Dula Thoroughfare Stream and Wetland Restoration
Project No. 65
2010 Monitoring Report: Year 4 of 5

June 2011

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SECTION 1
EXECUTIVE SUMMARY

SECTION 1

EXECUTIVE SUMMARY

The Dula Thoroughfare Stream and Wetland Restoration Project (Site) is located in Anson County, North Carolina, north of the Town of Wadesboro within the Piedmont eco-region and in the Yadkin River Basin (USGS Subbasin HUC 03040104) (Appendix 1.1). The Site includes one of the two Ecosystem Enhancement Program (EEP) project sites located on the 200-acre Bishop Site (Dula Thoroughfare (DT) and Unnamed Tributary (UT) to Dula Thoroughfare). The Site is confined within a North Carolina Department of Transportation (NCDOT)-owned conservation easement. The stream preservation/enhancement/restoration plan was designed by EcoScience Corporation and constructed by Vaughn Construction, Inc. Construction and planting activities were completed in February 2007. As-built surveys for the Site were performed in May 2007. The first annual monitoring activities were conducted in October 2007.

This report serves as the fourth year of the five year monitoring plan for the Site.

1.1 Goals and Objectives

Prior to restoration, the Site was predominantly utilized for row cropping and recreational activities, such as hunting and wildlife viewing. Historically, drainage features and wetland areas were dredged, straightened, and filled in to provide land for agricultural purposes. These activities are thought to have inhibited stream channel stability and water quality; therefore, producing an incised, eroded stream. Primary goals for the Site were to restore stable dimension, pattern, and profile for impacted on-site stream reaches and to restore adjacent riverine wetlands. Secondary Site restoration goals included stream channel and adjacent wetland enhancement and preservation.

Restoration goals established for the Site include:

Dula Thoroughfare

- Aquatic habitat creation via excavation of vernal pools within floodplain cut areas.
- Re-establishment of the characteristic, pre-disturbance Piedmont Bottomland Forest (Schafale and Weakley 1990) community adjacent to restoration reaches using bare root seedling plantings.

UT Dula Thoroughfare

- Re-establishment of the characteristic, pre-disturbance Piedmont Bottomland Forest (Schafale and Weakley 1990) community adjacent to restoration reaches using bare root seedling plantings.

The project objectives include:

Dula Thoroughfare

- Priority II stream restoration via excavation of approximately 2,730 linear feet of a designed E-type stream of Dula Thoroughfare (including an associated tributary), including adjacent floodplain excavation to achieve and entrenchment ratio characteristic of E-type streams.
- Restoration of approximately 3.1 acres of riverine wetlands adjacent to Dula Thoroughfare via floodplain excavation in previously identified hydric soil areas, thereby re-establishing jurisdictional wetland hydrology.

UT Dula Thoroughfare

- Level I enhancement of approximately 1,871 linear feet of stream via backfill of straightened and ditched portions of the existing watercourse, thereby re-establishing characteristic stream dimension and pattern by reintroducing flow into adjacent relic channel areas.
- Level II enhancement of approximately 480 linear feet of stream via riparian plantings adjacent to the UT to Dula Thoroughfare streambanks.
- Re-vegetation of open areas adjacent to the UT to Dula Thoroughfare via plantings of characteristic, pre-disturbance community types described by Schafale and Weakley (1990) using bare root seedling plantings.

The main reach of DT was restored by relocating approximately 2,730 lf of the existing channel and its tributary. DT (Reach 1) and its tributary (Reach 2) were designed as E-type streams by creating bankfull benches to re-establish floodplain connection. The UT to DT enhancement (Level 1) along Reach 3 was established via backfill of straightened and ditched portions of the existing watercourse, thereby re-establishing characteristic stream dimension and pattern by reintroducing flow into adjacent relic channel areas. Enhancement (Level 2) along Reach 4 was established through riparian plantings adjacent to the streambanks. The Site's riparian areas were planted to improve habitat and stabilize streambanks via planting bare root seedlings to recreate pre-disturbance vegetative communities within their appropriate landscape contexts. Appendix 2 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

1.2 Vegetative Assessment

JJG conducted the 2010 (year 4 of 5) vegetative assessment and vegetative plot analysis in July 2010 per the 2006 CVS-EEP Level 2 protocol (Lee et al., 2006). The eight vegetation plots

previously established in the design phase were selected randomly and represent the riparian buffer zone (DT has five vegetation plots and UT to DT has three vegetation plots). Vegetative monitoring success criteria, as stated in the 2007 mitigation plan, requires an average number of planted stems per acre exceeding 320 stems/acre after the third year of monitoring and 260 stems/acre after the fifth and final year of project monitoring. Vegetative monitoring success criteria require an average number of planted stems per acre exceeding 288 stems/acre after the fourth year of monitoring.

The 2010 vegetation monitoring results indicated that the main reach of DT appears to be meeting vegetation success criteria. However, the UT to DT results indicate the Site did not meet the 2010 vegetation success criteria. The DT and the UT to DT site density are approximately 810 and 243 planted stems per acre, respectively. The DT exceeds the year 4 goal of 288 planted stems per acre. The UT to DT did not exceed the year 4 goal for 288 planted stems per acre, but with natural recruitment and re-planting of woody vegetation, the planted riparian area could improve and exceed the vegetation success criteria by year five. Natural recruitment in Plot 13 and Plot 15 of the UT to DT vegetation sites increased dramatically from MY 2009.

In conclusion, the 2010 vegetation monitoring results indicated that the main reach of DT has met the year 4 vegetation success criteria. However, the UT to DT did not meet the year 4 vegetation success criteria. Although the UT to DT did not exceed the year 4 goal for 288 planted stems per acre, with natural recruitment, the planted riparian area could potentially improve by year 5 and exceed the vegetation success criteria. Please refer to Appendix 3 for more detailed information on the 2010 vegetation data.

1.3 Stream Assessment

Results from the 2010 stream monitoring effort indicate the DT and UT DT appear stable but DT has experienced abnormal flow conditions in MY 4. The entire restored stream length (main channel and its tributary) of DT was assessed from the project at the gravel road to the downstream end of the restoration project where the preservation reach begins. The UT to DT was assessed from the beginning of the project approximately 300 feet upstream from the first cross vane triplet to the downstream end of the restoration project where the preservation reach begins.

Dula Thoroughfare-Main Channel

Overall, the present stream dimensions along DT appear stable. The surveyed cross-sections 1-3 have had some minor adjustments over the past year but have remained stable. The dimension values of cross-section 1 differ from last year due to an adjustment in what was considered bankfull. The right pin for cross-section 3 could not be located in 2009, and a new pin was established. However, the right pin for cross-section 3 again could not be located in 2010, which resulted in a different cross-sectional survey in 2010. The average bankfull and water surface slopes for the 2010 monitoring year were calculated as 0.0012 ft/ft and 0.0011 ft/ft, respectively. Due to the lack of well defined bed features, riffle slopes were not calculated. Several areas

along the channel still continue to exhibit increasing levels of in-stream vegetation growth. The substrate along the reach was dominated by silt deposition.

Dula Thoroughfare-Tributary

Based on current monitoring data and the visual inspection, the channel appears to be functioning properly and maintaining stability. No erosion failure was observed along this reach. In-stream vegetation and poor streambank vegetation cover were observed and noted in the Current Condition Plan View (CCPV, Appendix 1.2). The substrate along the entire reach has coarsened within the last year, migrating from a system dominated by silt deposition to a D84 of 1.5 mm and D95 of 4.0 mm. The surveyed cross-section has developed a larger cross-sectional area and width over the last year.

UT to Dula Thoroughfare

During JJG's assessment, the channel was generally dry until approximately 200 feet upstream of cross-section 7. Beyond cross-section 7, the channel had normal flow conditions with riffles, runs, and pools present. Approximately midway down the project reach (between the first and second cross-vane triplets), the water in the channel disappears and then reappears 50 ft downstream. All cross-vanes triplets appear to be stable and are not showing any signs of erosion or piping. The surveyed cross-sections have remained stable over the last year.

Both DT and UT to DT appear stable but have each experienced abnormal flow conditions at times over the past few monitoring years. As a result, in-stream vegetation has developed throughout the channels. These areas will continue to be monitored closely for significant adjustments in the bed features and the channel thalweg. Overall, the Site appears to be stable and could function as intended in normal flow conditions.

A crest gauge is located on the main channel and its tributary of the DT site. The crest gauge was malfunctioning and will be repaired during MY 2011. Visual indicators, such as wrack lines and staining above the bankfull elevation, indicate that at least one bankfull or greater event occurred within the DT restoration project in monitoring year 2010.

1.4 Wetland Assessment

Three groundwater monitoring gauges were installed on the DT site by EcoScience. The monitoring gauges are programmed to download groundwater levels daily and were downloaded monthly in order to capture hydrological data during the growing season. The target wetland hydrological success criterion is saturation or inundation for at least 12.5 percent of the growing season in the lower landscape (floodplain) positions. To achieve the above hydrologic success criterion, groundwater levels must be within 12-inches of the ground surface for 31 consecutive days, which is 12.5 percent of the March 15 to November 18 (249 days).

Two gauges on Site achieved the wetland success criterion of soil saturation within the upper 12 inches for 31 consecutive days, which is 12.5 percent of the March 15 to November 18 (249 days) growing season. Data was collected from the gauges on July 27, 2010, as the Dula site

could not be accessed from September 1 through December 31 due to the landowner's hunting moratorium. Data was collected again in January 2011. Data from Groundwater gauge 1, which was replaced June 9, 2010, was processed from June 22 through the end of the growing season (data from June 9 – June 21 was not included due to an apparent malfunction). Groundwater gauge 2 was found to be malfunctioning at the January 2011 field survey and was replaced. Therefore, data from Groundwater gauge 2 was processed from the beginning of the growing season through July 27, 2010. Data from Groundwater gauge 3 was processed for the entire growing season.

There were no problem areas observed within the wetland restoration zones for the DT Site. Within the wetland zones, hydrophytic vegetation and hydrology indicators have continued to develop. The planted woody stem species throughout the wetland areas are meeting the required success criteria; however, minimal woody stems continue to be a problem in plot 14. It is suspected that the planted stem rates may have been too low in this area to achieve success criteria. With the natural recruitment of woody vegetation, the planted riparian area could improve and exceed the vegetation success criteria by year five. Plot 15 also did not meet the survival criteria for planted stems, but the survival rate is good and natural recruitment numbers are high. Please refer to Appendix 5 for wetland raw data tables and plots and a summary of wetland criteria attainment.

1.5 Annual Monitoring Summary

Overall, the Site appears to be stable and has met stream, vegetation, and wetland mitigation goals for monitoring year 4, with the exception of the UT to DT vegetation, which failed to meet the year four success criteria.

The background information provided in this report is referenced from the mitigation plan and previous monitoring reports prepared by EcoScience (2007). Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to 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.

SECTION 2
METHODOLOGY

SECTION 2
METHODOLOGY

2.1 Methodology

Methods employed for the DT Site were a combination of those established by standard regulatory guidance and procedures documents as well as previous monitoring reports completed by EcoScience. Geomorphic and stream assessments were performed following guidelines outlined in the Stream Channel Reference Sites: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration a Natural Channel Design Handbook (Doll et al, 2003). Vegetation assessments were performed following the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2006). JJG used the *Flora of the Carolinas, Virginia, Georgia, and surrounding areas* by Alan S. Weakley as the taxonomic standard for vegetation nomenclature for this report. Precipitation data for the hydrographs was obtained from Weather Underground for the Albemarle, NC weather station (the nearest offering daily precipitation data) through the following URL.
http://www.wunderground.com/history/airport/KVUJ/2008/1/1/CustomHistory.html?dayend=14&monthend=10&yearend=2008&req_city=NA&req_state=NA&req_statename=NA

SECTION 3
REFERENCES

SECTION 3
REFERENCES

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SECTION 4
APPENDICES

Appendix 1 - General Figures and Plan Views

Appendix 2 - General Project Tables

Appendix 3 - Vegetation Assessment Data

Appendix 4 – Stream Assessment Data

Appendix 5 – Wetland Assessment Data

APPENDIX 1
GENERAL FIGURES AND PLAN VIEWS

1.1 Vicinity Map

1.2. Current Condition Plan View

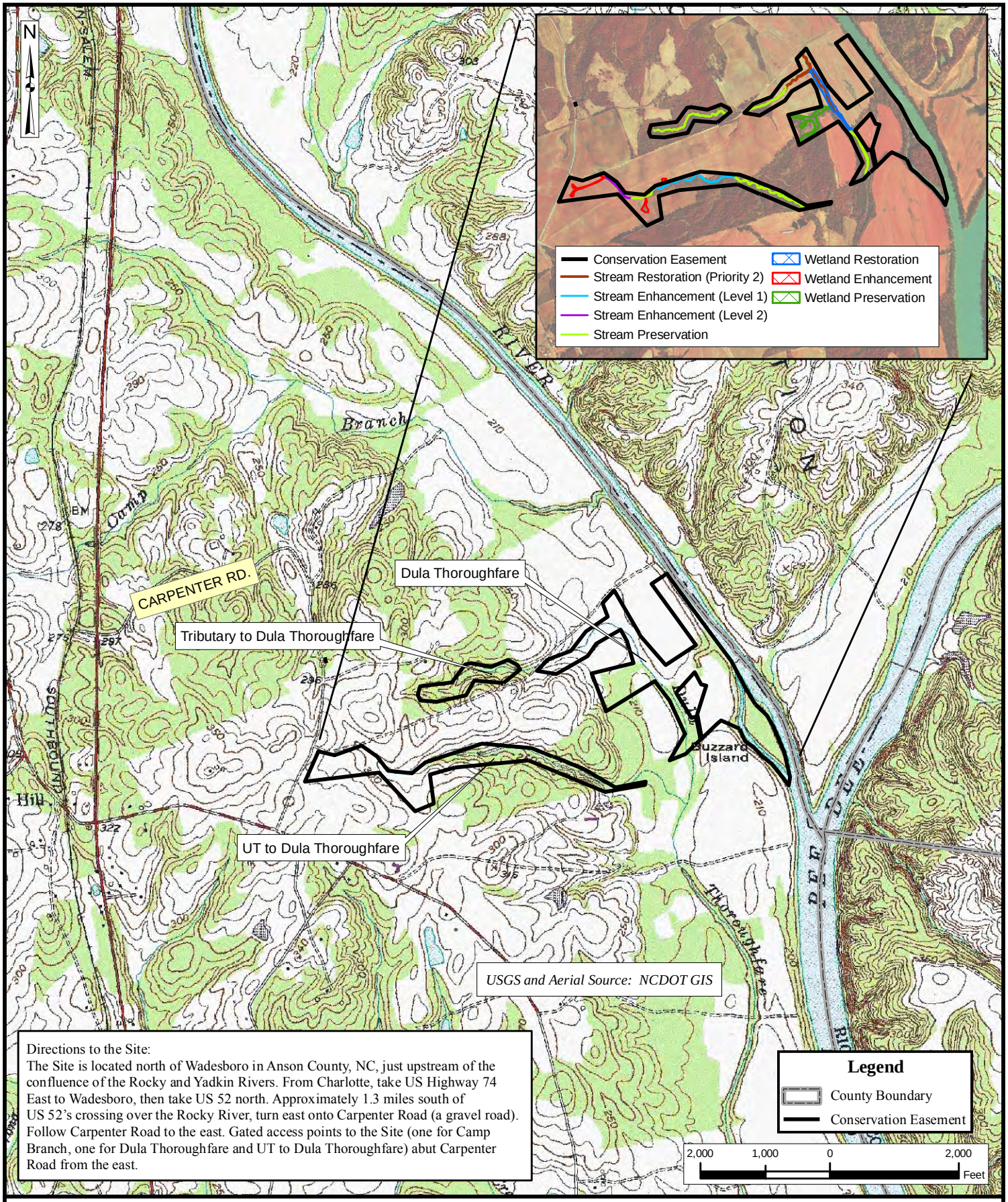
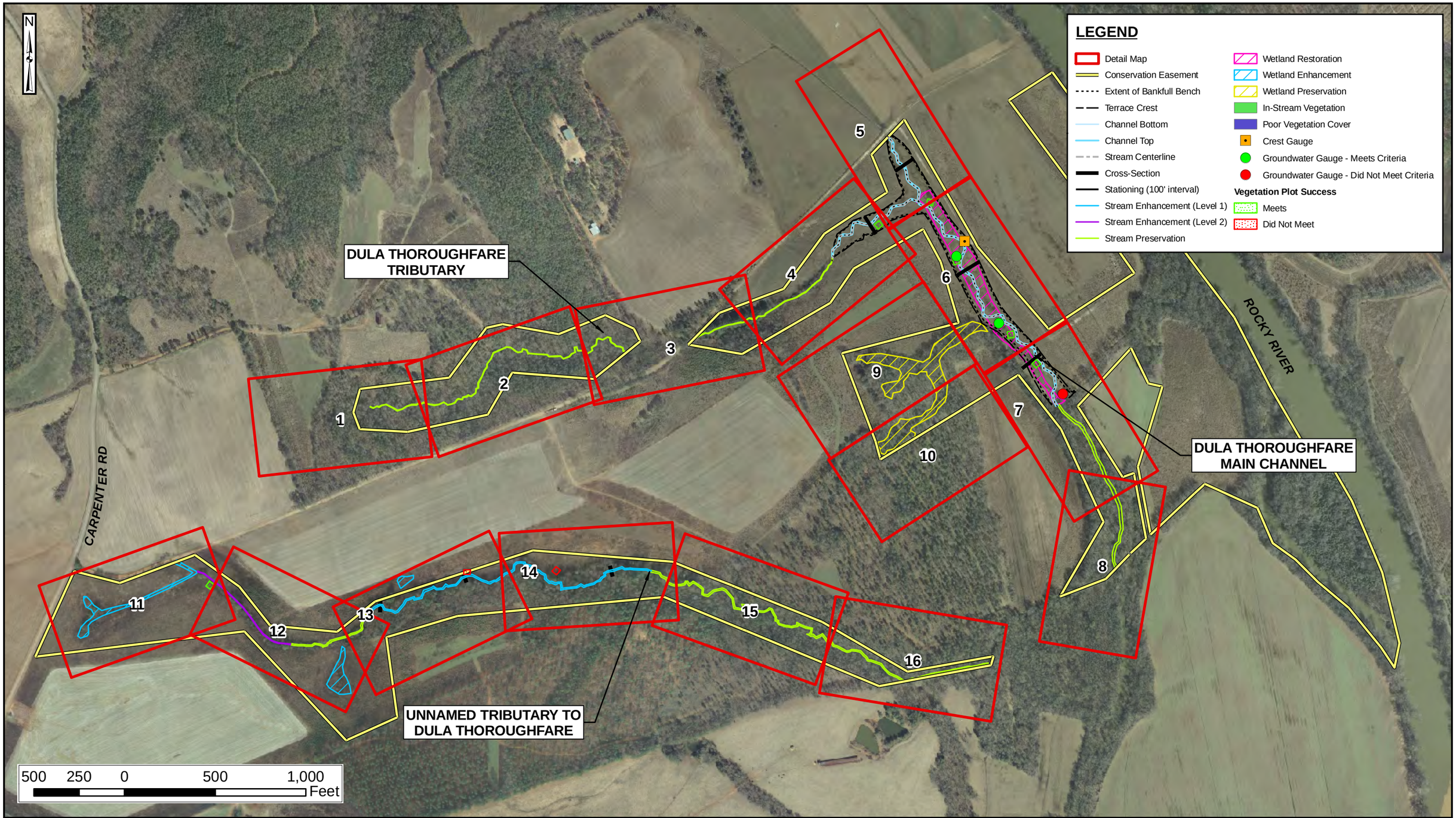


Figure 1. Vicinity Map
Dula Thoroughfare and UT to Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Anson County, NC
Monitoring Year 4 of 5
Submittal Date: June 2011



NOTES:
1. GENERAL SITE DATA ARE PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE

PROJECT NO. 65
ANSON COUNTY
NORTH CAROLINA
MONITORING YEAR 4 OF 5

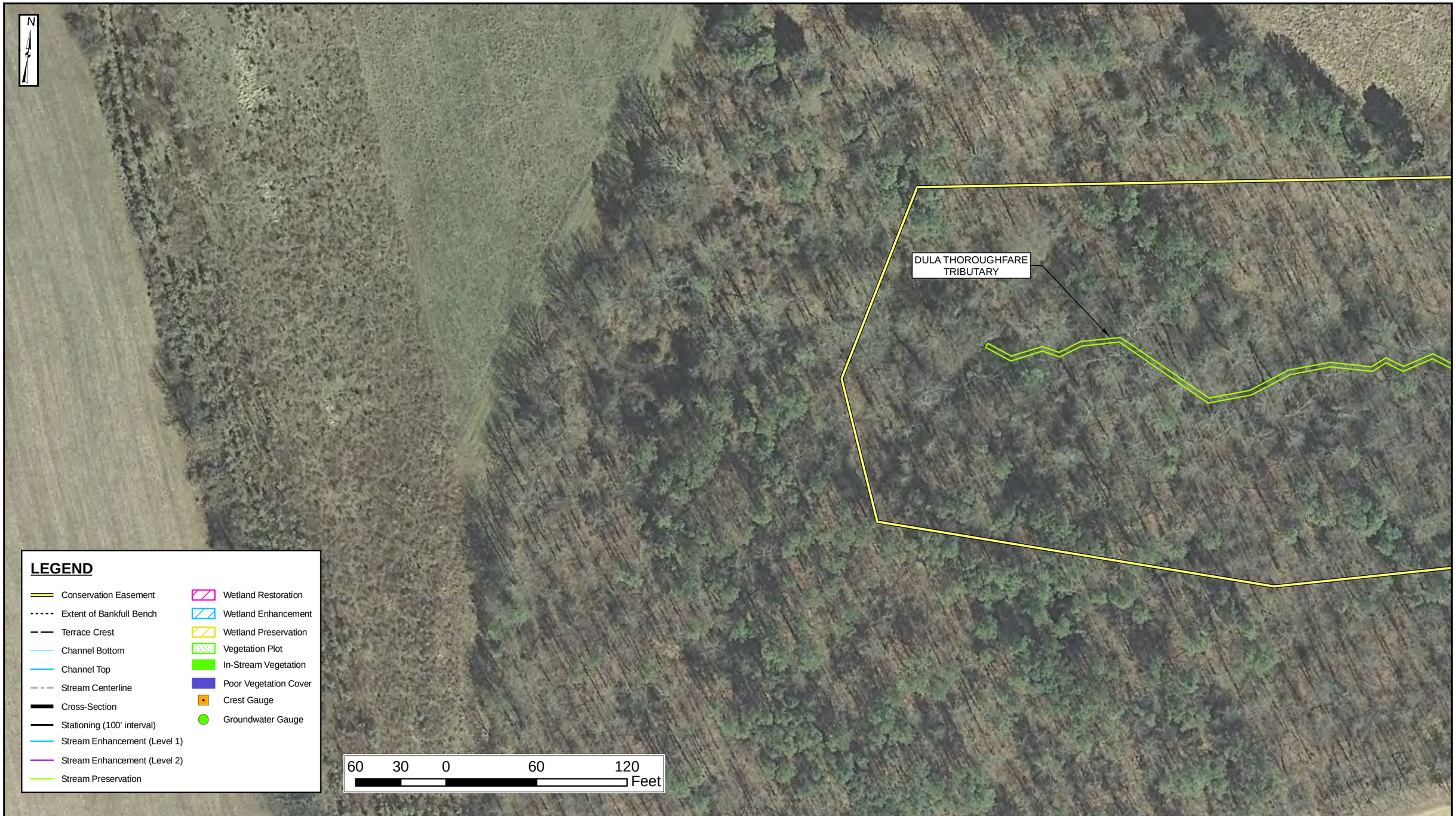
NC ECOSYSTEM ENHANCEMENT PROGRAM

DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
SCALE: 1" = 60'
JOB NO.: JJX31100

FIGURE INDEX



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DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
SCALE: 1" = 60'
JOB NO.: JJX31100

FIGURE 1 OF 16

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DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
SCALE: 1" = 60'
JOB NO.: JJX31100

FIGURE 2 OF 16

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DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
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FIGURE 3 OF 16

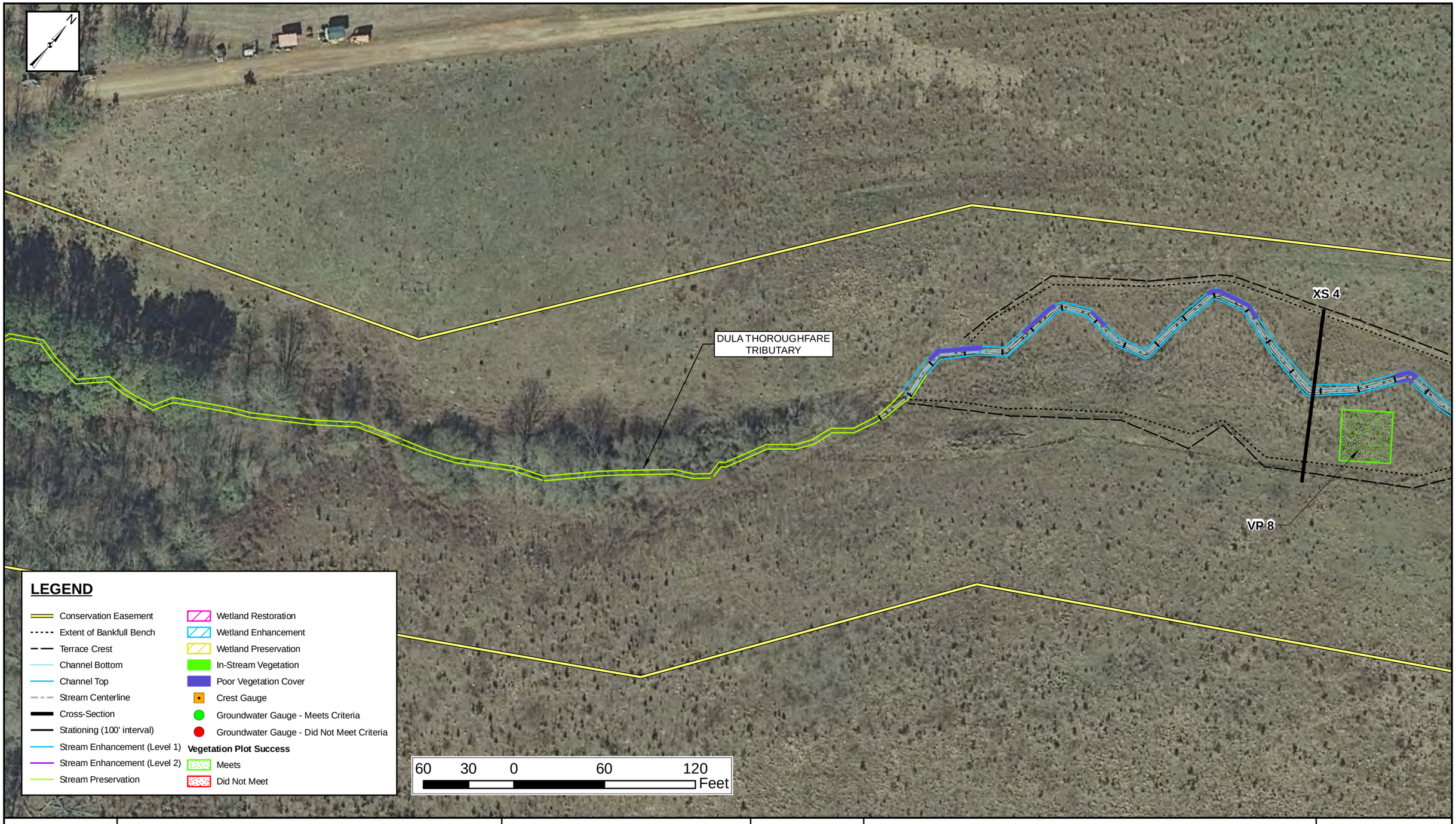

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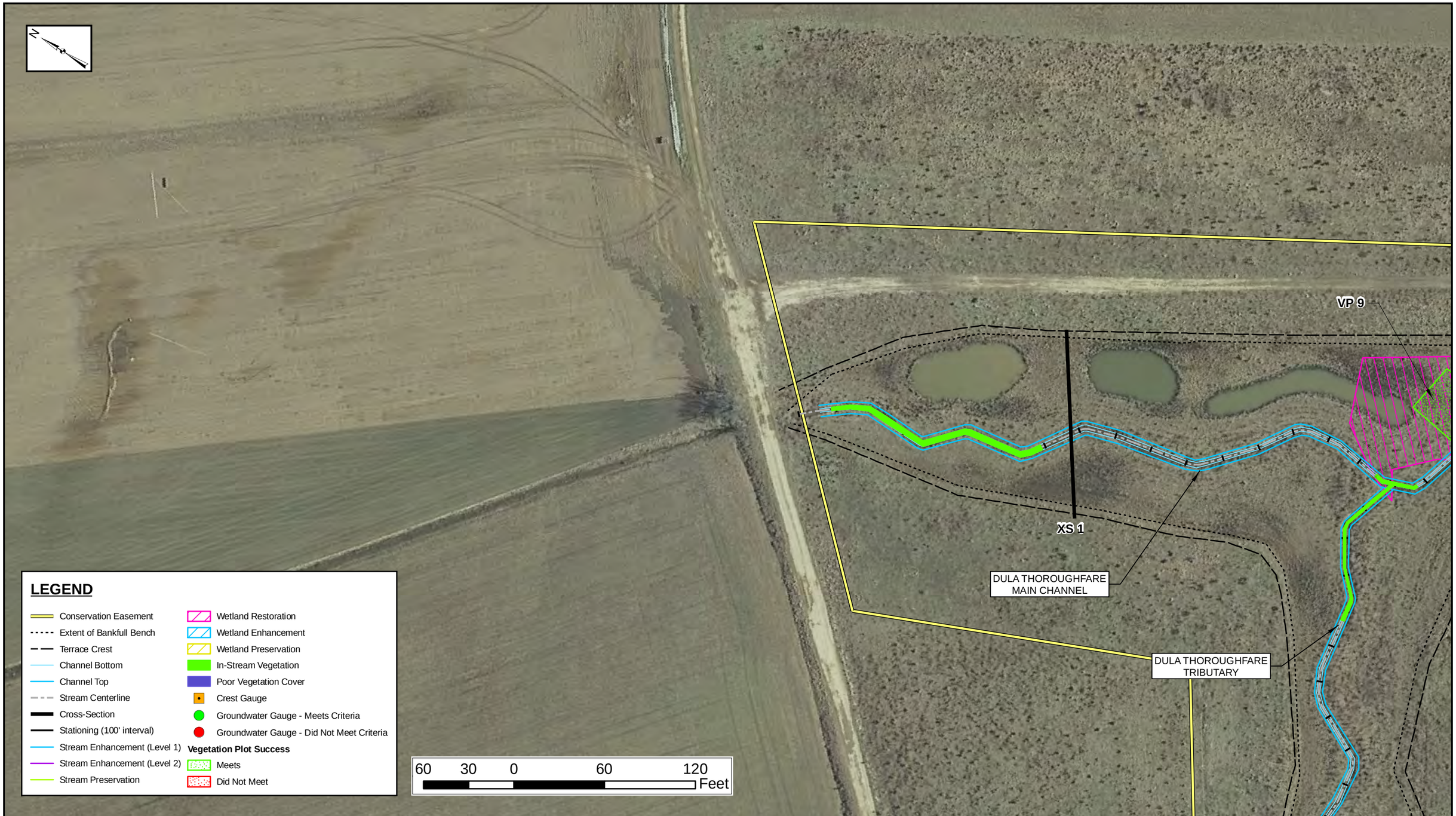
FIGURE 4 OF 16



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CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
SCALE: 1" = 60'
JOB NO.: JJX31100

FIGURE 5 OF 16

DULA THOROUGHFARE
MAIN CHANNEL

VP 9

GWG 3

GWG 2

VP 10

XS 2

VP 11

LEGEND

- Conservation Easement
- Extent of Bankfull Bench
- Terrace Crest
- Channel Bottom
- Channel Top
- Stream Centerline
- Cross-Section
- Stationing (100' interval)
- Stream Enhancement (Level 1)
- Stream Enhancement (Level 2)
- Stream Preservation
- Wetland Restoration
- Wetland Enhancement
- Wetland Preservation
- In-Stream Vegetation
- Poor Vegetation Cover
- Crest Gauge
- Groundwater Gauge - Meets Criteria
- Groundwater Gauge - Did Not Meet Criteria

Vegetation Plot Success

- Meets
- Did Not Meet

60 30 0 60 120 Feet

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DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
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FIGURE 6 OF 16

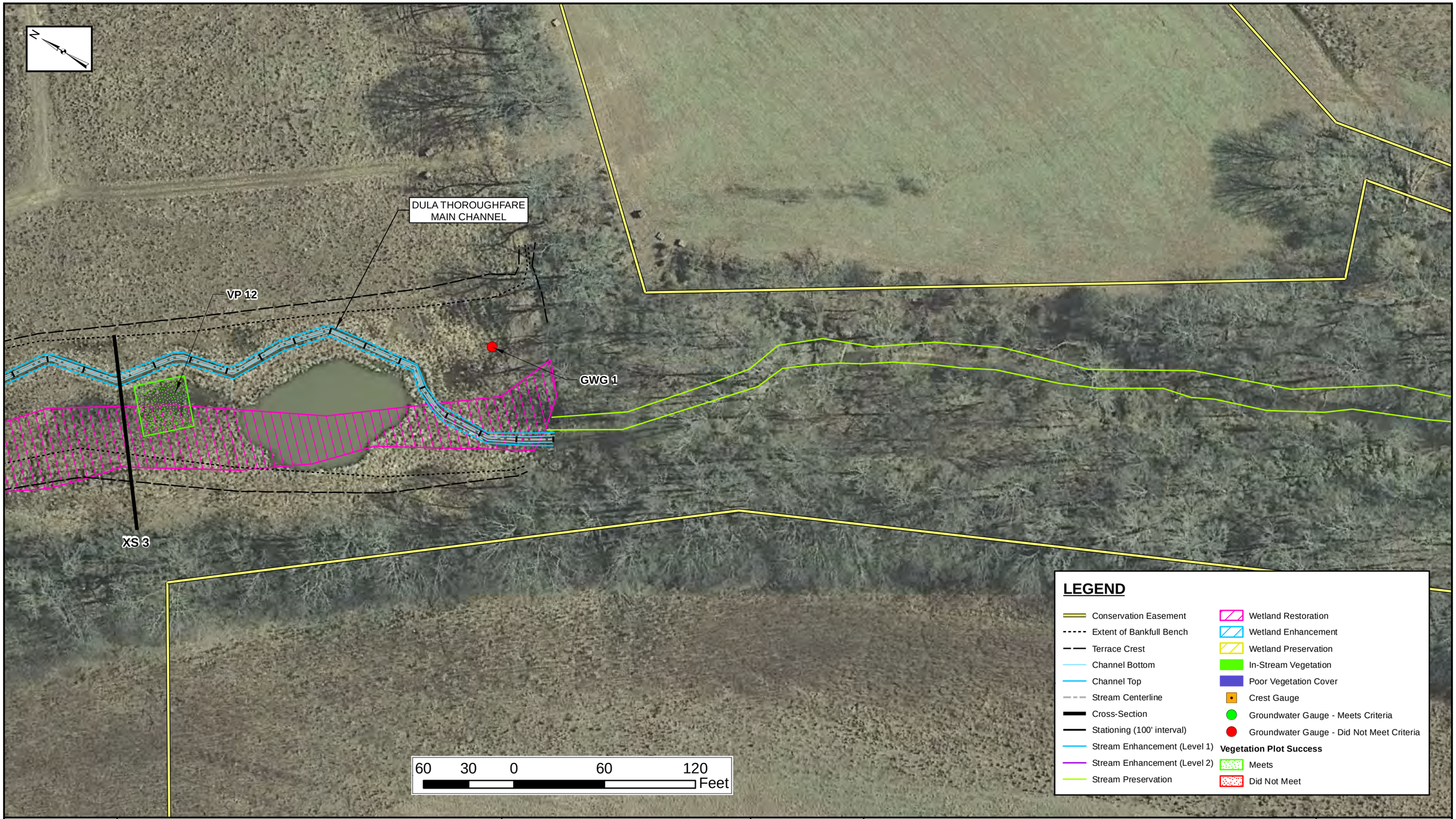

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FIGURE 7 OF 16

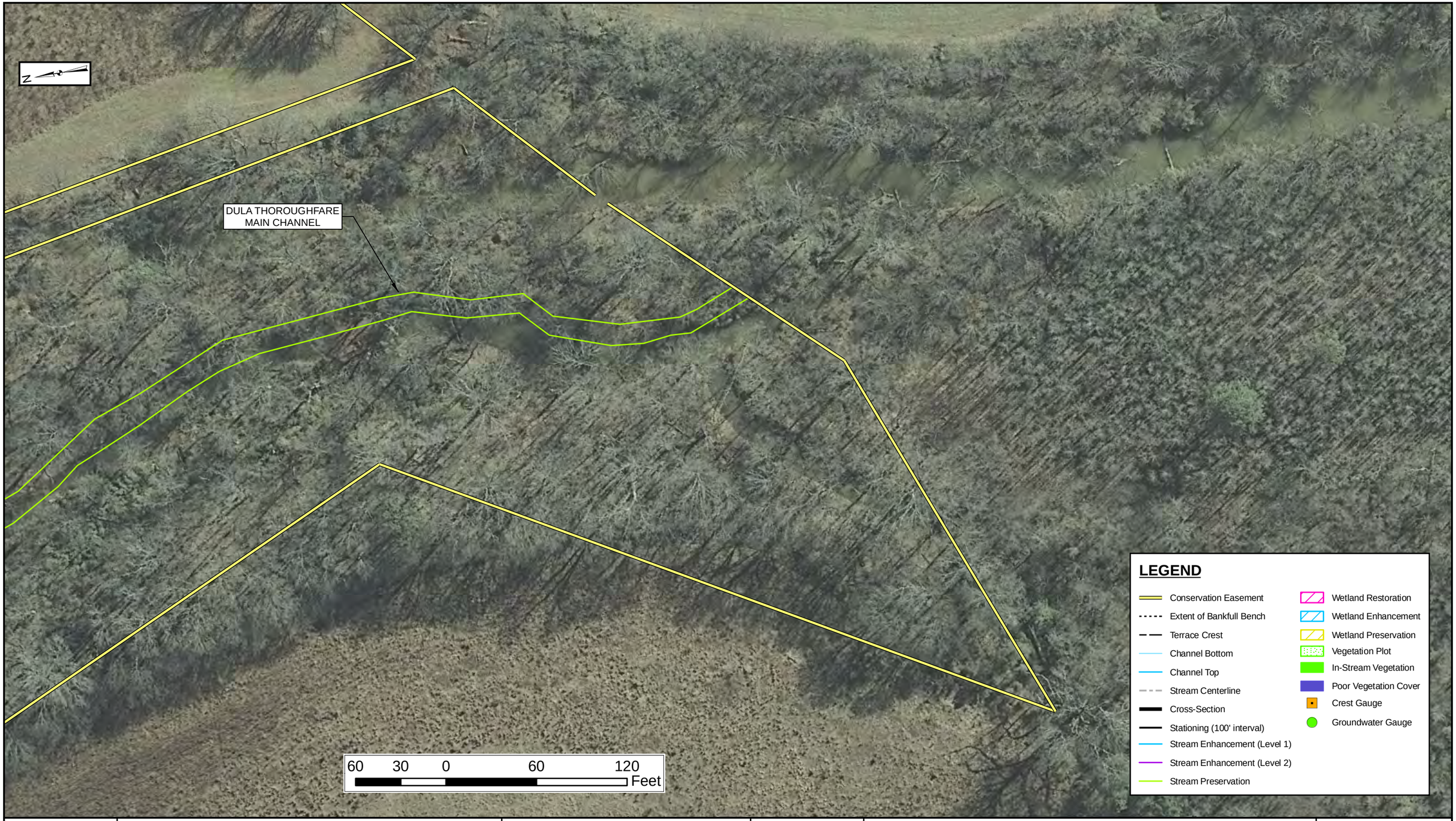

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FIGURE 8 OF 16

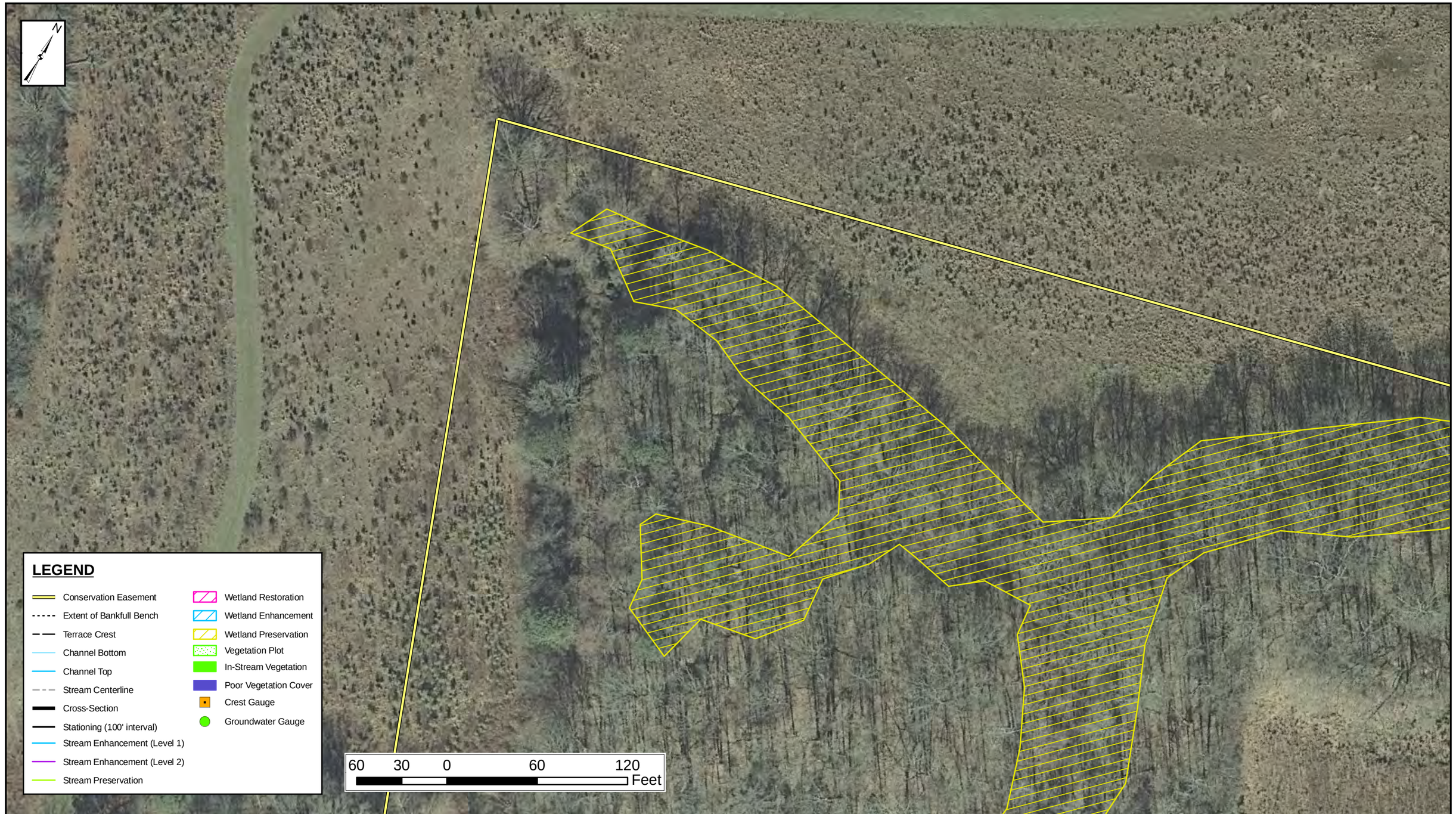

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FIGURE 9 OF 16

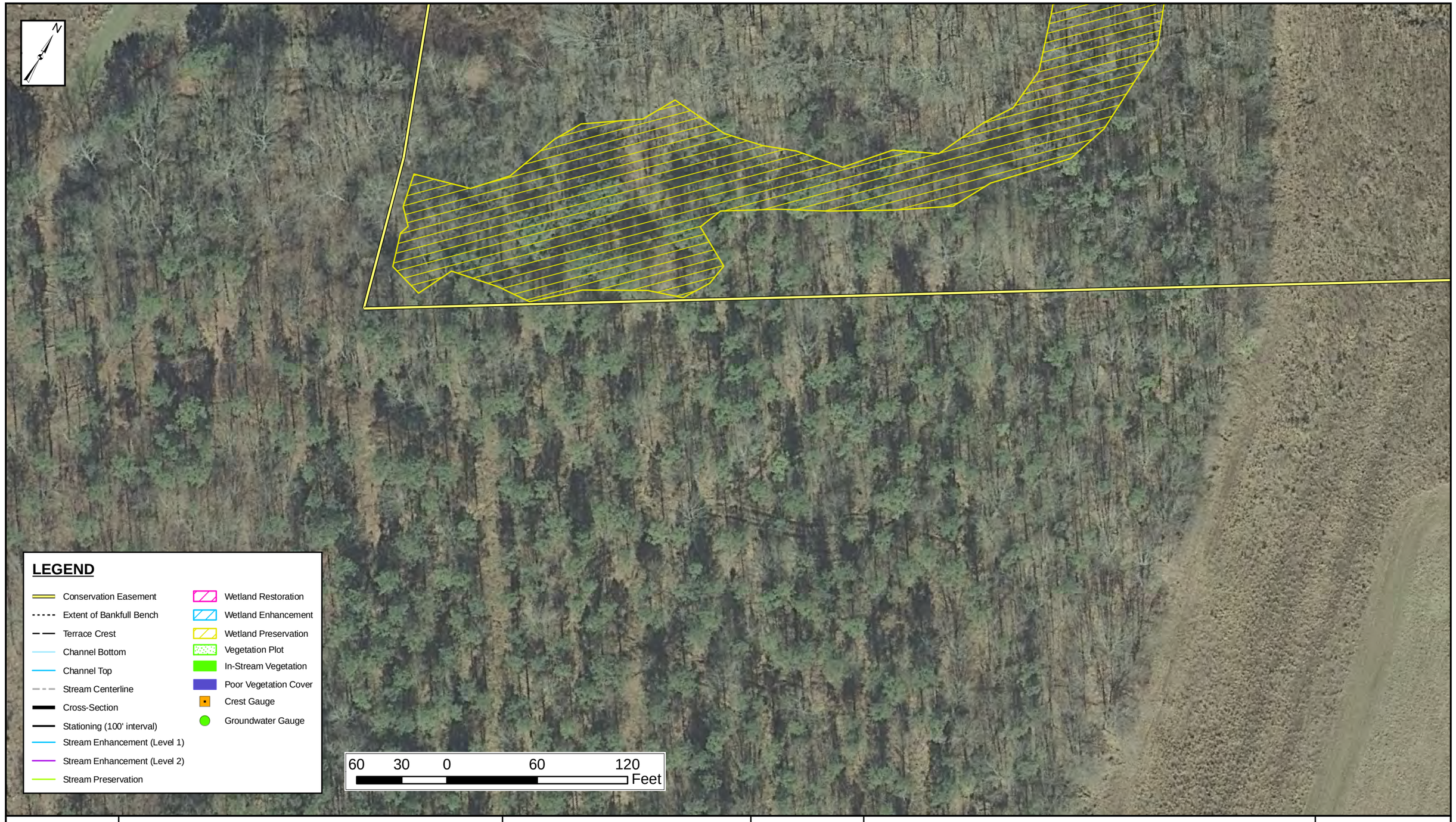

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FIGURE 10 OF 16

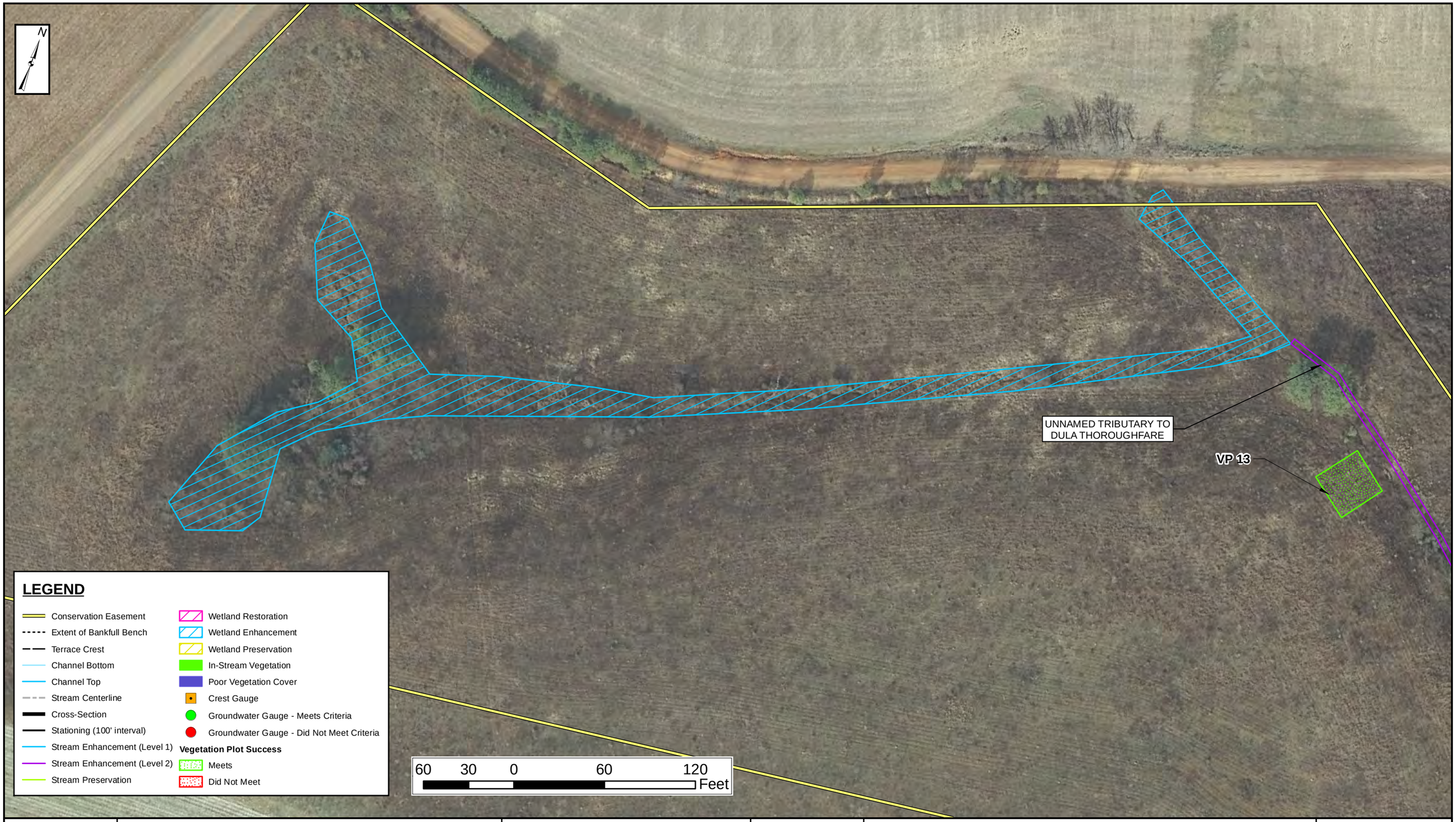

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FIGURE 11 OF 16

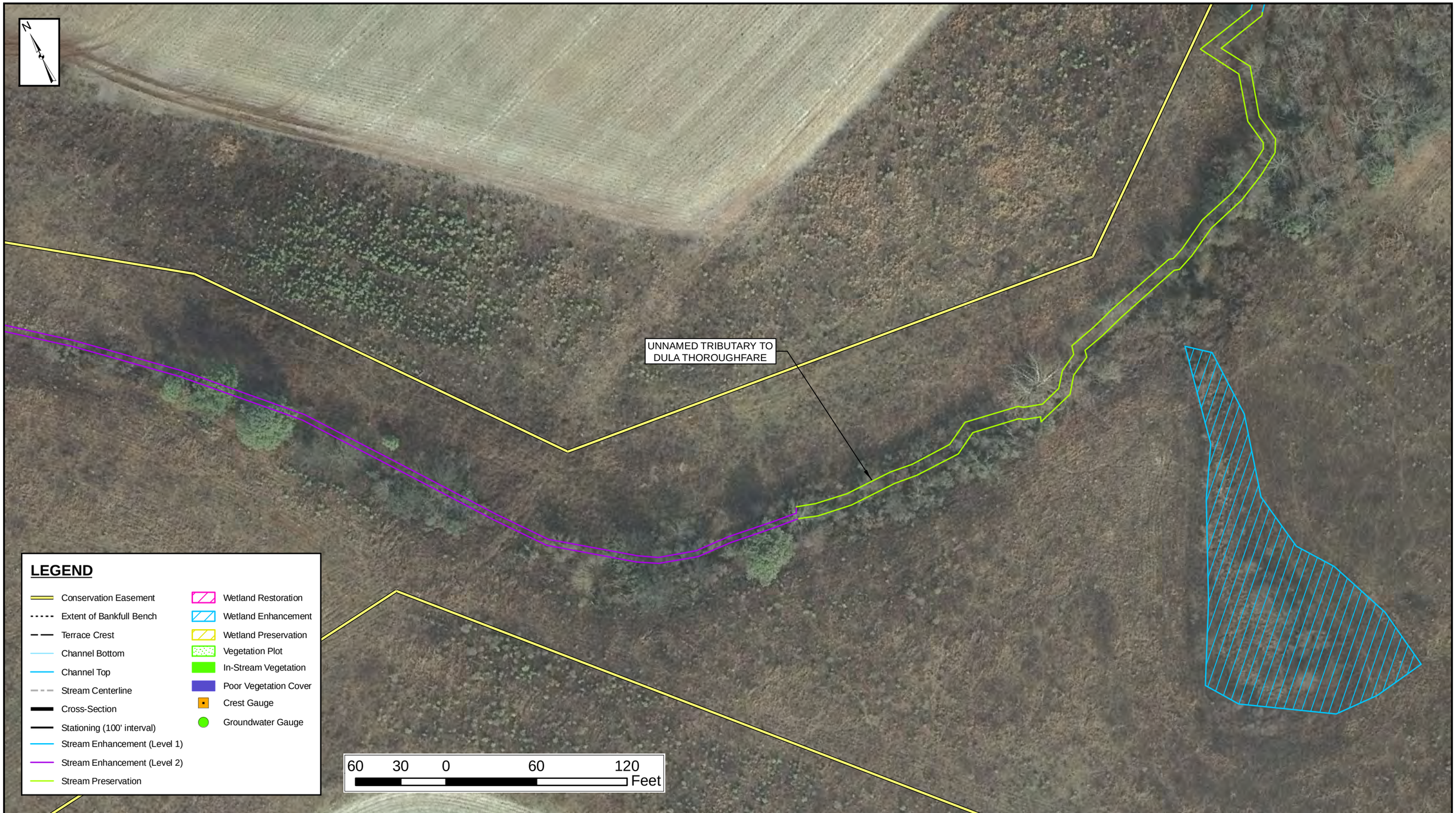

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FIGURE 12 OF 16

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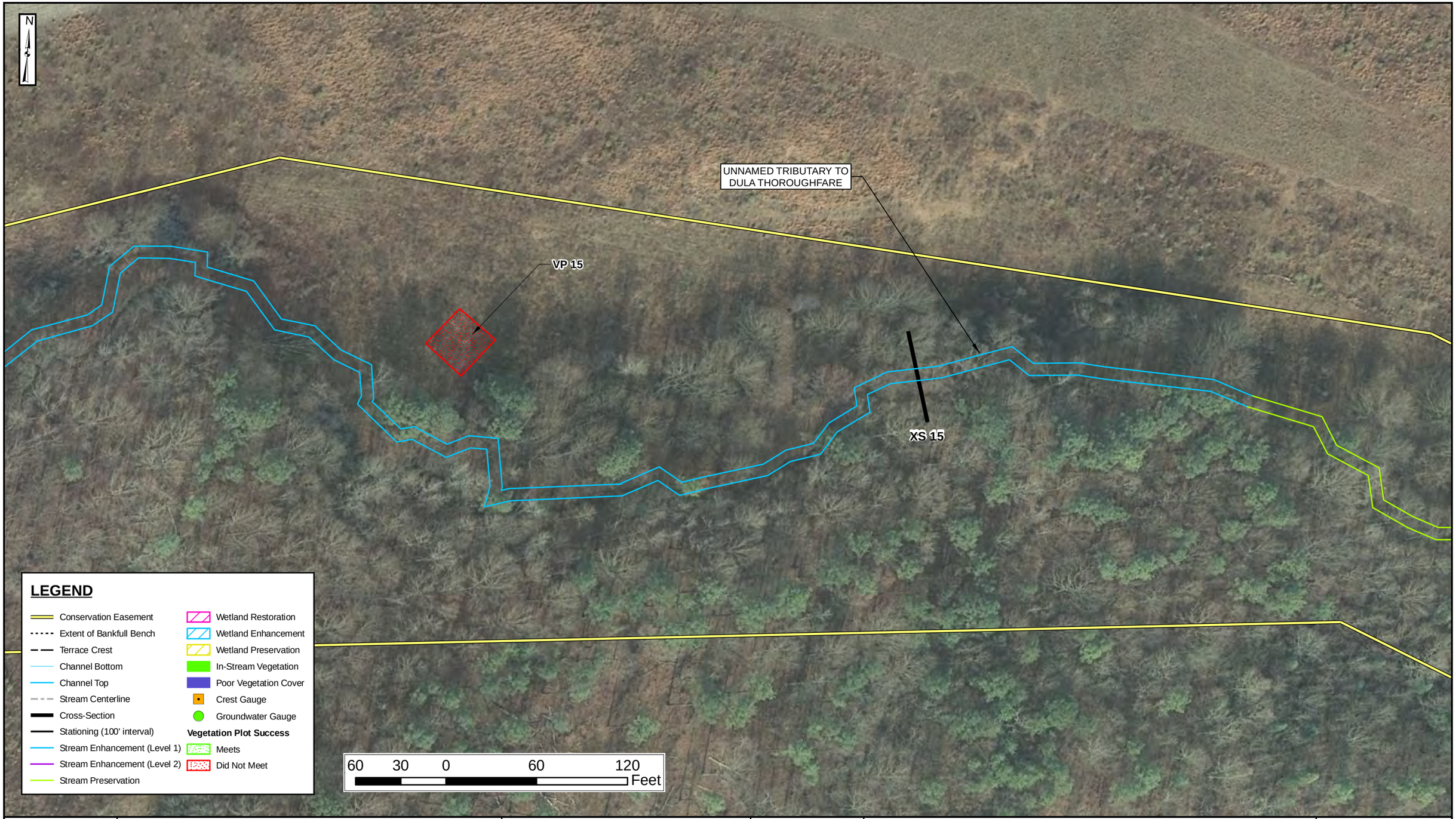
FIGURE 13 OF 16



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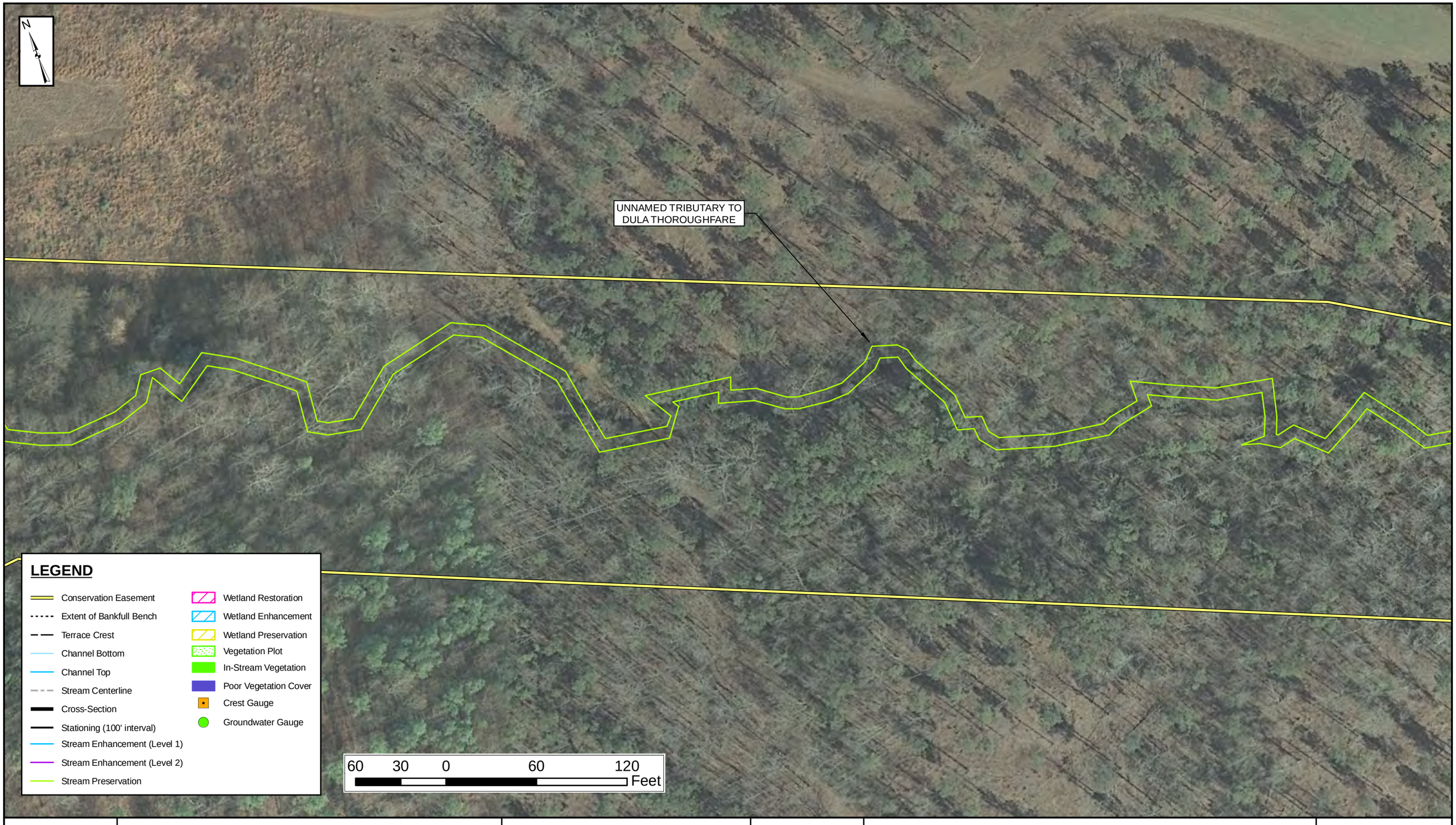
JOB NO.: JJX31100

FIGURE 14 OF 16



NOTES:
1. GENERAL SITE DATA ARE PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE

PROJECT NO. 65
ANSON COUNTY
NORTH CAROLINA
MONITORING YEAR 4 OF 5

NC ECOSYSTEM ENHANCEMENT PROGRAM

DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
SCALE: 1" = 60'
JOB NO.: JJX31100

FIGURE 15 OF 16

NOTES:
1. GENERAL SITE DATA ARE PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE

PROJECT NO. 65
ANSON COUNTY
NORTH CAROLINA
MONITORING YEAR 4 OF 5

NC ECOSYSTEM ENHANCEMENT PROGRAM

DULA THOROUGHFARE AND UT TO DULA THOROUGHFARE STREAM AND WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE: JUNE 2011
SCALE: 1" = 60'
JOB NO.: JJX31100

FIGURE 16 OF 16

APPENDIX 2
GENERAL PROJECT TABLES

2.1 Project Components and Mitigation Credits

2.2 Project Activity and Reporting History

2.3 Project Contacts

2.4 Project Background

Table 2.1. Project Components and Mitigation Credits Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65						
Mitigation Credits						
	Stream	**Riparian Wetland**	**Non-riparian Wetland**	**Buffer**	**Nitrogen Nutrient Offset**	**Phosphorous Nutrient Offset**
Type	R, EI, EII, P	R, WE, P	N/A			
Totals	11,436 lf	6.4 ac	N/A	N/A	N/A	N/A
Project Components						
Project Component/Reach ID	**Stationing (ft)**	**Existing Footage/ Acreage**	**Approach**	**Restoration or Restoration Equivalent**	**Restoration Footage or Acres**	**Mitigation Ratio**
Reach 1-DT Main Channel	0+00 – 20+25	2,025 lf	P2	Restoration	2,025 lf	1:1
Reach 2-DT Tributary	0+00 – 7+05	705 lf	P2	Restoration	705 lf	1:1
Reach 3-UT to DT	N/A*	1,871 lf	N/A	Enhancement Level 1	1,871 lf	1.5:1
Reach 4-UT to DT	N/A*	480 lf	N/A	Enhancement Level 2	480 lf	2.5:1
Stream Preservation **	N/A	6,355 lf	N/A	Preservation	6,355 lf	5:1
Riparian Wetland Restoration	N/A	3.1 ac	N/A	Restoration	3.1 ac	1:1
Riparian Wetland Enhancement	N/A	1.0 ac	N/A	Wetland Enhancement	1.0 ac	2:1
Riparian Wetland Preservation	N/A	2.3 ac	N/A	Preservation	2.3 ac	5:1
Component Summations						
Restoration Level	**Stream (linear feet)**	**Riparian Wetland (acres)**		**Non-riparian Wetland (acres)**	**Buffer (square feet)**	**Upland (acres)**
		Riverine	**Non-Riverine**			
Restoration (R)	2,730	3.1	N/A	N/A	N/A	N/A
Enhancement (E)		1	N/A	N/A	N/A	N/A
Enahncement I (E)	1,871					
Enhancement II (E)	480					
Creation (C)		N/A	N/A	N/A		
Preservation (P)	6,355	2.3	N/A	N/A		N/A
HQ Preservation (P)	N/A	N/A	N/A	N/A		N/A
Totals	**11,436**	**6.4**	**N/A**	**N/A**	**N/A**	**N/A**
BMP Elements						
Element	**Location**	**Purpose/Function**		**Notes**		
N/A	N/A	N/A		N/A		

BMP Elements

BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP - Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

Appendix 2.2 Project Activity and Reporting History
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

Activity or Report	Data Collection Completed	Actual Completion or Delivery
Restoration Plan	Aug-04	Sep-04
Final Design (90%)	Mar-05	Jun-05
Construction	N/A*	Feb-07
Temporary S&E mix applied to entire project area*	N/A	Throughout construction
Permanent seed mix applied to reach/segments	N/A	Oct-06
Bare Root Seedling Installation	N/A	Feb-07
Mitigation Plan	Jun-07	Oct-07
Final Report	Jun-07	Oct-07
Year 1 Monitoring	Oct-07 /Dec-07	Oct-07 /Dec-08
Year 2 Monitoring	May-08/Sept-08	Oct-08
Year 3 Monitoring	Jul-09/Jan-10	Jan-10
Year 4 Monitoring	Jun-10/Feb-11	Feb-11
Year 5 Monitoring	TBD	TBD

*Seed and mulch is added as each section of construction is completed.

Appendix 2.3 Project Contacts Table
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

Designer	EcoScience Corporation 1101 Haynes Street, Suite 101 Raleigh, NC 27604 919- 828-3433
Construction	Vaughn Contruction, Inc. Tommy Vaughn and Spencer Walker (Foremen) P.O. Box 796 Wadesboro, NC 28170 704- 694-6450
Planting Contractor	Kiker Forestry and Realty P.O. Box 933 Wadesboro, NC 28170 704- 694-6436
Seeding Contractor	N/A
Monitoring Performers	
Year 1	EcoScience Corporation 1101 Haynes Street, Suite 101 Raleigh, NC 27604 919- 828-3433
Year 2-present	Jordan, Jones & Goulding 309 E. Morehead St., Suite 110 Charlotte, NC 28202
Stream Monitoring, POC	Alison Nichols, 704-527-4106 ext.227
Vegetation Monitoring, POC	

Table 2.4 Project Attribute Table
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

Project County	Anson County, North Carolina
Drainage Areas:	
DT	0.36 square miles
UT to DT	0.23 square miles
Impervious cover estimate (%)	<1 percent for all streams
Stream Orders (per USGS)	1st
DT and UT to DT	
Physiographic Region	Piedmont
Ecoregion (Griffith and Omernik)	Triassic Basins
Rosgen Classifications of As-built:	E5
Dula Thoroughfare	E/D5
UT to Dula Thoroughfare	
Cowardin Classification	Streams: R2UB12/R4SB23
	Wetlands: PFO1
Dominant soil types	Badin Channery Silt Loam (BaB, BaC) Badin-Goldston Complex (BgD) McQueen (MrB) Shellbluff (ShA) Tetotum (ToA) Chewacla (ChA)
Reference Site ID	N/A* (reference areas established on-Site)
USGS HUCs for Project and Reference	03040104 and 03040105
NCDWQ Sub-basins for Project and Reference	03-07-10
NCDWQ classification for Project and Reference	C
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
Percent of project easement fenced	No fencing along easement

APPENDIX 3
VEGETATION ASSESSMENT DATA

3.1 Vegetation Plot Mitigation Success

3.2 Vegetation Monitoring Plot Photos

3.3 Vegetation Plot Summary Data Table

3.4 Vegetation Condition Assessment

Appendix 3.1 Vegetation Plot Mitigation Success
Dula Thoroughfare Stream and Wetland Restoration/EEP Project 65
Dula Thoroughfare and UT Dula Thoroughfare
Monitoring Year 4 of 5

Vegetation Plot ID	Vegetation Survival Threshold Met
	(Y/N)
Plot 8	Y
Plot 9	Y
Plot 10	Y
Plot 11	Y
Plot 12	Y
Plot 13	Y
Plot 14	N
Plot 15	N

Vegetation Plot 8
(1/2011)

Vegetation Plot 9
(1/2011)

Vegetation Plot 10
(1/2011)

Vegetation Plot 11
(1/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix 3.2 Vegetation Monitoring Plot Photos
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5
Submittal Date: March 2011

Prepared by:

JJG

Vegetation Plot 12
(1/2011)

Vegetation Plot 13
(1/2011)

Vegetation Plot 14
(1/2011)

Vegetation Plot 15
(1/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix 3.2 Vegetation Monitoring Plot Photos
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5
Submittal Date: March 2011

Prepared by:

JJG

Appendix 3.3 Vegetation Plot Summary Data Table
Dula Thoroughfare/EEP Project No. 65
Monitoring Year 4 of 5

			Current Data (MY4-2010)										Annual Means							
			Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Current Mean		MY1 - 2007		MY2 - 2008		MY3 - 2009	
Species	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer negundo	box-elder	T		1									N/A	1	N/A	N/A	N/A	1	N/A	N/A
Baccharis hamilifolia	groundsel tree	S		1		1							N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
Betula nigra	river birch	T	1	1	16	16	13	14	2	2	3	3	7	7	7	7	7	9	7	7
Carya ovata	shagbark hickory	T							1	1			1	1	1	1	1	1	1	1
Celtis laevigata	sugarberry	T					1	1					1	1	1	1	1	1	1	1
Cephalanthus occidentalis	common buttonbush	T	1	2	5	5	3	3			3	4	3	4	3	3	3	3	3	3
Cornus amomum	silky dogwood	T	3	3	9	12	3	3			1	1	4	5	4	4	4	5	4	4
Fraxinus pennsylvanica	green ash	T	3	4			4	4				3	4	4	3	3	4	3	4	4
Liquidambar styraciflua	sweet gum	T								4		2	N/A	3	N/A	N/A	N/A	1	N/A	N/A
Nyssa biflora	swamp tupelo	T	1	1	1	1							1	1	1	1	1	1	1	1
Pinus taeda	loblolly pine	T				1							N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
Platanus occidentalis	American sycamore	T			1	1			5	5			3	3	3	3	3	3	3	3
Quercus michauxii	swamp chestnut oak	T	2	2			1	1	1	1			1	1	1	1	1	1	1	1
Quercus pagoda	cherrybark oak	T	2	2	1	3	1	1			1	1	1	2	1	1	1	1	1	1
Quercus phellos	willow oak	T	2	5	2	2	1	1	1	1			2	2	2	2	2	2	2	2
Quercus rubra	Northern red oak	T		1									N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
Quercus sp.	oak species	T											N/A	N	N/A	N/A	N/A	3	N/A	N/A
Ulmus alata	winged elm	T								58			N/A	58	N/A	N/A	N/A	N/A	N/A	N/A
Ulmus americana	American elm	T			3	4	1	1	1	1		25	2	8	2	2	2	3	2	2
	Plot Area (acres)		**0.0247**																	
	Species Count		**8**	**11**	**8**	**10**	**9**	**9**	**6**	**8**	**4**	**7**	**12**	**16**	**7**	**7**	**7**	**8**	**12**	**12**
	Stem Count		**15**	**23**	**38**	**46**	**28**	**29**	**11**	**73**	**8**	**39**	**29**	**101**	**21**	**21**	**20**	**24**	**29**	**29**
	Stems per Acre		**607**	**931**	**1538**	**1862**	**1134**	**1174**	**445**	**2955**	**324**	**1579**	**810**	**1700**	**842**	**842**	**802**	**980**	**810**	**818**

Type=**S**hrub or **T**ree
P = Planted
T = Total

Appendix 3.3 Vegetation Plot Summary Data Table
UT to Dula Thoroughfare/EEP Project No. 65
Monitoring Year 4 of 5

			Current Data (MY4-2010)						Annual Means							
			Plot 13		Plot 14		Plot 15		Current Mean		MY1 - 2007		MY2 - 2008		MY3 - 2009	
Species	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer rubrum	red maple	T						17	N/A	17	N/A	N/A	N/A	N/A	N/A	N/A
Carya glabra	pignut hickory	T						1	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
Celtis laevigata	sugarberry	T	2	2					2	2	4	4	2	3	3	3
Cornus amomum	silky dogwood	T							N/A	N/A	N/A	N/A	N/A	2	N/A	N/A
Cornus florida	flowering dogwood	S					1	1	1	1	1	1	1	1	1	1
Diospyros virginiana	common persimmon	T		2				5	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A
Fagus grandifolia	American beech	T	1	3			1	1	1	2	1	1	1	1	1	1
Liquidambar styraciflua	sweet gum	T						5	N/A	5	N/A	N/A	N/A	1	N/A	N/A
Nyssa biflora	swamp tupelo	T							N/A	N/A	1	1	1	1	1	1
Pinus taeda	loblolly pine	T		19				2	N/A	11	N/A	N/A	N/A	N/A	N/A	N/A
Quercus falcata	southern red oak	T	2	2	2	2	1	1	2	2	2	2	1	1	2	2
Quercus phellos	willow oak	T					1	1	1	1	1	1	1	2	1	1
Quercus rubra	northern red oak	T	5	5			2	2	4	4	4	4	4	4	4	4
Rhus glabra	smooth sumac	S		2				3	N/A	3	N/A	N/A	N/A	N/A	N/A	N/A
Taxodium distichum	bald cypress	T		1					N/A	1	N/A	N/A	N/A	N/A	N/A	N/A
	Plot Area (acres)		**0.0247**													
	Species Count		**4**	**8**	**1**	**1**	**5**	**11**	**4**	**8**	**4**	**4**	**4**	**4**	**6**	**6**
	Stem Count		**10**	**36**	**2**	**2**	**6**	**39**	**7**	**27**	**8**	**8**	**6**	**6**	**9**	**9**
	Stems per Acre		**405**	**1457**	**81**	**81**	**243**	**1579**	**243**	**1039**	**310**	**310**	**243**	**256**	**283**	**283**

Type=**S**hrub or **T**ree
P = Planted
T = Total

Appendix 3.4 Vegetation Condition Assessment
Dula Thoroughfare/EEP Project No. 65
Monitoring Year 4 of 5

Planted Acreage **9**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0	0.00%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	0	0	0%
		Total	**0**	**0**	**0.00%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.				

Easement Acreage **71**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1000	0	0	0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

Appendix 3.4 Vegetation Condition Assessment
UT to Dula Thoroughfare/EEP Project No. 65
Monitoring Year 4 of 5

Planted Acreage **17**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0	0.00%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	0	0	0%
		Total	**0**	**0**	**0.00%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.		1	0.05	0.003

Easement Acreage **34**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1000	0	0	0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

APPENDIX 4
STREAM ASSESSMENT DATA

4.1 Stream Station and Cross-Section Photos

4.2 Qualitative Visual Stability Assessment

4.3 Verification of Bankfull Events

4.4 Cross-Section Plots and Raw Data Tables*

4.5 Longitudinal Plots and Raw Data Tables*

4.6 Pebble Count Plots and Raw Data Tables*

*Raw data tables have been provided electronically.

Photo Point 1-Upstream (2/2011)

Photo Point 1-Downstream (2/2011)

Photo Point 2-Upstream (2/2011)

Photo Point 2-Downstream (2/2011)

Photo Point 3 - Main Channel (2/2011)

Photo Point 4-Upstream (2/2011)

Photo Point 4-Downstream (2/2011)

Cross-Section 1-Upstream
Dula Thoroughfare (2/2011)

Cross-Section 1-Downstream
Dula Thoroughfare (2/2011)

Cross-Section 2-Upstream
Dula Thoroughfare (2/2011)

Cross-Section 2-Downstream
Dula Thoroughfare (2/2011)

Prepared For:	Dula Thoroughfare Stream Restoration Monitoring Year 4 of 5	Date: March 2011 EEP Project No.: 65
	Appendix 4.1 Stream Station and Cross-Section Photos	

Cross-Section 3-Upstream
Dula Thoroughfare (2/2011)

Cross-Section 3-Downstream
Dula Thoroughfare (2/2011)

Cross-Section 4-Upstream
Dula Thoroughfare (2/2011)

Cross-Section 4-Downstream
Dula Thoroughfare (2/2011)

Prepared For:	Dula Thoroughfare Stream Restoration Monitoring Year 4 of 5	Date: March 2011 EEP Project No.: 65
	Appendix 4.1 Stream Station and Cross-Section Photos	

Cross-Section 5-Upstream
UT Dula Thoroughfare (2/2011)

Cross-Section 5-Downstream
UT Dula Thoroughfare (2/2011)

Cross-Section 6-Upstream
UT Dula Thoroughfare (2/2011)

Cross-Section 6-Downstream
UT Dula Thoroughfare (2/2011)

Cross-Section 7-Upstream
UT Dula Thoroughfare (2/2011)

Cross-Section 7-Downstream
UT Dula Thoroughfare (2/2011)

Appendix 4.2a Qualitative Visual Stability Assessment
Dula Thoroughfare - Main Channel (2,025 lf)
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

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	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition*	Texture/Substrate	N/A*	N/A*			N/A			
	3. Meander Pool Condition	Depth Sufficient	8	30			27%			
		Length Appropriate	8	30			27%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	30	30			100%			
		Thalweg centering at downstream of meander bend (Glide)	30	30			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	17	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	1	17	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	N/A	0			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	N/A	0			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	0			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	N/A	0			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	N/A	0			N/A			

*As in previous years, the stream bed features consist of runs and small pools and lack well-defined riffle features.

Appendix 4.2b Qualitative Visual Stability Assessment
Dula Thoroughfare - Tributary (705 lf)
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

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	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition*	Texture/Substrate	N/A	0			N/A			
	3. Meander Pool Condition	Depth Sufficient	N/A	11			N/A			
		Length Appropriate	0	11			0%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	11	11			100%			
		Thalweg centering at downstream of meander bend (Glide)	11	11			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			5	328	77%	0	0	77%
	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	5	328	77%	0	0	77%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	N/A	0			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	N/A	0			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	0			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	N/A	0			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	N/A	0			N/A			

*The stream bed features consist mainly of runs and small pools.

Appendix 4.2c Qualitative Visual Stability Assessment
UT to Dula Thoroughfare (2,351 lf)
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

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	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition*	Texture/Substrate	N/A	0			N/A			
	3. Meander Pool Condition	Depth Sufficient	N/A	0			N/A			
		Length Appropriate	N/A	0			N/A			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	N/A	0			N/A			
		Thalweg centering at downstream of meander bend (Glide)	N/A	0			N/A			
2. Bank	**1. Scoured/Eroded**	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.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	N/A	N/A			N/A			

Appendix 4.3 Verification of Bankfull Events
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Monitoring Year 4 of 5

Date of Collection	Date of Occurrence	Method	Photo # (if available)
12/2007	N/A*	Crest Gauge (Main Channel and Tributary)	N/A
9/30/2008	Unknown	Crest Gauge (Main Channel and Tributary)	N/A
6/2009	Unknown	Crest Gauge (Main Channel and Tributary)	N/A
1/2011	Unknown	Visual Observation (Main Channel and Tributary)	N/A

Appendix 4.4 Cross-Section Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

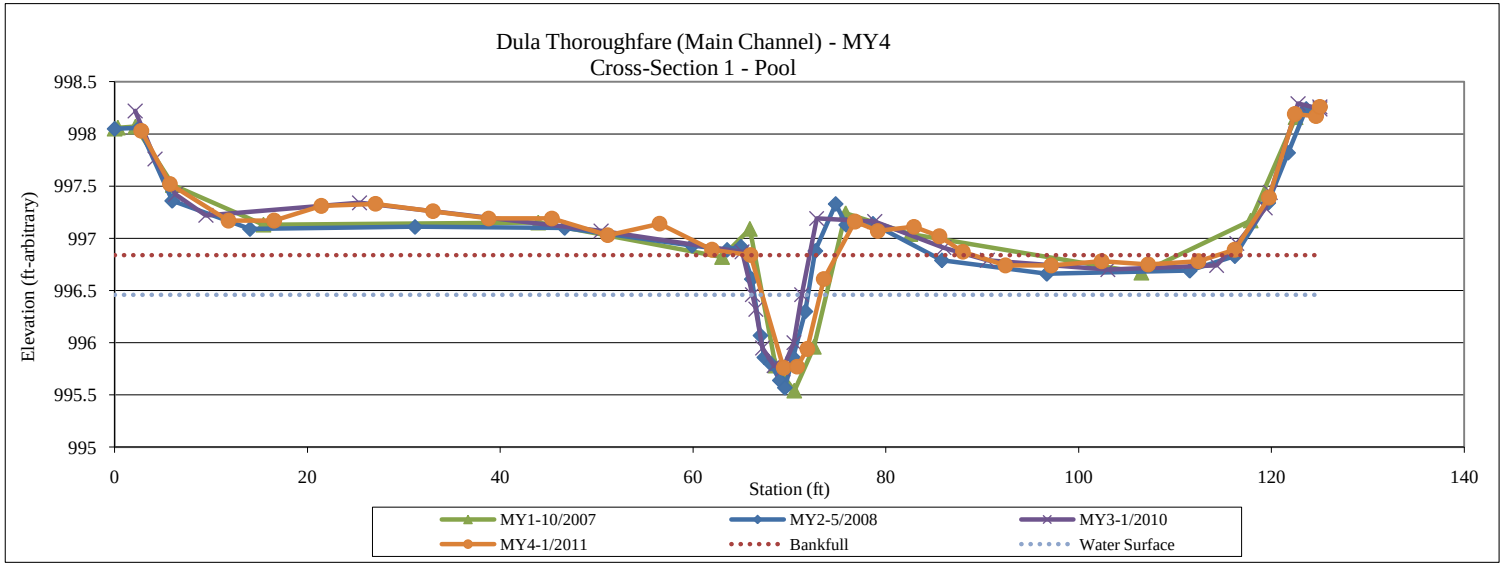
Project Name	**Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-1, Riffle, 1+93**
Survey Date	**1/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	996.84
Bankfull Cross-Sectional Area (ft^2)	5.52
Bankfull Width (ft)	8.95
Flood Prone Area Elevation (ft)	997.92
Flood Prone Width (ft)	116.34
Bankfull Mean Depth (ft)	0.62
Bankfull Max Depth (ft)	1.08
W/D Ratio	14.40
Entrenchment Ratio	13.00
Bank Height Ratio	1.00

XS-1: View Upstream

XS-1: View Downstream

Station	Elevation	Notes
2.77	998.03	xs1
5.74	997.52	xs1
11.81	997.17	xs1
16.54	997.17	xs1
21.44	997.31	xs1
27.06	997.33	xs1
33.02	997.26	xs1
38.8	997.19	xs1
45.36	997.19	xs1
51.15	997.03	xs1
56.53	997.14	xs1
61.96	996.89	xs1
65.97	996.84	xs1
69.4	995.76	xs1
70.8	995.77	xs1
71.86	995.94	xs1
73.57	996.61	xs1
76.79	997.16	xs1
79.17	997.07	xs1
82.91	997.11	xs1
85.56	997.02	xs1
88	996.87	xs1
92.41	996.74	xs1
97.15	996.74	xs1
102.39	996.78	xs1
107.22	996.75	xs1
112.43	996.78	xs1
116.2	996.89	xs1
119.75	997.39	xs1



Station	Elevation	Notes
122.43	998.19	xs1
124.63	998.17	xs1
125.02	998.26	xs1-rpt

Appendix 4.4 Cross-Section Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

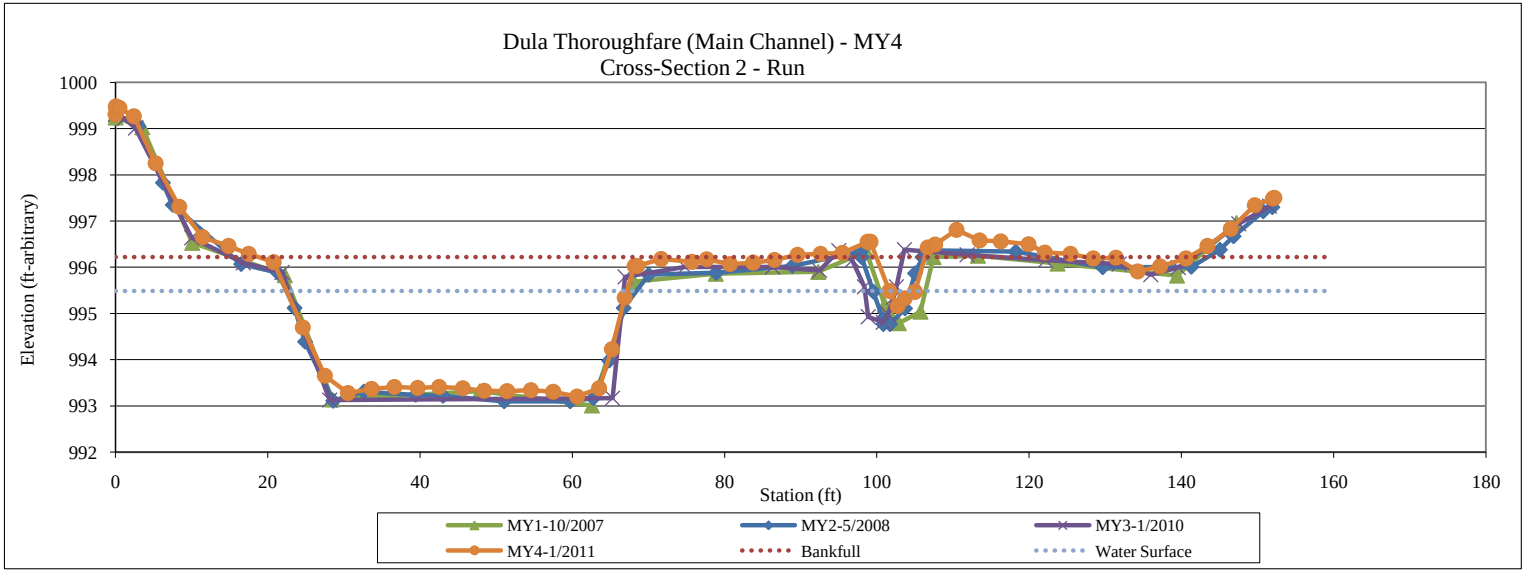
Project Name	**Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-2, Run, 10+21**
Survey Date	**1/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	996.22
Bankfull Cross-Sectional Area (ft^2)	4.08
Bankfull Width (ft)	6.35
Flood Prone Area Elevation (ft)	999.24
Flood Prone Width (ft)	149.75
Bankfull Mean Depth (ft)	0.64
Bankfull Max Depth (ft)	3.02
W/D Ratio	9.92
Entrenchment Ratio	23.57
Bank Height Ratio	1.00

XS-2: View Upstream

XS-2: View Downstream

Station	Elevation	Notes
0	999.31	xs2-lpt
0.08	999.45	xs2
0.06	999.48	xs2
0.52	999.45	xs2
2.39	999.27	xs2
5.27	998.25	xs2
8.39	997.31	xs2
11.44	996.65	xs2
14.86	996.46	xs2
17.49	996.29	xs2
20.77	996.11	xs2
24.6	994.7	xs2
27.51	993.65	xs2
30.53	993.28	xs2
33.65	993.37	xs2
36.62	993.41	xs2
39.71	993.39	xs2
42.49	993.41	xs2
45.6	993.38	xs2
48.42	993.33	xs2
51.44	993.32	xs2
54.56	993.34	xs2
57.49	993.31	xs2
60.63	993.2	xs2
63.51	993.38	xs2
65.19	994.23	xs2
66.87	995.34	xs2-re
68.17	996.03	xs2-b-po
68.54	996.03	xs2



Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
71.66	996.18	xs2	92.62	996.29	xs2	105	995.47	xs2-rew	122.06	996.32	xs2	143.41	996.46	xs2
75.72	996.12	xs2	95.46	996.31	xs2	106.67	996.43	xs2-rb	125.44	996.29	xs2	146.48	996.83	xs2
77.66	996.17	xs2	98.77	996.55	xs2	107.64	996.49	xs2	128.41	996.19	xs2	149.63	997.34	xs2
80.73	996.07	xs2	99.18	996.55	xs2-lb	110.49	996.81	xs2	131.4	996.21	xs2	152.05	997.49	xs2
83.74	996.1	xs2	101.66	995.49	xs2-lew	113.48	996.58	xs2	134.27	995.91	xs2	152.22	997.5	xs2-rpt
86.55	996.16	xs2	102.74	995.16	xs2	116.28	996.56	xs2	137.19	996.02	xs2			
89.6	996.27	xs2	103.66	995.33	xs2	119.92	996.5	xs2	140.61	996.19	xs2			

Appendix 4.4 Cross-Section Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

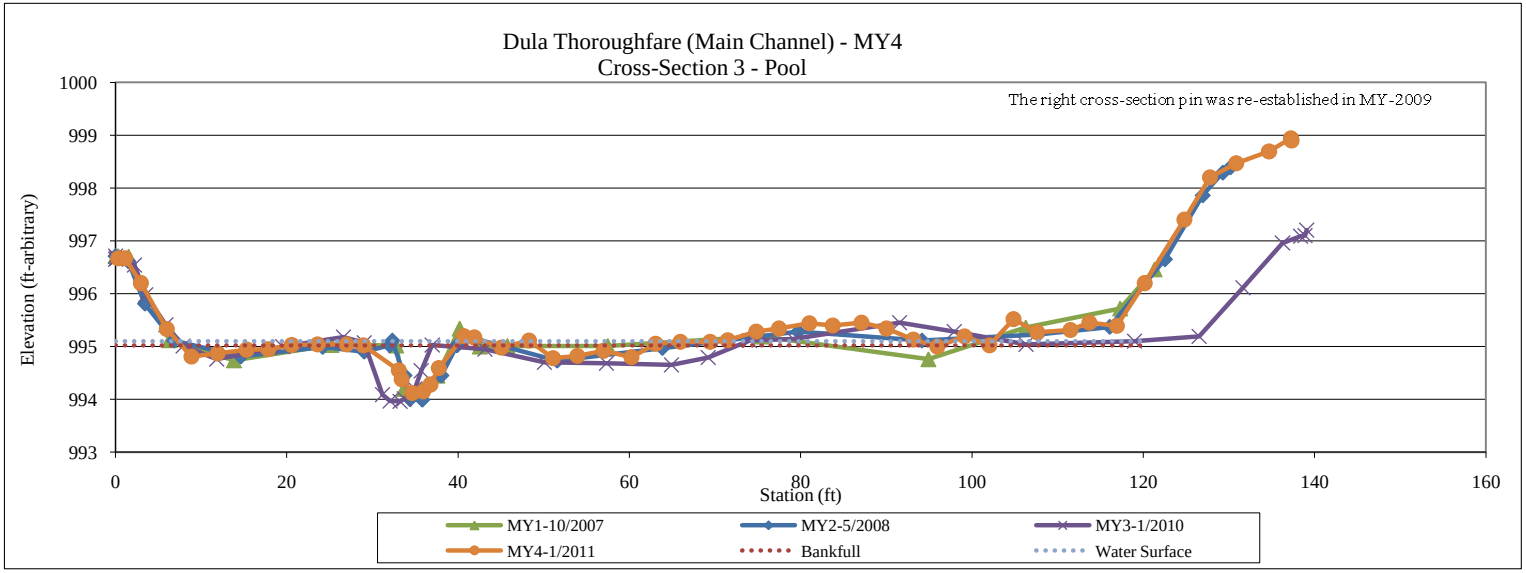
Project Name	**Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-3, Pool, 16+99**
Survey Date	**1/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	995.02
Bankfull Cross-Sectional Area (ft^2)	4.94
Bankfull Width (ft)	10.87
Flood Prone Area Elevation (ft)	995.92
Flood Prone Width (ft)	115.11
Bankfull Mean Depth (ft)	0.45
Bankfull Max Depth (ft)	0.90
W/D Ratio	24.16
Entrenchment Ratio	10.59
Bank Height Ratio	1.00

XS-3: View Upstream

XS-3: View Downstream

Station	Elevation	Notes
0	996.71	xs3-lpt
0	996.16	xs3-lpt
0.31	996.67	xs3
1.13	996.67	xs3
2.96	996.2	xs3
5.98	995.33	xs3
8.86	994.81	xs3
11.92	994.87	xs3
15.31	994.94	xs3
17.85	994.95	xs3
20.58	995.03	xs3
23.6	995.04	xs3
27	995.04	xs3
28.94	995.02	xs3-lb
33.06	994.55	xs3-lew
33.4	994.38	xs3
34.66	994.12	xs3
35.93	994.15	xs3
36.78	994.28	xs3
37.74	994.59	xs3-rew
40.67	995.2	xs3-rb
41.91	995.17	xs3
45.06	994.98	xs3
48.28	995.11	xs3
51.08	994.78	xs3
53.91	994.82	xs3
56.99	994.92	xs3
60.24	994.8	xs3
63.06	995.05	xs3



Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
65.97	995.09	xs3	87.11	995.45	xs3	107.62	995.27	xs3	130.84	998.47	xs3			
69.43	995.09	xs3	90	995.34	xs3	111.5	995.31	xs3	134.68	998.69	xs3			
71.48	995.12	xs3	93.17	995.13	xs3	113.7	995.45	xs3	137.24	998.94	xs3			
74.82	995.28	xs3	95.96	995	xs3	116.92	995.39	xs3	137.32	998.9	xs3-rpt			
77.46	995.34	xs3	99.14	995.19	xs3	120.16	996.2	xs3						
81.02	995.44	xs3	102.04	995.02	xs3	124.79	997.4	xs3						
83.75	995.4	xs3	104.84	995.52	xs3	127.78	998.2	xs3						

Appendix 4.4 Cross-Section Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Tributary
Monitoring Year 4 of 5

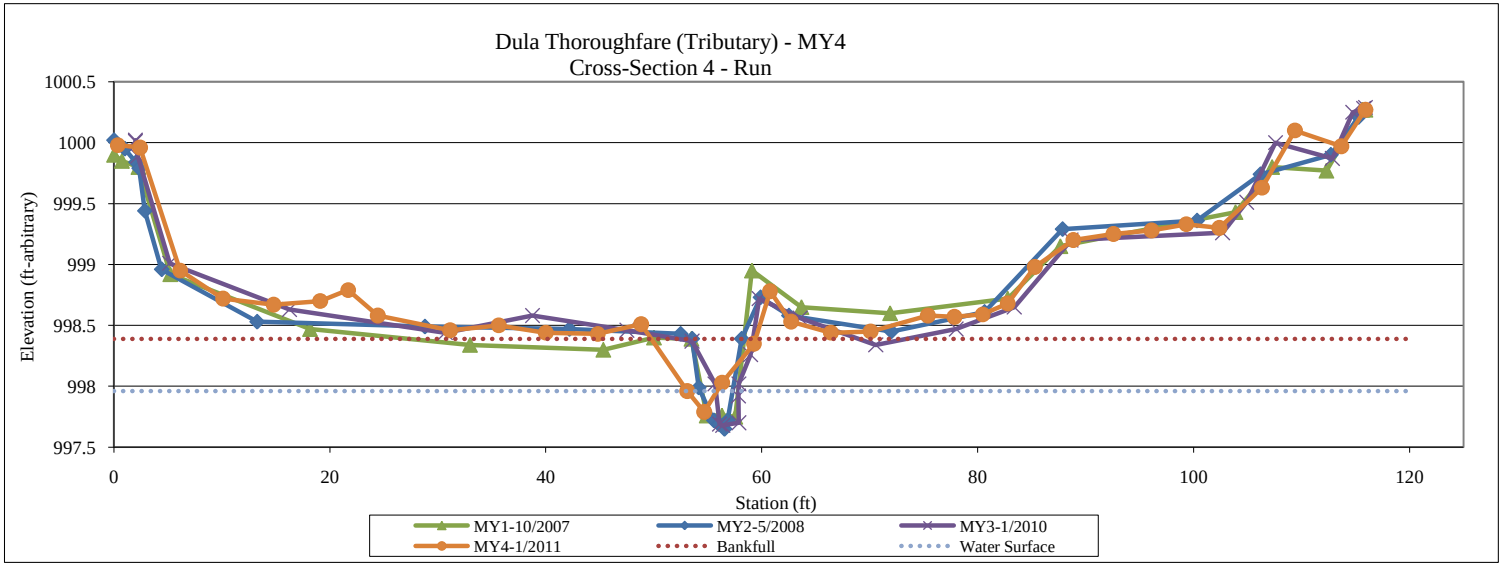
Project Name	**Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-4, Run**
Survey Date	**1/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	998.39
Bankfull Cross-Sectional Area (ft^2)	2.92
Bankfull Width (ft)	9.66
Flood Prone Area Elevation (ft)	998.99
Flood Prone Width (ft)	79.46
Bankfull Mean Depth (ft)	0.30
Bankfull Max Depth (ft)	0.60
W/D Ratio	32.20
Entrenchment Ratio	8.23
Bank Height Ratio	1.00

XS-4: View Upstream

XS-4: View Downstream

Station	Elevation	Notes
-0.71	999.48	xs4-lpt
0.37	999.98	xs4
2.42	999.96	xs4
6.14	998.95	xs4
10.11	998.72	xs4
14.79	998.67	xs4
19.11	998.7	xs4
21.7	998.79	xs4
24.45	998.58	xs4
31.14	998.46	xs4
35.64	998.5	xs4
40	998.44	xs4
44.82	998.43	xs4
48.84	998.51	xs4
53.1	997.96	xs4-lew
54.67	997.79	xs4
56.33	998.03	xs4-rew
59.29	998.35	xs4
60.77	998.78	xs4-rew
62.72	998.53	xs4
66.41	998.44	xs4
70.09	998.45	xs4
75.39	998.58	xs4
77.85	998.57	xs4
80.47	998.59	xs4
82.79	998.68	xs4
85.29	998.98	xs4
88.87	999.2	xs4
92.59	999.25	xs4



Station	Elevation	Notes
96.11	999.28	xs4
99.33	999.33	xs4
102.4	999.3	xs4
106.34	999.63	xs4
109.39	1000.1	xs4
113.68	999.97	xs4
115.92	1000.27	xs4-rpt

Appendix 4.4 Cross-Section Plots and Raw Data Tables
UT Dula Thoroughfare Stream Restoration/EEP Project No. 65
Monitoring Year 4 of 5

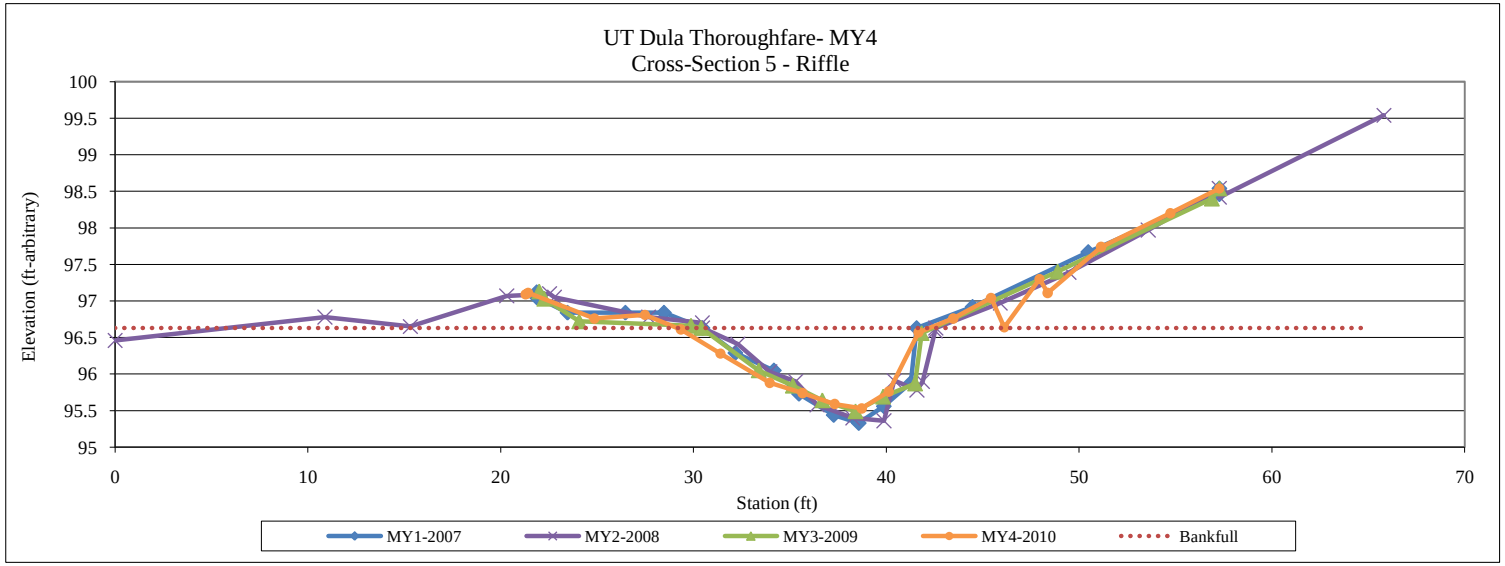
Project Name	**UT Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-5, Riffle**
Survey Date	**1/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	96.63
Bankfull Cross-Sectional Area (ft^2)	8.41
Bankfull Width (ft)	13.08
Flood Prone Area Elevation (ft)	97.93
Flood Prone Width (ft)	29.81
Bankfull Mean Depth (ft)	0.64
Bankfull Max Depth (ft)	1.10
W/D Ratio	20.44
Entrenchment Ratio	2.28
Bank Height Ratio	1.00

XS-5: View Upstream

XS-5: View Downstream

Station	Elevation	Notes
21.29	97.09	xs5-lpt
21.42	97.11	xs5
24.86	96.76	xs5
27.48	96.81	xs5
29.35	96.61	xs5
31.4	96.28	xs5-lb
33.95	95.88	xs5
35.65	95.74	xs5
37.32	95.59	xs5
38.72	95.53	xs5
40.13	95.76	xs5
41.67	96.57	xs5-rb
43.47	96.76	xs5
45.43	97.04	xs5
46.12	96.64	occ1
47.94	97.3	xs5
48.37	97.11	xs5-rpt
51.14	97.74	xs5
54.73	98.2	xs5
57.27	98.54	xs5-rpt



Appendix 4.4 Cross-Section Plots and Raw Data Tables
UT Dula Thoroughfare Stream Restoration/EEP Project No. 65
Monitoring Year 4 of 5

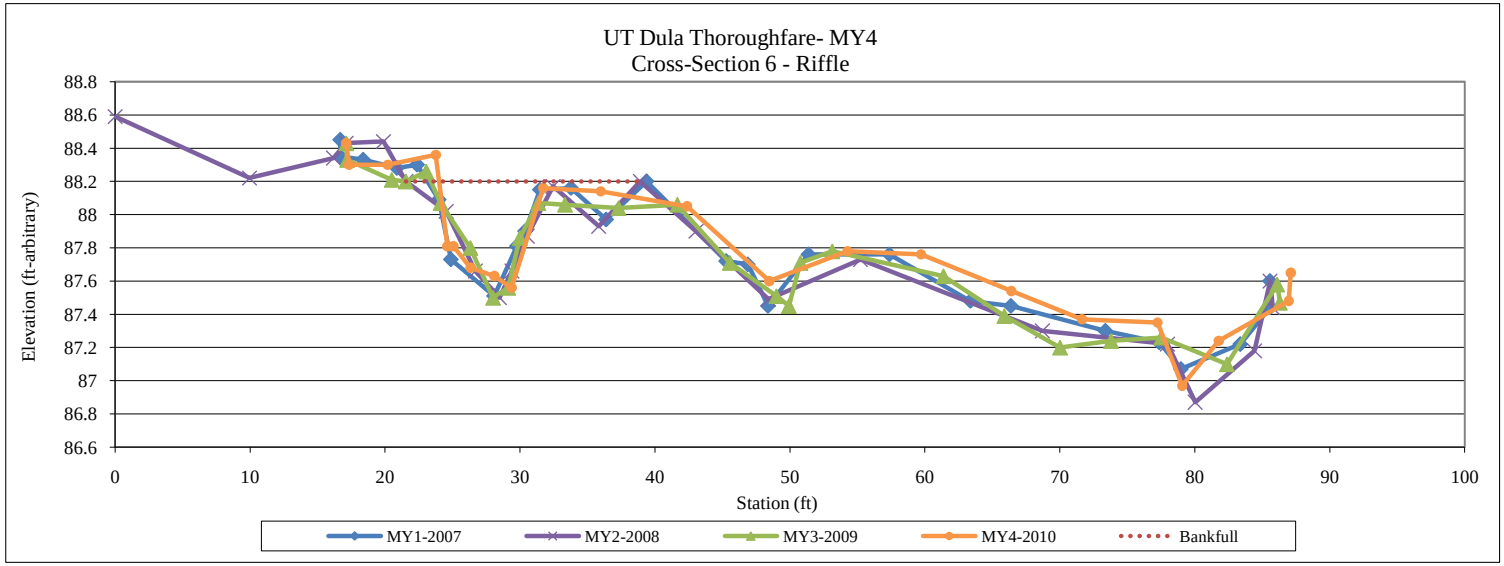
Project Name	**UT Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-6, Riffle**
Survey Date	**1/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	88.20
Bankfull Cross-Sectional Area (ft^2)	3.85
Bankfull Width (ft)	14.90
Flood Prone Area Elevation (ft)	89.43
Flood Prone Width (ft)	69.99
Bankfull Mean Depth (ft)	0.26
Bankfull Max Depth (ft)	1.23
W/D Ratio	57.31
Entrenchment Ratio	4.70
Bank Height Ratio	1.00

XS-6: View Upstream

XS-6: View Downstream

Station	Elevation	Notes
17.12	88.43	xs6-lpt
17.34	88.3	xs6
20.2	88.3	xs6
23.76	88.36	xs14-lb
24.62	87.81	xs6
25.06	87.81	xs6
26.34	87.68	xs6
28.1	87.63	xs6
29.38	87.56	xs6
31.71	88.16	xs14-rb
35.98	88.14	xs6
42.39	88.05	xs6
48.47	87.6	xs6
54.26	87.78	xs6
59.72	87.76	xs6
66.4	87.54	xs6
71.65	87.37	xs6
77.24	87.35	xs6
79.07	86.97	occ1
81.78	87.24	xs6
86.96	87.48	xs6
87.11	87.65	xs6-rpt



Appendix 4.4 Cross-Section Plots and Raw Data Tables
UT Dula Thoroughfare Stream Restoration/EEP Project No. 65
Monitoring Year 4 of 5

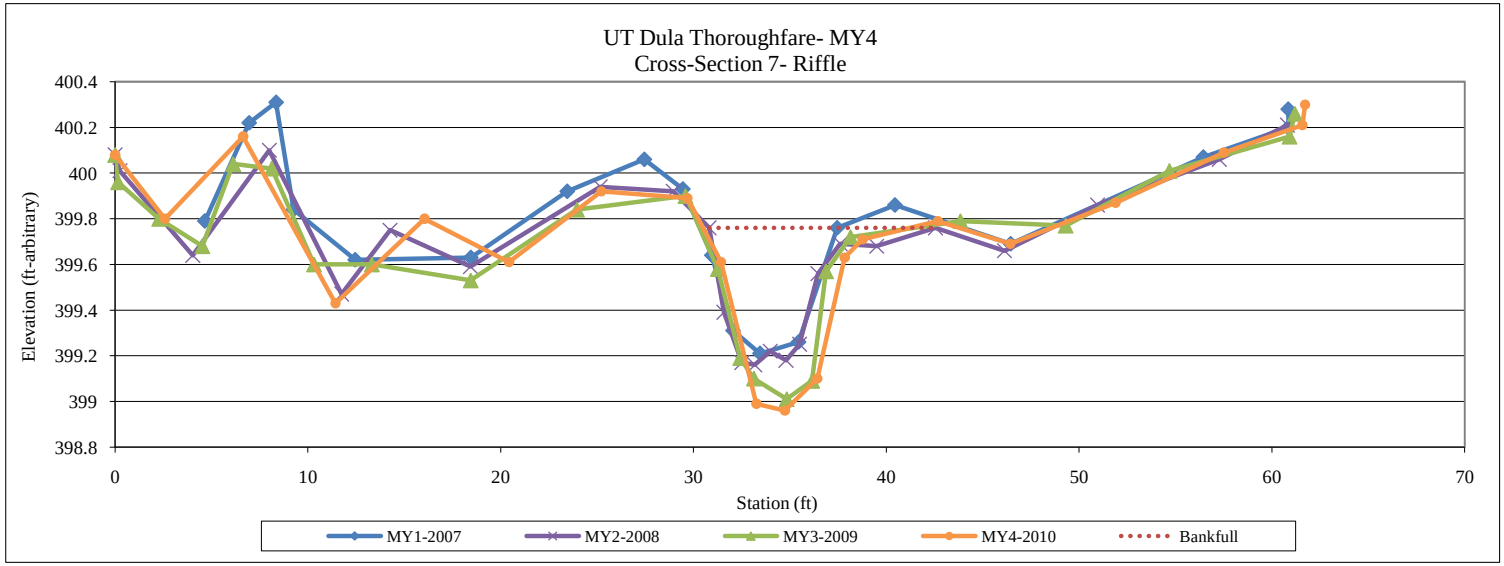
Project Name	**UT Dula Thoroughfare**
EEP Project Number	**65**
Cross-Section ID	**XS-7, Riffle**
Survey Date	**1/2011**

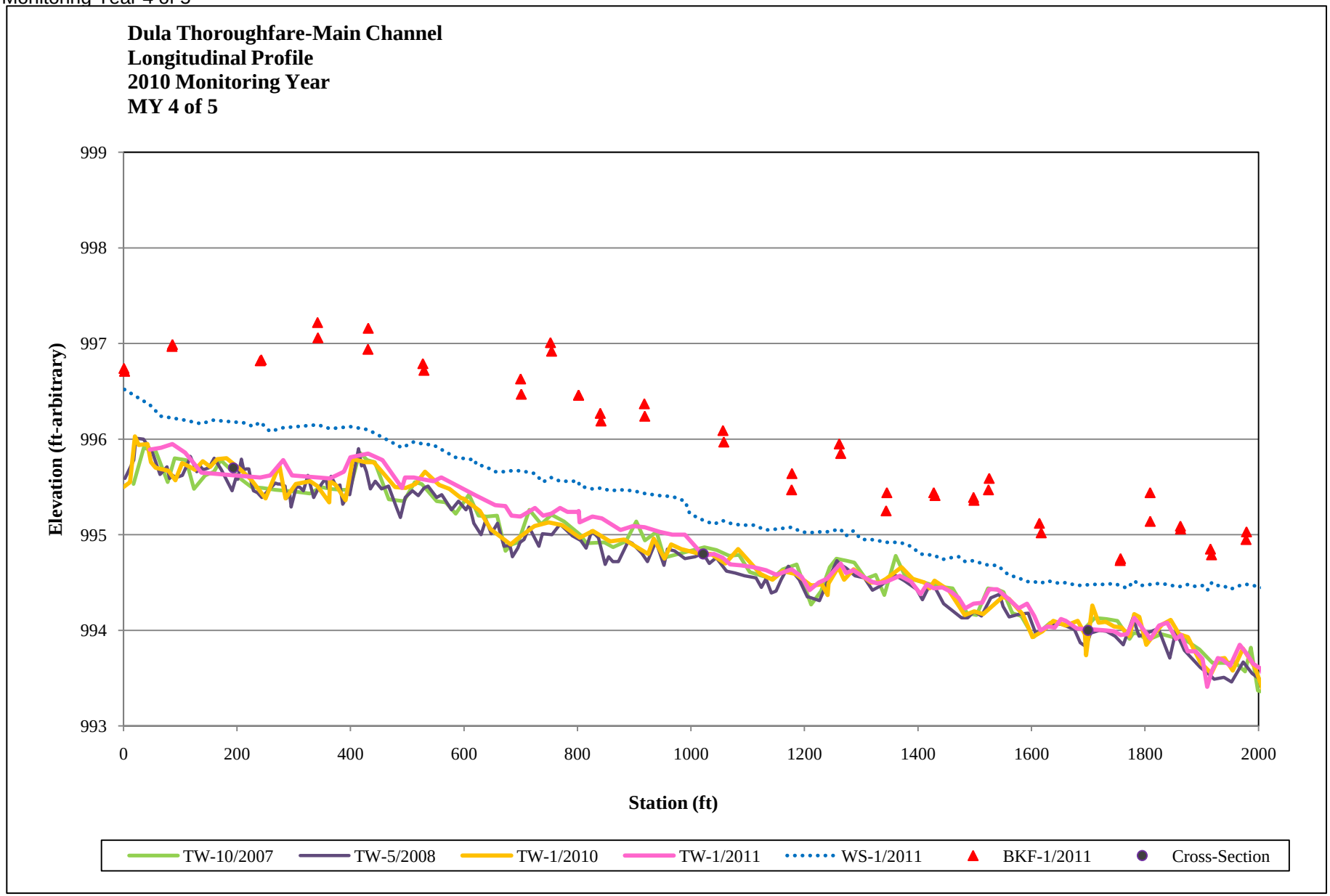
SUMMARY DATA	
Bankfull Elevation (ft)	
Bankfull Cross-Sectional Area (ft^2)	
Bankfull Width (ft)	
Flood Prone Area Elevation (ft)	
Flood Prone Width (ft)	
Bankfull Mean Depth (ft)	
Bankfull Max Depth (ft)	
W/D Ratio	
Entrenchment Ratio	
Bank Height Ratio	

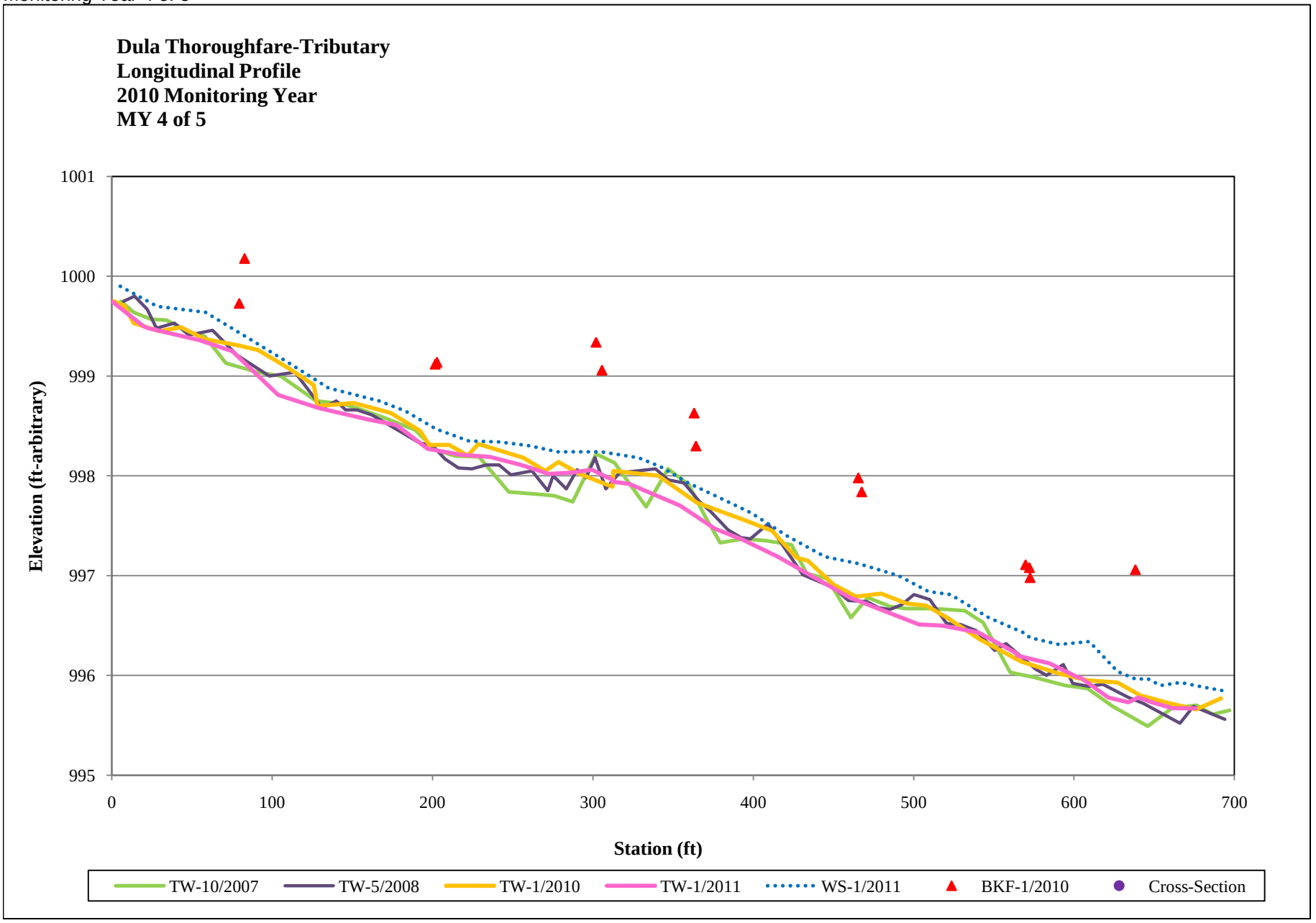
XS-7: View Upstream

XS-7: View Downstream

Station	Elevation	Notes
0	400.08	xs7-lpt
2.59	399.8	xs7
6.64	400.16	xs7
11.43	399.43	xs7
16.05	399.8	xs7
20.43	399.61	xs7
25.22	399.92	xs7
29.68	399.89	xs7-lb
31.43	399.61	xs7
33.26	398.99	xs7
34.74	398.96	xs7
36.42	399.1	xs7
37.84	399.63	xs7
38.77	399.71	xs7-rb
42.67	399.79	xs7
46.43	399.69	xs7
51.89	399.87	xs7
57.5	400.09	xs7
61.58	400.21	xs7
61.72	400.3	xs7-rpt




Dula Thoroughfare-Main Channel
Longitudinal Profile
2010 Monitoring Year
MY 4 of 5
Elevation (ft-arbitrary)
999
998
997
996
995
994
993
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Station (ft)
TW-10/2007
TW-5/2008
TW-1/2010
TW-1/2011
WS-1/2011
BKF-1/2011
Cross-Section

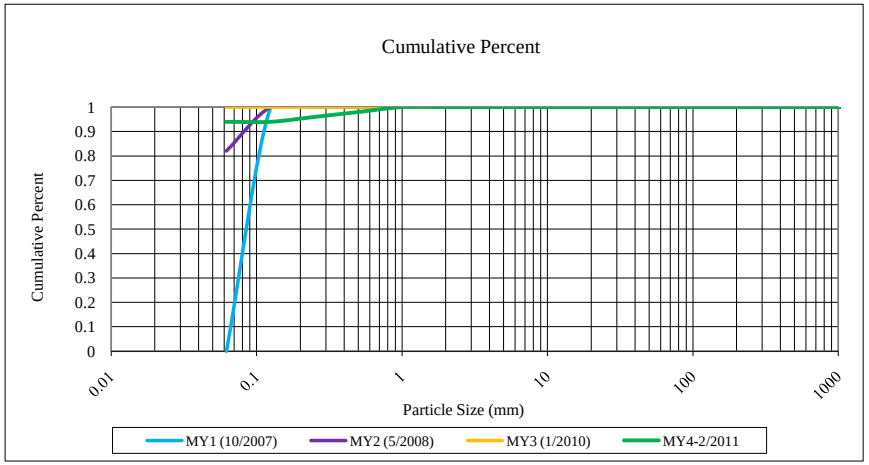

Dula Thoroughfare-Tributary
Longitudinal Profile
2010 Monitoring Year
MY 4 of 5
Elevation (ft-arbitrary)
1001
1000
999
998
997
996
995
0
100
200
300
400
500
600
700
Station (ft)
TW-10/2007
TW-5/2008
TW-1/2010
TW-1/2011
WS-1/2011
BKF-1/2010
Cross-Section

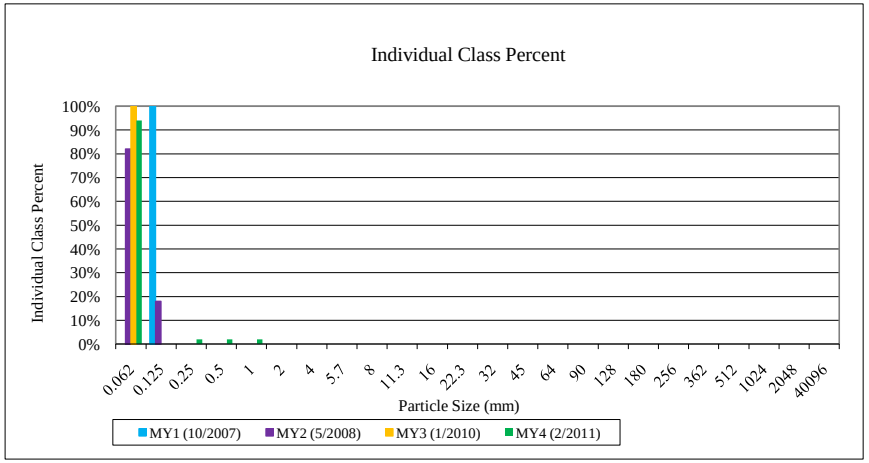
Appendix 4.6 Pebble Count Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

Project Name: Dula Thoroughfare-Main Channel					
Cross-Section: 1					
Feature: Pool					
			MY4-2/2011		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	94	94%	94%
Sand	very fine sand	0.125	0	0%	94%
	fine sand	0.250	2	2%	96%
	medium sand	0.50	2	2%	98%
	coarse sand	1.00	2	2%	100%
	very coarse sand	2.0	0	0%	100%
Gravel	very fine gravel	4.0	0	0%	100%
	fine gravel	5.7	0	0%	100%
	fine gravel	8.0	0	0%	100%
	medium gravel	11.3	0	0%	100%
	medium gravel	16.0	0	0%	100%
	course gravel	22.3	0	0%	100%
	course gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			100	100%	100%

Summary Data	
D50	
D84	
D95	0.188

D50 and D84 were not calculated due to particle size.



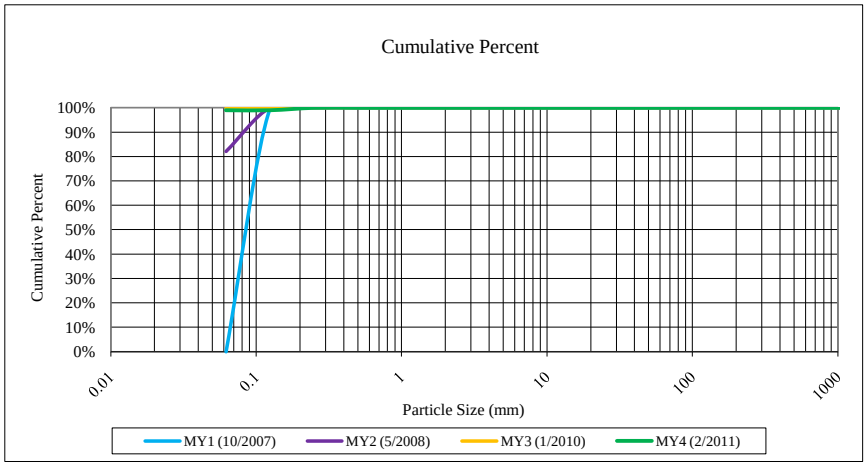


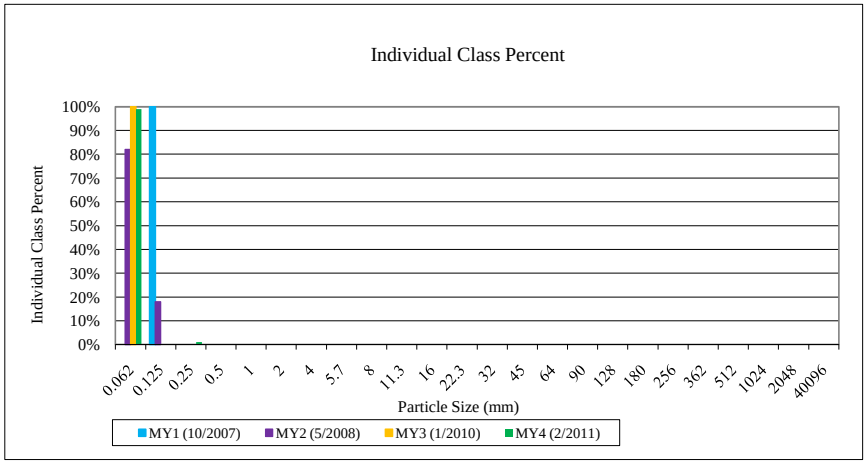
Appendix 4.6 Pebble Count Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

Project Name: Dula Thoroughfare-Main Channel					
Cross-Section: 2					
Feature: Run					
			MY4-2/2011		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	99	99%	99%
Sand	very fine sand	0.125	0	0%	99%
	fine sand	0.250	1	1%	100%
	medium sand	0.50	0	0%	100%
	coarse sand	1.00	0	0%	100%
	very coarse sand	2.0	0	0%	100%
Gravel	very fine gravel	4.0	0	0%	100%
	fine gravel	5.7	0	0%	100%
	fine gravel	8.0	0	0%	100%
	medium gravel	11.3	0	0%	100%
	medium gravel	16.0	0	0%	100%
	course gravel	22.3	0	0%	100%
	course gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			100	100%	100%

Summary Data	
D50	
D84	
D95	

D50, D84 and D95 were not calculated due to particle size.



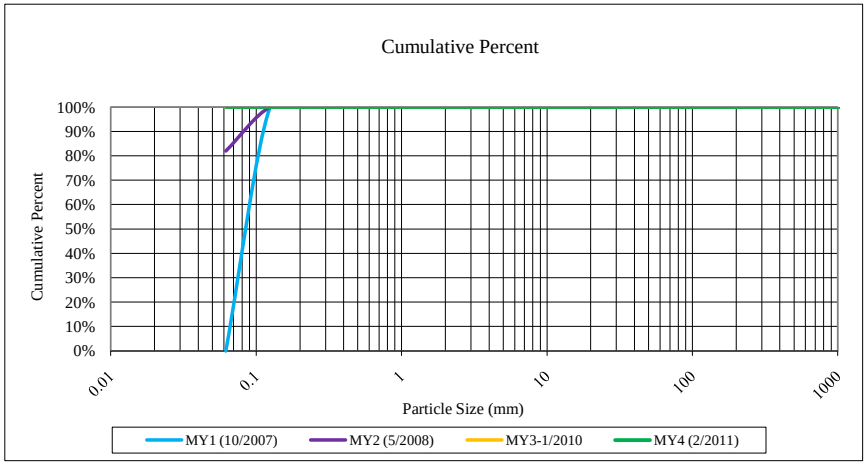


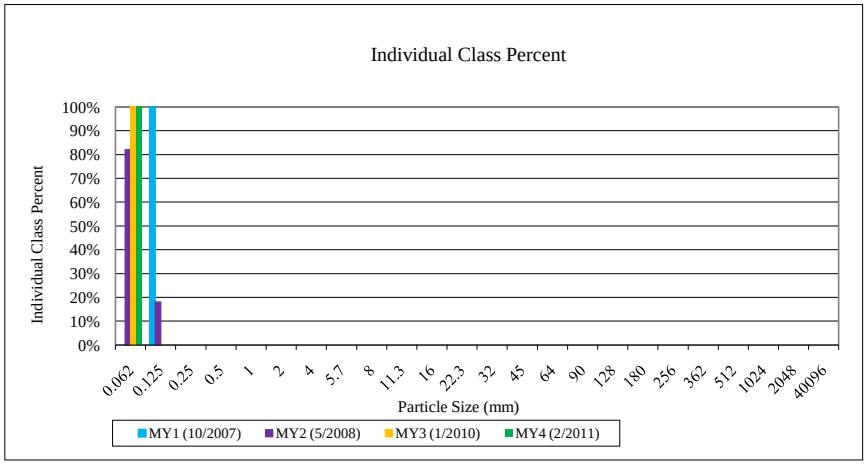
Appendix 4.6 Pebble Count Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

Project Name: Dula Thoroughfare-Main Channel					
Cross-Section: 3					
Feature: Pool					
			MY4-2/2011		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	100	100%	100%
Sand	very fine sand	0.125	0	0%	100%
	fine sand	0.250	0	0%	100%
	medium sand	0.50	0	0%	100%
	coarse sand	1.00	0	0%	100%
	very coarse sand	2.0	0	0%	100%
Gravel	very fine gravel	4.0	0	0%	100%
	fine gravel	5.7	0	0%	100%
	fine gravel	8.0	0	0%	100%
	medium gravel	11.3	0	0%	100%
	medium gravel	16.0	0	0%	100%
	course gravel	22.3	0	0%	100%
	course gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			100	100%	100%

Summary Data	
D50	
D84	
D95	

D50, D84 and D95 were not calculated due to particle size.



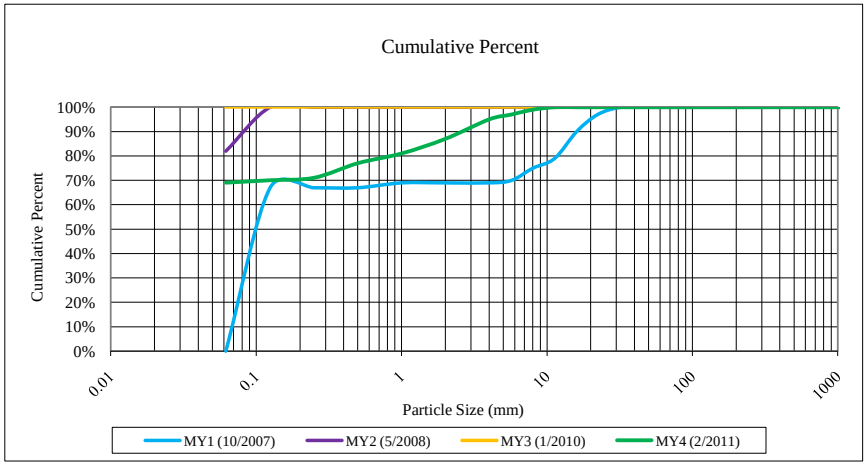


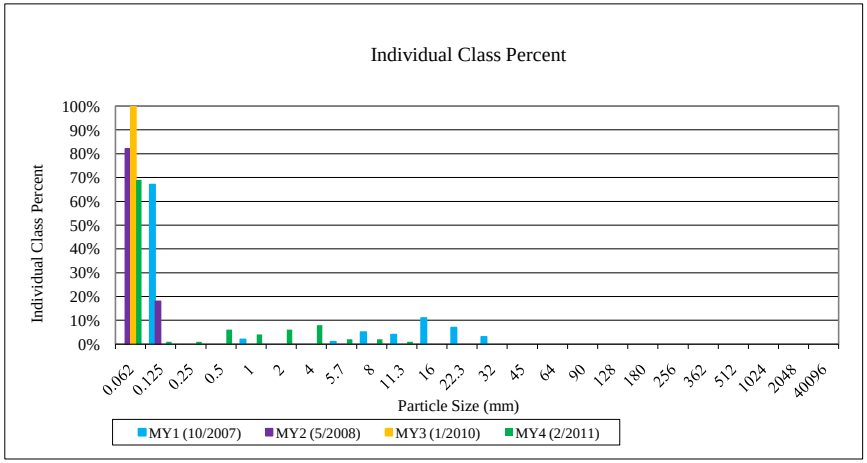
Appendix 4.6 Pebble Count Plots and Raw Data Tables
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Dula Thoroughfare Main Channel
Monitoring Year 4 of 5

Project Name: Dula Thoroughfare-Tributary					
Cross-Section: 4					
Feature: Run					
			MY4-2/2011		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	69	69%	69%
Sand	very fine sand	0.125	1	1%	70%
	fine sand	0.250	1	1%	71%
	medium sand	0.50	6	6%	77%
	coarse sand	1.00	4	4%	81%
	very coarse sand	2.0	6	6%	87%
Gravel	very fine gravel	4.0	8	8%	95%
	fine gravel	5.7	2	2%	97%
	fine gravel	8.0	2	2%	99%
	medium gravel	11.3	1	1%	100%
	medium gravel	16.0	0	0%	100%
	course gravel	22.3	0	0%	100%
	course gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			100	100%	100%

Summary Data	
D50	
D84	1.5
D95	4.0

D50 was not calculated due to particle size.





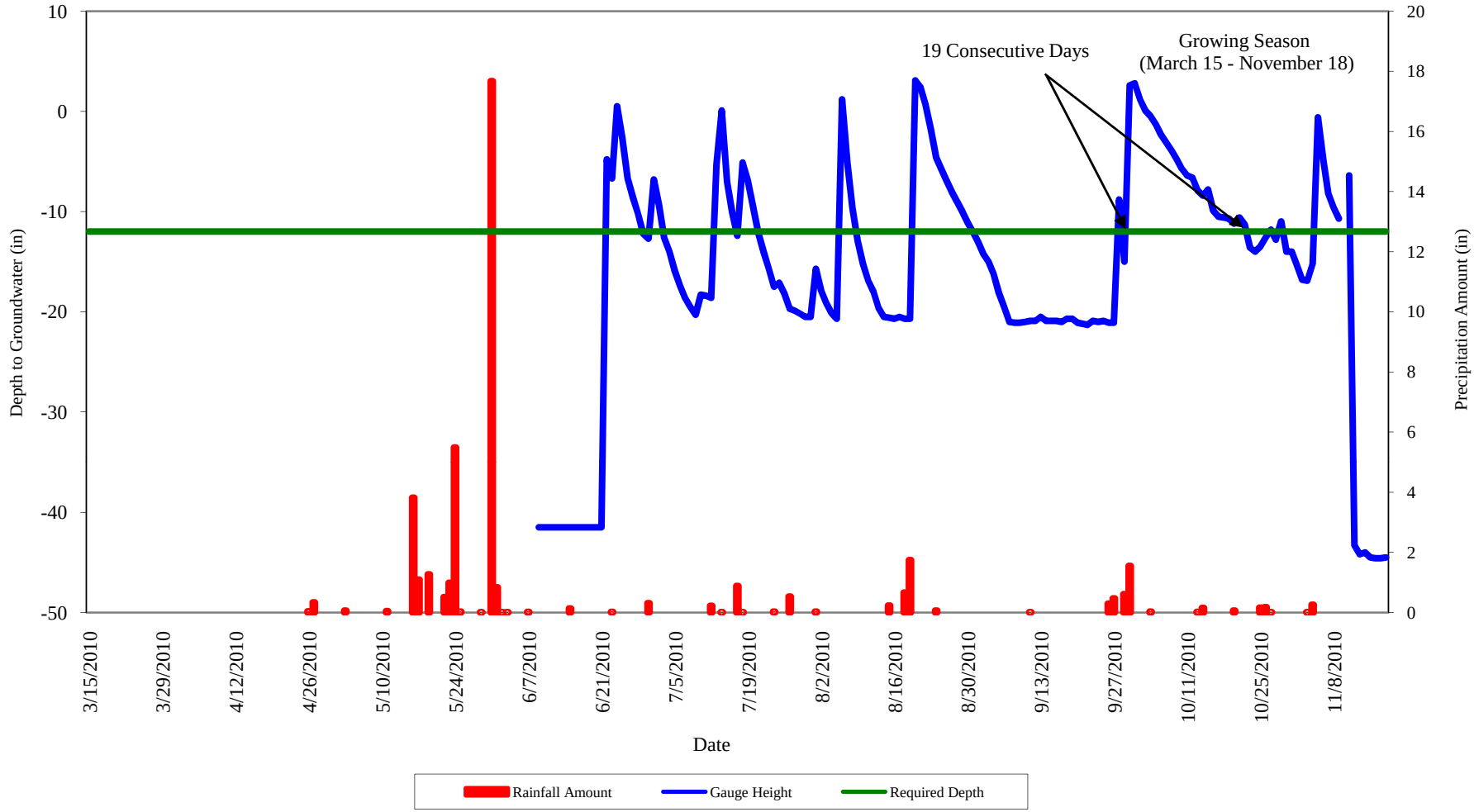
APPENDIX 5
WETLAND DATA ASSESSMENT

1. Precipitation – Water Level Plots for Gauges*

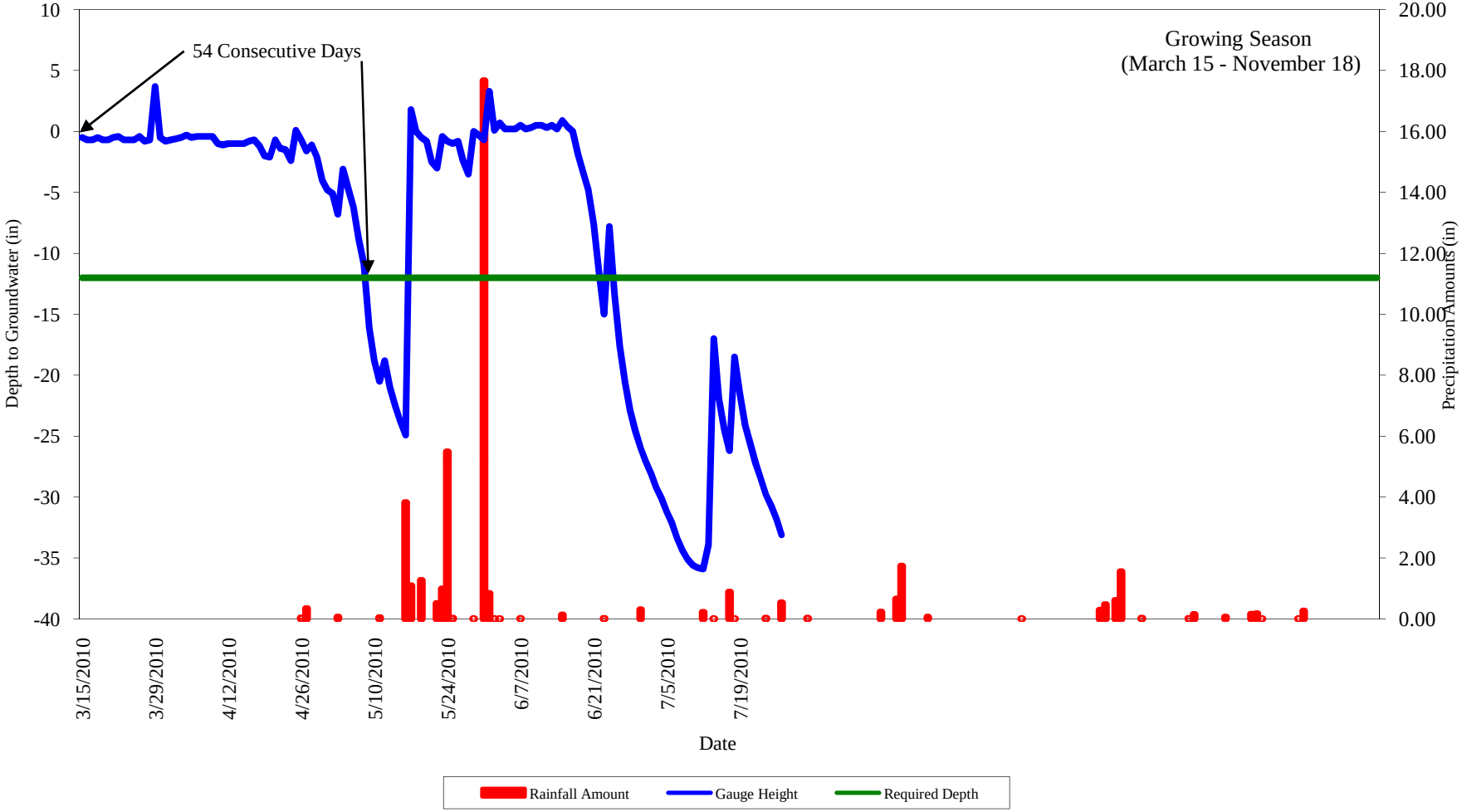
2. Wetland Criteria Attainment

*Raw data tables have been provided electronically.

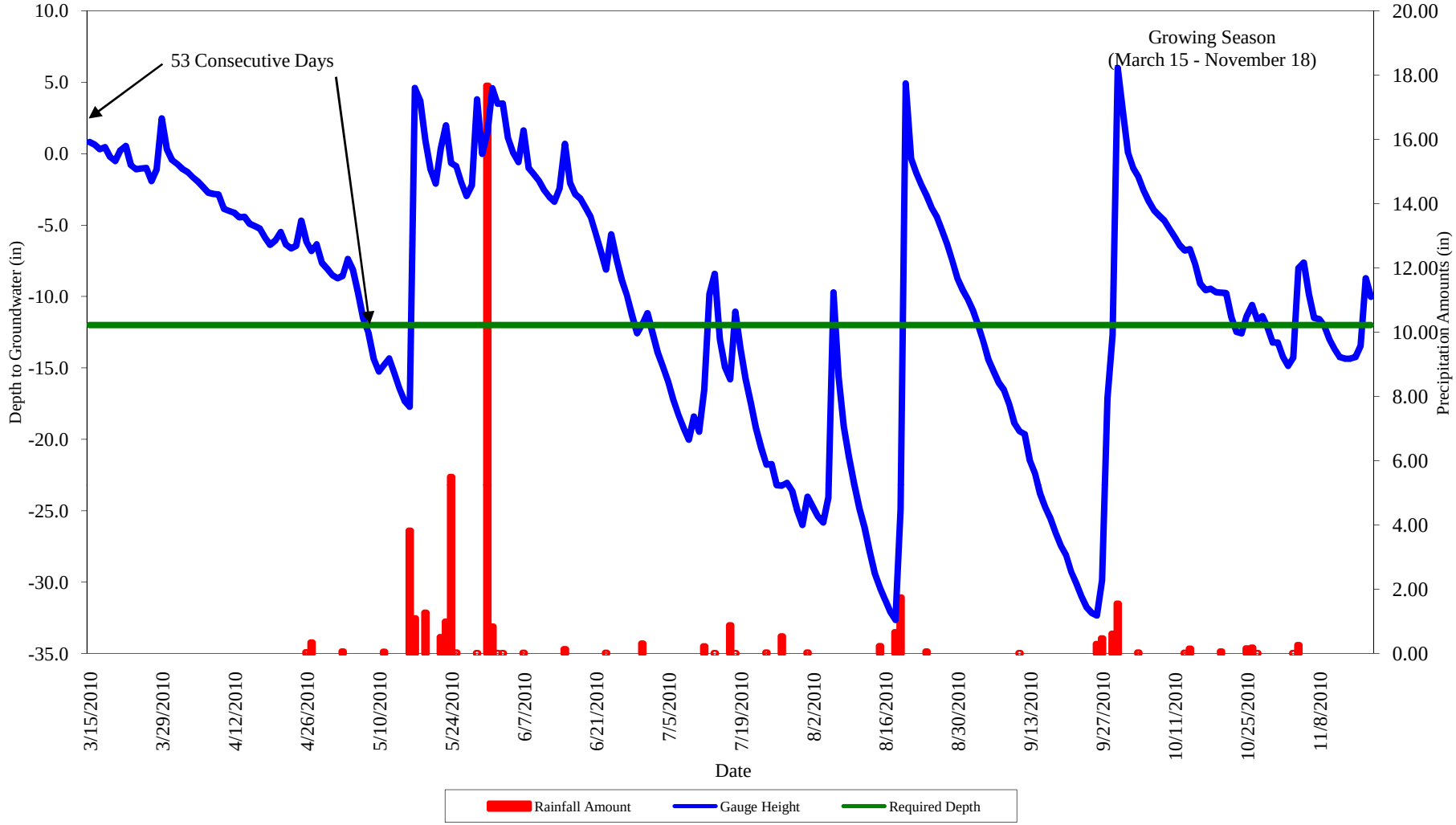
Appendix 5.1 Precipitation - Water Level Plots for Gauges
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Groundwater Gauge 1
Monitoring Year 4 of 5



Appendix 5.1 Precipitation - Water Level Plots for Gauges
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Groundwater Gauge 2
Monitoring Year 4 of 5



Appendix 5.1 Precipitation - Water Level Plots for Gauges
Dula Thoroughfare Stream and Wetland Restoration/EEP Project No. 65
Groundwater Gauge 3
Monitoring Year 4 of 5



Appendix 5.2 Wetland Criteria Attainment
UT to Dula Thoroughfare/EEP Project No. 65
Monitoring Year 4 of 5

Summary of Groundwater Gauge Results for Years 1 through 5					
Gauge	**Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)**				
	Year 1 (2007)	**Year 2 (2008)**	**Year 3 (2009)**	**Year 4 (2010)**	**Year 5 (2011)**
GW1	N/A*	Yes/81 Days (76%)	Yes/117 Days (57%)^	No/19 Days (38%)	
GW2	Yes/41 Days (16%)**	Yes/69 Days (49%)	Yes/99 Days (44%)	Yes/54 Days (69%)^^	
GW3	Yes/42 Days (17%)**	Yes/80 Days (70%)	Yes/96 Days (43%)	Yes/53 Days (61%)	

*Gauge was not installed until 7/11/2007
**Percentages based off of number reported in EcoScience report, raw data was unavailable
^Groundwater data is only reported through 9/28/2009
^^Groundwater data is only reported through 7/27/2010