.51	147.84	72.41	147.85	65.25	148.54
67.17	147.96	73.74	147.97	74.39	147.99	66.22	148.18
68.59	147.83	75.02	148.41	74.66	148.28	67.07	148.03
69.50	147.86	76.19	149.02	76.99	148.99	67.57	147.79
70.23	147.70	82.42	149.10	80.33	148.99	68.92	147.76
71.20	147.61	90.40	149.50	85.02	149.26	70.01	147.60
72.18	147.78			90.54	149.21	70.68	147.37
72.54	147.89			90.68	149.45	71.27	147.75
73.50	147.94					72.31	147.86
74.43	147.96					72.81	147.86
74.91	148.28					73.59	147.96
76.61	148.62					73.94	148.01
77.27	148.88					74.13	148.18

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	149.02	149.07	148.99	148.89
Bankfull Cross-Sectional Area	11.69	11.94	11.05	10.25
Bankfull Width	15.9	15.64	12.84	12.22
Flood Prone Area Elevation	150.38	150.41	150.35	150.41
Flood Prone Width	200	200	200	200
Max Depth at Bankfull	1.41	1.34	1.36	1.52
Mean Depth at Bankfull	0.74	0.76	0.86	0.84
W/D Ratio	21.49	20.58	14.93	14.55
Entrenchment Ratio	12.58	12.79	15.58	16.37
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C



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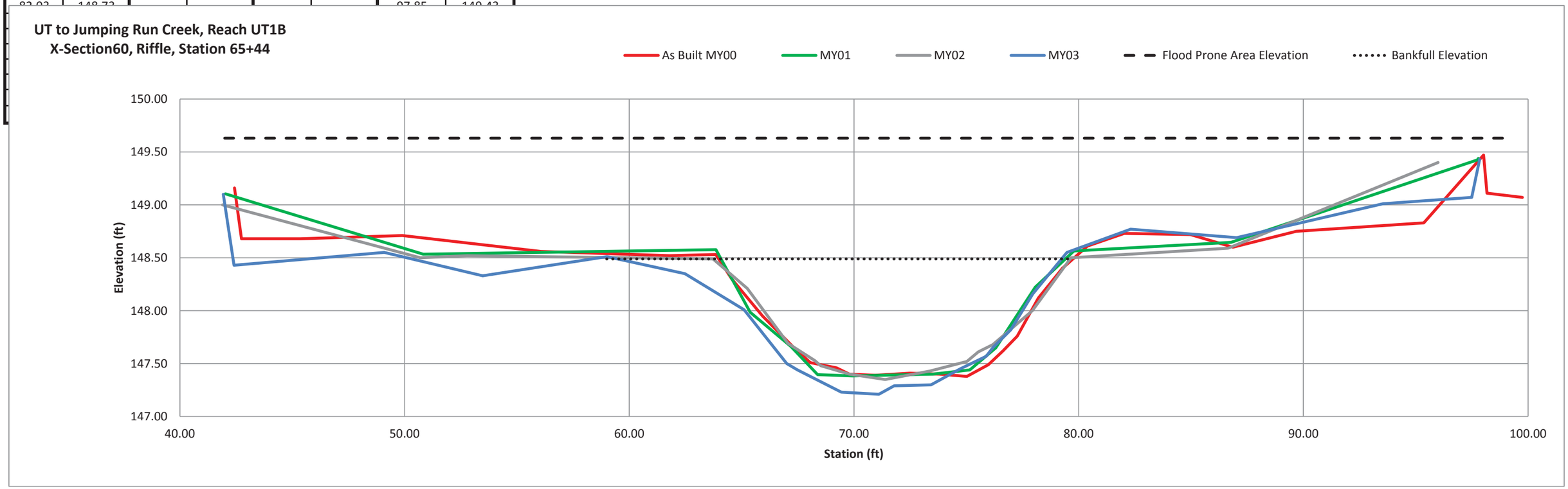
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-6, Riffle, STA 65+44
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
42.43	149.16	42.03	149.10	41.90	149.00	41.93	149.10
42.74	148.68	50.83	148.53	50.70	148.50	42.41	148.43
45.36	148.68	63.86	148.58	52.78	148.52	49.10	148.55
49.90	148.71	65.38	147.99	63.73	148.49	53.48	148.33
56.07	148.56	67.20	147.66	65.25	148.21	59.01	148.51
61.78	148.52	68.38	147.40	67.07	147.69	62.48	148.35
63.85	148.53	69.92	147.38	68.25	147.53	65.11	148.01
64.56	148.30	71.52	147.39	68.52	147.48	67.01	147.50
65.93	147.95	73.51	147.40	69.79	147.40	67.49	147.44
67.33	147.65	75.16	147.44	71.39	147.35	69.44	147.23
68.06	147.51	76.31	147.65	73.38	147.43	71.11	147.21
69.22	147.46	78.07	148.22	75.03	147.52	71.79	147.29
69.80	147.40	79.79	148.56	75.53	147.61	73.43	147.30
70.94	147.39	86.78	148.65	76.18	147.68	74.72	147.45
72.49	147.41	97.75	149.43	77.94	148.00	75.89	147.57
73.80	147.40	97.79	149.44	79.66	148.50	76.18	147.65
75.03	147.38			86.65	148.59	76.98	147.82
75.98	147.49			96.00	149.40	77.96	148.16
76.63	147.62					79.48	148.55
77.27	147.76					82.31	148.77
78.21	148.12					87.03	148.69
79.28	148.40					93.55	149.01
80.39	148.61					97.49	149.07

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	148.61	148.58	148.49	148.51
Bankfull Cross-Sectional Area	14.51	13.74	12.05	14.64
Bankfull Width	16.39	17.17	15.90	20.32
Flood Prone Area Elevation	149.84	149.78	149.63	149.81
Flood Prone Width	200.00	200.00	200.00	200.00
Max Depth at Bankfull	1.23	1.20	1.14	1.30
Mean Depth at Bankfull	0.89	0.80	0.76	0.72
W/D Ratio	18.42	21.46	20.92	28.22
Entrenchment Ratio	12.20	11.65	12.58	9.84
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C



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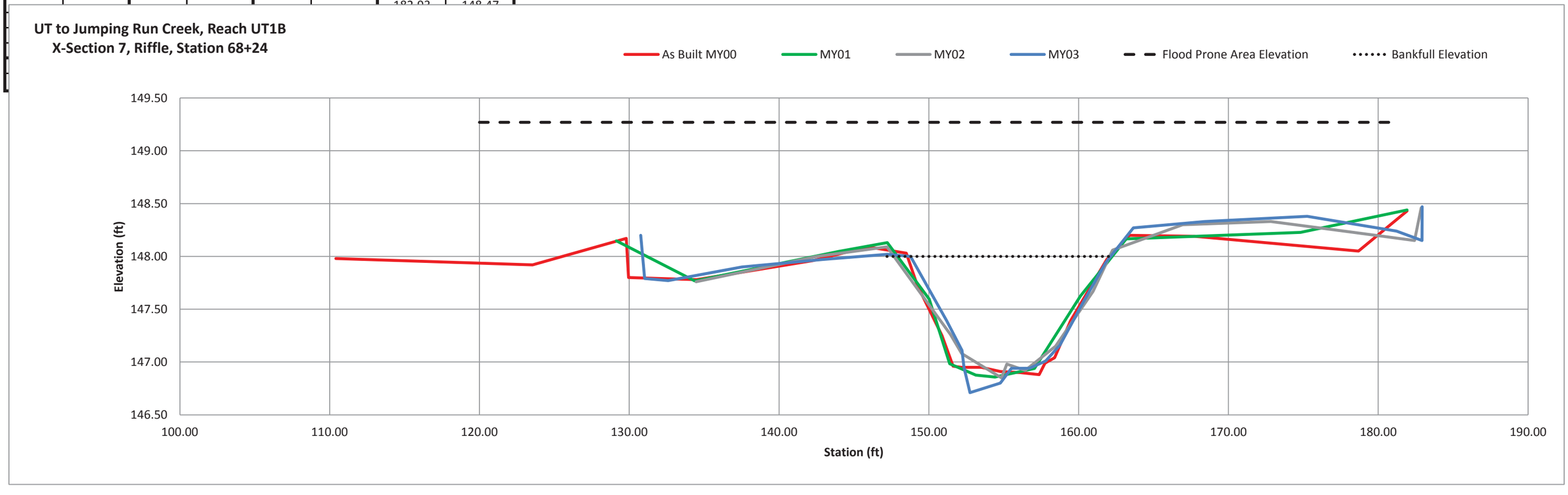
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-7, Riffle, STA 68+24
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
110.41	147.98	129.14	148.15	134.46	147.76	130.77	148.20
123.54	147.92	134.38	147.77	142.52	148.00	131.03	147.79
129.80	148.17	143.99	148.05	147.21	148.09	132.60	147.77
129.95	147.80	147.23	148.13	147.46	148.04	137.52	147.90
134.50	147.78	150.02	147.60	151.44	147.26	142.89	147.97
142.25	147.96	151.39	146.98	152.19	147.08	147.22	148.02
145.91	148.09	153.14	146.88	154.85	146.85	148.78	148.00
148.49	148.03	154.42	146.86	155.21	146.98	151.19	147.39
149.22	147.73	157.05	146.94	156.43	146.92	152.21	147.11
150.88	147.25	160.12	147.62	158.46	147.15	152.34	146.95
151.62	146.96	163.18	148.17	160.97	147.67	152.75	146.71
152.18	146.95	174.81	148.23	162.27	148.06	154.77	146.80
153.51	146.95	181.92	148.44	166.94	148.30	155.51	146.94
154.78	146.91			172.83	148.33	156.73	146.94
156.05	146.90			178.19	148.23	157.80	147.01
157.36	146.88			182.42	148.15	158.75	147.16
157.76	146.99			182.87	148.46	159.55	147.37
158.39	147.04					160.04	147.50
159.46	147.39					161.80	147.94
161.88	147.97					163.65	148.27
163.39	148.20					168.43	148.33
167.73	148.19					175.26	148.38
178.68	148.05					181.22	148.24
181.92	148.43					182.92	148.15

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	148.09	148.13	148.06	148.00
Bankfull Cross-Sectional Area	11.77	12.18	10.95	10.08
Bankfull Width	16.87	15.72	14.91	13.36
Flood Prone Area Elevation	149.30	149.40	149.27	149.29
Flood Prone Width	200.00	200.00	200.00	200.00
Max Depth at Bankfull	1.21	1.27	1.21	1.29
Mean Depth at Bankfull	0.70	0.77	0.73	0.75
W/D Ratio	24.10	20.42	20.42	17.81
Entrenchment Ratio	11.86	12.72	13.41	14.97
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C



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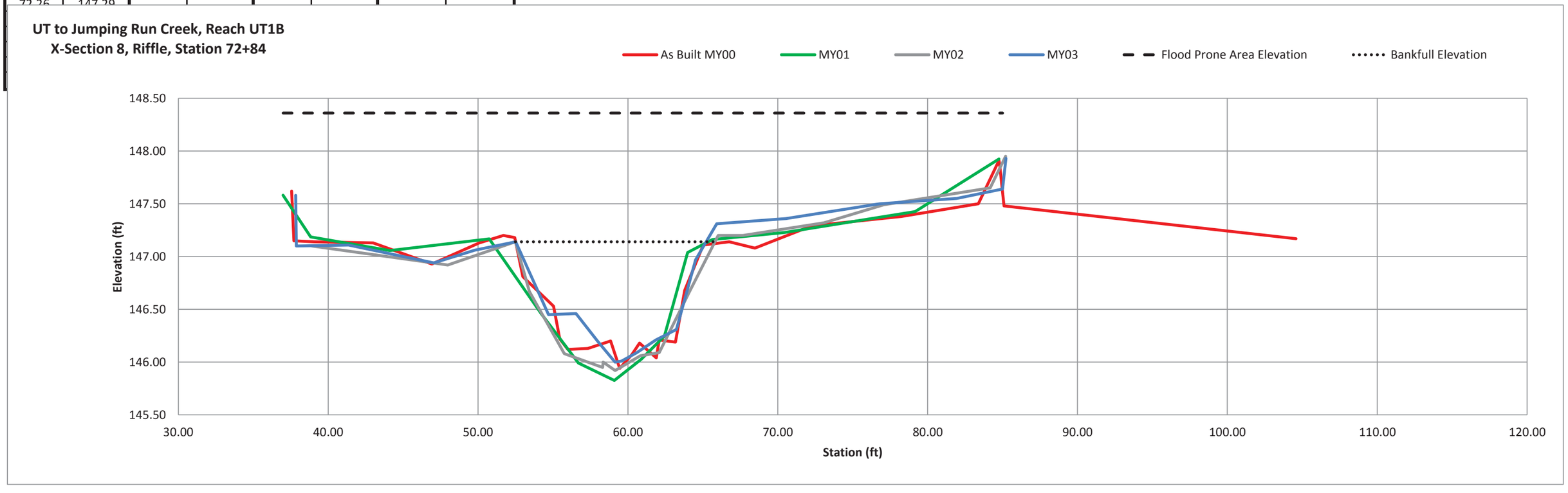
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-8, Riffle, STA 72+84
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
37.56	147.62	36.99	147.58	38.91	147.10	37.83	147.58
37.71	147.15	38.83	147.19	47.98	146.92	37.87	147.10
39.04	147.14	44.12	147.06	52.49	147.14	41.35	147.11
43.00	147.13	50.75	147.17	53.42	146.67	47.05	146.94
46.92	146.93	54.21	146.46	55.76	146.08	49.77	147.06
50.07	147.13	56.70	145.99	58.31	145.95	52.51	147.14
51.69	147.20	59.09	145.83	58.35	146.00	54.70	146.45
52.45	147.18	60.88	146.03	59.15	145.92	56.54	146.46
52.99	146.81	62.43	146.25	60.83	146.06	57.97	146.20
55.04	146.53	63.98	147.04	62.09	146.09	59.14	146.00
55.45	146.22	65.64	147.16	64.11	146.67	59.57	146.01
55.99	146.12	70.44	147.23	66.02	147.20	60.59	146.09
57.33	146.13	79.16	147.43	67.67	147.20	61.86	146.21
58.84	146.20	84.76	147.93	73.08	147.32	63.24	146.31
59.45	145.94			77.07	147.49	64.52	146.97
60.26	146.07			84.17	147.65	65.93	147.31
60.77	146.18			85.21	147.95	70.56	147.36
61.89	146.04					76.79	147.50
62.09	146.21					81.94	147.55
63.17	146.19					85.00	147.64
63.79	146.68					85.23	147.93
65.03	147.11						
66.76	147.14						
68.47	147.08						
72.26	147.29						

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	147.20	147.17	147.14	147.14
Bankfull Cross-Sectional Area	10.81	11.37	11.08	9.16
Bankfull Width	15.10	15.24	13.31	12.71
Flood Prone Area Elevation	148.46	148.51	148.36	148.28
Flood Prone Width	200.00	200.00	200.00	200.00
Max Depth at Bankfull	1.26	1.34	1.22	1.14
Mean Depth at Bankfull	0.72	0.75	0.83	0.72
W/D Ratio	20.97	20.32	16.04	17.65
Entrenchment Ratio	13.25	13.12	15.03	15.74
Bank Height Ratio	1.000	1.000	1.000	1.0
Stream Type	C	C	C	C



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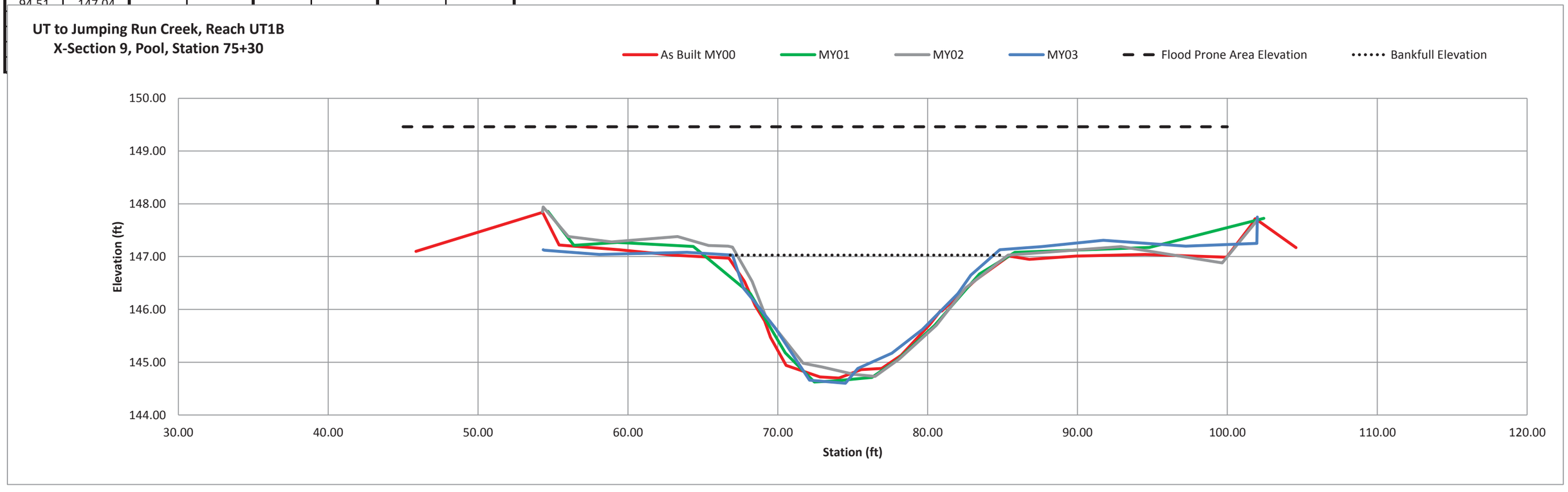
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-9, Pool, STA 75+30
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
45.86	147.10	54.66	147.86	54.29	147.85	54.34	147.13
54.31	147.84	56.39	147.21	54.35	147.94	54.42	147.12
54.32	147.83	59.30	147.27	56.03	147.38	58.09	147.04
55.41	147.22	64.36	147.19	58.91	147.28	63.94	147.08
59.39	147.13	68.17	146.30	63.31	147.38	66.98	147.03
63.00	147.03	70.50	145.18	65.38	147.21	67.71	146.40
66.74	146.97	72.44	144.63	66.68	147.20	68.55	146.11
67.78	146.53	73.73	144.64	66.98	147.18	69.87	145.63
68.50	146.07	76.28	144.71	68.29	146.53	72.12	144.66
69.12	145.78	78.01	145.05	69.18	145.88	74.51	144.60
69.51	145.47	80.48	145.70	71.69	144.98	75.34	144.88
70.56	144.94	83.46	146.67	72.96	144.91	77.61	145.17
72.81	144.72	85.82	147.08	75.08	144.77	79.65	145.62
74.08	144.70	94.80	147.17	76.49	144.73	82.02	146.30
75.57	144.86	102.44	147.73	78.10	145.06	82.88	146.65
76.93	144.88			80.59	145.70	84.81	147.13
78.23	145.13			82.55	146.41	87.59	147.19
80.13	145.71			85.37	147.03	91.72	147.31
80.85	145.97			92.90	147.19	97.22	147.20
80.94	145.97			99.66	146.88	101.97	147.25
83.22	146.56			102.00	147.69	102.00	147.75
85.42	147.01						
86.79	146.95						
89.91	147.01						
94.51	147.04						

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	146.97	147.08	147.19	147.03
Bankfull Cross-Sectional Area	25.96	29.08	29.36	25.48
Bankfull Width	18.48	20.67	26.07	17.43
Flood Prone Area Elevation	149.24	149.53	149.55	149.46
Flood Prone Width	200.00	200.00	200.00	200.00
Max Depth at Bankfull	2.27	2.45	2.46	2.43
Mean Depth at Bankfull	1.40	1.41	1.13	1.46
W/D Ratio	13.20	14.66	23.07	11.94
Entrenchment Ratio	10.82	9.68	7.67	11.47
Bank Height Ratio	1.0	1.0	1.0	1.0
Stream Type	C	C	C	C



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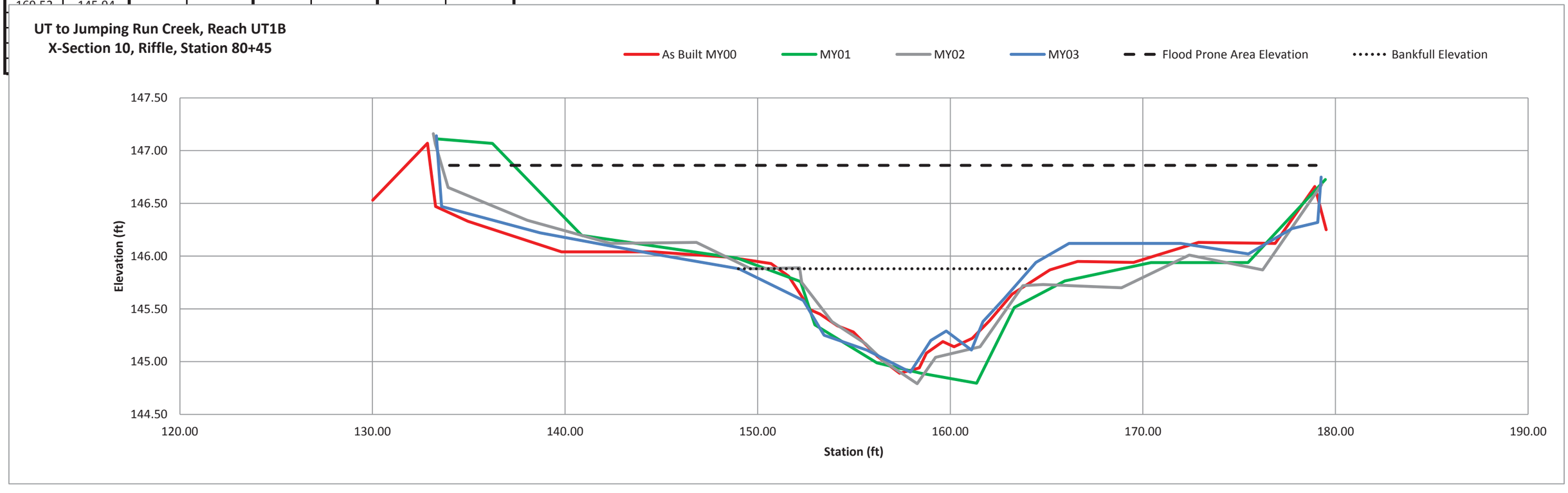
River Basin	Cape Fear River
Watershed	Jumping Run Creek
XS ID	XS-10, Riffle, STA 80+45
Drainage Area(sq. mi.)	1.2
Date	10/9/2012
Field Crew	T. Taylor, J. Gilman, A. Baldwin

MY00		MY01		MY02		MY03	
Station	Elevation	Station	Elevation	Station	Elevation	Station	Elevation
130.01	146.53	133.23	147.11	133.16	147.16	133.32	147.14
132.86	147.07	136.23	147.07	133.27	147.06	133.59	146.47
133.28	146.47	140.87	146.20	133.93	146.65	138.70	146.22
134.96	146.33	148.97	145.98	138.04	146.34	144.59	146.02
139.81	146.04	152.23	145.76	142.36	146.12	149.02	145.88
144.59	146.04	152.97	145.35	146.82	146.13	152.37	145.58
148.52	145.99	156.19	144.99	149.64	145.88	153.45	145.25
150.69	145.93	158.49	144.89	152.18	145.89	155.66	145.11
151.61	145.81	161.37	144.80	152.29	145.75	157.93	144.90
152.74	145.49	163.33	145.51	153.86	145.38	158.99	145.20
153.24	145.45	165.95	145.77	155.60	145.17	159.79	145.29
154.14	145.34	170.43	145.94	156.57	145.00	161.10	145.11
154.97	145.28	175.46	145.94	158.28	144.79	161.70	145.38
156.22	145.05	179.48	146.73	159.24	145.04	162.81	145.60
157.37	144.89			161.55	145.14	164.45	145.94
158.39	144.94			163.77	145.72	166.17	146.12
158.76	145.08			164.82	145.73	169.86	146.12
159.62	145.19			168.89	145.70	171.97	146.12
160.20	145.14			172.41	146.01	175.48	146.02
161.14	145.22			176.22	145.87	177.74	146.26
162.05	145.39			179.29	146.68	179.08	146.32
163.22	145.64					179.26	146.75
165.17	145.87						
166.62	145.95						

SUMARY DATA	MY00	MY01	MY02	MY03
Bankfull Elevation	145.87	145.76	145.73	145.88
Bankfull Cross-Sectional Area	7.41	8.10	6.04	7.82
Bankfull Width	14.02	13.61	12.45	15.14
Flood Prone Area Elevation	146.85	146.72	146.67	146.86
Flood Prone Width	103.50	41.41	45.35	50.00
Max Depth at Bankfull	0.98	0.96	0.94	0.98
Mean Depth at Bankfull	0.53	0.59	0.36	0.52
W/D Ratio	26.45	23.07	34.58	29.12
Entrenchment Ratio	7.38	3.04	3.64	3.30
Bank Height Ratio	1.00	1.00	1.0	1.0
Stream Type	C	C	C	C



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UT to Jumping Run Creek, Reach UT1B
Longitudinal Profile, Year 03, STA 47+45 to 82+10

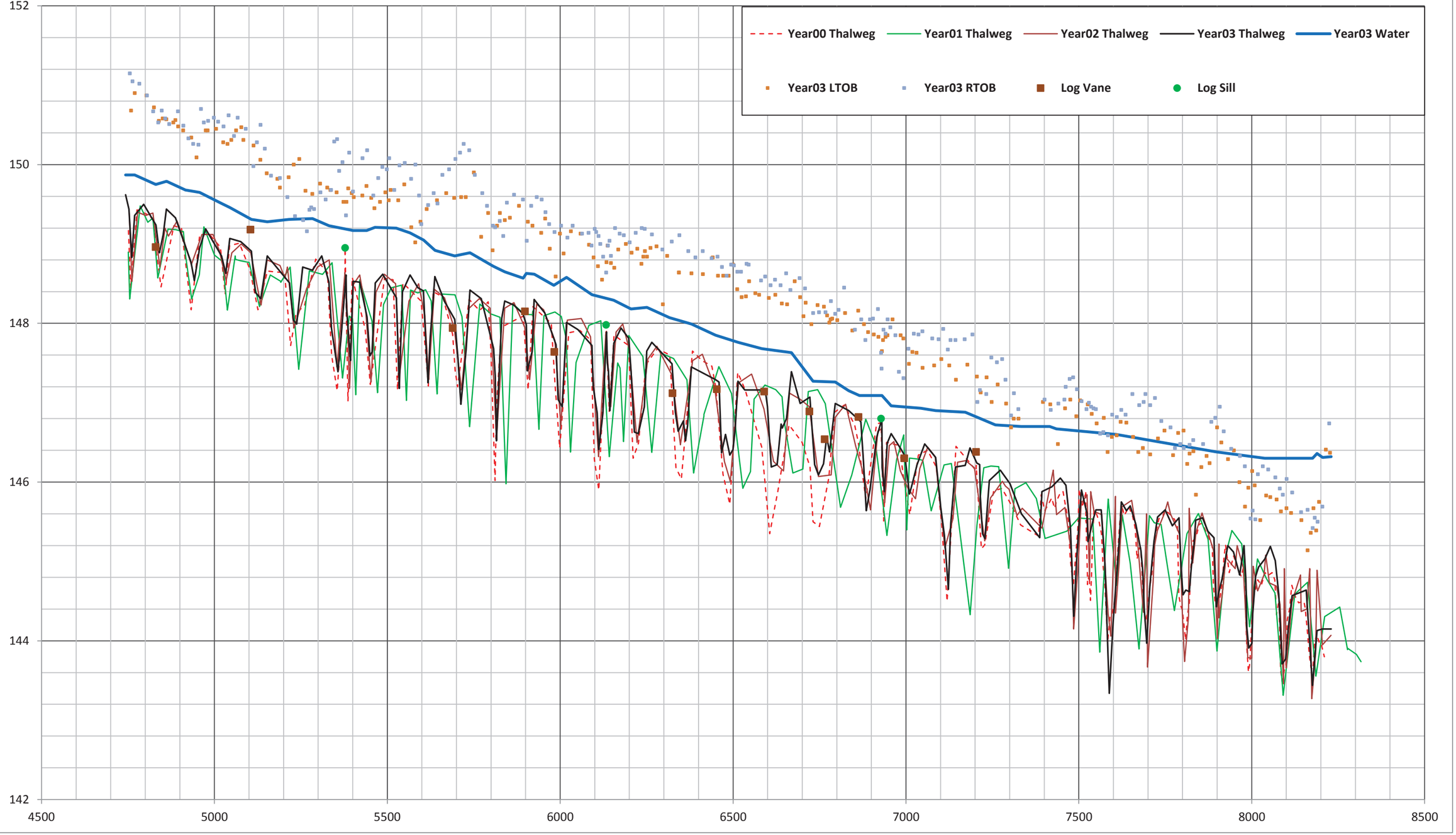

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Table 10a. Baseline Stream Data Summary
UT to Jumping Run Creek Stream and Wetland Restoration Project / EEP No.92345 - UT1b (4500 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					12.10	15.23	13.01	20.55	3.95	5	-	-	-	-	-	-	-	13.4	-	14.02	15.98	15.75	18.48	1.32	8
Floodprone Width (ft)					15.59	18.68	17.51	23.94	3.62	5	-	-	-	-	-	-	-	100+	-	103.50	187.94	200.00	200.00	34.12	8
Bankfull Mean Depth (ft)					0.54	0.77	0.86	0.94	0.19	5	-	-	-	-	-	-	-	0.9	-	0.53	0.82	0.75	1.40	0.26	8
[1]Bankfull Max Depth (ft)					0.87	1.18	1.17	1.45	0.25	5	-	-	-	-	-	-	-	1.1	-	0.98	1.35	1.25	2.27	0.39	8
Bankfull Cross Sectional Area (ft^2)					10.97	11.23	11.13	11.80	0.33	5	7.80	51.85	51.85	95.90	-	2	-	12.0	-	7.41	13.35	11.74	25.96	5.48	8
Width/Depth Ratio					12.47	21.84	15.20	37.78	11.53	5	8.00	11.00	11.00	14.00	-	2	-	15.0	-	13.20	20.53	20.94	26.45	3.97	8
Entrenchment Ratio					1.13	1.25	1.29	1.35	0.09	5	4.00	8.50	8.50	13.00	-	2	8.0	10.0	12.0	7.35	12.85	12.53	21.58	4.00	8
[1]Bank Height Ratio					2.94	4.14	4.29	5.45	0.95	5	1.00	1.15	1.15	1.30	-	2	-	1.0	-	1	1	1	1	0	8
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.399	49.709	48.08305	78.4581	11.12	32
Riffle Slope (ft/ft)					-	-	-	-	-	-	-	-	-	-	-	-	0.001	0.003	0.005	0.0002	0.4671	0.005	6	1.662	13
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27.7	59.89	61.4	96	18.34	30
Pool Max depth (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	-	0.865	1.4959	1.572	2.395	0.391	30
Pool Spacing (ft)					-	-	-	-	-	-	-	-	-	-	-	-	38	61.5	85	79	106.48	104	143	17.09	29
Pattern																									
Channel Beltwidth (ft)					-	-	-	-	-	-	-	-	-	-	-	-	38	79.0	120	40.15	70.42	69.35	96.96	13.68	26.00
Radius of Curvature (ft)					-	-	-	-	-	-	-	-	-	-	-	-	30	40.0	50	32.49	41.47	39.95	55.87	6.35	30.00
Rc:Bankfull width (ft/ft)					-	-	-	-	-	-	1.5	-	2.25	3	-	-	2	2.8	3.5	2.32	2.59	2.54	3.02	-	-
Meander Wavelength (ft)					-	-	-	-	-	-	-	-	-	-	-	-	70	120	170	152.37	179.88	176.05	228.52	23.44	14.00
Meander Width Ratio					-	-	-	-	-	-	2	-	4.15	6.3	-	-	3.5	5.8	8	2.86	4.41	4.40	5.25	-	-
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					-												0.03			0.056					
Max part size (mm) mobilized at bankfull					-												-			-					
Stream Power (transport capacity) W/m^2					-												0.026			0.69					
Additional Reach Parameters																									
Rosgen Classification					F5						E5/C5						C5c			C5c					
Bankfull Velocity (fps)					-												0.78			-					
Bankfull Discharge (cfs)					9.4																				
Valley length (ft)					-						-														
Channel Thalweg length (ft)					6501						-						3400			3471					
Sinuosity (ft)					1.07						1.22/1.77						1.2			1.2					
Water Surface Slope (Channel) (ft/ft)					0.0006												0.0016			0.00124					
BF slope (ft/ft)					-												-			**0.00137**					
[3]Bankfull Floodplain Area (acres)					-						-						-			-					
[4]% of Reach with Eroding Banks					-						-														
Channel Stability or Habitat Metric					-						-														
Biological or Other					-						-														

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)

UT to Jumping Run Creek Stream and Wetland Restoration / EEP No. 92345 - UT1b (4500 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%	-	0	-	0	0			-	-	-	-	-			-	-	-	-	-			52	-	48	-	-		
[1]SC% / Sa% / G% / C% / B% / Be%	0	33	67	0	0	0		0	100	0	0	0	0															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.14	0.26	0.5	4.4	7.3	-	30	0.3	0.4	0.5	0.9	1.2	-	-														
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	-	-	-	-	-			-	-	-	-	-										-	-	-	-	-		
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0	-	-	-	-				-	-	-	-											-	-	-	-			

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.

The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable secti

the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provi

a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number (UT Jumping Run Creek) Segment/Reach: UT1b (4500 feet)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	150.47	150.46	150.48	150.46				150.58	150.36	150.35	150.51				149.75	149.78	149.68	149.62				149.34	149.32	149.29	149.15				149.02	149.07	148.99	148.89			
Bankfull Width (ft)	15.60	15.35	15.60	16.99				19.33	17.03	17.56	18.53				15.50	16.16	15.00	15.90				18.22	17.38	19.25	17.90				15.90	15.64	12.84	12.22			
Floodprone Width (ft)	200+	200+	200+	200+				200+	200+	200+	200+				200+	200+	200+	200+				200+	200+	200+	200+				200+	200+	200+	200+			
Bankfull Mean Depth (ft)	0.83	0.79	0.80	0.75				1.12	1.01	0.89	1.00				0.76	0.76	0.71	0.62				1.23	1.17	1.08	1.20				0.74	0.76	0.86	0.84			
Bankfull Max Depth (ft)	1.31	1.28	1.30	1.37				2.25	2.02	1.81	2.27				1.14	1.19	1.11	1.16				2.20	2.24	2.12	2.34				1.41	1.34	1.36	1.52			
Bankfull Cross Sectional Area (ft^2)	12.90	13.16	12.52	12.74				21.57	17.26	15.57	18.60				11.71	13.91	10.69	9.88				22.42	20.32	20.78	21.47				11.69	11.94	11.05	10.25			
Bankfull Width/Depth Ratio	18.73	19.43	19.50	22.65				17.26	16.86	17.13	18.53				20.90	21.26	21.13	25.65				14.81	14.85	17.82	14.92				21.49	20.58	14.93	14.55			
Bankfull Entrenchment Ratio	12.86	13.03	12.82	11.77				10.35	11.74	11.56	10.79				12.91	12.38	13.33	12.58				10.98	11.51	10.39	11.17				21.58	12.79	15.58	16.37			
Bankfull Bank Height Ratio	1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00			
Cross Sectional Area between end pins (ft^2)	16.50	17.00	17.25	17.50				26.30	26.50	26.70					21.70	22.10	21.85					32.10	32.50	33.15					19.00	19.10	18.50				
d50 (mm)																																			

	Cross Section 6 (Riffle)							Cross Section 7 (Riffle)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	148.61	148.58	148.49	148.51				148.09	148.13	148.06	148.00				147.20	147.17	147.14	147.14				146.97	147.08	147.19	147.03				145.87	145.76	145.73	145.88			
Bankfull Width (ft)	16.39	17.17	15.90	20.32				16.87	15.72	14.91	13.36				15.10	15.24	13.31	12.71				18.48	20.67	26.07	17.43				14.02	13.61	12.45	15.14			
Floodprone Width (ft)	200+	200+	200+	200+				200+	200+	200+	200+				200+	200+	200+	200+				200+	200+	200+	200+				103.50	41.41	45.35	50+			
Bankfull Mean Depth (ft)	0.89	0.80	0.76	0.72				0.70	0.77	0.73	0.75				0.72	0.75	0.83	0.72				1.40	1.41	1.13	1.46				0.53	0.59	0.36	0.52			
Bankfull Max Depth (ft)	1.23	1.20	1.14	1.30				1.21	1.27	1.21	1.29				1.26	1.34	1.22	1.14				2.27	2.45	2.46	2.43				0.98	0.96	0.94	0.98			
Bankfull Cross Sectional Area (ft^2)	14.51	13.74	12.05	14.64				11.77	12.18	10.95	10.08				10.81	11.37	11.08	9.16				25.96	29.08	29.36	25.48				7.41	8.10	6.04	7.82			
Bankfull Width/Depth Ratio	18.42	21.46	20.92	28.22				24.10	20.42	20.42	17.81				20.97	20.32	16.04	17.65				13.20	14.66	23.07	11.94				26.45	23.07	34.58	29.12			
Bankfull Entrenchment Ratio	12.20	11.65	12.58	9.84				11.86	12.72	13.41	14.97				13.25	13.12	15.03	15.74				10.82	9.68	7.67	11.47				7.35	3.04	3.64	3.30			
Bankfull Bank Height Ratio	1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00				1.00	1.00	1.00	1.00			
Cross Sectional Area between end pins (ft^2)	24.30	24.50	24.00					13.10	13.40	13.25					17.20	17.60	16.85					40.10	42.10	43.65					85.50	86.10	85.05				
d50 (mm)																																			

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
UT to Jumping Run Creek/EEP No. 92345 - UT1b (3661 feet)

Parameter	Baseline						MY-1*						MY-2*						MY- 3**						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	14.02	15.983	15.75	18.48	1.3206	8	14.02	15.983	15.75	19	1.32	8	12.45	15.76	14.955	26.07	4.361	8	12.22	15.51	15.52	20.32	2.74	8												
Floodprone Width (ft)	103.5	187.94	200	200	34.118	8	103.5	187.94	200	200	34.12	8	45.35	177.91	200	200	58.452	8	50+	181.3	200+	200+	53	8												
Bankfull Mean Depth (ft)	0.53	0.8213	0.75	1.4	0.2563	8	0.53	0	0.75	1.4	0.26	8	0.36	0.7814	0.815	149.87	0.2277	8	0.52	0.80	0.74	1.46	0.28	8												
[1]Bankfull Max Depth (ft)	0.98	1.3513	1.245	2.27	0.3918	8	0.98	0.83	1.27	2.28	0.39	8	0.94	1.3757	1.26	149.93	0.4964	8	0.98	1.40	1.30	2.43	0.45	8												
Bankfull Cross Sectional Area (ft^2)	7.41	13.345	11.74	25.96	5.4803	8	7.41	13.345	11.74	25.96	5.49	8	6.04	13.293	11.565	148.73	7.3972	8	7.82	12.51	10.17	25.48	5.66	8												
Width/Depth Ratio	13.2	20.533	20.935	26.45	3.9725	8	13.2	20.533	20.935	26.45	3.96	8	14.93	21.352	20.673	149.75	6.4807	8	11.94	20.95	20.23	29.12	6.41	8												
Entrenchment Ratio	7.35	12.854	12.53	21.58	4.0027	8	7.36	13	12.6	21.58	4.00	8	3.6426	11.533	13.117	149.86	4.3207	8	3.30	12.01	12.18	16.37	4.19	8												
[1]Bank Height Ratio	1	1	1	1	0	8	1	1	1	1	0.00	8	1	1	1	1	0	8	1.00	1.00	1.00	1.00	0.00	8												
Profile																																				
Riffle Length (ft)	31.399	49.709	48.083	78.458	11.125	32	31.399	49.8	48.083	78.458	11.12	32	30	50	48	79	11.26	32	2.54	31.89	30.575	68.68	17.5	26												
Riffle Slope (ft/ft)	0.0002	0.4671	0.0050	6.0000	1.6624	13	0.0002	0.4671	0.0050	6.0000	1.6624	13	0.0002	0.4623	0.0048	5.5200	1.7500	13	0.0003	0.0017	0.0017	0.0059	0.001	19												
Pool Length (ft)	27.7	59.89	61.4	96	18.339	30	27.7	59.89	61.4	96	18.34	30	28.1	58.7	60.4	94.3	18.14	30	12.53	32.33	32.915	55.6	11	34												
Pool Max depth (ft)	0.87	1.50	1.57	2.40	0.39	30	0.87	1.60	1.59	2.60	0.39	30	0.90	1.64	1.58	2.77	0.41	30	1.7	2.148	2.04	3.39	0.37	35												
Pool Spacing (ft)	79	106.48	104	143	17.089	29	79	106.48	104	143	17.09	29	78.4	105.8	104.7	144.2	17.18	29	77.33	107	103.7	161.69	20	32												
Pattern																																				
Channel Beltwidth (ft)	40.15	70.418	69.349	96.958	13.679	26																														
Radius of Curvature (ft)	32.491	41.465	39.95	55.871	6.3477	30																														
Rc:Bankfull width (ft/ft)	2.3175	2.5944	2.5365	3.0233	-	-																														
Meander Wavelength (ft)	152.37	179.88	176.05	228.52	23.435	14																														
Meander Width Ratio	2.8638	4.406	4.4031	5.2466	-	-																														
Additional Reach Parameters																																				
Rosgen Classification	C5						C5						C5						C5																	
Channel Thalweg length (ft)	3471						3471						3471						3471																	
Sinuosity (ft)	1.2						1.2						1.2						1.2																	
Water Surface Slope (Channel) (ft/ft)	0.00124						0.00126						0.00126						0.00126																	
BF slope (ft/ft)	0.00137						0.00137						0.00137						0.0014																	
[3]Ri% / Ru% / P% / G% / S%	**52**	**0**	**48**	**0**	**0**		**52**	**0**	**48**	**0**	**0**		**52**	**0**	**48**	**0**	**0**		**52**	**0**	**48**	**0**	**0**													
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	-						-						-						-																	
Channel Stability or Habitat Metric	-						-						-						-																	
Biological or Other	-						-						-						-																	

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3
*Low flow asa result of dry conditions. Water surface data was insufficient.
**Recent rainfall resulted in high stream flow causing high water surface data.

Appendix E. Hydrology Data

Table 12 – Verification of Bankfull Events
Figure 5 – Monthly Rainfall Data
Figures 6a-p – Precipitation and Water Level Plots
Table 13 – Wetland Hydrology Criteria Attainment

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Table 12 - Verification of Bankfull Events UT to Jumping Run Creek Stream and Wetland Restoration Project - EEP Project No. 92345			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
n/a	n/a	None observed	n/a

Backwater area looking downstream, well 15 located on the right side of the photo

Backwater area facing upstream, well 15 located to the left outside of photo