FINAL

UT to Town Creek Restoration Project – Option A
Year 1 Monitoring Report

Stanly County, North Carolina

DMS Project ID Number – 94648; NC DEQ Contract No. 003277

Yadkin Pee-Dee River Basin: 03040105060040

Project Info:	Monitoring Year: 1 of 7 Year of Data Collection: 2016 Year of Completed Construction: 2016 Submission Date: January 2017
Submitted To:	NCDEQ – Division of Mitigation Services 1625 Mail Service Center Raleigh, NC 27699 NCDEQ Contract ID No. 003277

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SAW-2013-01280; DWR#14-1024

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APPENDICES

1.0 EXECUTIVE SUMMARY

Michael Baker Engineering, Inc., (Baker) restored 5,554 linear feet (LF) and enhanced 791 LF (447 LF of Enhancement I and 344 LF of Enhancement II) of perennial and intermittent stream along an Unnamed Tributary (UT) to Town Creek and three additional unnamed tributaries. Also as part of this Project, Baker restored and created 4.12 acres of riparian wetlands and enhanced 1.00 acre of riparian wetlands and constructed two stormwater wetland best management practices (BMPs) upstream of the mitigation areas. Though no mitigation credit is being sought for wetland enhancement, additional stream mitigation credit is being sought for the inclusion of the proposed stormwater BMPs and the extended riparian buffer width within the conservation easement. This report documents and presents the Year 1 monitoring data as required during the monitoring period.

The primary goals of the Project were to improve aquatic habitat degradation by improving ecologic functions and reducing non-points source loads from agricultural run-off to the impaired areas as described in the Lower Yadkin – Pee Dee RBRP and as identified below:

- Improve aquatic and terrestrial habitat through increasing dissolved oxygen concentrations, reduction in nutrient and sediment loading, improving substrate and in-stream cover, and reduction of in-stream water temperature;
- Improve both aquatic and riparian aesthetics;
- Create geomorphically stable conditions along UT to Town Creek and its tributaries through the Project area;
- Prevent cattle from accessing the project area thereby protecting riparian and wetland vegetation and reducing excessive bank erosion;
- Restore historical wetlands, create new wetlands, and enhance/preserve existing wetlands to improve terrestrial habitat and reduce sediment and nutrient loading to UT to Town Creek and the Little Long Creek Watershed.

To accomplish these goals, the following objectives were identified:

- Restore, enhance, create, and protect riparian wetlands and buffers to reduce nutrient and pollutant loading by particle settling, vegetation filtering and nutrient uptake;
- Construct wetland BMPs on the upstream extent of Reaches 4 and 7 to improve water quality by capturing and retaining stormwater run-off from the adjacent cattle pastures to allow for the biological removal of nutrient pollutant loads and for sediment to settle out of the water column;
- Restore existing incised, eroding, and channelized streams by creating stable channels with access to their geomorphic floodplains;
- Improve in-stream habitat by providing a more diverse bedform with riffles and pools, creating deeper pools and areas of water re-aeration, and reducing bank erosion;
- Control invasive species vegetation within the project reaches;
- Establish native stream bank, riparian floodplain, and wetland vegetation, protected by a permanent conservation easement, to increase stormwater runoff filtering capacity, improve bank stability, shade the stream to decrease water temperature, and provide improved wildlife habitat quality.

UT to Town Creek Restoration Project – Option A (Site) is located in Stanly County, approximately 1.7 miles west of the Town of New London, within cataloging unit 03040105 of the Yadkin Pee-Dee River Basin (see Figure 1). The Site is located in a North Carolina Division of Mitigation Services (NCDMS) - Targeted Local Watershed (03040105060040). The Project involved stream restoration and enhancement, as well as wetland restoration, creation, and enhancement along UT to Town Creek and several of its tributaries, which had been impaired due to historical pasture conversion and cattle grazing.

During Year 1 monitoring, vegetation conditions were performing close to 100% for both the planted acreage and invasive/encroachment area categories. As noted in Table 6b, there were a total of four small areas of sparse herbaceous vegetation along Reach 1 and Reach 2. These areas totaled less than 0.15 acres and are located in areas with poor soils that are frequently inundated by overbank storm flows. Invasive species areas of concern consisted of approximately 0.05 acres of Chinese privet (*Ligustrum sinese*) that are localized in the easement in areas of mature woody vegetation where Reaches 4, 5, and 6 converge. Tables summarizing and maps depicting the vegetative assessment problem areas can be found in Appendix B.

Based on data collected from the twenty monitoring plots during Year 1 monitoring, the average density of total planted stems per plot ranges from 526 to 809 stems per acre with a tract mean of 700 stems per acre. Therefore, the Year 1 data demonstrate that the Site is on track for meeting the minimum success interim criteria of 320 trees per acre by the end of Year 3. Vegetation stem counts are summarized in Tables 7 and 9 of Appendix C.

The nineteen (19) permanent cross-sections located throughout the Site show minimal adjustment to stream dimension since construction. Longitudinal profiles for Reach 1, 2, 3, and 6 have remained geomorphically stable throughout the Year 1 post-construction monitoring period. Pools are well maintained and grade control structures (constructed riffles, rock j-hooks, log vanes, and boulder steps) help maintain the overall profile desired. In addition, Tables 5a through 5h (Appendix B) indicate the Site has remained geomorphically stable with lateral/vertical stability and in-stream structure performance of 100% on all stream reaches and no noted areas of bank scour and/or erosion around structures. Visual observations and a review of reachwide pebble count data collected indicates that each Reach is sufficiently moving fines through the system. Cross-sectional, longitudinal profile, and pebble count data are provided in Figures 3, 4, and 5 respectively, in Appendix D.

Groundwater monitoring data collected during the growing season (March 27 through November 5) of the Year 1 monitoring period documented that nine of the ten groundwater monitoring wells exhibited soil saturation within 12 inches of the ground surface for the minimum success criteria of nine percent (9%) or 20 consecutive days during the growing season. UTTC AW7 exhibited the highest percentage of consecutive days meeting saturated conditions, as well as, the having the highest number of cumulative days meeting conditions. Though UTTC AW8 did not meet the 9% minimum success criteria for the site in Year 1, it was very close with 7% and will likely improve as ground water levels within the Site stabilize. It should also be noted that UTTC AW8 is located in a jurisdictional wetland and outside the boundary of the wetland areas where credit is being generated (See CCPV in Appendix B). See Appendix E for a depiction of plot of wetland gauge data as it relates to monthly precipitation for Monitoring Year 1 (Figure 6) and a summary of wetland attainment for all ten monitoring gauges (Table 12). See Figure 2 in Appendix B, for a depiction of wetland mitigation areas and corresponding gauge locations.

In-stream pressure transducers were installed on Reach 6 and 7 to document flow conditions throughout the monitoring year. Since post-construction installation, each gauge (R6_W1 and R6_W2) on Reach 6 has documented at least one period of consecutive stream flow for the required minimum of 30 days through the end of Monitoring Year 1, while only one gauge (R7_W2) on Reach 7 met the minimum criteria. It should be noted that while R7_W1 did not meet the minimum success criteria for flow during Monitoring Year 1 of 30 consecutive days, the pressure transducers were installed on March 1, 2016. As such, 2 months of flow data was not collected along this reach. Figure 7 in Appendix E, depict the documented flow conditions for each gauge from installation through Monitoring Year 1 relative to local rainfall data, while Table 13 documents both the total cumulative days of flow and the maximum number of consecutives days of flow.

Two bankfull event were observed and documented during MY1. Information on bankfull events is provided in Table 14 of Appendix E.

Summary information/data related to the Site 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 Baseline Monitoring Report and in the Mitigation Plan available on the North Carolina Division of Mitigation Services (NCDMS) website. All raw data supporting the tables and figures in the appendices is available from NCDMS upon request.

2.0 METHODOLOGY

The monitoring plan for the Site includes criteria to evaluate the success of the stream, wetland, and vegetation components of the project. Stream and vegetation monitoring will be conducted for five years, while wetland monitoring will be conducted for seven years. Monitoring methods used will follow the NCDMS Monitoring Report Template, Version 1.2.1 – 12/01/09 and are based on the design approaches and overall project goals. To evaluate success criteria associated with a geomorphically stable channel, hydrologic connectivity, and aquatic habitat diversity, geomorphic monitoring methods will be conducted for project reaches that involve Restoration and Enhancement Level I mitigation. The success criteria for the proposed Enhancement Level II reaches/sections will follow the methods described in sections 2.1.3, 2.1.4, and 2.2, whereas, wetland restoration and creation mitigation will follow those outlined in sections 2.3. The specific locations of monitoring features, such as vegetation plots, permanent cross-sections, reference photograph stations, ground water gauges, flow gauges, and crest gauges, are shown on the CCPV sheets found in Figure 2 of Appendix B.

Year 1 monitoring data were collected in October and November 2016. All visual site assessment data contained in Appendix B were collected on October 10th and 11th and November 4th of 2016. Vegetation data and plot photos were collected on November 3rd, 4th, and 9th of 2016. Sediment data were collected on October 10 and 11, 2016.

Stream survey data were collected on November 1st and 2nd of 2016 and were certified on November 8th of 2016. Stream survey data were collected to meet the requirements for a topographic ground survey to the accuracy of Class C Vertical and Class A Horizontal (21 NCAC-56 section .1606) and was geo-referenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the UT to Town Creek Restoration Project Option A's As-built Survey.

2.1 Stream Monitoring

Geomorphic monitoring of the Restoration and Enhancement Level I reaches will be conducted once a year for a minimum of five years following the completion of construction. These activities will evaluate the success criteria associated with a geomorphically stable channel, hydrologic connectivity, and aquatic habitat diversity. The stream parameters to be monitored include stream dimension (cross-sections), profile (longitudinal profile survey), visual observation with photographic documentation, documentation of bankfull events and documentation of hydrologic conditions for restored intermittent reaches. Additionally, monitoring methods for all reaches will include those described under Photo Documentation of Site, Visual Assessment, and Vegetation Monitoring. The methods used and related success criteria are described below for each parameter. Figure 2 shows approximate locations of the proposed monitoring devices throughout the project site.

2.1.1 Morphologic Parameters and Channel Stability

2.1.1.1 Dimension

A total of nineteen (19) permanent cross-sections, twelve (12) riffles and seven (7) pools, were installed throughout the entire project area. Cross-sections selected for monitoring included representative riffles and pools for each of the four project reaches, Reach 1, 2, 3, and 6, which implemented at least 500 linear feet of Restoration or Enhancement I activities.

Each cross-section was marked on both banks with permanent pins to establish the exact transect used. A common benchmark was also chosen to consistently reference and facilitate the comparison of year-to-year data. The cross-sectional surveys are conducted annually and include measurements of Bank Height Ratio (BHR) and Entrenchment Ratio (ER). The monitoring survey includes points measured at all breaks in slope, including top of stream banks, bankfull, inner berm, edge of channel, and thalweg, if the features are present. Riffle cross-sections are classified using the Rosgen Stream Classification System (Rosgen, 1994), and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

There should be little change in annual cross-sectional surveys from those collected during the post-construction as-built survey. If changes do take place, they will be evaluated to determine if they represent a movement toward a more unstable condition (e.g., down-cutting or erosion) or a movement toward increased stability (e.g., settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross-sectional data is presented in Figure 3 of Appendix D.

2.1.1.2 Longitudinal Profile

Longitudinal profiles were surveyed for portions of the restored lengths of Reaches 1, 2, 3, and 6 and are provided in Figure 4 of Appendix D. Longitudinal profiles will be replicated annually during the five year monitoring period.

Measurements taken during longitudinal profiles include thalweg, water surface, and the top of low bank. All measurements were taken at the head of each feature (e.g., riffle, run, pool, glide) and the maximum pool depth. Surveys were tied to a permanent benchmark.

The pools should remain relatively deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools. Bed form observations should be consistent with those observed for channels of the design stream type as well as other design information.

2.1.1.3 Substrate and Sediment Transport

After construction, there should be minimal change in the pebble count data over time given the current watershed conditions and sediment supply regime. Reachwide pebble counts were collected for Reaches 1, 2, 3, and 6. Samples collected combined with evidence provided by changes in cross-sectional data and visual assessments will reveal changes in sediment gradation that occur over time as the stream adjusts to upstream sediment loads. Bed material distribution data are located in Figure 5 of Appendix D.

2.1.2 Stream Hydrology

2.1.2.1 Bankfull Events

The occurrence of bankfull events within the monitoring period were documented by the use of a crest gauge and photographs. The crest gauge will record the highest watermark between site visits, and the gauge will be checked at each site visit to determine if a bankfull event has occurred. The crest gauge was installed in the floodplain of Reach 3 within ten feet (horizontal) of the restored channel. Photographs will be used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Two bankfull flow events must be documented within a five-year monitoring period. The two bankfull events must occur in separate years; otherwise, the monitoring will continue until two bankfull events have been documented in separate years to demonstrate a floodplain connection has been restored.

2.1.2.2 Flow Documentation

A combination of photographic and flow gauge data were collected from in-stream pressure transducers and remote in-field cameras that were installed on restored intermitted reaches. R7_W1 and R7_W2

were installed Reach 7, while R6_W1 and R6_W2 were installed on Reach 6. Collected data will document that the restored intermittent stream systems continue to exhibit base flow for of at least 30 consecutive days throughout each monitoring year under normal climatic conditions. In order to determine if rainfall amounts were normal for the given year, rainfall gauge data was obtained from the nearest Stanly County weather station (CRONOS Database, NEWL – North Stanly Middle School, if available) and compared to the average monthly rainfall amounts from the Stanly County WETS Table (USDA, 2000). If a normal year of precipitation does not occur during the first five years of monitoring, flow conditions will continue to be monitored on the site until it documents that the intermittent streams have been flowing for the required duration.

Flow data and photographic documentation collected during Year 1 monitoring are located in Appendix E.

2.1.3 Photographic Documentation of Site

Photographs were used to document restoration success visually. Reference stations and cross-section photos were photographed during the as-built survey; this will be repeated for at least five years following construction. Reference photos were taken once a year, from a height of approximately five to six feet. Permanent markers ensure that the same locations (and view directions) are utilized during each monitoring period. Photographers will make an effort to consistently maintain the same area in each photo over time. Selected site photographs are shown in Appendix B for reference stations and Appendix D for cross-sections.

2.1.3.1 Lateral Reference Photos

Reference photo transects were taken of the right and left banks at each permanent cross-section. A survey tape was captured in most photographs which represents the cross-section line located perpendicular to the channel flow. The water line was located in the lower edge of the frame in order to document bank and riparian conditions.

2.1.3.2 Longitudinal Station Photos

Stream reaches were photographed longitudinally beginning at the upstream portion of the Site and moving downstream. Photographs were taken looking both upstream and downstream at locations throughout the restored stream valley. The photograph points were established close enough together to provide an overall view of the reach lengths, primary grade control structures, and valley crenulations. The angle of the photo depends on what angle provides the best view was noted and will be continued in future photos. Site photographs are located in Appendix B.

2.1.4 Visual Assessment

Visual monitoring assessments of all stream sections will be conducted by qualified personnel twice per monitoring year with at least five months in between each site visit. Photographs will be used to document system performance and any areas of concern related to stream bank stability, condition of in-stream structures, channel migration, aggradation/degradation, headcuts, live stake mortality, impacts from invasive plant species or animal species, floodplain vegetative conditions, and condition of pools and riffles. The photo locations will be shown on a plan view map and descriptions will be documented in as either stream problem areas (SPAs) or vegetative problem areas (VPAs) in there associated monitoring assessment tables located in Appendix B.

2.2 Vegetation Monitoring

In order to determine if the criteria are achieved, vegetation-monitoring quadrants were installed and are monitored across the restoration site in accordance with the CVS-NCDMS Protocol for Recording Vegetation, Level 1, Version 4.2 (2008). The total number of quadrants was calculated using the CVS-NCEEP Entry Tool

Database version 2.3.1 (CVS-NCEEP, 2012) with twenty (20) plots established randomly within the planted riparian buffer areas. No monitoring quadrants were established within the undisturbed wooded areas of the project area. The size of individual quadrants are 100 square meters for woody tree species.

Level 1 CVS vegetation monitoring was conducted between spring, after leaf-out has occurred, and fall prior to leaf fall. Individual quadrant data provided during subsequent monitoring events will include species composition, density, survival, and stem height. Relative values were calculated, and importance values were determined. Individual seedlings were marked to ensure that they can be found in succeeding monitoring years. Mortality was determined from the difference between the previous year's living, planted seedlings and the current year's living, planted seedlings.

The interim measure of vegetative success for the site is the survival of at least 320, 3-year old, planted trees per acre at the end of Year 3 of the monitoring period. The final vegetative success criteria is the survival of 260, 5-year old, planted trees per acre at the end of Year 5 of the monitoring period.

Photographs were used to visually document vegetation success in sample plots and are located in Appendix C.

2.3 Wetland Monitoring

Ten groundwater monitoring stations were installed in restored, created, and enhanced wetland areas similar to those from preconstruction monitoring to document hydrologic conditions at the Project site. The wetland gauges are depicted on the CCPV figures (Figure 2) found in Appendix B. Installation and monitoring of the groundwater stations have been conducted in accordance with the USACE standard methods outlined in the *ERDC TN-WRAP-05-2* (USACE, 2005). In order to determine if the rainfall is normal for the given year, rainfall amounts were tallied using data obtained from the Stanly County WETS Station (USDA, 2000) and from the automated weather station at the North Stanly Middle School (NEWL) in New London, approximately 1.5 miles southeast of the Project Site on Old Salisbury Rd. Data from the NEWL station was obtained from the CRONOS Database located on the State Climate Office of North Carolina's website (2016).

Success criteria for wetland hydrology will be met when each wetland site is saturated within 12 inches of the soil surface for 9 percent of the growing season as documented in the approved Mitigation Plan. To document the hydrologic conditions of the restored site, each groundwater monitoring station will be monitored for seven years post-construction or until wetland success criteria are met. Visual inspection of proposed wetland areas will be conducted to document any visual indicators that would be typical of jurisdictional wetlands. This could include, but is not limited to, vegetation types present, surface flow patterns, stained leaves, and ponded water. Wetland plants will be documented along with other visual indicators noted above. Wetland restoration and creation areas that exhibit all three wetland indicators (the presence of hydric soils, wetland hydrology, and wetland vegetation) after construction and through the monitoring period will validate wetland restoration and creation success.

2.4 Stormwater Management Monitoring

Implementation of stormwater wetland BMPs located at the upstream extent of Reaches 4 and 7 were visually monitored for vegetative survivability and permanent pool storage capacity using photo documentation during the 5-Year monitoring period. Maintenance measures will be implemented during the 5-Year monitoring period to replace dead vegetative material and to remove excess sedimentation from permanent pools, as needed.

3.0 REFERENCES

Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (formerly NC Ecosystem Enhancement Program). 2012. CVS-NCEEP Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC.

Lee, M., Peet R., Roberts, S., Wentworth, T. 2008. CVS-EEP Protocol for Recording Vegetation Level 1-2 Plot Sampling Only. Version 4.2.

North Carolina Division of Mitigation Services (formerly NC Ecosystem Enhancement Program). 2011. Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation. November 7, 2011.

_____. 2009. Procedural Guidance and Content Requirements for EEP Monitoring Report, v. 1.2.1. Raleigh, NC.

Rosgen, D. L. 1994. A Classification of Natural Rivers. Catena 22:169-199.

State Climate Office of North Carolina, 2016. CRONOS Database, North Stanly Middle School (NEWL), Stanly County, NC. http://climate.ncsu.edu/cronos/?station=NEWL&temporal=sensormeta

United States Department of Agriculture, 2000. WETS Table. Climate Data for Stanly County, NC. Wets Station: Albemarle, NC 0090, FIPS: 37167, 1971 - 2000. http://agacis.rcc-acis.org/37167/wets

United States Army Corps of Engineers. 2005. "Technical Standard for Water-Table Monitoring of Potential Wetland Sites," WRAP Technical Notes Collection (ERDC TN-WRAP-05-2), U.S. Army Engineer Research and Development Center. Vicksburg, MS.

APPENDIX A

Project Vicinity Map and Background Tables

DIRECTIONS TO SITE FROM RALEIGH, NC:
Take I-40 West toward Sanford/Wake Forest. Take Exit 293 (I-440/US-64 W/US-1) toward Sanford/Wake Forest. Keep left at the fork toward US-1 S/US-64 W. Take Exit 293A for US-1 S/US-64 W toward Sanford/Asheboro. Keep left at the fork toward US-1 S/US-64 W. Continue on US-1 S/US-64 W towards Apex/Sanford/Asheboro. Take exit 98B to merge onto US-64 W towards Pittsboro/Asheboro. After 62 miles, turn left onto Connector Rd. Turn right onto NC 49 S. After 28.4 miles, take a slight left onto N Main St. After 1.1 miles, turn left onto Old Salisbury Rd. Follow Old Salisbury Rd. for approximately 2.0 miles to its intersection with Misenheimer Rd. / Steakhouse Rd. Go through the intersection and continue on Old Salisbury Rd. for approximately 0.4 miles and the Project site is on the right accessed via a dirt farm road.

The subject project site is an environmental restoration site of the NCDEQ Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with DMS.

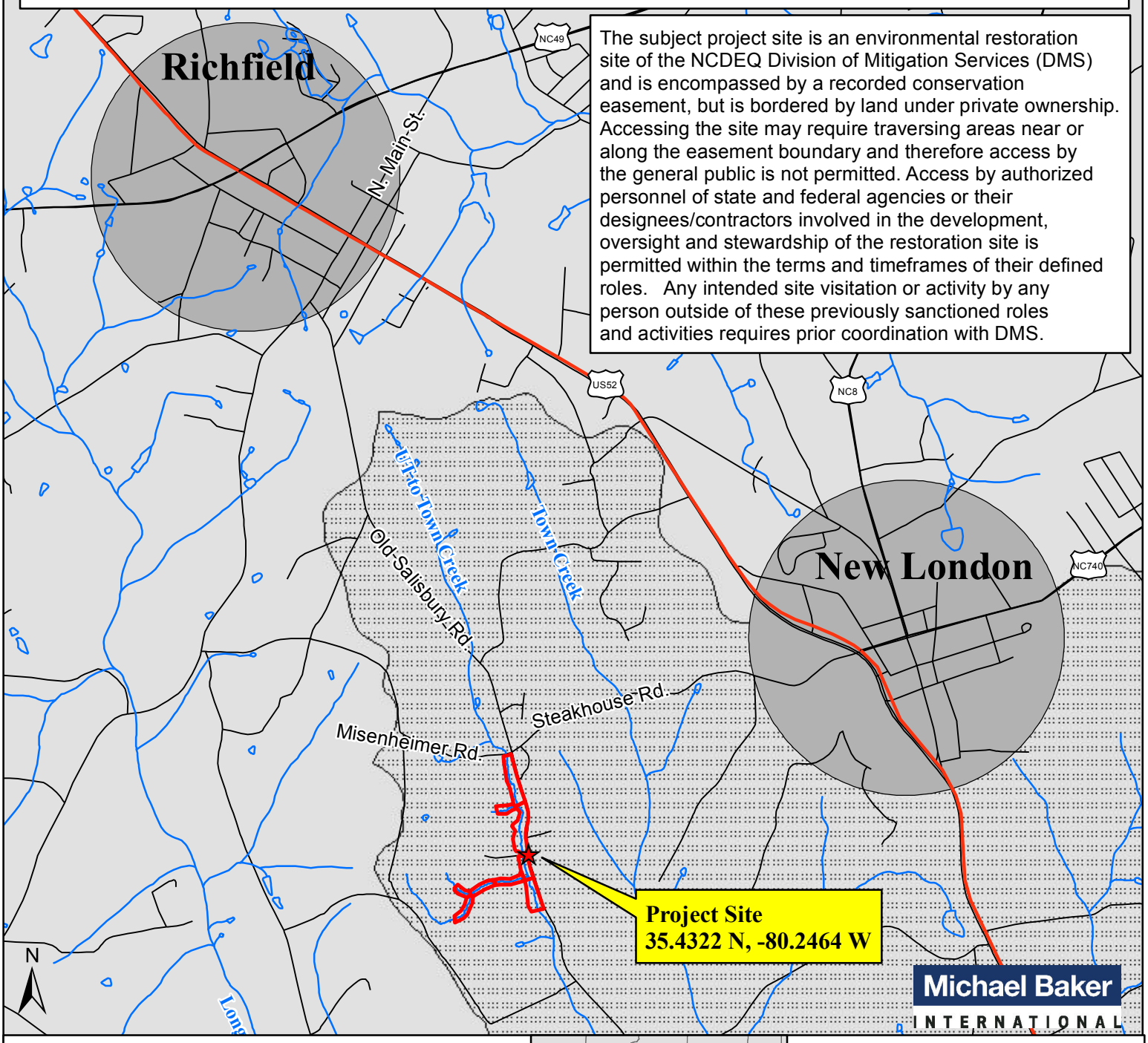


Figure 1. Vicinity Map

UT to Town Creek Restoration Project - Option A

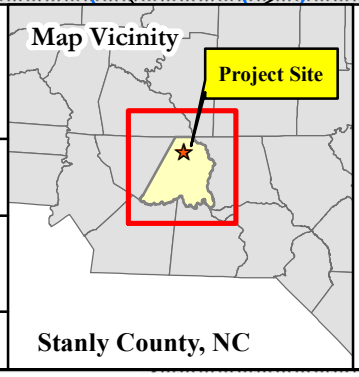
Stanly County, NC

Reference: NCDOT 02 & NC One Map

NC DMS Project No. 94648
NCDEQ Contract No. 003277

2017

0 1,500 3,000 Feet 1" = 3000'



LEGEND

- Project Area
- Streams
- US Highways
- Roads
- Major Waterways
- Municipalities
- Yadkin (HUC 03040105060-040)

Table 1. Project Mitigation Components
UT to Town Creek Restoration Project - Option A: DMS Project No ID. 94648

Project Component (reach ID, etc.)	Wetland Position and Hydro Type	Existing Footage or Acreage	Stationing	Restored Footage, Acreage, or SF	Creditable Footage, Acreage, or SF	Restoration Level	Approach		Mitigation Credits	Notes/Comments
							Priority Level	Mitigation Ratio (X:1)		
Reach 1		1181	10+00 - 22+04	1,204	1,204	R	PI	1:1.0668	1284	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement. Mitigation ratio of 1:1.0668 for buffer widths in excess of 50-ft.
Reach 2		1672	22+04 - 40+46	1,842	1,782	R	PI	1:1.08	1925	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement, and a 60-ft culverted farm road crossing. Mitigation ratio of 1:1.07 for buffer widths in excess of 50-ft.
Reach 3		721	40+46 - 48+75	829	829	R	PI	1:1.10	912	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, and Permanent Conservation Easement. Mitigation ratio of 1:1.1 for buffer widths in excess of 50-ft.
Reach 4		404	10+00 - 14+47	447	447	EI	PIII	1:1	447	Dimension and Profile modified in keeping with reference, Planted Buffer, Livestock Exclusion, Permanent Conservation Easement, and Headwater Constructed Wetland. Mitigation Ratio of 1:1 as result of water quality benefits from the implementation of headwater constructed wetland.
Reach 5		324	10+00 - 13+44	344	344	EII	PIV	2.5:1	138	Dimension modified and structure implementation in keeping with reference, Planted Buffer, Livestock Exclusion, and Permanent Conservation Easement.
Reach 6		1349	14+47 - 28+13	1,366	1,340	R	P1	1:1	1340	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement, and a 26-ft culverted farm road crossing.
Reach 7		386	10+00 - 13+99	399	399	R	P1	1:1	399	Headwater Constructed Wetland, Full Channel Restoration, Planted Buffer, Livestock Exclusion, and Permanent Conservation Easement.
Wetland Group 1 (WG1)	RNR	0		2.56	2.56	R		1:1	2.56	Minor floodplain grading, of 12-inches or less, to restore floodplain hydrolgy and remediate compaction, based on hydric soil investigation. Planted, Excluded Livestock and Permanent Conservation Easement.
Wetland Group 2 (WG2)	RNR	0		1.56	1.56	C		3:1	0.52	Floodplain grading, of 12-inches or greater, to restore relic floodplain hydrolgy and remediate compaction, based on hydric soil investigation. Planted, Excluded Livestock and Permanent Conservation Easement.
Buffer Group 1 (BG1)										
Buffer Group 2 (BG2)										
Buffer Group 3 (BG3)										

Length and Area Summations by Mitigation Category

Restoration Level	Stream	Riparian Wetland		Non-riparian Wetland	Credited Buffer
	(linear feet)	(acres)		(acres)	(square feet)
		Riverine	Non-Riverine		
Restoration	5554	2.56			
Enhancement					
Enhancement I	447				
Enhancement II	344				
Creation		1.56			
Preservation					
High Quality Pres					

Overall Assets Summary

Asset Category	Overall Credits
Stream	**6445***
RP Wetland	**3.08**

General Note - The above component table is intended to be a close complement to the asset map. Each entry in the above table should have clear distinction and appropriate symbology in the asset map.

1 - **Wetland Groups** represent pooled wetland polygons in the map with the same wetland type and restoration level. If some of the wetland polygons within a group are in meaningfully different landscape positions, soil types or have different community targets (as examples), then further segmentation in the table may be warranted. **Buffer groups** represent pooled buffer polygons with common restoration levels.

2 - **Wetland Position and Hydro Type** - Indicates Riparian Riverine, (RR) , riparinan non-riverine (RNR) or Non-Riverine (NR)

3- **Restored** Footage, Acreage or Square Feet (SF)

* Stream assests are based on the stream length from the As-Built survey. Since the As-Built survey stream lengths exceeded the anticipated design lengths, the stream assets exceeded that of the proposed assest range listed in the Mitigation Plan.

Table 2. Project Activity and Reporting History			
UT to Town Creek Restoration Project - Option A: DMS Project No ID. 94648			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Mitigation Plan Prepared	N/A	N/A	Apr-14
Mitigation Plan Amended	N/A	N/A	Dec-14
Mitigation Plan Approved	N/A	N/A	Dec-14
Final Design – (at least 90% complete)	N/A	N/A	Jan-15
Construction Begins	N/A	N/A	Jul-15
Temporary S&E mix applied to entire project area	N/A	N/A	Jan-16
Permanent seed mix applied to entire project area	N/A	N/A	Jan-16
Planting of live stakes	Feb-16	N/A	Mar-16
Planting of bare root trees	Feb-16	N/A	Mar-16
Planting of herbaceous plugs	Jun-16	N/A	May-16
End of Construction	Dec-16	N/A	Jan-16
Survey of As-built conditions (Year 0 Monitoring-baseline)	Apr-16	May-16	Jun-16
Baseline Monitoring Report	May-16	Jun-16	Nov-16
Year 1 Monitoring	Dec-16	Dec-16	Jan-17
Year 2 Monitoring	Dec-17	N/A	N/A
Year 3 Monitoring	Dec-18	N/A	N/A
Year 4 Monitoring	Dec-19	N/A	N/A
Year 5 Monitoring	Dec-20	N/A	N/A
Year 6 Wetland Monitoring	Dec-21	N/A	N/A
Year 7 Wetland Monitoring	Dec-22	N/A	N/A

Table 3. Project Contacts **UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648**	
Designer	
Michael Baker Engineering, Inc.	797 Haywood Road, Suite 201 Asheville, NC 28806 Contact: Jacob Byers, PE, Tel. 828-412-6101
Construction Contractor	
Wright Contracting, LLC.	160 Walker Road Lawndale, NC 28090 Contact: Joe Wright, Tel. 919-663-0810
Planting Contractor	
H.J. Forest Service	P.O. Box 458 Holly Ridge, NC 28445 Contact: Matt Hitch, Tel. 910-512-1743
Seeding Contractor	
Wright Contracting, LLC.	160 Walker Road Lawndale, NC 28090 Contact: Joe Wright, Tel. 919-663-0810
Seed Mix Sources	Green Resources, Tel. 336-855-6363 Mellow Marsh Farm, Tel. 919-742-1200
Nursery Stock Suppliers	Mellow Marsh Farm, Tel. 919-742-1200 Foggy Mountain Nursery, Tel. 336-384-5323 ArborGen, Tel. 843-528-3203
Monitoring Performers	
Michael Baker Engineering, Inc.	9716-B Rea Road #56 Charlotte, NC 28277 Contact:
Stream Monitoring Point of Contact	Kristi Suggs, Tel. 704-579-4828
Vegetation Monitoring Point of Contact	Kristi Suggs, Tel. 704-579-4828

Table 4. Project Attributes **UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648**							
Project County	Stanly						
Physiographic Region	Piedmont						
Ecoregion	Carolina Slate Belt						
Project River Basin	Yadkin - Pee Dee						
USGS HUC for Project (14 digit)	03040105060040						
NCDWQ Sub-basin for Project	03-07-13						
Within Extent of DMS Watershed Plan	Lower Yadkin RBRP, 2009						
WRC Class (Warm Cool Cold)	Warm						
% Project Easement Fenced/Demarcated	100%						
Beaver activity observed during design phase	No activity observed						
Restoration Component Attribute Table							
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Drainage Area (ac.)	532.1	616.6	766.7	53.7	48.9	127.8	29.2
Stream Order	2	2	3	1	1	2	1
Restored Length (LF)	1,204	1,782	829	447	344	1,340	399
Perennial (P)/Intermittent (I)	P	P	P	I	I	I	I
Watershed Type (Rural, Urban, etc.)	R	R	R	R	R	R	R
Watershed LULC Distribution							
Rural Residential	6%	1%	0%	1%	2%	0%	0%
Ag-Row Crop	8%	0%	0%	14%	4%	0%	10%
Ag-Livestock	57%	85%	70%	59%	17%	88%	64%
Forested	8%	0%	0%	17%	62%	0%	21%
Other/Open Area	8%	0%	0%	0%	9%	0%	0%
Commercial	10%	0%	0%	0%	0%	0%	0%
Roadway	3%	4%	2%	3%	<1%	0%	0%
Wooded-Livestock	0%	10%	28%	6%	4%	12%	5%
Open Water	0%	0%	0%	0%	<1%	0%	0%
Watershed Impervious Cover (%)	19%	5%	2%	4%	<4%	<1%	<1%
NCDWR AU/Index#	13-17-31-1-1						
NCDWQ Classification	C						
303(d) Listed	No						
303 (d) Listing Stressor	N/A						
Total Acreage of Easement	5.35	8.01	3.79	1.97	1.06	3.55	1.36
Total Vegetated Easement Acreage	4.81	6.97	3.48	1.63	0.94	3.22	1.26
Total Planted Acreage for Restoration	4.81	6.97	3.48	1.63	0.94	3.22	1.26
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**	**Reach 6**	**Reach 7**
Rosgen Classification (existing)	E4	E4	E4	B4	B4	B4	B4a
Rosgen Classification (as-built)	C4	C4	C4	B4	B4	C4b	B4a
Valley Type	VIII	VIII	VIII	II	II	II	II
Valley Slope	0.0092	0.0092	0.0089	0.023	0.0447	0.0243	0.0495
Trout Waters Designation	No						
Species of Concern, edangered etc. (Y/N)	No*, Yes**						
Dominant Soil Series and Characteristics							
Series	OaA	OaA	OaA	GoF	GoF	GoF	BaD
Depth	46”	46”	46”	36”	36”	36”	40”
Clay %	10-35%	10-35%	10-35%	5-27%	5-27%	5-27%	Oct-55
K	0.28	0.28	0.28	0.05	0.05	0.05	0.15-0.24
T	4	4	4	4	4	4	3

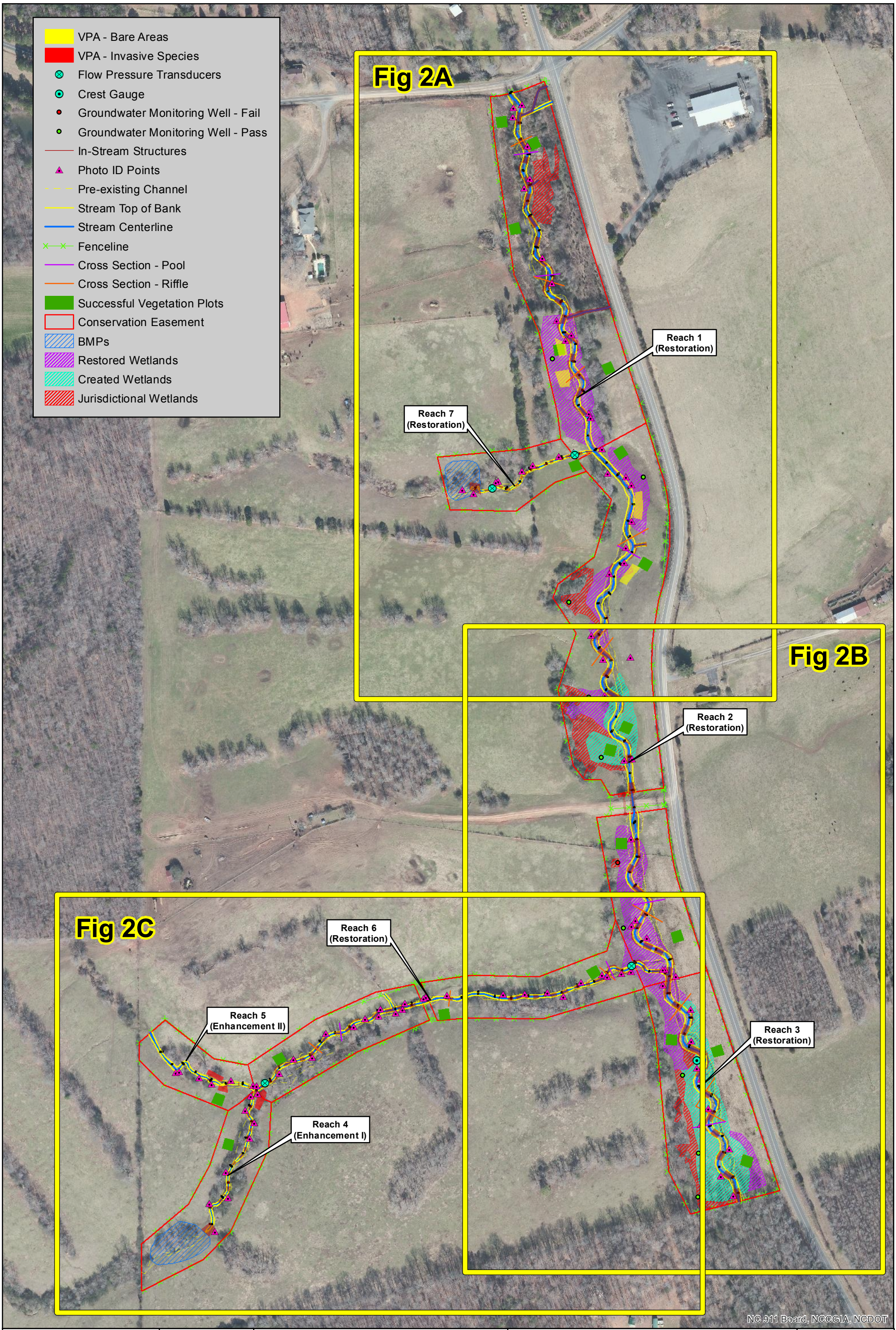
* Bald Eagle (*Haliaeetus leucocephalus*) a BGEPA species is listed as occurring in Stanly County; however, suitable habitat is not located within the Project area or within two miles of the Site.

** Schweinitz’s Sunflower (*Helianthus schweinitzii*) A federally endangered species is listed as occurring within Stanly County and though suitable habitat is present, a field study was conducted and no species were located within the Project area. NCNHP database indicated there are no known populations of these species within two miles of the study area.

(NRCS, 2010a; NCDENR, 2007 & 2008; USFWS, 2012; NCNHP, 2012)

APPENDIX B

Visual Assessment Data



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services

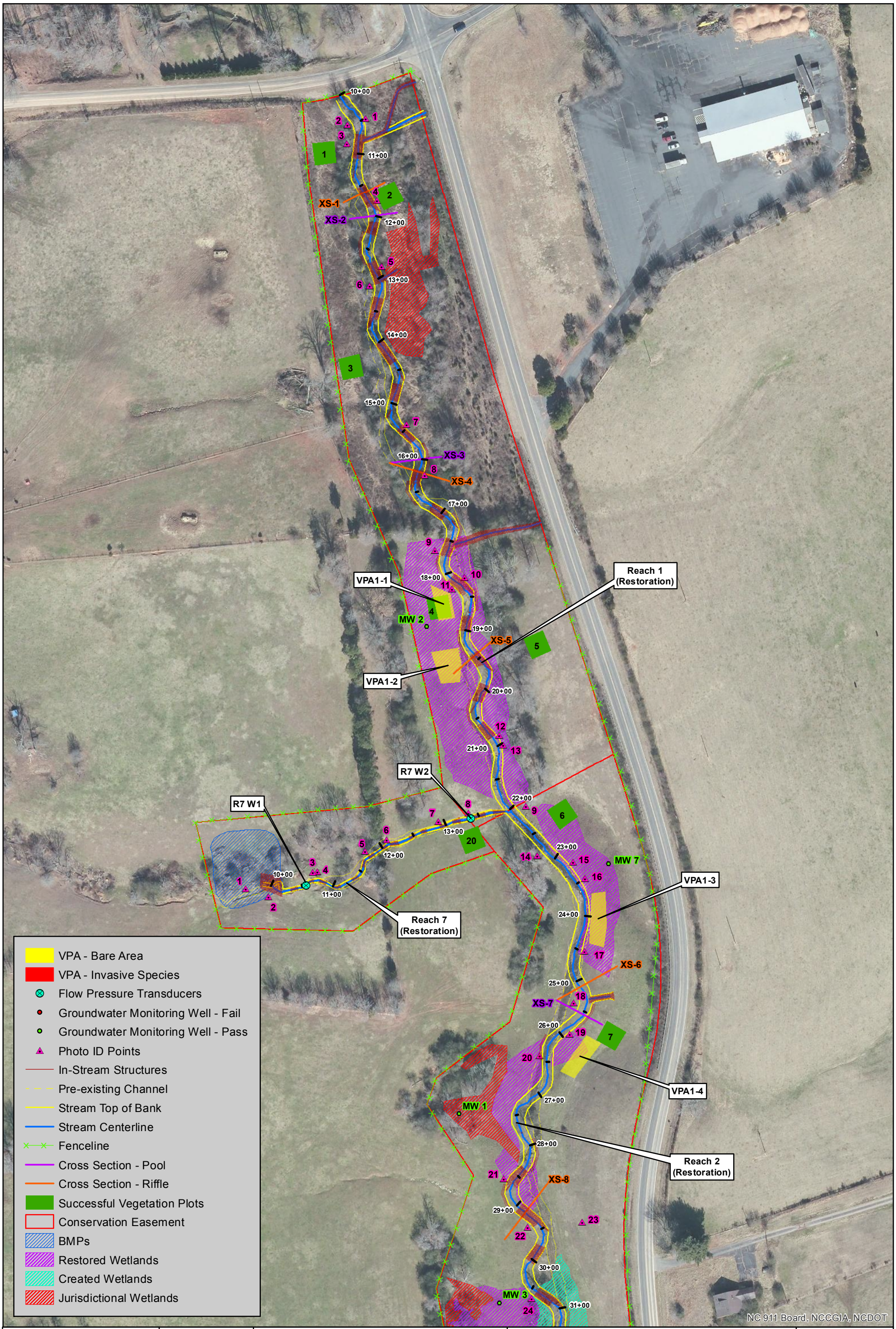
0 125 250 500 Feet

1" = 250'

N

Figure 2 Overview
Current Condition Plan View
UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Baker Project No. 120857
Date: 2017
Monitoring Year: 1 of 7
Drawn By: RWM
Sheet: 1 of 4



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services

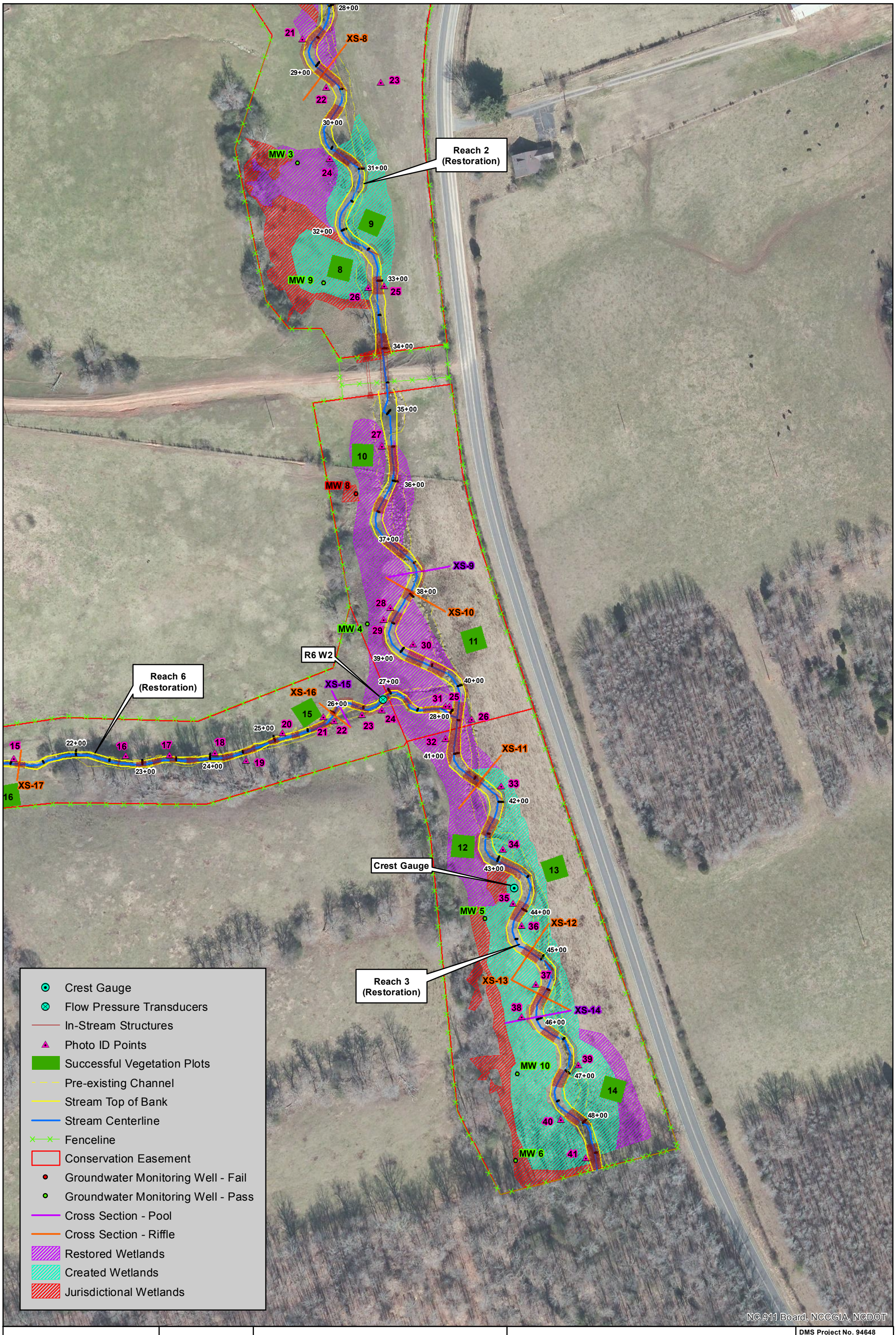
0 62.5 125 250 Feet

1" = 125'

N

Figure 2A
Current Condition Plan View
UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Baker Project No. 120857
Date: 2017
Monitoring Year: 1 of 7
Drawn By: RWM
Sheet: 2 of 4



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services

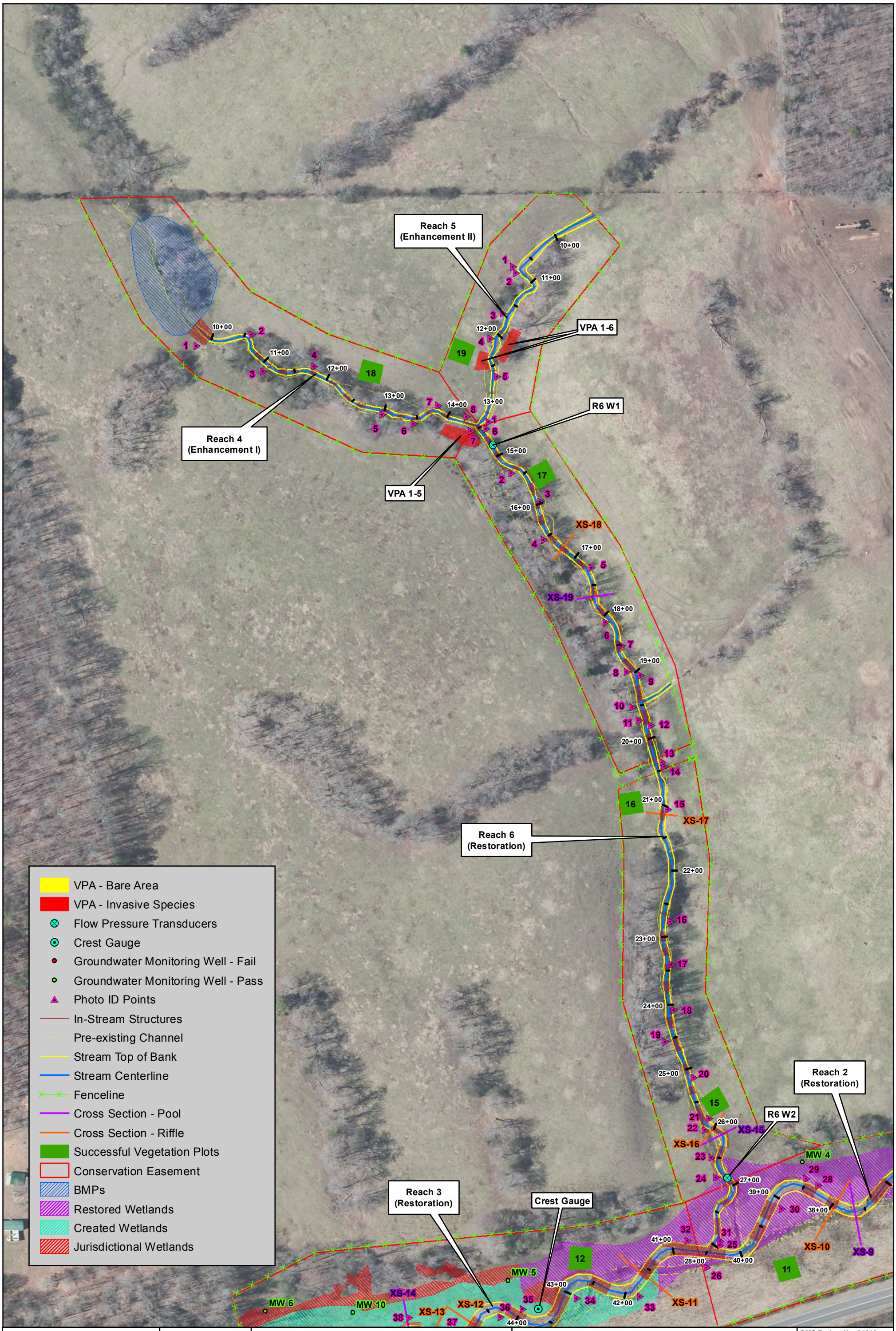
0 62.5 125 250 Feet

1" = 125'

N

Figure 2B
Current Condition Plan View
UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Baker Project No. 120857
Date: 2017
Monitoring Year: 1 of 7
Drawn By: RWM
Sheet: 3 of 4



Michael Baker INTERNATIONAL

North Carolina Division of Mitigation Services

0 62.5 125 250 Feet

1" = 125'

N

Figure 2C
Current Condition Plan View
UT to Town Creek Restoration Project - Option A
Stanly County, NC

DMS Project No. 94648
Baker Project No. 120857
Date: 2017
Monitoring Year: 1 of 7
Drawn By: RWM
Sheet: 4 of 4

Table 5a. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 1**
Assessed Length (LF)	**1,204**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	18	18			100%			
	3. Pool Condition	1. Depth	18	18			100%			
		2. Length	18	18			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	18	18			100%			
		2. Thalweg centering for pool/glide	18	18			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			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. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	10	10			100%			

Table 5b. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 2**
Assessed Length (LF)	**1,782**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	21	21			100%			
	3. Pool Condition	1. Depth	20	20			100%			
		2. Length	20	20			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	21	21			100%			
		2. Thalweg centering for pool/glide	20	20			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			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. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	9	9			100%			

Table 5c. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 3**
Assessed Length (LF)	**829**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	11	11			100%			
	3. Pool Condition	1. Depth	10	10			100%			
		2. Length	10	10			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	11	11			100%			
		2. Thalweg centering for pool/glide	10	10			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			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. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	6	6			100%			

Table 5d. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 4**
Assessed Length (LF)	**447**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	15	15			100%			
	3. Pool Condition	1. Depth	12	12			100%			
		2. Length	12	12			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	15	15			100%			
		2. Thalweg centering for pool/glide	12	12			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			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. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	11	11			100%			

Table 5e. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 5**
Assessed Length (LF)	**344**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	4	4			100%			
	3. Pool Condition	1. Depth	4	4			100%			
		2. Length	4	4			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	4	4			100%			
		2. Thalweg centering for pool/glide	4	4			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			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. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	4	4			100%			

Table 5f. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 6**
Assessed Length (LF)	**1,340**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	33	33			100%			
	3. Pool Condition	1. Depth	34	34			100%			
		2. Length	34	34			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	33	33			100%			
		2. Thalweg centering for pool/glide	34	34			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			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. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	26	26			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	20	20			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	20	20			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	26	26			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	20	20			100%			

Table 5g. Visual Stream Morphology Stability Assessment
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach ID	**UT to Town Creek - Reach 7**
Assessed Length (LF)	**399**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	**1. Vertical Stability**	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate	14	14			100%			
	3. Pool Condition	1. Depth	12	12			100%			
		2. Length	12	12			100%			
	4.Thalweg position	1. Thalweg centering for riffle/run	14	14			100%			
		2. Thalweg centering for pool/glide	12	12			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			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. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	14	14			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	14	14			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	14	14			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth	13	13			100%			

Table 5h. Stream Problem Areas
UT to Town Creek Restoration Project - Option A: Project No. 94846

Reach 1			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A
Reach 2			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A
Reach 3			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A
Reach 4			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A
Reach 5			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A
Reach 6			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A
Reach 7			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
No issues in Year 1	N/A	N/A	N/A

Note: The first digit in the Photo Number column references the monitoring year and the second digit references the problem area or photo (which would be identical to a prior years problem area/photo number when persisting from a previous monitoring year).

Table 6a. Vegetation Condition Assessment
UT to Town Creek Restoration Project: Project No. 94648

Reach ID	**Reaches 1 - 7**
Planted Acreage	**22.31**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	N/A	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	N/A	0	0.00	0.0%
			Total	0	0.00	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	N/A	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage	**25.09**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	NA	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	N/A	N/A	0	0.00	0.0%

Table 6b. Vegetation Problem Areas UT to Town Creek Restoration Project: Project No. 94648			
Reach 1			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Bare Floodplain	N/A	Poor Soils	VPA1-1
Bare Floodplain	N/A	Frequent inundation and poor soils	VPA1-2
Reach 2			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Bare Floodplain	N/A	Frequent inundation and poor soils	VPA1-3
Bare Floodplain	N/A	Poor Soils	VPA1-4
Reach 3			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Bare Floodplain	N/A	Frequent inundation and poor soils	VPA1-3
Reach 4			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations - Privet	13+00 - 14+47	Privet growing in easement along right bank.	-
Reach 5			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations - Privet	N/A	Privet growing in right and left floodplains.	-
Reach 6			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations - Privet	14+47 - 17+00	Privet growing in easement along right bank.	-
Reach 7			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic	N/A	N/A	-

*Note: The first digit in the Photo Number column references the monitoring year and the second digit references the problem area or photo (which would be identical to a prior years problem area/photo number when persisting from a previous monitoring year).

Stream Station Photos

UT to Town Creek – Reach 1

PID 1: Station 10+50 – Upstream (10/11/16)

PID 2: Station 10+50 – Downstream (10/11/16)

PID 3: Station 10+80 – Left Floodplain (10/11/16)

PID 4: Station 11+90 – Downstream (10/11/16)

PID 5: Station 12+85 – Upstream (10/11/16)

UT to Town Creek – Reach 1

PID 6: Station 13+05 – Left Floodplain (10/11/16)

PID 7: Station 15+30 – Upstream (10/11/16)

PID 8: Station 16+25 – Downstream (10/11/16)

PID 9: Station 17+75 – Left Floodplain (10/11/16)

UT to Town Creek Reach 1

PID 10: Station 18+10– Downstream (10/11/16)

PID 11: Station 18+10 – Upstream (10/11/16)

PID 12: Station 20+90 – Downstream (10/11/16)

PID 13: Station 21+00 – Upstream (10/11/16)

PID 14: Station 22+75 – Upstream (10/11/16)

PID 15: Station 23+25 – Upstream (10/11/16)

PID 16: Station 23+50 – Downstream (10/11/16)

PID 17: Station 24+60– Upstream (10/11/16)

PID 18: Station 25+30– Left Floodplain (10/11/16)

PID 19: Station 25+90– Downstream (10/11/16)

PID 20: Station 26+50– Downstream (10/11/16)

PID 21: Station 28+75 – Downstream (10/11/16)

PID 22: Station 29+35 – Upstream (10/11/16)

PID 23: Station 29+50 – Downstream Project View from Floodplain Knoll (10/11/16)

PID 24: Station 30+60 – Upstream (10/11/16)

PID 25: Station 33+10 – Upstream (10/11/16)

PID 26: Station 33+10 – Downstream (10/11/16)

PID 27: Station 35+50 – Upstream (10/11/16)

PID 28: Station 38+30 – Upstream (10/11/16)

PID 29: Station 38+40 – Downstream (10/11/16)

PID 30: Station 39+10 – Downstream (10/11/16)

PID 31: Station 40+25 – Downstream (10/11/16)

PID 32: Station 40+80 – Upstream (10/11/16)

PID 33: Station 41+80 – Upstream (10/11/16)

PID 34: Station 43+00 – Downstream (10/11/16)

PID 35: Station 44+00 – Downstream (10/11/16)

PID 36: Station 44+25 – Upstream (10/11/16)

PID 37: Station 45+50 – Downstream (10/11/16)

PID 38: Station 45+95 – Upstream (10/11/16)

PID 39: Station 46+80 – Upstream (10/11/16)

PID 40: Station 47+75 – Upstream (10/11/16)

PID 41: Station 48+60 – Downstream (10/11/16)

UT to Town Creek – Reach 4

PID 1: Station 09+80 – Upstream (10/11/16)

PID 3: Station 11+20 – Upstream (10/11/16)

PID 2: Station 10+60 – Upstream (10/11/16)

PID 4: Station 11+75 – Upstream (10/11/16)

PID 5: Station 12+95 – Upstream (10/11/16)

PID 6: Station 13+45 – Downstream (10/11/16)

PID 7: Station 13+80 – Upstream (10/11/16)

PID 8: Station 14+ 20 – Upstream (10/11/16)

UT to Town Creek – Reach 5

PID 1: Station 10+70 – Upstream (10/11/16)

PID 2: Station 10+75 – Downstream (10/11/16)

PID 3: Station 11+75 – Upstream (10/11/16)

PID 4: Station 12+20 – Upstream (10/11/16)

PID 5: Station 12+65 – Upstream (10/11/16)

PID 6: Station 13+30 – Upstream (10/11/16)

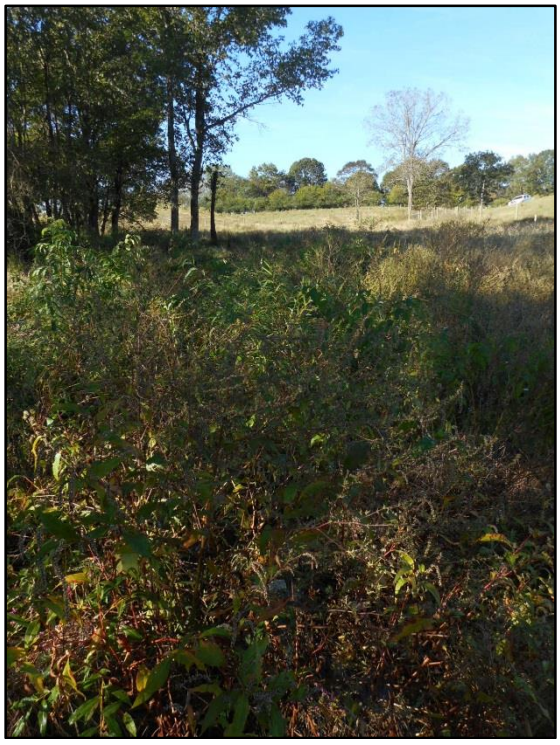
PID 7: Station 13+43 – Upstream (10/11/16)

UT to Town Creek – Reach 6

PID 1: Station14+55 – Upstream (10/11/16)

PID 2: Station 15+30 – Upstream (10/11/16)

PID 3: Station 16+00 – Upstream (10/11/16)



PID 4: Station 16+50 – Upstream (10/11/16)

UT to Town Creek – Reach 6

PID 5: Station 17+25 – Upstream (10/11/16)

PID 6: Station 18+00 – Upstream (10/11/16)

PID 7: Station 18+50 – Upstream (10/11/16)

PID 8: Station 18+90 – Downstream (10/11/16)

PID 9: Station 19+05 – Upstream (10/11/16)

PID 10: Station 19+50 – Left Floodplain (10/11/16)

PID 11: Station 19+50 – Upstream (10/11/16)

PID 12: Station 19+85 – Upstream (10/11/16)

UT to Town Creek – Reach 6

PID 13: Station 20+50 - Upstream (10/11/16)

PID 14: Station 20+50 - Downstream (10/11/16)

PID 15: Station 21+00 – Upstream (10/11/16)

PID 16: Station 22+75 – Upstream (10/11/16)

PID 17: Station 23+40 – Upstream (10/11/16)

PID 18: Station 24+00 – Upstream (10/11/16)

UT to Town Creek – Reach 6

PID 19: Station 24+50 – Upstream (10/11/16)

PID 20: Station 23+25 – Upstream (10/10/2016)

PID 21: Station 25+80 - Downstream (10/11/16)

PID 22: Station 25+85 – Upstream (10/11/16)

PID 23: Station 26+50 – Upstream (10/11/16)

UT to Town Creek – Reach 6

PID 24: Station 26+75 – Upstream (10/11/16)

PID 25: Station 28+00 – Upstream (10/11/16)

PID 26: Station 28+14 – Upstream (10/11/16)

UT to Town Creek – Reach 7

PID 1: Station 09+40: Upstream (10/11/16)

PID 2: Station 09+90 – Upstream (10/11/16)

PID 3: Station 10+70 – Upstream (10/11/16)

PID 4: Station 10+80 – Downstream (10/11/16)

PID 5: Station 11+75 – Upstream (10/11/16)

PID 7: Station 12+90 – Upstream (10/11/16)

PID 6: Station 12+20 – Upstream (10/11/16)

PID 8: Station 13+50 – Upstream (10/11/16)

PID 9: Station 13+99 – Upstream (10/11/16

Vegetation Problem Area Photos

UT to Town Creek – Reach 1

VPA1-1 – Sparse herbaceous vegetation (10/10//16)

VPA1-2 – Sparse herbaceous vegetation (10/10//16)

UT to Town Creek – Reach 2

VPA1-3 & 1-4 – Sparse herbaceous vegetation (10/10/16)

UT to Town Creek – Reach 6

VPA1-5 – Chinese privet in floodplain (11/04/16)

UT to Town Creek – Reach 5

VPA1-6 – Chinese privet in floodplain (11/04/16)

APPENDIX C

Vegetation Plot Data

Table 7. Vegetation Plot Mitigation Success Summary
UT to Town Creek Restoration Project: Project No. 94648

Wetland/Stream Vegetation Totals (per acre)				
Plot #	**Stream/ Wetland Stems[2]**	**Volunteers[3]**	**Total[4]**	**Success Criteria Met?**
VP1	769	0	769	Yes
VP2	809	0	809	Yes
VP3	688	0	688	Yes
VP4	647	0	647	Yes
VP5	688	0	688	Yes
VP6	769	0	769	Yes
VP7	688	0	688	Yes
VP8	688	0	688	Yes
VP9	526	0	526	Yes
VP10	809	0	809	Yes
VP11	890	0	890	Yes
VP12	728	0	728	Yes
VP13	607	0	607	Yes
VP14	647	0	647	Yes
VP15	688	0	688	Yes
VP16	809	0	809	Yes
VP17	647	0	647	Yes
VP18	769	0	769	Yes
VP19	567	0	567	Yes
VP20	567	0	567	Yes
Project Avg	**700**	**0**	**700**	**Yes**

[1]Buffer Stems: Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.

[2]Stream/ Wetland Stems: Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines

[3]Volunteers: Native woody stems. Not planted. No vines.

[4]Total: Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

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 Town Creek Restoration Project: Project No. 94648	
Report Prepared By	Russell Myers
Date Prepared	12/19/2016 9:09
database name	120857_UTtoTown_cvs-eep-entrytool-v2.3.1_MY1.mdb
database location	L:\projects\120857_UT Town\Monitoring\YR-1\Monitoring Data\Veg Data
computer name	ASHELCTOMSIC
file size	47063040
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.
PROJECT SUMMARY----------	
Project Code	94648
project Name	UT to Town Creek Restoration Project - Option A
Description	
River Basin	Yadkin-Pee Dee
length(ft)	
stream-to-edge width (ft)	
area (sq m)	101576
Required Plots (calculated)	20
Sampled Plots	20

Table 9. CVS Stem Count of Planted Stems by Plot and Species
UT to Town Creek Restoration Project: Project No. 94648

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2016)																							
			94648-01-VP1			94648-01-VP2			94648-01-VP3			94648-01-VP4			94648-01-VP5			94648-01-VP6			94648-01-VP7			94648-01-VP8		
			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
Asimina triloba	pawpaw	Tree																								
Betula nigra	river birch	Tree	1	1	1				4	4	4	2	2	2	2	2	2	4	4	4						
Callicarpa americana	American beautyberry	Shrub	1	1	1													2	2	2	5	5	5			
Carpinus caroliniana	American hornbeam	Tree	1	1	1	2	2	2	1	1	1	2	2	2				1	1	1						
Cephalanthus occidentalis	common buttonbush	Shrub																								
Cercis canadensis	eastern redbud	Tree																4	4	4	2	2	2			
Cornus amomum	silky dogwood	Shrub										4	4	4							4	4	4			
Cornus florida	flowering dogwood	Tree				1	1	1				1	1	1							3	3	3			
Diospyros virginiana	common persimmon	Tree	4	4	4	3	3	3							4	4	4									
Fraxinus pennsylvanica	green ash	Tree																								
Liriodendron tulipifera	tuliptree	Tree										1	1	1												
Nyssa sylvatica	blackgum	Tree																								
Platanus occidentalis	American sycamore	Tree	1	1	1	1	1	1	4	4	4	1	1	1	2	2	2	4	4	4				12	12	12
Quercus	oak	Tree																								
Quercus alba	white oak	Tree																			3	3	3			
Quercus falcata	southern red oak	Tree	3	3	3	4	4	4	1	1	1	1	1	1												
Quercus lyrata	overcup oak	Tree	1	1	1										2	2	2	1	1	1				1	1	1
Quercus michauxii	swamp chestnut oak	Tree	5	5	5	1	1	1	2	2	2				1	1	1							1	1	1
Quercus pagoda	cherrybark oak	Tree													1	1	1							2	2	2
Quercus phellos	willow oak	Tree	2	2	2	6	6	6	5	5	5				5	5	5	3	3	3				1	1	1
Quercus rubra	northern red oak	Tree																								
Sambucus canadensis	Common Elderberry	Shrub																								
Sambucus nigra	European black elderberry	Shrub				2	2	2				4	4	4												
Unknown																										
		Stem count	19	19	19	20	20	20	17	17	17	16	16	16	17	17	17	19	19	19	17	17	17	17	17	17
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	9	9	9	8	8	8	6	6	6	8	8	8	7	7	7	7	7	7	5	5	5	5	5	5
		Stems per ACRE	769	769	769	809	809	809	688	688	688	647	647	647	688	688	688	769	769	769	688	688	688	688	688	688

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%

Pnols = Planted No Live Stakes
P-all = Planted Includes Live Stakes
T = Total

Table 9 Cont. CVS Stem Count of Planted Stems by Plot and Species
UT to Town Creek Restoration Project: Project No. 94648

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2016)																						
			94648-01-VP9			94648-01-VP10			94648-01-VP11			94648-01-VP12			94648-01-VP13			94648-01-VP14			94648-01-VP15			94648-01-VP16		
			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
Asimina triloba	pawpaw	Tree																			2	2	2			
Betula nigra	river birch	Tree										3	3	3										2	2	2
Callicarpa americana	American beautyberry	Shrub				1	1	1	5	5	5	1	1	1	1	1	1									
Carpinus caroliniana	American hornbeam	Tree	3	3	3																					
Cephalanthus occidentalis	common buttonbush	Shrub				1	1	1																4	4	4
Cercis canadensis	eastern redbud	Tree				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4	4			
Cornus amomum	silky dogwood	Shrub	3	3	3	2	2	2	1	1	1	1	1	1	1	1	1	4	4	4	5	5	5	3	3	3
Cornus florida	flowering dogwood	Tree	3	3	3	1	1	1																		
Diospyros virginiana	common persimmon	Tree							2	2	2	1	1	1	5	5	5							2	2	2
Fraxinus pennsylvanica	green ash	Tree	1	1	1	9	9	9	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2			
Liriodendron tulipifera	tuliptree	Tree							2	2	2	3	3	3				3	3	3						
Nyssa sylvatica	blackgum	Tree				1	1	1	3	3	3	2	2	2	1	1	1							5	5	5
Platanus occidentalis	American sycamore	Tree							1	1	1							2	2	2						
Quercus	oak	Tree																								
Quercus alba	white oak	Tree	1	1	1	1	1	1							1	1	1				1	1	1	1	1	1
Quercus falcata	southern red oak	Tree	1	1	1				4	4	4							3	3	3						
Quercus lyrata	overcup oak	Tree	1	1	1				1	1	1				1	1	1				1	1	1	1	1	1
Quercus michauxii	swamp chestnut oak	Tree										1	1	1	1	1	1				1	1	1			
Quercus pagoda	cherrybark oak	Tree																						1	1	1
Quercus phellos	willow oak	Tree																1	1	1	1	1	1			
Quercus rubra	northern red oak	Tree				1	1	1	1	1	1															
Sambucus canadensis	Common Elderberry	Shrub				1	1	1				3	3	3	1	1	1							1	1	1
Sambucus nigra	European black elderberry	Shrub				1	1	1																		
Unknown																										
	Stem count		13	13	13	20	20	20	22	22	22	18	18	18	15	15	15	16	16	16	17	17	17	20	20	20
	size (ares)		1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		7	7	7	11	11	11	11	11	11	10	10	10	10	10	10	7	7	7	8	8	8	9	9	9
	Stems per ACRE		526	526	526	809	809	809	890	890	890	728	728	728	607	607	607	647	647	647	688	688	688	809	809	809

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%

Pnols = Planted No Live Stakes
P-all = Planted Includes Live Stakes
T = Total

Table 9 Cont. CVS Stem Count of Planted Stems by Plot and Species
UT to Town Creek Restoration Project: Project No. 94648

Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2016)												MY1 (2016)			MY0 (2016)		
			94648-01-VP17			94648-01-VP18			94648-01-VP19			94648-01-VP20								
			Pnols	P-all	T	Pnols	P-all	T	Pnols	P-all	T	Pnols	P-all	T	Pnols	P-all	T	Pnols	P-all	T
Asimina triloba	pawpaw	Tree	4	4	4										6	6	6	5	5	5
Betula nigra	river birch	Tree													18	18	18	21	21	21
Callicarpa americana	American beautyberry	Shrub													16	16	16	7	7	7
Carpinus caroliniana	American hornbeam	Tree													10	10	10	16	16	16
Cephalanthus occidentalis	common buttonbush	Shrub							1	1	1	2	2	2	8	8	8	5	5	5
Cercis canadensis	eastern redbud	Tree	1	1	1	8	8	8							24	24	24	29	29	29
Cornus amomum	silky dogwood	Shrub	1	1	1										29	29	29	31	31	31
Cornus florida	flowering dogwood	Tree				2	2	2	1	1	1	1	1	1	13	13	13	21	21	21
Diospyros virginiana	common persimmon	Tree	1	1	1	1	1	1	4	4	4	2	2	2	29	29	29	7	7	7
Fraxinus pennsylvanica	green ash	Tree	7	7	7	8	8	8	6	6	6				40	40	40	43	43	43
Liriodendron tulipifera	tuliptree	Tree							1	1	1	1	1	1	11	11	11	12	12	12
Nyssa sylvatica	blackgum	Tree													12	12	12	9	9	9
Platanus occidentalis	American sycamore	Tree										1	1	1	29	29	29	31	31	31
Quercus	oak	Tree																3	3	3
Quercus alba	white oak	Tree							1	1	1	1	1	1	10	10	10	12	12	12
Quercus falcata	southern red oak	Tree										2	2	2	19	19	19	15	15	15
Quercus lyrata	overcup oak	Tree													10	10	10	16	16	16
Quercus michauxii	swamp chestnut oak	Tree										1	1	1	14	14	14	29	29	29
Quercus pagoda	cherrybark oak	Tree													4	4	4			
Quercus phellos	willow oak	Tree	2	2	2							3	3	3	29	29	29	27	27	27
Quercus rubra	northern red oak	Tree													2	2	2			
Sambucus canadensis	Common Elderberry	Shrub													6	6	6	19	19	19
Sambucus nigra	European black elderberry	Shrub													7	7	7			
Unknown																		7	7	7
	Stem count		16	16	16	19	19	19	14	14	14	14	14	14	346	346	346	365	365	365
	size (ares)		1			1			1			1			20			20		
	size (ACRES)		0.02			0.02			0.02			0.02			0.49			0.49		
	Species count		6	6	6	4	4	4	6	6	6	9	9	9	22	22	22	21	21	21
	Stems per ACRE		647	647	647	769	769	769	567	567	567	567	567	567	700	700	700	739	739	739

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%

Pnols = Planted No Live Stakes
P-all = Planted Includes Live Stakes
T = Total

Vegetation Plot Photos

Vegetation Plot 1 (11/04/16)

Vegetation Plot 2 (11/04/16)

Vegetation Plot 3 (11/04/16)

Vegetation Plot 4 (11/04/16)

Vegetation Plot 5 (11/04/16)

Vegetation Plot 6 (11/04/16)

Vegetation Plot 7 (11/04/2016)

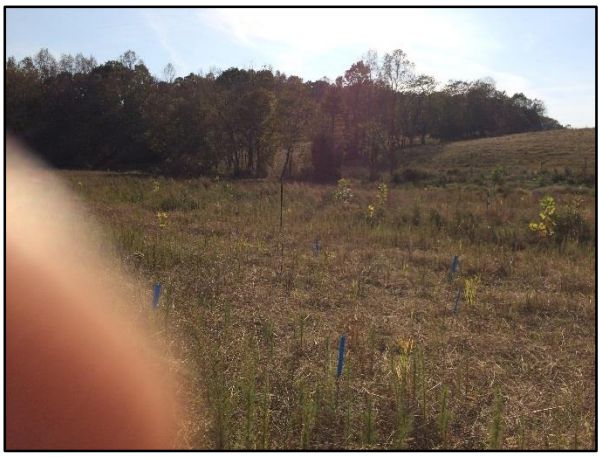
Vegetation Plot 8 (11/03/2016)

Vegetation Plot 9 (11/03/2016)

Vegetation Plot 10 (11/03/2016)

Vegetation Plot 11 (11/03/2016)

Vegetation Plot 12 (11/03/2016)



Vegetation Plot 13 (11/03/2016)

Vegetation Plot 14 (11/03/2016)

Vegetation Plot 15 (11/09/2016)

Vegetation Plot 16 (11/09/2016)

Vegetation Plot 17 (11/09/2016)

Vegetation Plot 18 (11/04/2016)

Vegetation Plot 19 (11/04/2016)

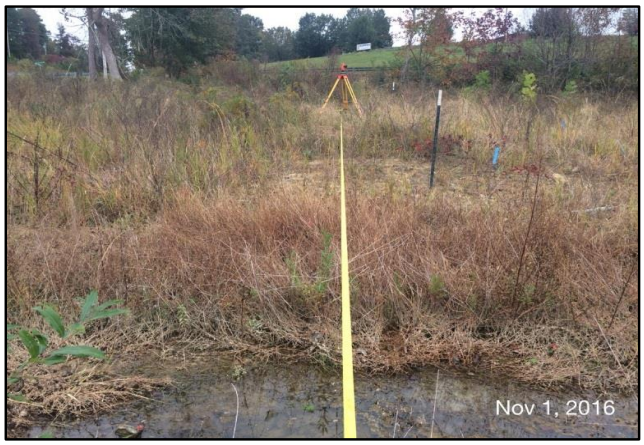
Vegetation Plot 20 (11/04/2016)

Appendix D

Stream Survey Data

Figure 3. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X1 - Reach 1 (Station 11+68)
Monitoring Year 1 - Collected November 2016



LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	9.18	11.99	0.77	1.09	15.67	1.05	2.71	574.3	574.35	32.46

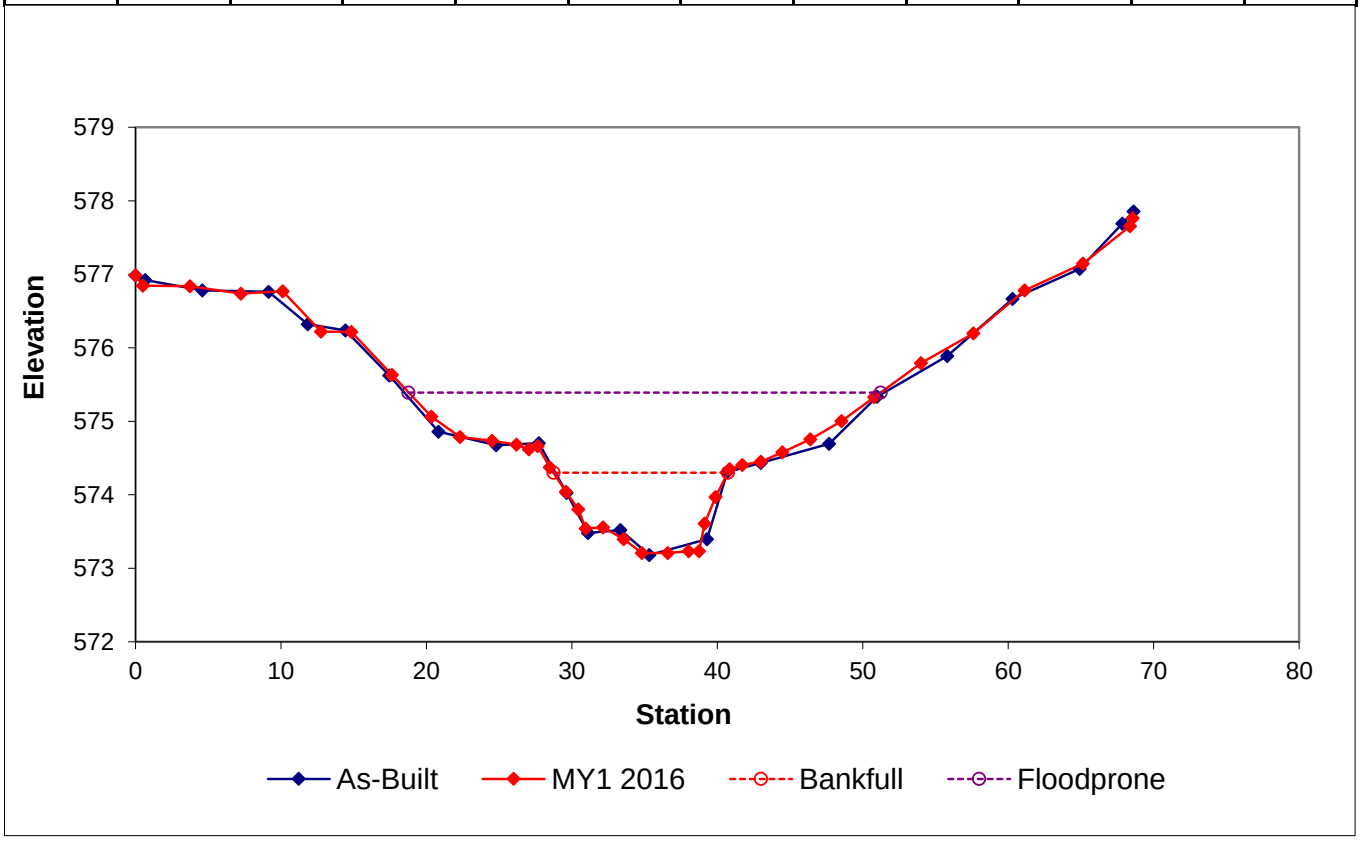


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X2 - Reach 1 (Station 12+06)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		24.81	19.73	1.26	2.48	15.68	1.01	3.59	574.71	574.72	70.74

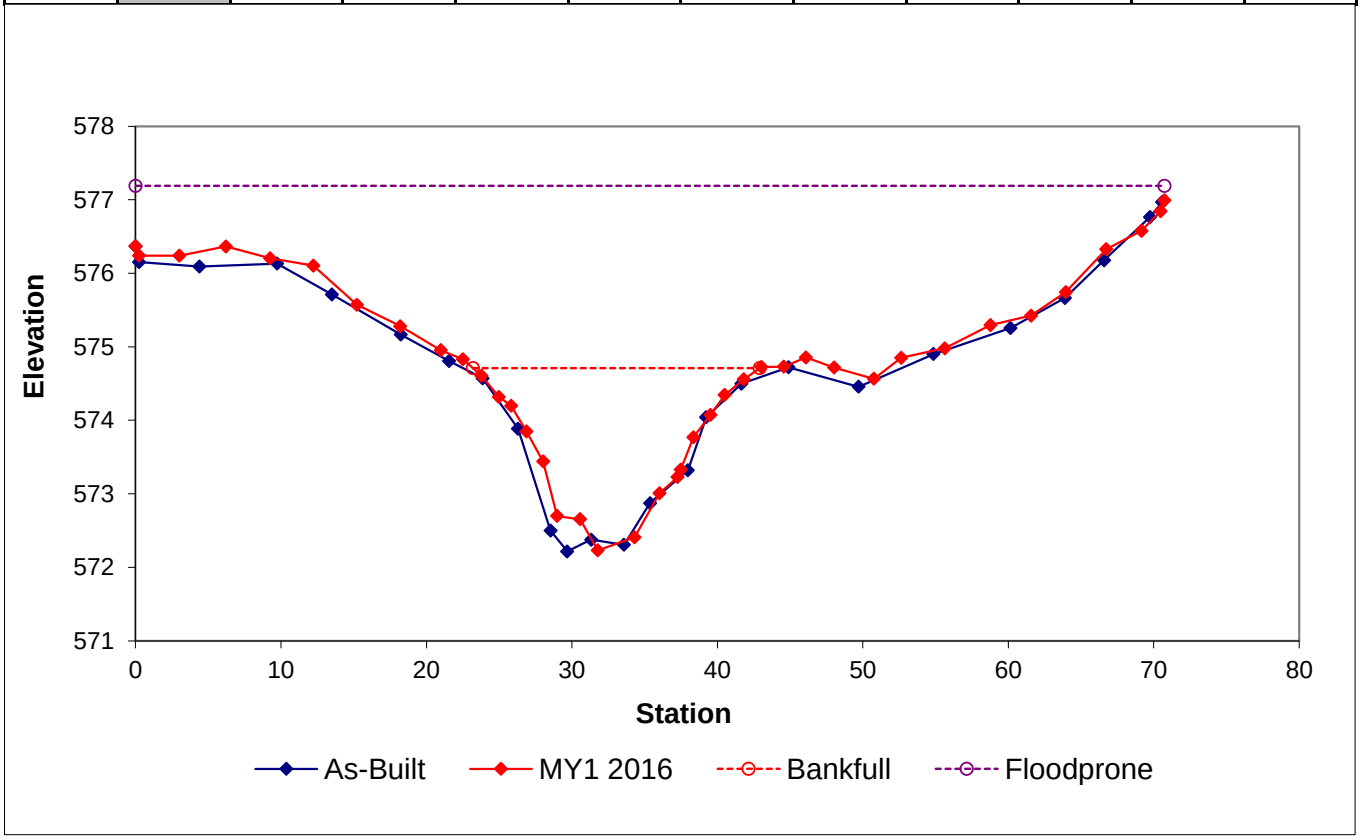


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X3 - Reach 1 (Station 15+97)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		21.74	16.35	1.33	2.43	12.3	1.01	4.72	571.55	571.58	77.26

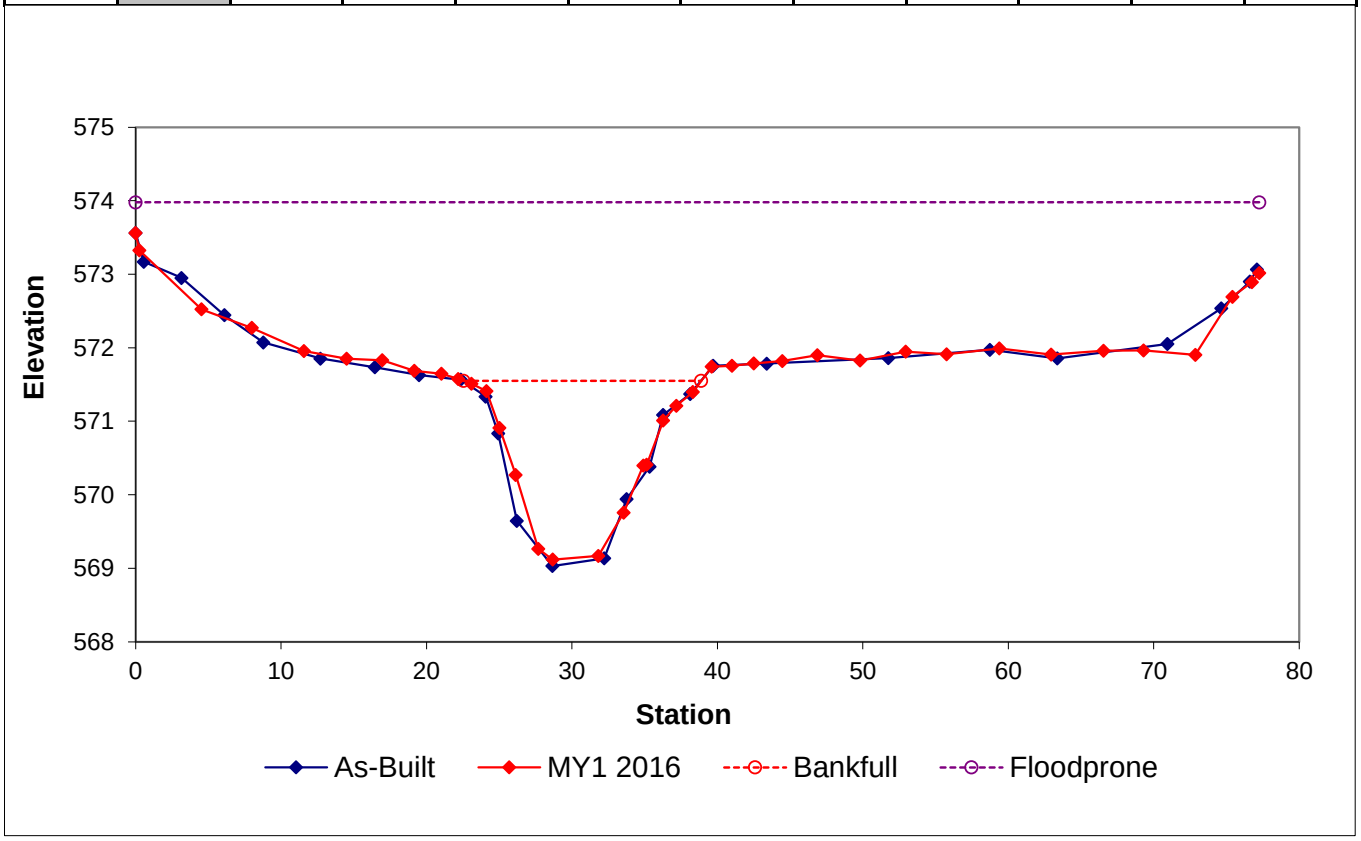


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X4 - Reach 1 (Station 16+17)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	12.35	14.74	0.84	1.2	17.59	1.01	6.12	571.46	571.48	90.19

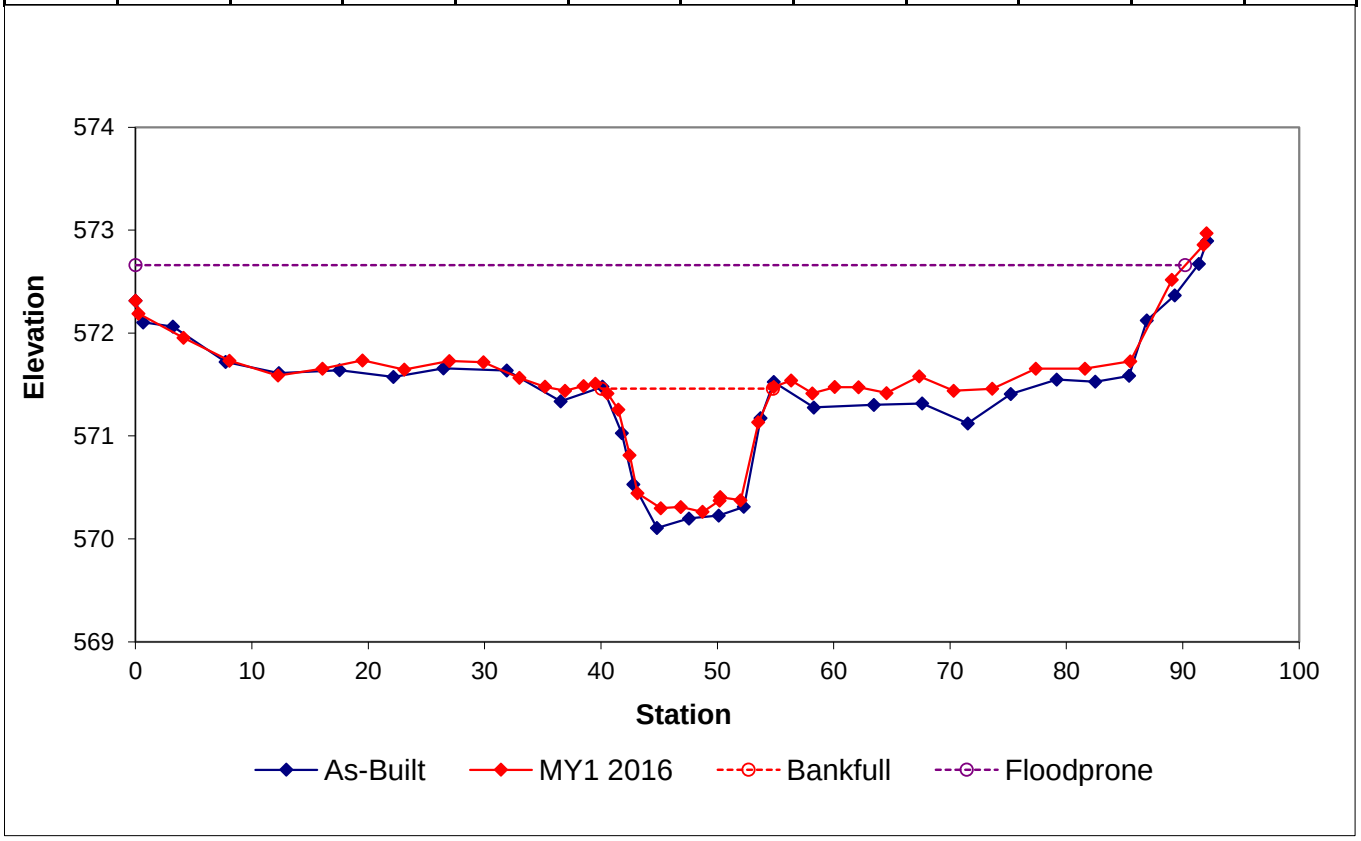


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X5 - Reach 1 (Station 19+41)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	10.28	12.05	0.85	1.19	14.12	1.11	6.56	568	568.13	78.98

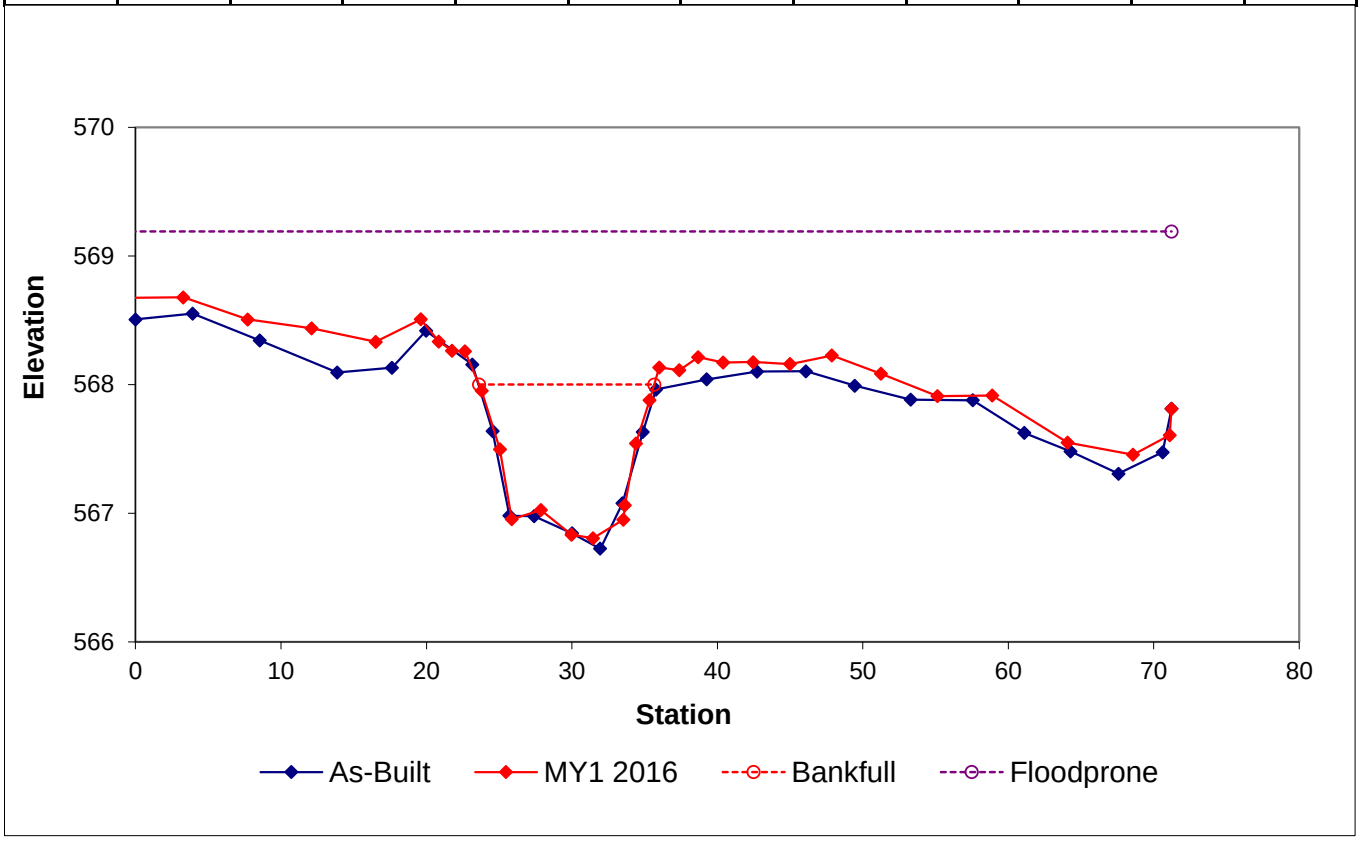


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X6 - Reach 2 (Station 25+14)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	14.63	15.39	0.95	1.38	16.18	1.04	5.02	561.9	561.96	77.30

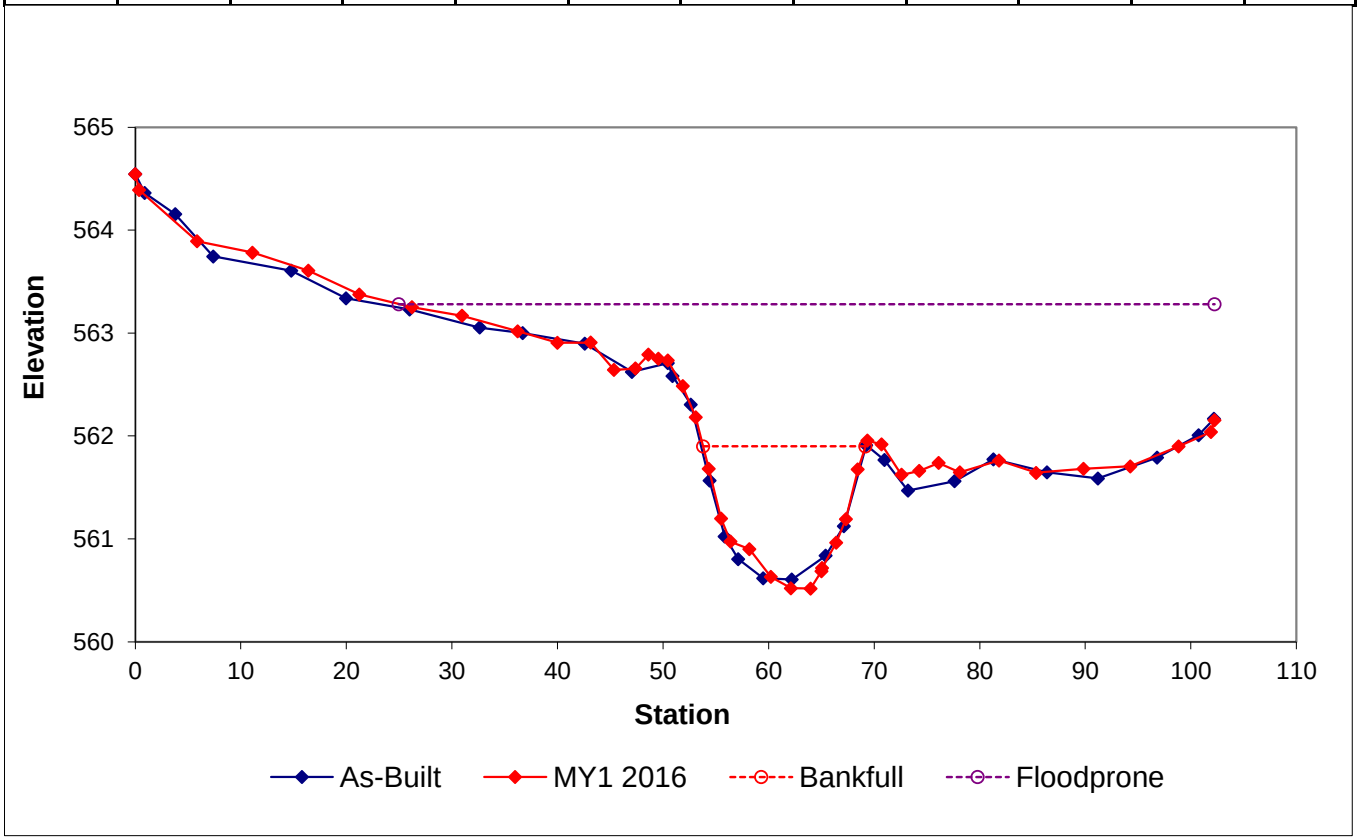
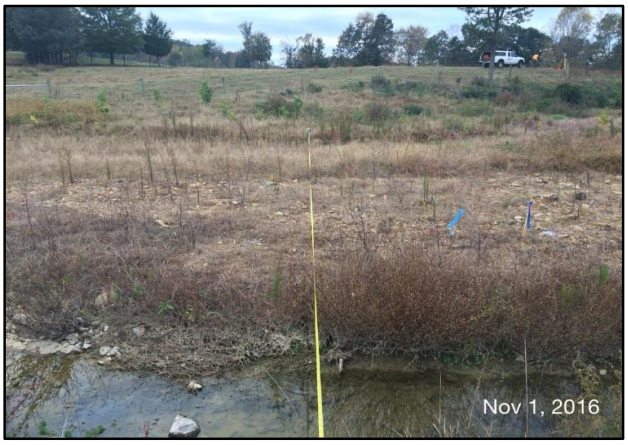


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X7 - Reach 2 (Station 25+59)
Monitoring Year 1 - Collected November 2016

LEFT BANK



RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		21.81	15.91	1.37	2.51	11.60	1.04	4.80	561.64	561.73	76.35

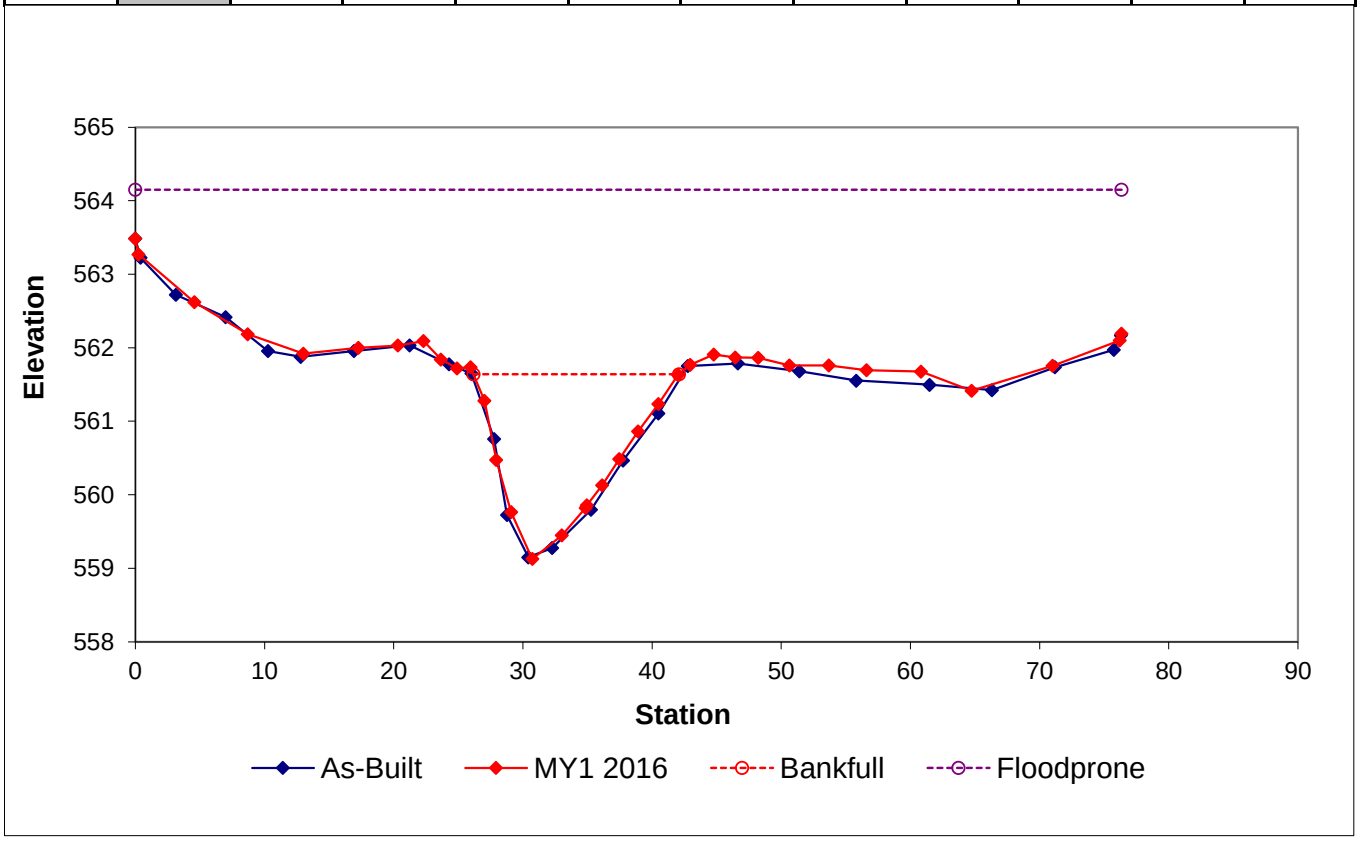


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X8 - Reach 2 (Station 29+15)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	15.06	14.59	1.03	1.64	14.13	1.11	7.04	558.82	559.01	102.73

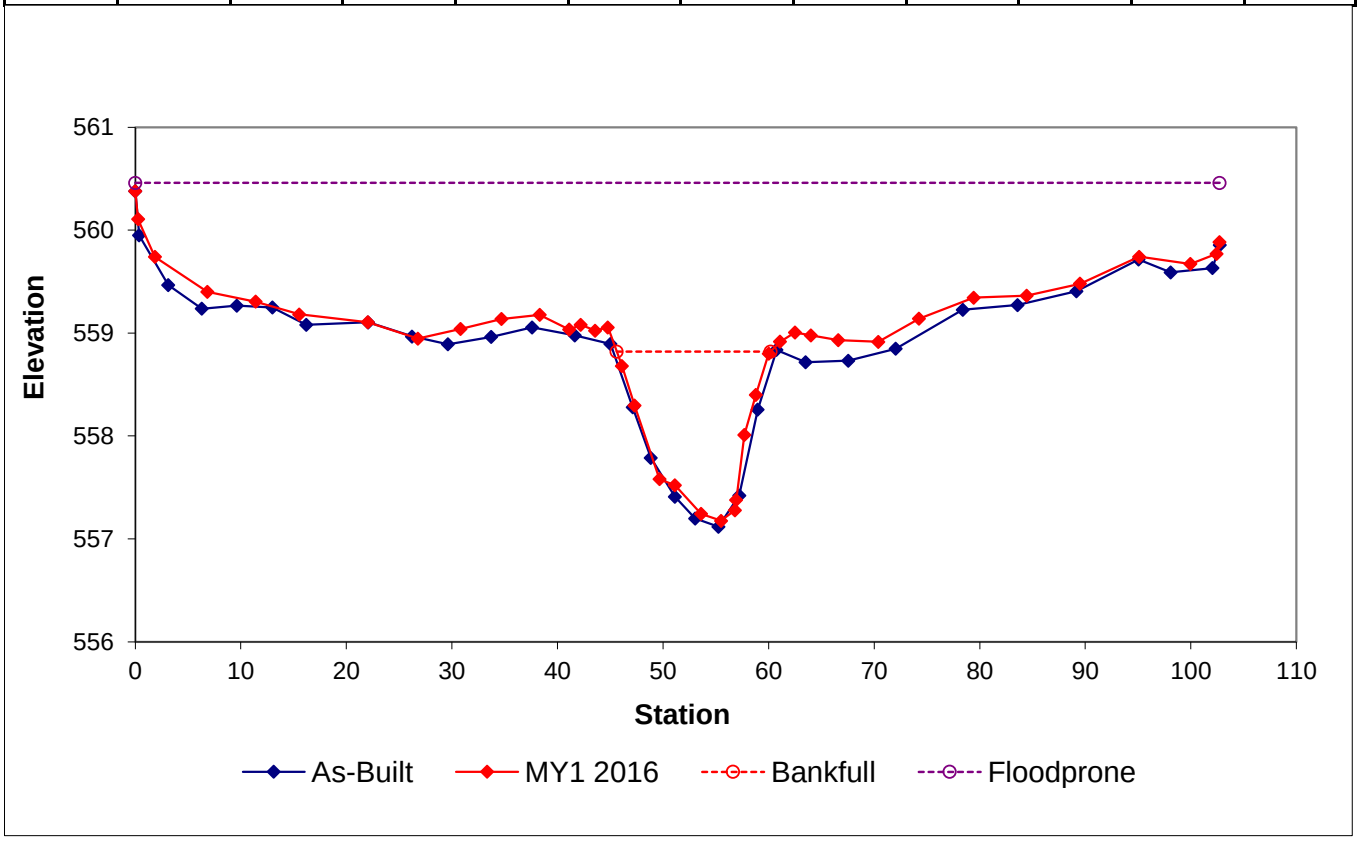


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X9 - Reach 2 (Station 37+64)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		30.86	20.33	1.52	2.80	13.40	1.00	4.70	552.73	552.74	95.49

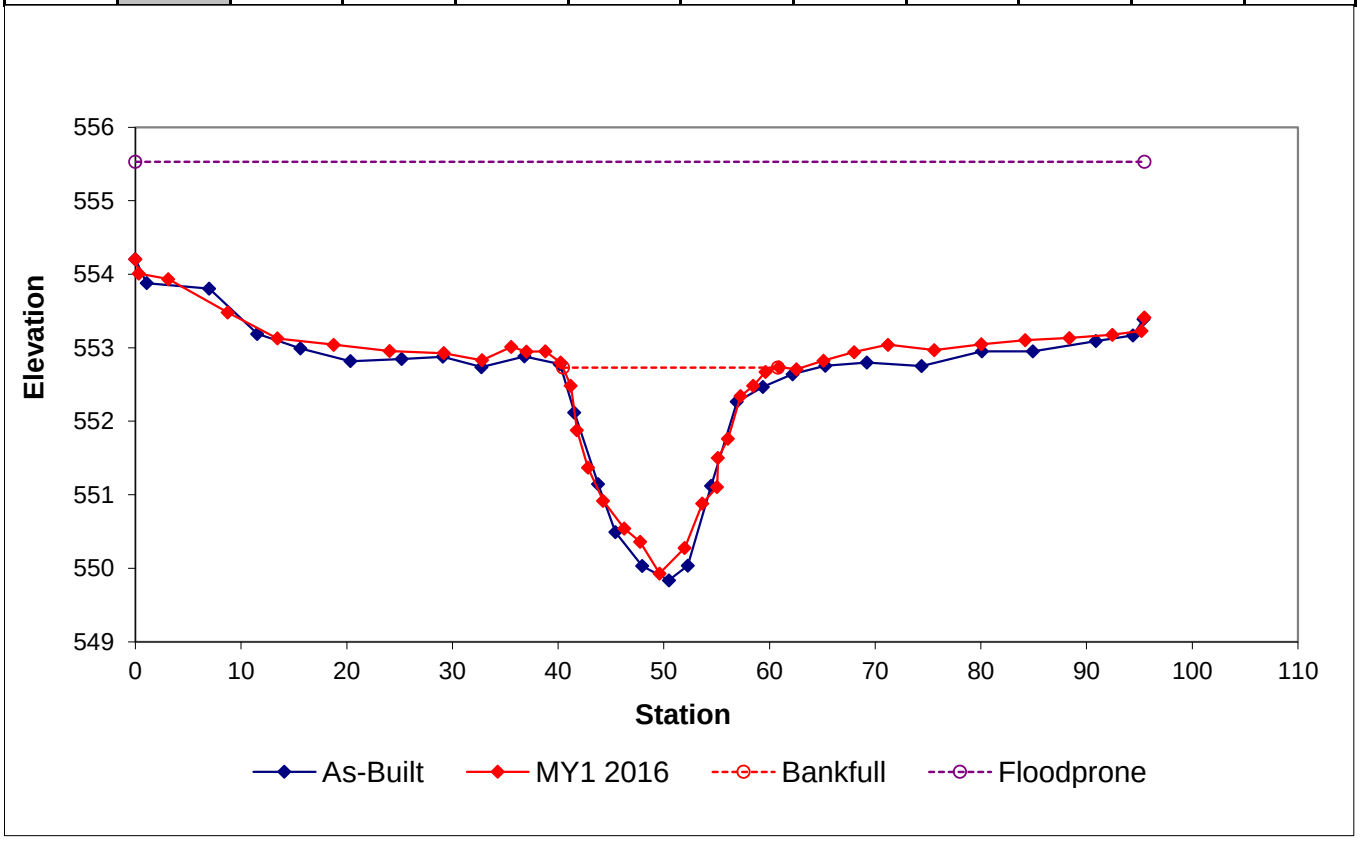
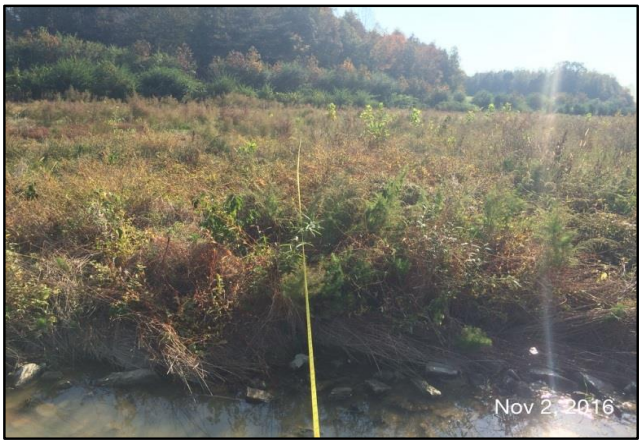


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X10 - Reach 2 (Station 37+95)
Monitoring Year 1 - Collected November 2016



LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	15.06	13.90	1.08	1.51	12.83	1.01	7.21	552.80	552.82	100.20

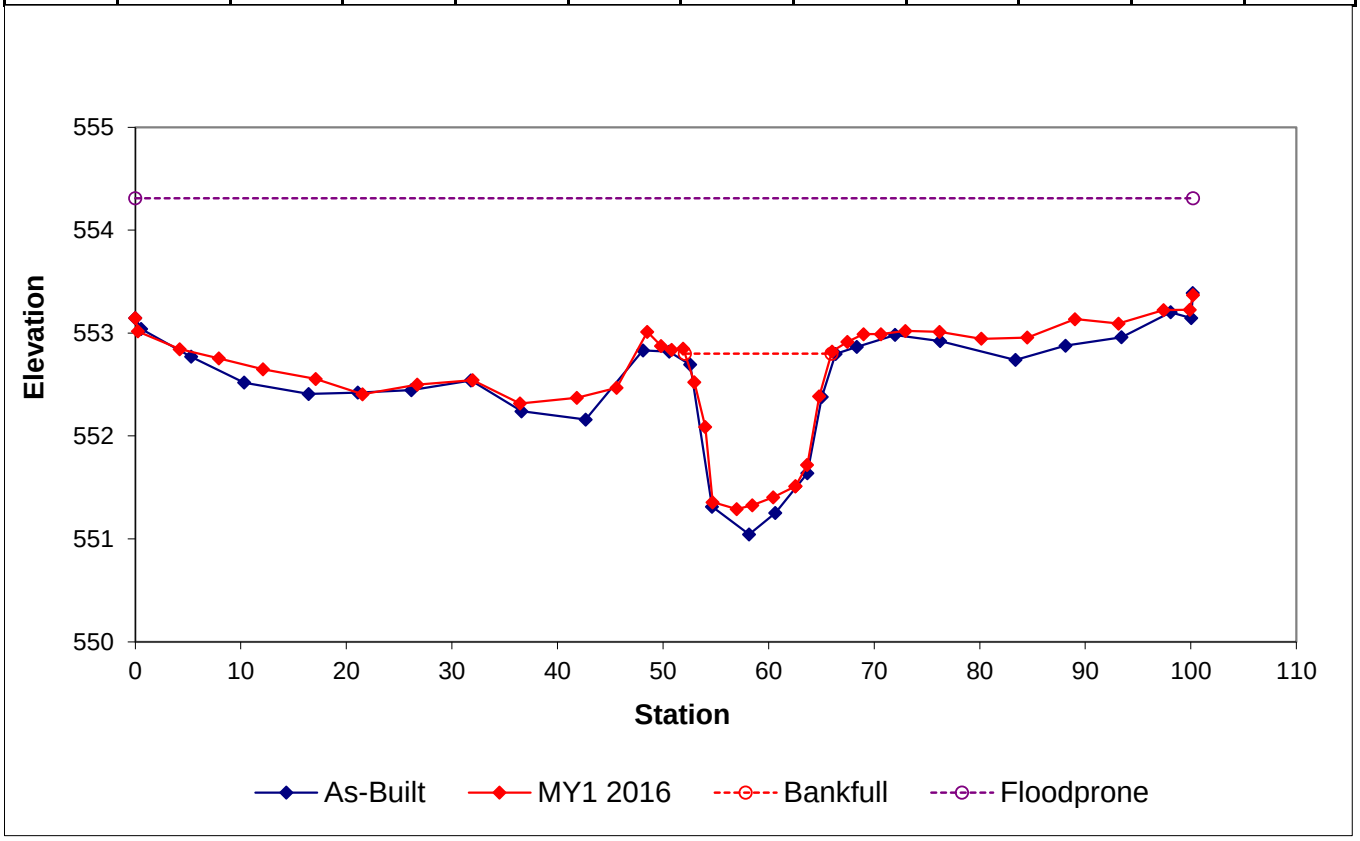


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X11 - Reach 3 (Station 41+62)
Monitoring Year 1 Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	14.53	17.12	0.85	1.41	20.18	0.97	5.83	550.50	550.46	99.85

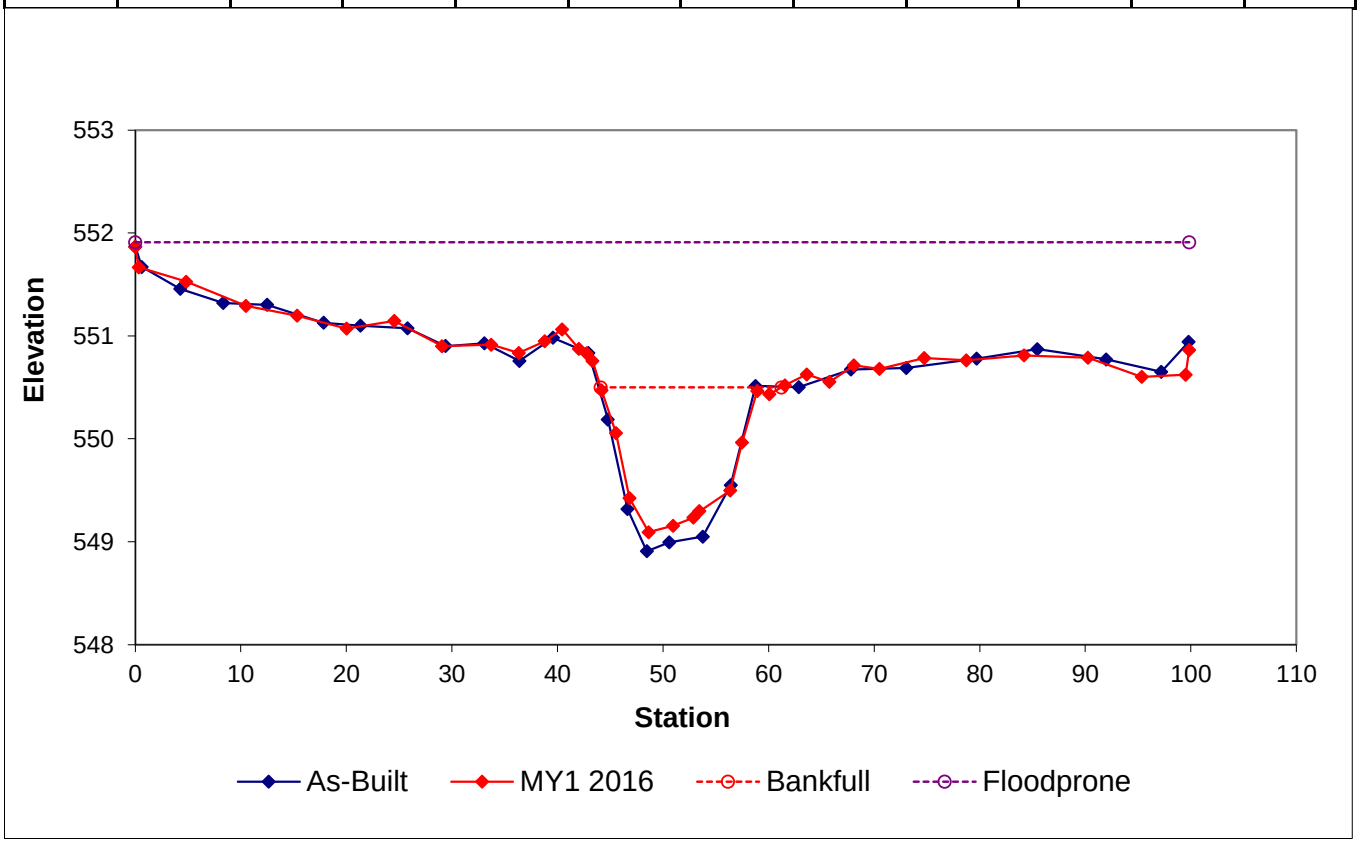


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X12 - Reach 3 (Station 44+81)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	17.63	16.53	1.07	1.64	15.5	1.01	6.05	548.87	548.88	99.95

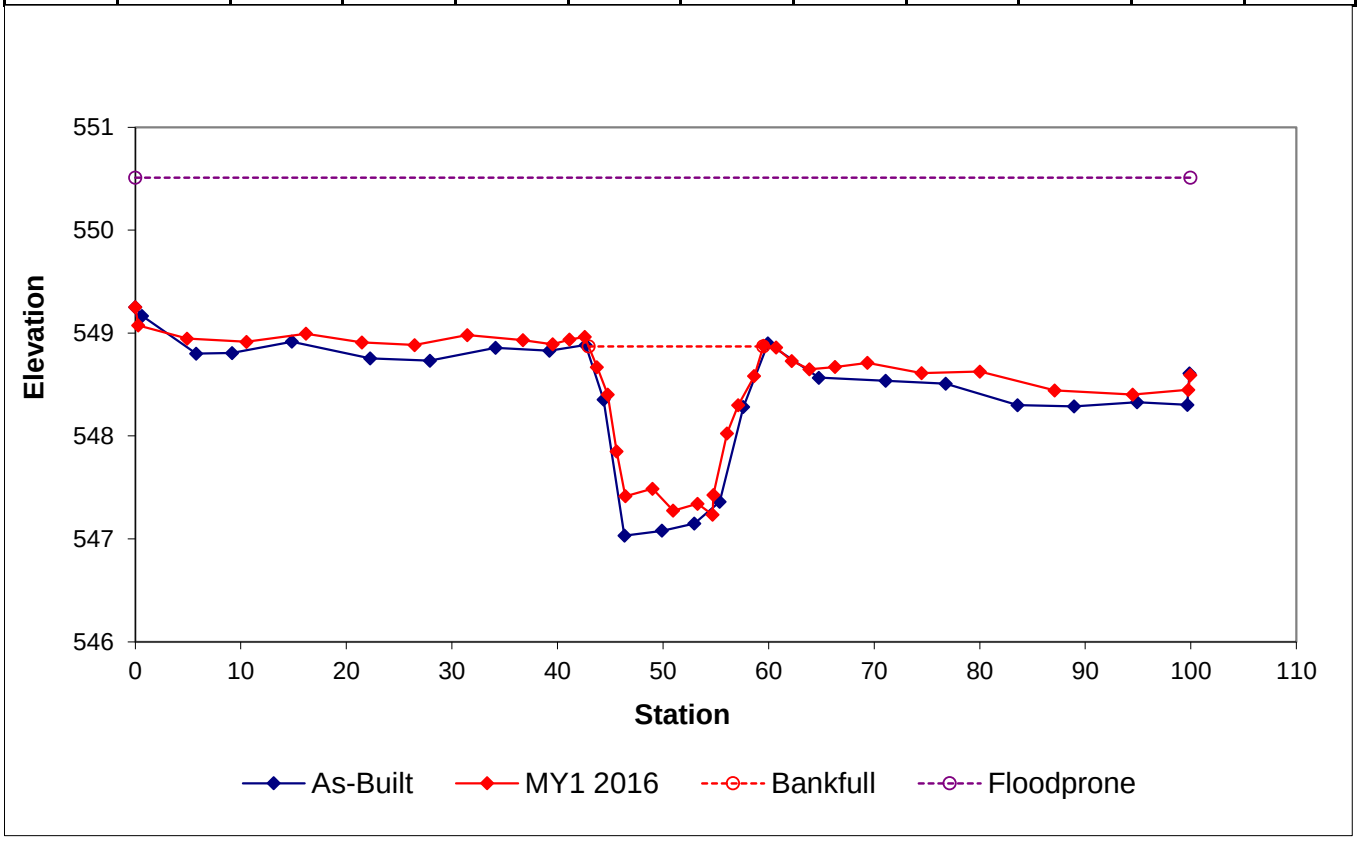
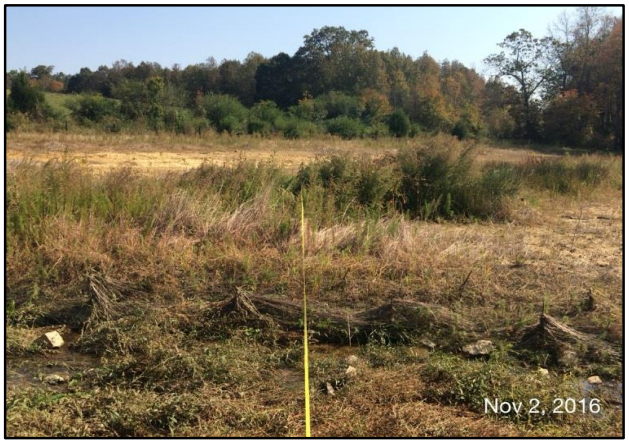


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X13 - Reach 3 (Station 45+62)
Monitoring Year 1 - Collected November 2016



LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	17.19	17.24	1.00	1.49	17.28	1.01	5.71	548.10	548.11	98.44

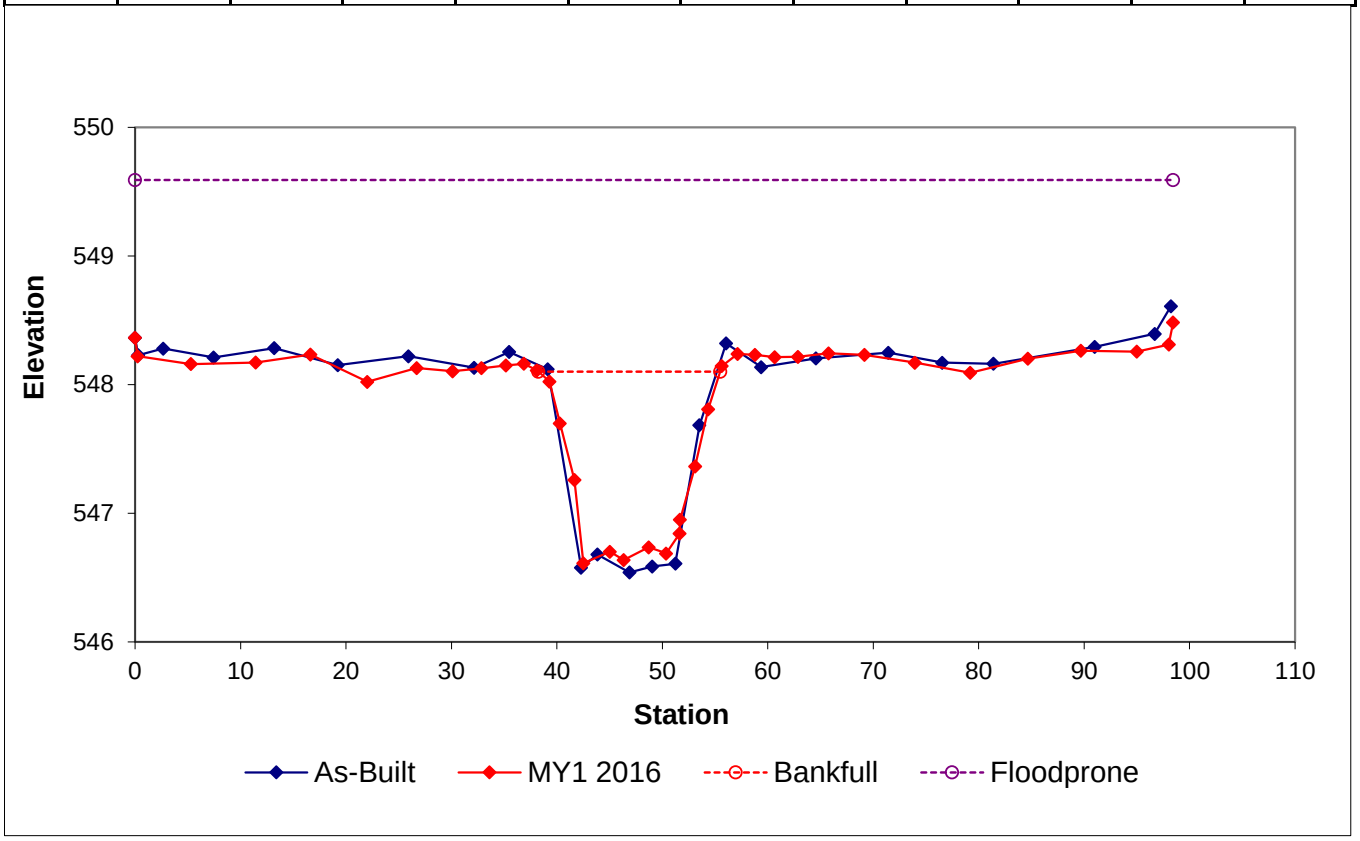


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X14 - Reach 3 (Station 45+97)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		32.52	18.99	1.71	3.06	11.09	1.01	5.20	547.87	547.89	98.78

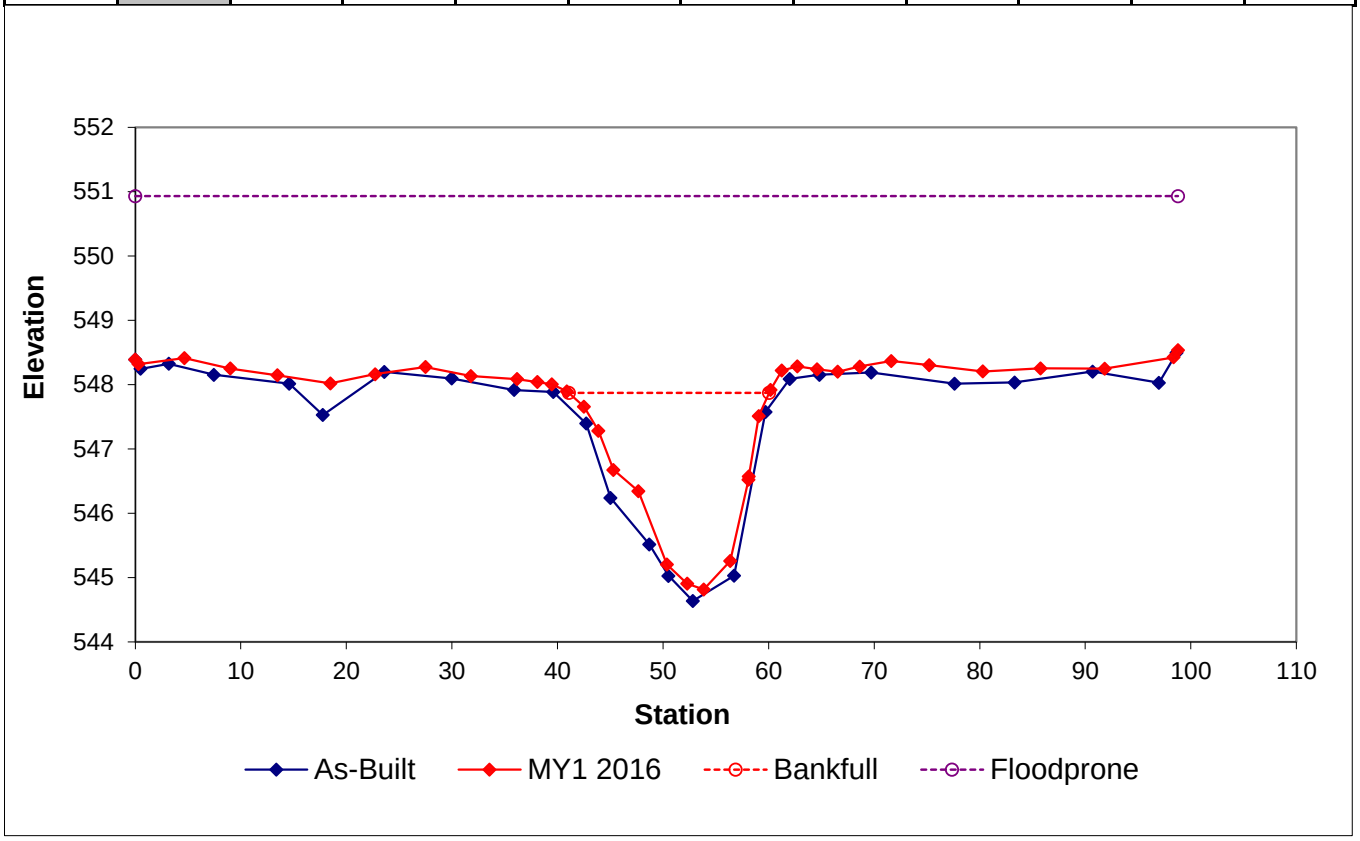


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X15 - Reach 6 (Station 26+15)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		9.37	10.60	0.88	1.79	11.99	1.01	5.69	553.79	553.81	60.33

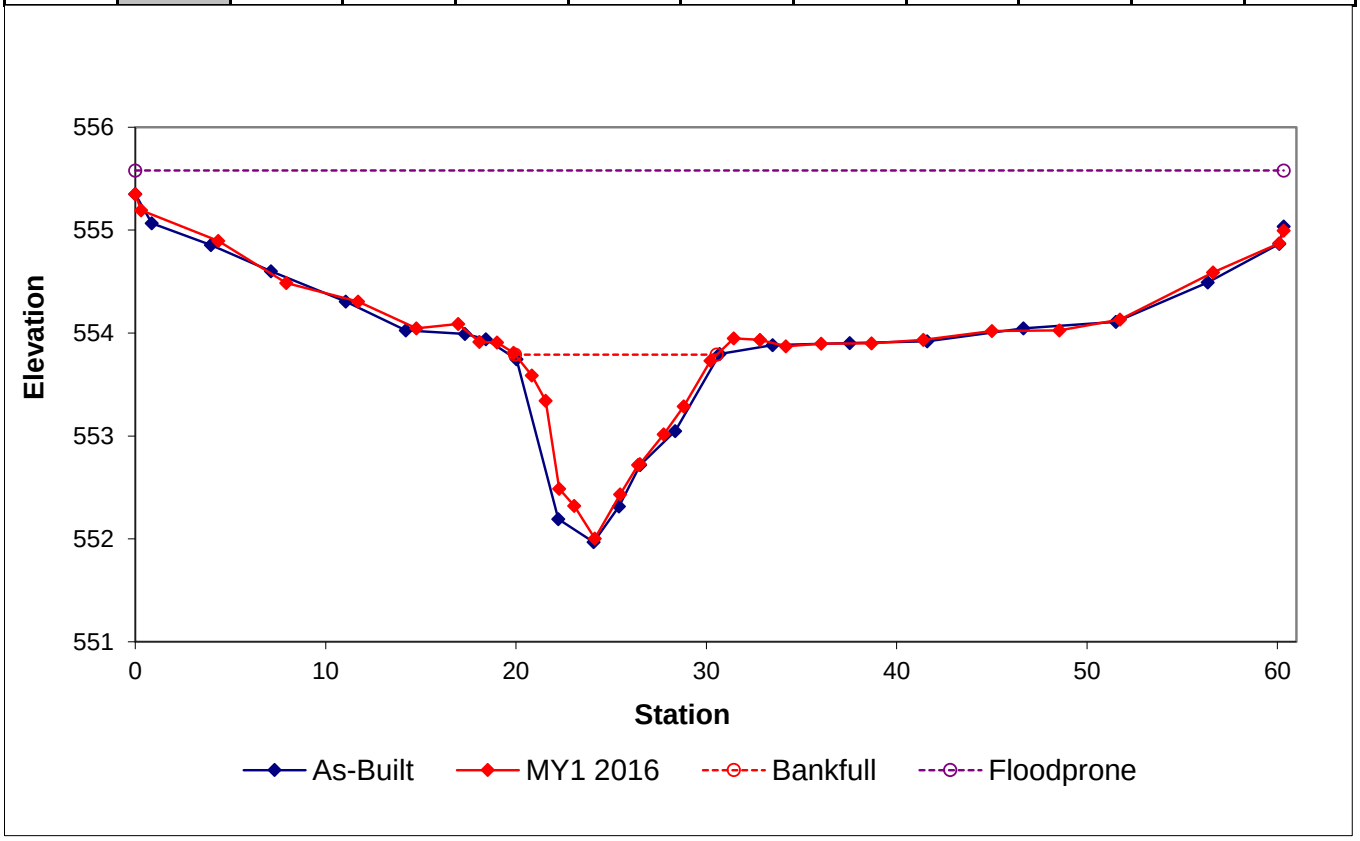


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X16 - Reach 6 (Station 26+00)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	5.73	9.34	0.61	1.09	15.23	1.02	5.66	554.26	554.28	52.90

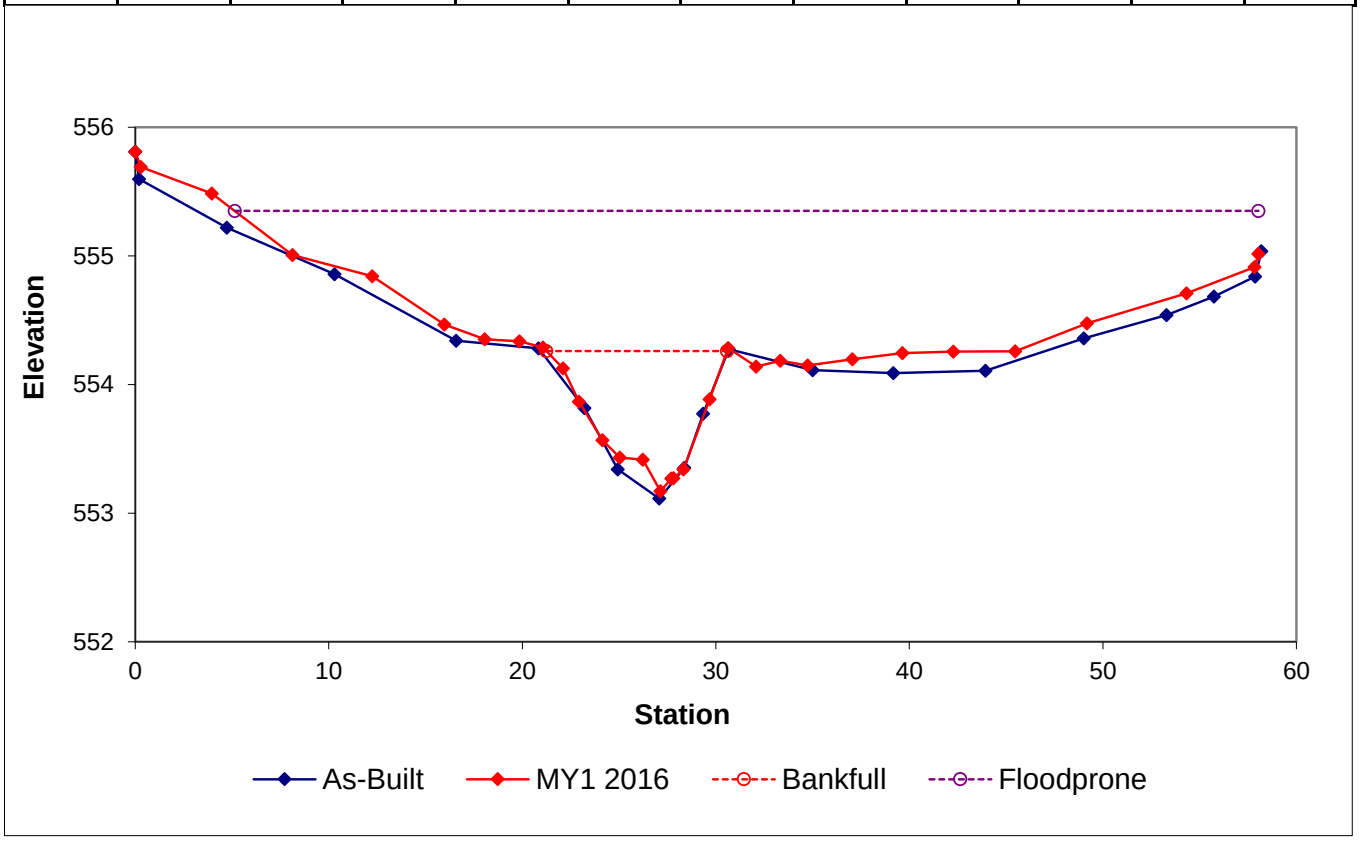


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X17 - Reach 6 - (Station 21+04)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	8.37	10.27	0.82	1.29	12.60	1.06	2.97	565.03	565.11	30.45

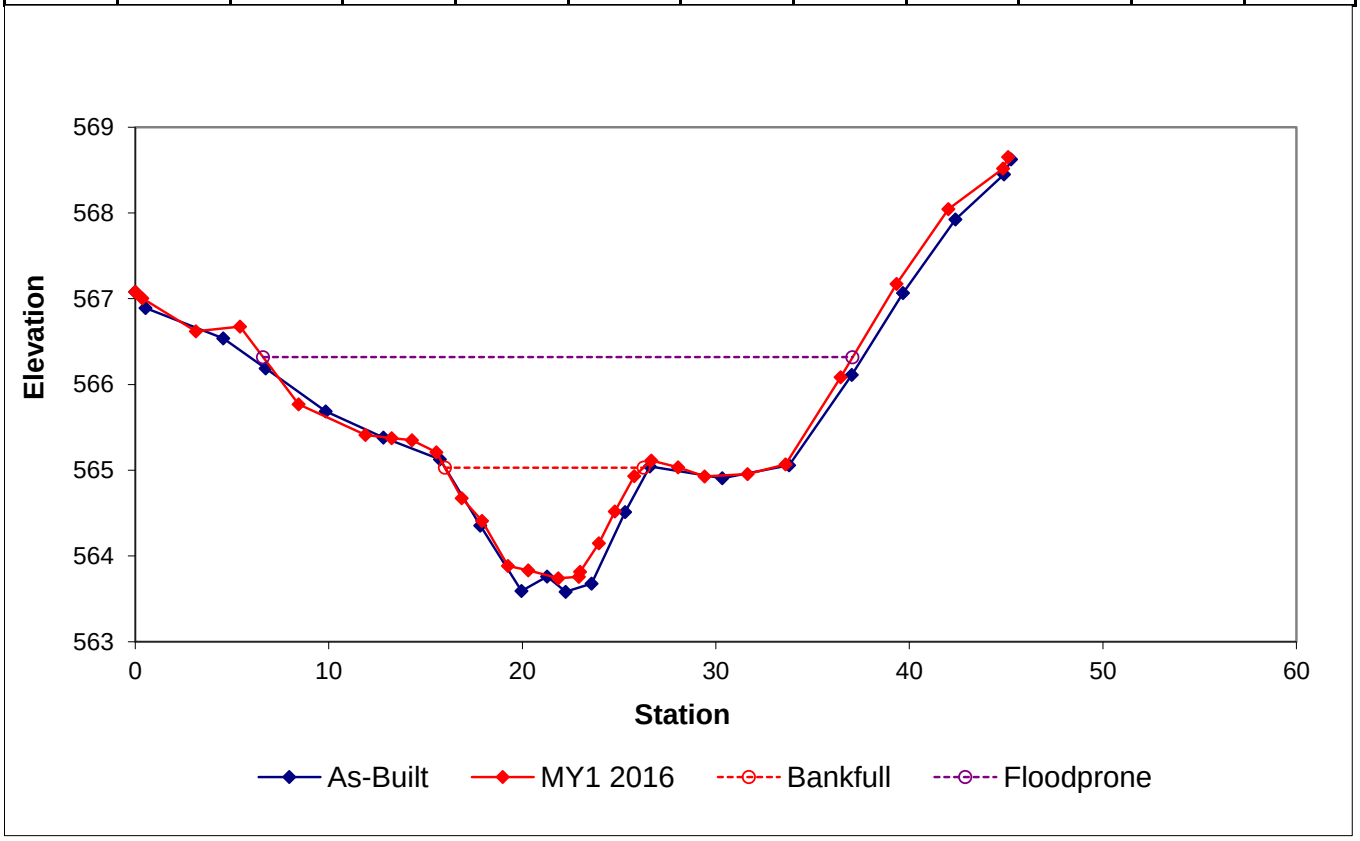


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X18 - Reach 6 (Station 16+74)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Riffle	C	4.28	7.47	0.57	1.06	13.02	1.07	4.55	577.96	578.03	33.98

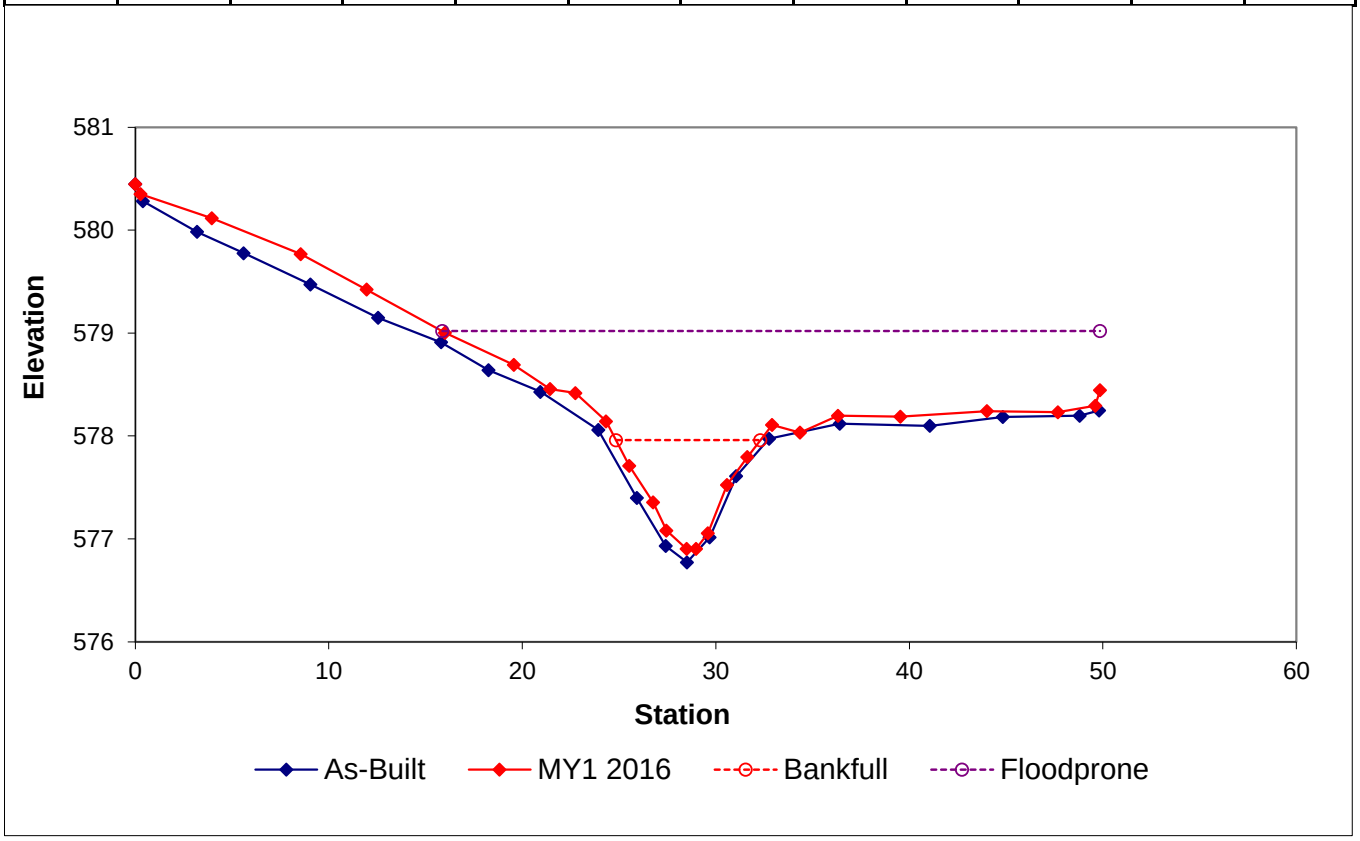


Figure 3 Continued. Cross-sections with Annual Overlays
UT to Town Creek Restoration Project - Option A: Project No. 94648

Permanent Cross-section
X19 - Reach 6 (Station 17+65)
Monitoring Year 1 - Collected November 2016

LEFT BANK

RIGHT BANK

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev	WFPA
Pool		7.29	10.14	0.72	1.31	14.11	1.00	3.95	575.75	575.75	40.11

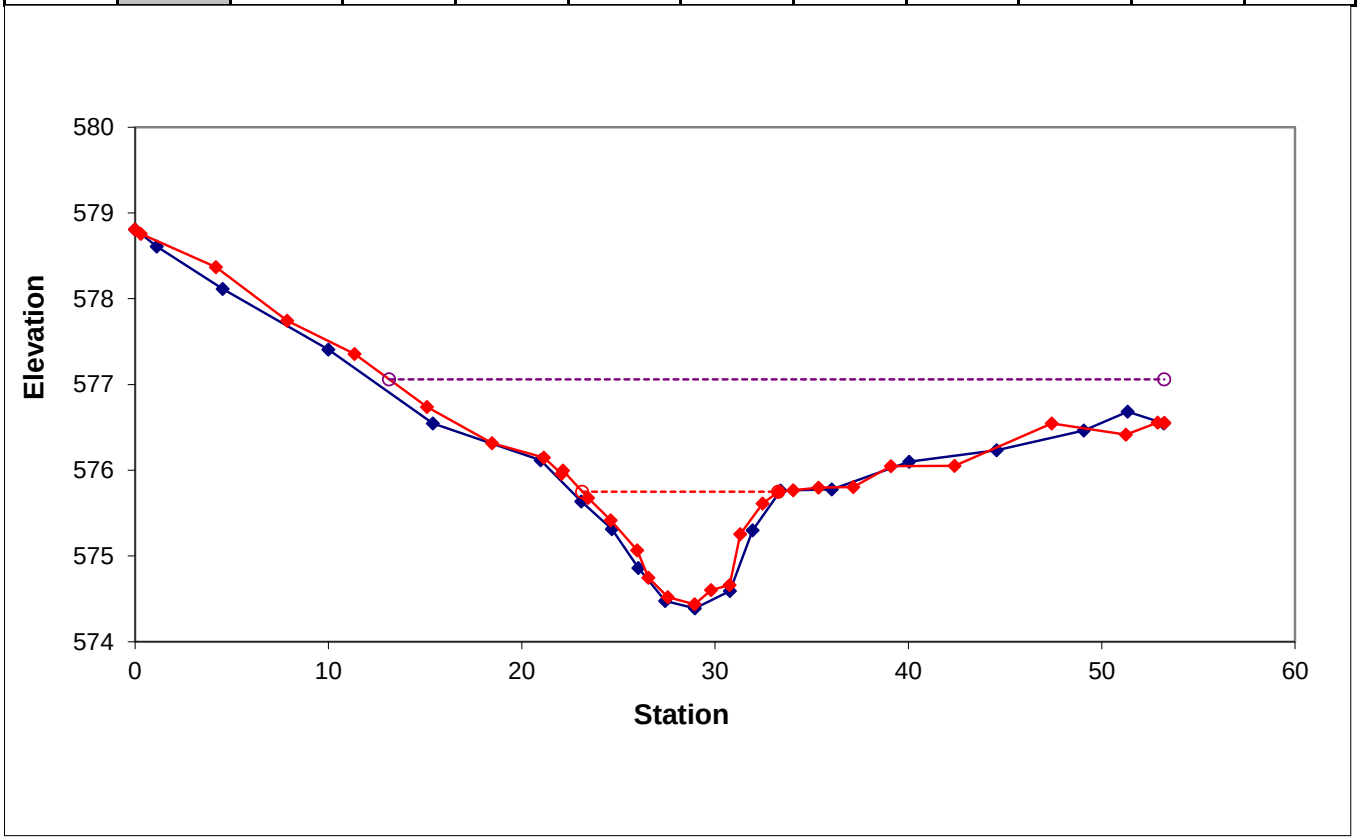


Table 10. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 1 (1,204 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	11.0	9.0	-----	-----	11.9	-----	2	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	77.0	-----	-----	-----	-----	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.4	1.2	-----	-----	1.5	-----	2	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	1.8	-----	-----	2.1	-----	2	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	18.9	-----	13.8	-----	-----	-----	-----	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	5.8	-----	-----	10.3	-----	2	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	6.5	-----	-----	8.6	-----	2	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	1.2	-----	-----	1.2	-----	2	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	50.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	31	-----	-----	101	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	17	-----	-----	77	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.4	-----	-----	8.6	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	63	-----	-----	144	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	2.6	-----	-----	11.2	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.011	-----	-----	0.056	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	65.6	-----	-----	206.5	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.8	-----	-----	-----	1	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----		11.3 / 33.0 / 50.0 / 128.0 / >2048						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	0.61	-----	-----	0.71	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	32	-----	-----	37.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.830	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----			-----	:4 (incisec	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----		-----	-----	3.6	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	77.8	-----	-----	-----	50	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)[2]	-----	-----	-----	-----	-----	-----	-----	1181	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0080	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

[1] Reach 1 data based on two riffle cross-sections and one pool cross-section.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 1 (1,204 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	13.5	-----	-----	-----	-----	11.8	-----	-----	14.4	-----	3
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	45	-----	-----	63	-----	-----	33.1	-----	-----	91.8	-----	3
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	0.8	-----	-----	1.0	-----	3
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	1.4	-----	-----	-----	-----	1.2	-----	-----	1.4	-----	3
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	13.8	-----	-----	-----	-----	9.1	-----	-----	13.9	-----	3
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	13.2	-----	-----	-----	-----	14.4	-----	-----	15.2	-----	3
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	3.3	-----	-----	4.7	-----	-----	2.8	-----	-----	6.4	-----	3
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	3
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	50	-----	-----	-----	-----	-----	31.2	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	42.0	51.6	-----	72.9	-----	18
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.6	-----	-----	-----	15
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	15.5	35.0	35.4	62.8	12.7	18
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.01	-----	-----	0.017	-----	-----	0.008	0.017	0.017	0.031	0.006	18
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	20.3	-----	-----	67.5	-----	-----	38.0	64.0	64.0	81.7	11.0	17
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	2.1	-----	-----	3.6	-----	-----	2.50	-----	-----	2.52	0.0	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					11.3 / 33.0 / 50.0 / 128.0 / >2048						4.0 / 18.4 / 31.2 / 96.6 / >2048 / >2048				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.41	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	26.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	0.830	-----	-----	-----	0.83	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	13.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,082	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,192	-----	-----	-----	-----	-----	1,206	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.11	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0094	-----	-----	-----	-----	-----	0.0096	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 2 (1,782 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	11.3	-----	12.6	-----	-----	-----	1	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	81.0	-----	-----	-----	-----	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.4	-----	1.2	-----	-----	-----	1	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	19.6	-----	14.5	-----	-----	-----	1	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	11.0	-----	-----	-----	1	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	6.4	-----	-----	-----	1	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	1.3	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	50.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	60	-----	185	-----	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	21	-----	80	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.7	-----	6.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	100	-----	340	-----	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	7.9	-----	27	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.01	-----	0.033	-----	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	49	-----	319	-----	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.1	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----		11.3 / 33.0 / 50.0 / 128.0 / >2048						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	0.77	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	42.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.9	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	:4 (incisec	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	3.8	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	81.2	-----	-----	-----	55	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	1,672	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.009	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 2 (1,782 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	14.0	-----	-----	-----	-----	15.4	-----	-----	15.6	-----	3
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	83	-----	-----	104.0	-----	-----	74.9	-----	-----	102.7	-----	3
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----	1.0	-----	-----	1.1	-----	3
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	1.4	-----	-----	-----	-----	1.3	-----	-----	1.8	-----	3
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	14.7	-----	-----	-----	-----	14.8	-----	-----	17.0	-----	3
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	13.3	-----	-----	-----	-----	14.2	-----	-----	16.5	-----	3
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	5.9	-----	-----	7.4	-----	-----	4.8	-----	-----	6.7	-----	3
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	3
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	50	-----	-----	-----	-----	-----	20.9	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	48.6	54.7	-----	65.6	-----	7
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.0	-----	-----	-----	8
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	16.4	48.9	39.1	101.3	37.2	21
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	-----	-----	-----	-----	-----	-----	0.003	0.018	0.018	0.035	0.0	21
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	21	-----	-----	70	-----	-----	46.0	75.4	70.0	130.2	23.5	19
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	2.1	-----	-----	3.7	-----	-----	2.5	-----	-----	2.9	0.3	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					11.3 / 33.0 / 50.0 / 128.0 / >2048						<0.063 / 12.2 / 20.9 / 68.5 / 151.8 / >2048				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	35.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	0.96	-----	-----	-----	-----	-----	0.96	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	55	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,549	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,833	-----	-----	-----	-----	-----	1,842	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.07	-----	-----	-----	-----	-----	1.19	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0127	-----	-----	-----	-----	-----	0.0077	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 3 (829 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	12.9	9.8	-----	-----	12.7	-----	2	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	230.3	-----	-----	-----	-----	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.6	1.5	-----	-----	1.8	-----	2	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	2.9	-----	-----	3.2	-----	2	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	24.3	18.0	-----	-----	18.9	-----	2	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	5.4	-----	-----	8.6	-----	2	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	18.1	-----	-----	23.5	-----	2	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	15.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	40	-----	-----	65	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	34	-----	-----	61	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.7	-----	-----	4.9	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	63	-----	-----	199	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	5	-----	-----	20.3	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.014	-----	-----	0.03	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	38	-----	-----	132	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	2.6	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----		1.0 / 11.0 / 15.0 /64.0 / 150.0						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180				
Reach Shear Stress (competency) lb/f²	-----	-----	-----	-----	0.3	-----	-----	0.33	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	15.8	-----	-----	16.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	:4 (incisec	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	3.4	-----	-----	3.6	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	101.6	-----	-----	-----	65.0	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)[2]	-----	-----	-----	-----	-----	-----	-----	721	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.008	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 3 (829 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	15.5	-----	-----	-----	-----	14.9	-----	-----	17.1	-----	3
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	104	-----	-----	218.0	-----	-----	99.3	-----	-----	99.8	-----	3
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	1.1	-----	-----	1.3	-----	3
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	1.6	-----	-----	-----	-----	1.6	-----	-----	1.8	-----	3
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	18.2	-----	-----	-----	-----	16.3	-----	-----	21.5	-----	3
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	13.2	-----	-----	-----	-----	13.5	-----	-----	14.0	-----	3
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	6.7	-----	-----	14.1	-----	-----	5.8	-----	-----	6.7	-----	3
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	3
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	15	-----	-----	-----	-----	-----	21.8	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	31.0	-----	-----	47.0	-----	-----	54.5	63.2	-----	71.8	-----	9
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	3.5	-----	-----	8.0	-----	-----	-----	3.2	-----	-----	-----	7
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	25.2	46.1	43.3	67.0	15.4	11
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.005	-----	-----	0.006	-----	-----	0.005	0.020	0.016	0.055	0.0	11
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	62	-----	-----	109	-----	-----	63.7	77.7	77.2	90.9	8.3	9
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	2.4	-----	-----	4.11	-----	-----	3.2	-----	-----	3.2	-----	1
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					1.0 / 11.0 / 15.0 / 64.0 / 150.0						2.0 / 12.6 / 21.8 / 74.1 / 128.0 / 128 - 180				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.23	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	1.2	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	65.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	695	-----	-----	-----	-----
Channel length (ft^2)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	803	-----	-----	-----	-----	-----	829	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.16	-----	-----	-----	-----	-----	1.19	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0032	-----	-----	-----	-----	-----	0.0062	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 6 (1,340 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	5.7	-----	6.1	-----	-----	-----	1	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	9.7	-----	-----	-----	1	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.9	-----	0.8	-----	-----	-----	1	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	1.3	-----	-----	-----	1	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft^2)	-----	80.0	300.0	6.7	-----	4.7	-----	-----	-----	1	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	7.8	-----	-----	-----	1	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	1.6	-----	-----	-----	1	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	1.9	-----	-----	-----	1	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	32.0	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	40	-----	-----	65	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	8	-----	-----	69	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.3	-----	-----	11.4	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	49	-----	-----	141	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	6.6	-----	-----	10.7	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	24.0	-----	-----	259.0	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	1.4	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	11.3 / 22.6 / 32.0 / 90 / 150						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180					
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	0.97	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	53.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	B4	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	25.8	-----	-----	-----	14	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	1,349	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.023	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 6 (1,340 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	10.0	-----	-----	-----	-----	8.5	-----	-----	10.5	-----	-----
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	19	-----	-----	87.0	-----	-----	33.1	-----	-----	55.4	-----	-----
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	0.6	-----	-----	-----	-----	0.6	-----	-----	0.9	-----	-----
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	0.9	-----	-----	-----	-----	1.2	-----	-----	1.5	-----	-----
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	6.3	-----	-----	-----	-----	5.3	-----	-----	9.8	-----	-----
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	15.9	-----	-----	-----	-----	11.4	-----	-----	15.1	-----	-----
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	1.9	-----	-----	8.7	-----	-----	3.1	-----	-----	5.7	-----	-----
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	-----
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	28.3	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.0	21.8	20.6	50.9	9.8	33
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.025	-----	-----	0.041	-----	-----	0.002	0.039	0.036	0.095	0.0	33
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	-----	50.0	-----	-----	-----	-----	17.5	39.2	38.8	82.7	14.2	34
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	1.3	-----	-----	2.2	-----	-----	1.4	-----	-----	1.8	-----	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800					11.3 / 22.6 / 32.0 / 90.0 / 150.0						8.7 / 21.5 / 28.3 / 73.4 / 160.7 / >2048				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.67	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	32.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----	-----	0.2	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	C4b	-----	-----	-----	-----	-----	C4b	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	2.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	14	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1259	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,370	-----	-----	-----	-----	-----	1366	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.04	-----	-----	-----	-----	-----	1.09	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0226	-----	-----	-----	-----	-----	0.0226	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----		-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 7 (399 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition						Reference Reach(es) Data											
											UT to Rocky Creek						Spencer Creek Upstream					
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																						
BF Width (ft)	-----	23.0	80.0	3.2	-----	5.0	-----	-----	-----	1	-----	12.2	-----	-----	-----	-----	-----	8.7	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	7.5	-----	-----	-----	1	-----	72.4	-----	-----	-----	-----	-----	228.5	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.6	-----	0.3	-----	-----	-----	1	-----	1.3	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	0.5	-----	-----	-----	1	-----	1.8	-----	-----	-----	-----	-----	1.9	-----	-----	-----	-----
BF Cross-sectional Area (ft^2)	-----	80.0	300.0	2.6	-----	1.6	-----	-----	-----	1	-----	16.3	-----	-----	-----	-----	-----	10.6	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	15.7	-----	-----	-----	1	-----	9.1	-----	-----	-----	-----	-----	7.3	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	1.5	-----	-----	-----	1	-----	6	-----	-----	-----	-----	-----	26.3	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	2.6	-----	-----	-----	1	-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	17.5	-----	-----	-----	-----	-----	22.6	-----	-----	-----	-----	-----	8.6	-----	-----	-----	-----
Pattern																						
Channel Beltwidth (ft)	-----	-----	-----	-----	30	-----	-----	48	-----	-----	-----	-----	-----	-----	-----	-----	24	-----	-----	52	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	7	-----	-----	41	-----	-----	-----	-----	-----	-----	-----	-----	5.4	-----	-----	22.1	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	1.4	-----	-----	8.2	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	2.5	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	26	-----	-----	101	-----	-----	-----	-----	-----	-----	-----	-----	54	-----	-----	196	-----	-----
Meander Width Ratio	-----	-----	-----	-----	6	-----	-----	9.6	-----	-----	-----	-----	-----	-----	-----	-----	2.8	-----	-----	6	-----	-----
Profile																						
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.0227	-----	-----	0.0578	-----	-----	0.0606	-----	-----	0.089	-----	-----	0.1	-----	-----	0.067	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	19	-----	-----	259	-----	-----	26.3	-----	-----	81.3	-----	-----	13	-----	-----	46.5	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----	-----	2.2	-----	-----	-----	-----	-----	2.5	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																						
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	8.5 / 12.4 / 17.5 / 50.6 / 81.6						<0.063 / 2.4 / 22.6 / 120 / 256						0.06 / 3 / 8.6 / 77 / 180					
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	0.65	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	38.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																						
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.046	-----	-----	-----	-----	-----	1.05	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	B4	-----	-----	-----	-----	-----	E4b	-----	-----	-----	-----	-----	E4 / C4	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	5.5	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	9.6	-----	-----	-----	4.7	-----	-----	-----	-----	-----	85	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	386	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----	-----	1.10	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.045	-----	-----	-----	-----	-----	0.0235	-----	-----	-----	-----	-----	0.0132	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10 Cont. Baseline Stream Summary Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 7 (399 LF)

Parameter	Reference Reach(es) Data												Design						As-built					
	Richland Creek						Morgan Branch																	
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																								
BF Width (ft)	16.2	-----	-----	16.7	-----	-----	-----	33.2	-----	-----	-----	-----	-----	5.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Floodprone Width (ft)	50	-----	-----	53	-----	-----	-----	77.5	-----	-----	-----	-----	10	-----	-----	38.0	-----	-----	-----	-----	-----	-----	-----	-----
BF Mean Depth (ft)	0.9	-----	-----	0.9	-----	-----	-----	2.3	-----	-----	-----	-----	-----	0.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Max Depth (ft)	1.4	-----	-----	1.5	-----	-----	-----	2.8	-----	-----	-----	-----	-----	0.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Cross-sectional Area (ft^2)	15	-----	-----	15.5	-----	-----	-----	75.1	-----	-----	-----	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Width/Depth Ratio	18	-----	-----	18.6	-----	-----	-----	14.1	-----	-----	-----	-----	-----	15.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Entrenchment Ratio	3.0	-----	-----	3.3	-----	-----	-----	2.3	-----	-----	-----	-----	2	-----	-----	7.6	-----	-----	-----	-----	-----	-----	-----	-----
Bank Height Ratio	-----	1	-----	2.5	-----	-----	-----	1	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d50 (mm)	-----	45	-----	-----	-----	-----	-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																								
Channel Beltwidth (ft)	25	-----	-----	40	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	14.3	-----	-----	26.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	0.9	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	90	-----	-----	94	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	1.5	-----	-----	2.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																								
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	8.2	15.3	12.4	32.5	8.0	14
Riffle Slope (ft/ft)	0.013	-----	-----	0.0413	-----	-----	0.014	-----	-----	0.024	-----	-----	0.045	-----	-----	0.073	-----	-----	0.015	0.062	0.046	0.171	0.049	14
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	37.3	-----	-----	95.8	-----	-----	146	-----	-----	277.0	-----	-----	8.0	-----	-----	25.0	-----	-----	15.0	27.8	28.0	42.5	10.2	12
Pool Max Depth (ft)	-----	2.5	-----	-----	-----	-----	-----	4.1	-----	-----	-----	-----	0.6	-----	-----	1.1	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																								
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95			6.0 / - / 45 / 125 / -						- / 1.2 / 3 / 77 / 800						-----						-----			
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																								
Drainage Area (SM)	-----	-----	-----	1	-----	-----	-----	-----	-----	8.35	-----	-----	-----	-----	-----	0.0	-----	-----	-----	-----	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	B4a	-----	-----	-----	-----	-----	B4a	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	6.6	-----	-----	-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	524	-----	-----	-----	4.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	382	-----	-----	-----	-----
Channel length $(ft)^2$	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	399	-----	-----	-----	-----	-----	413	-----	-----	-----	-----
Sinuosity	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.04	-----	-----	-----	-----	-----	1.08	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	0.0133	-----	-----	-----	-----	-----	0.007	-----	-----	-----	0.0407	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 11a. Cross-section Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648
Reach 1 (1,204 LF)

	Cross-section X-1 (Riffle)							Cross-section X-2 (Pool)							Cross-section X-3 (Pool)							Cross-section X-4 (Riffle)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	10.8	12.0						22.2	19.7						16.4	16.4						14.4	14.7					
BF Mean Depth (ft)	0.8	0.8						1.2	1.3						1.4	1.3						1.0	0.8					
Width/Depth Ratio	13.7	15.7						18.0	15.7						11.6	12.3						15.0	17.6					
BF Cross-sectional Area (ft²)	8.4	9.2						27.4	24.8						23.2	21.7						13.9	12.4					
BF Max Depth (ft)	1.4	1.1						2.5	2.5						2.5	2.4						1.4	1.2					
Width of Floodprone Area (ft)	33.1	32.5						70.6	70.7						77.1	77.3						91.8	90.2					
Entrenchment Ratio	2.8	2.7						3.2	3.6						4.7	4.7						6.4	6.1					
Bank Height Ratio	1.0	1.1						1.0	1.0						1.0	1.0						1.0	1.0					
Wetted Perimeter (ft)	12.3	13.5						24.7	22.3						19.2	19.0						16.4	16.4					
Hydraulic Radius (ft)	0.7	0.7						1.1	1.1						1.2	1.1						0.8	0.8					
d50 (mm)	-	-						-	-						-	-						-	-					

	Cross-section X-5 (Riffle)																											
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	12.1	12.1																										
BF Mean Depth (ft)	0.8	0.9																										
Width/Depth Ratio	14.4	14.1																										
BF Cross-sectional Area (ft²)	10.1	10.3																										
BF Max Depth (ft)	1.2	1.2																										
Width of Floodprone Area (ft)	71.2	79.0																										
Entrenchment Ratio	5.9	6.6																										
Bank Height Ratio	1.0	1.1																										
Wetted Perimeter (ft)	13.7	13.8																										
Hydraulic Radius (ft)	0.7	0.7																										
d50 (mm)	-	-																										

Reach 2 (1,782 LF)

	Cross-section X-6 (Riffle)							Cross-section X-7 (Pool)							Cross-section X-8 (Riffle)							Cross-section X-9 (Pool)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	15.6	15.4						16.3	15.9						15.4	14.6						24.3	20.3					
BF Mean Depth (ft)	1.0	1.0						1.4	1.4						1.1	1.0						1.4	1.5					
Width/Depth Ratio	16.5	16.2						11.5	11.6						14.5	14.1						17.9	13.4					
BF Cross-sectional Area (ft²)	14.8	14.6						23.2	21.8						16.5	15.1						33.1	30.9					
BF Max Depth (ft)	1.3	1.4						2.5	2.5						1.7	1.6						2.9	2.8					
Width of Floodprone Area (ft)	74.9	77.3						75.8	76.4						102.7	102.7						95.4	95.5					
Entrenchment Ratio	4.8	5.0						4.6	4.8						6.7	7.0						3.9	4.7					
Bank Height Ratio	1.0	1.0						1.0	1.0						1.0	1.1						1.0	1.0					
Wetted Perimeter (ft)	17.5	17.3						19.2	18.7						17.6	16.7						27.1	23.4					
Hydraulic Radius (ft)	0.8	0.8						1.2	1.2						0.9	0.9						1.2	1.3					
d50 (mm)	-	-						-	-						-	-						-	-					

	Cross-section X-10 (Riffle)																											
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	15.5	13.9																										
BF Mean Depth (ft)	1.1	1.1																										
Width/Depth Ratio	14.2	12.8																										
BF Cross-sectional Area (ft²)	17.0	15.1																										
BF Max Depth (ft)	1.8	1.5																										
Width of Floodprone Area (ft)	100.0	100.2																										
Entrenchment Ratio	6.4	7.2																										
Bank Height Ratio	1.0	1.0																										
Wetted Perimeter (ft)	17.7	16.1																										
Hydraulic Radius (ft)	1.0	0.9																										
d50 (mm)	-	-																										

Table 11a Cont. Cross-section Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 3 (829 LF)

	Cross-section X-11 (Riffle)							Cross-section X-12 (Riffle)							Cross-section X-13 (Riffle)							Cross-section X-14 (Pool)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	14.9	17.1						17.1	16.5						16.0	17.2						21.3	19.0					
BF Mean Depth (ft)	1.1	0.9						1.3	1.1						1.2	1.0						1.8	1.7					
Width/Depth Ratio	13.5	20.2						13.7	15.5						14.0	17.3						11.7	11.1					
BF Cross-sectional Area (ft²)	16.3	14.5						21.5	17.6						18.3	17.2						39.0	32.5					
BF Max Depth (ft)	1.6	1.4						1.8	1.6						1.6	1.5						3.2	3.1					
Width of Floodprone Area (ft)	99.8	99.9						99.7	100.0						98.3	98.4						98.7	98.8					
Entrenchment Ratio	6.7	5.8						5.8	6.1						6.1	5.7						4.6	5.2					
Bank Height Ratio	1.0	1.0						1.0	1.0						1.0	1.0						1.0	1.0					
Wetted Perimeter (ft)	17.1	18.8						19.6	18.7						18.3	19.2						25.0	22.4					
Hydraulic Radius (ft)	1.0	0.8						1.1	0.9						1.0	0.9						1.6	1.5					
d50 (mm)	-	-						-	-																			

Reach 6 (1,347 LF)

	Cross-section X-15 (Pool)							Cross-section X-16 (Riffle)							Cross-section X-17 (Riffle)							Cross-section X-18 (Riffle)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	11.0	10.6						9.7	9.3						10.5	10.3						8.5	7.5					
BF Mean Depth (ft)	1.0	0.9						0.6	0.6						0.9	0.8						0.6	0.6					
Width/Depth Ratio	10.9	12.0						15.1	15.2						11.4	12.6						13.5	13.0					
BF Cross-sectional Area (ft²)	11.1	9.4						6.2	5.7						9.8	8.4						5.3	4.3					
BF Max Depth (ft)	1.8	1.8						1.2	1.1						1.5	1.3						1.2	1.1					
Width of Floodprone Area (ft)	60.3	60.3						55.4	52.9						33.1	30.5						37.3	34.0					
Entrenchment Ratio	5.5	5.7						5.7	5.7						3.1	3.0						4.4	4.6					
Bank Height Ratio	1.0	1.0						1.0	1.0						1.0	1.1						1.0	1.1					
Wetted Perimeter (ft)	13.0	12.4						11.0	10.6						12.4	11.9						9.7	8.6					
Hydraulic Radius (ft)	0.9	0.8						0.6	0.5						0.8	0.7						0.5	0.5					
d50 (mm)	-	-						-																				

	Cross-section X-19 (Pool)																											
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																												
BF Width (ft)	10.8	10.1																										
BF Mean Depth (ft)	0.8	0.7																										
Width/Depth Ratio	13.7	14.1																										
BF Cross-sectional Area (ft²)	8.4	7.3																										
BF Max Depth (ft)	1.4	1.3																										
Width of Floodprone Area (ft)	41.4	40.1																										
Entrenchment Ratio	3.8	4.0																										
Bank Height Ratio	1.0	1.0																										
Wetted Perimeter (ft)	12.3	11.6																										
Hydraulic Radius (ft)	0.7	0.6																										
d50 (mm)	-	-																										

Table 11b. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 1 (1,204 LF)

Parameter	As-built						MY1					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	11.8	-----	-----	14.4	-----	3	12.0	12.9	12.1	14.7	1.5	3
Floodprone Width (ft)	33.1	-----	-----	91.8	-----	3	32.5	67.2	79.0	90.2	30.6	3
BF Mean Depth (ft)	0.8	-----	-----	1.0	-----	3	0.8	0.8	0.8	0.9	0.1	3
BF Max Depth (ft)	1.2	-----	-----	1.4	-----	3	1.1	1.2	1.2	1.2	0.1	3
BF Cross-sectional Area (ft^2)	9.1	-----	-----	13.9	-----	3	9.2	10.6	10.3	12.4	1.6	3
Width/Depth Ratio	14.4	-----	-----	15.2	-----	3	14.1	15.8	15.7	17.6	1.8	3
Entrenchment Ratio	2.8	-----	-----	6.4	-----	3	2.7	5.1	6.1	6.6	2.1	3
Bank Height Ratio	1.0	-----	-----	1.0	-----	3	1.0	1.1	1.1	1.1	0.1	3
d50 (mm)	-----	31.2	-----	-----	-----	-----	-----	64.0	-----	-----	-----	-----
Pattern												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	42.0	51.6	-----	72.9	-----	18	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	2.6	-----	-----	-----	15	-----	-----	-----	-----	-----	-----
Profile												
Riffle Length (ft)	15.5	35.0	35.4	62.8	12.7	18	12.9	28.0	21.6	59.5	15.6	12
Riffle Slope (ft/ft)	0.008	0.017	0.017	0.031	0.006	18	0.007	0.020	0.018	0.033	0.008	12
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	38.0	64.0	64.0	81.7	11.0	17	57.6	66.2	61.4	83.0	9.7	10
Pool Max Depth (ft)	2.5	-----	-----	2.5	0.0	2	2.4	-----	-----	2.5	0.0	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters							-----	-----	-----	-----	-----	-----
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95		4.0 / 18.4 / 31.2 / 96.6 / >2048						19.02 / 46 / 64 / 101.2 / 125.5				
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters												
Drainage Area (SM)	-----	0.83	-----	-----	-----	-----	-----	0.83	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	1,082	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	1,206	-----	-----	-----	-----	-----	750	-----	-----	-----	-----
Sinuosity	-----	1.11	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0096	-----	-----	-----	-----	-----	0.009	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Table 11b Cont. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 2 (1,782 LF)

Parameter	As-built						MY1					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	15.4	-----	-----	15.6	-----	3	13.9	14.6	14.6	15.4	0.8	3
Floodprone Width (ft)	74.9	-----	-----	102.7	-----	3	77.3	93.4	100.2	102.7	14.0	3
BF Mean Depth (ft)	1.0	-----	-----	1.1	-----	3	1.0	1.0	1.0	1.1	0.1	3
BF Max Depth (ft)	1.3	-----	-----	1.8	-----	3	1.4	1.5	1.5	1.6	0.1	3
BF Cross-sectional Area (ft^2)	14.8	-----	-----	17.0	-----	3	14.6	14.9	15.1	15.1	0.3	3
Width/Depth Ratio	14.2	-----	-----	16.5	-----	3	12.8	14.4	14.1	16.2	1.7	3
Entrenchment Ratio	4.8	-----	-----	6.7	-----	3	5.0	6.4	7.0	7.2	1.2	3
Bank Height Ratio	1.0	-----	-----	1.0	-----	3	1.0	1.0	1.0	1.1	0.1	3
d50 (mm)	-----	20.9	-----	-----	-----	-----	-----	38.0	-----	-----	-----	-----
Pattern												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	48.6	54.7	-----	65.6	-----	7	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	3.0	-----	-----	-----	8	-----	-----	-----	-----	-----	-----
Profile												
Riffle Length (ft)	16.4	48.9	39.1	101.3	37.2	21	21.4	32.0	32.1	42.6	9.0	13
Riffle Slope (ft/ft)	0.003	0.018	0.018	0.035	0.0	21	0.004	0.014	0.013	0.032	0.007	13
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	46.0	75.4	70.0	130.2	23.5	19	46.1	65.9	66.3	95.2	14.0	12
Pool Max Depth (ft)	2.5	-----	-----	2.9	0.3	2	2.5	-----	-----	2.8	0.2	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95	<0.063 / 12.2 / 20.9 / 68.5 / 151.8						16.95 / 27.48 / 37.95 / 158.40 / >2048					
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters												
Drainage Area (SM)	-----	0.96	-----	-----	-----	-----	-----	0.96	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	1,549	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	1,842	-----	-----	-----	-----	-----	1,006	-----	-----	-----	-----
Sinuosity	-----	1.19	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0077	-----	-----	-----	-----	-----	0.0069	-----	-----	-----	-----
BF slope (ft/ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Table 11b Cont. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 3 (829 LF)

Parameter	As-built						MY1					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	14.9	-----	-----	17.1	-----	3	16.5	16.9	17.1	17.2	0.4	3
Floodprone Width (ft)	99.3	-----	-----	99.8	-----	3	98.4	99.4	99.9	100.0	0.9	3
BF Mean Depth (ft)	1.1	-----	-----	1.3	-----	3	0.9	1.0	1.0	1.1	0.1	3
BF Max Depth (ft)	1.6	-----	-----	1.8	-----	3	1.4	1.5	1.5	1.6	0.1	3
BF Cross-sectional Area (ft^2)	16.3	-----	-----	21.5	-----	3	14.5	16.4	17.2	17.6	1.7	3
Width/Depth Ratio	13.5	-----	-----	14.0	-----	3	15.5	17.7	17.3	20.2	2.4	3
Entrenchment Ratio	5.8	-----	-----	6.7	-----	3	5.7	5.9	5.8	6.1	0.2	3
Bank Height Ratio	1.0	-----	-----	1.0	-----	3	1.0	1.0	1.0	1.0	0.0	3
d50 (mm)	-----	21.8	-----	-----	-----	-----	-----	53.7	-----	-----	-----	-----
Pattern												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	54.5	63.2	-----	71.8	-----	9	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	3.2	-----	-----	-----	7	-----	-----	-----	-----	-----	-----
Profile												
Riffle Length (ft)	25.2	46.1	43.3	67.0	15.4	11	16.9	24.5	23.5	32.5	5.7	7
Riffle Slope (ft/ft)	0.005	0.020	0.016	0.055	0.0	11	0.009	0.019	0.021	0.028	0.006	7
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	63.7	77.7	77.2	90.9	8.3	9	66.8	77.0	81.2	83.0	7.5	5
Pool Max Depth (ft)	3.2	-----	-----	3.2	-----	1	-----	3.1	-----	-----	-----	1
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	----
d16 / d35 / d50 / d84 / d95			2.0 / 12.6 / 21.8 / 74.1 / 128.0						16 / 36.88 / 53.7 / 112.6 / 214.7			
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters												
Drainage Area (SM)	-----	1.2	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	695	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	829	-----	-----	-----	-----	-----	496	-----	-----	-----	-----
Sinuosity	-----	1.19	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0062	-----	-----	-----	-----	-----	0.0064	-----	-----	-----	-----
BF slope (ft/ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Table 11b Cont. Stream Reach Morphology Data
UT to Town Creek Restoration Project - Option A: DMS Project ID No. 94648

Reach 6 (1,347 LF)

Parameter	As-built						MY1					
Dimension and Substrate - Riffle	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
BF Width (ft)	8.5	-----	-----	10.5	-----	-----	7.5	9.0	9.3	10.3	1.4	3
Floodprone Width (ft)	33.1	-----	-----	55.4	-----	-----	30.5	39.1	34.0	52.9	12.1	3
BF Mean Depth (ft)	0.6	-----	-----	0.9	-----	-----	0.6	0.7	0.6	0.8	0.1	3
BF Max Depth (ft)	1.2	-----	-----	1.5	-----	-----	1.1	1.2	1.1	1.3	0.1	3
BF Cross-sectional Area (ft^2)	5.3	-----	-----	9.8	-----	-----	4.3	6.1	5.7	8.4	2.1	3
Width/Depth Ratio	11.4	-----	-----	15.1	-----	-----	12.6	13.6	13.0	15.2	1.4	3
Entrenchment Ratio	3.1	-----	-----	5.7	-----	-----	3.0	4.4	4.6	5.7	1.4	3
Bank Height Ratio	1.0	-----	-----	1.0	-----	-----	1.0	1.1	1.1	1.1	0.1	3
d50 (mm)	-----	28.3	-----	-----	-----	-----	-----	34.3	-----	-----	-----	-----
Pattern												
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile												
Riffle Length (ft)	5.0	21.8	20.6	50.9	9.8	33	9.8	22.6	20.5	53.5	12.3	12
Riffle Slope (ft/ft)	0.002	0.039	0.036	0.095	0.0	33	0.009	0.021	0.018	0.06	0.015	12
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	17.5	39.2	38.8	82.7	14.2	34	29.5	41.0	39.0	61.7	8.8	16
Pool Max Depth (ft)	1.4	-----	-----	1.8	-----	2	1.3	-----	-----	1.8	-----	2
Pool Volume (ft^3)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters												
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95			8.7 / 21.5 / 28.3 / 73.4 / 160.7						14.4 / 22.6 / 34.3 / 86.4 / 2435.5			
Reach Shear Stress (competency) lb/f^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m^2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters												
Drainage Area (SM)	-----	0.2	-----	-----	-----	-----	-----	0.2	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	C4b	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	1259	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length $(ft)^2$	-----	1366	-----	-----	-----	-----	-----	751	-----	-----	-----	-----
Sinuosity	-----	1.09	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	0.0226	-----	-----	-----	-----	-----	0.0227	-----	-----	-----	-----
BF slope (ft/ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Figure 4. Year 1 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

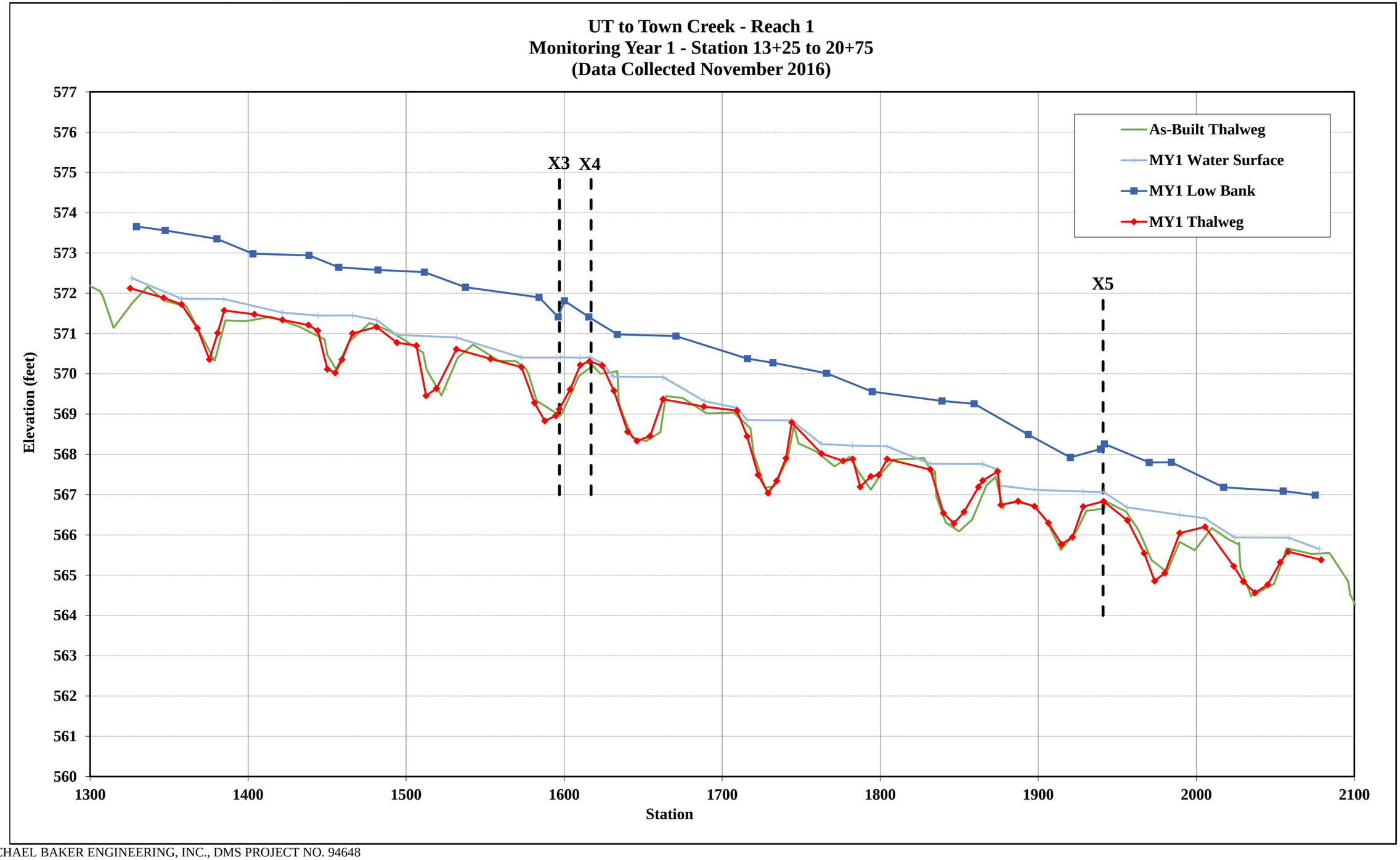


Figure 4 Cont. Year 1 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

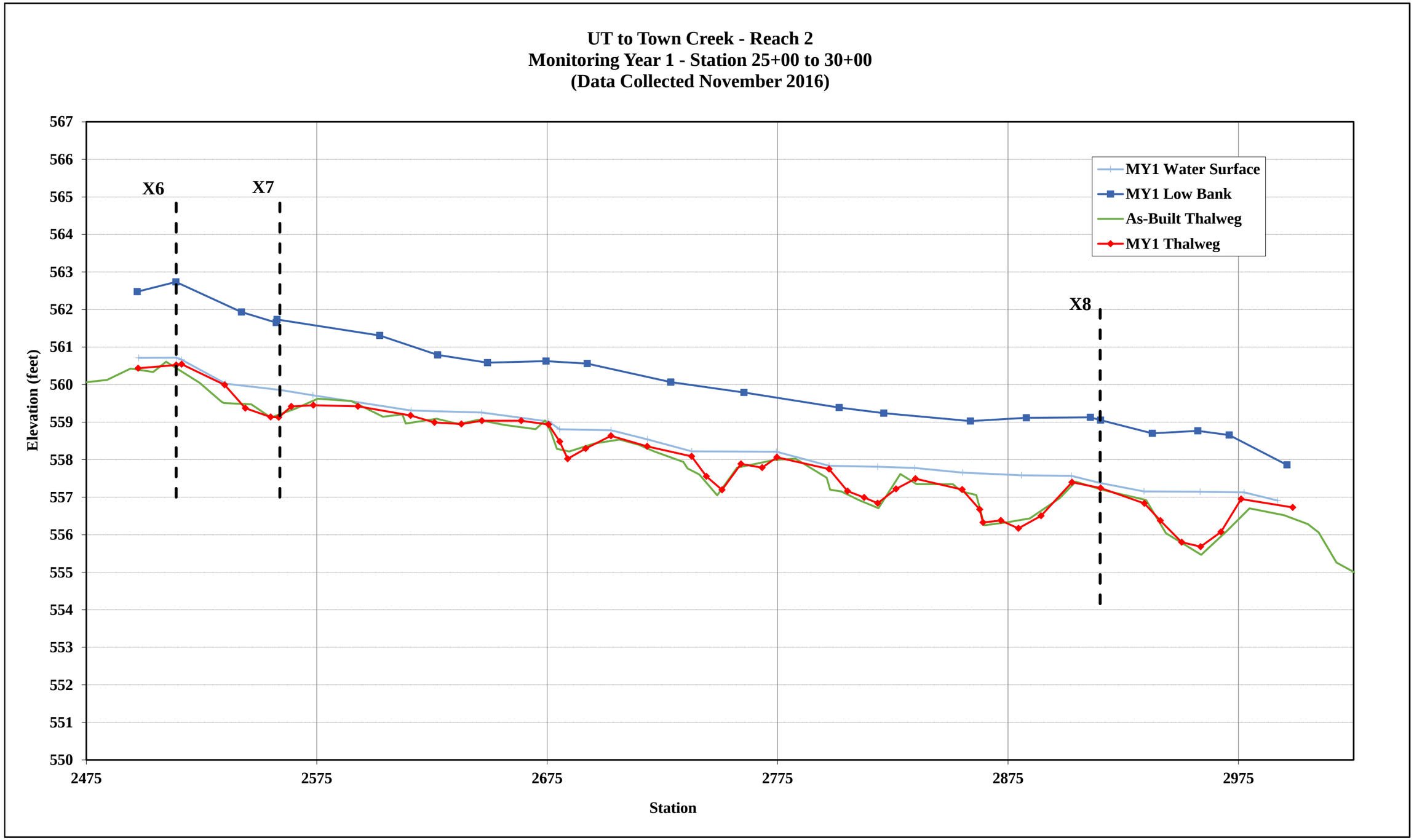


Figure 4 Cont. Year 1 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

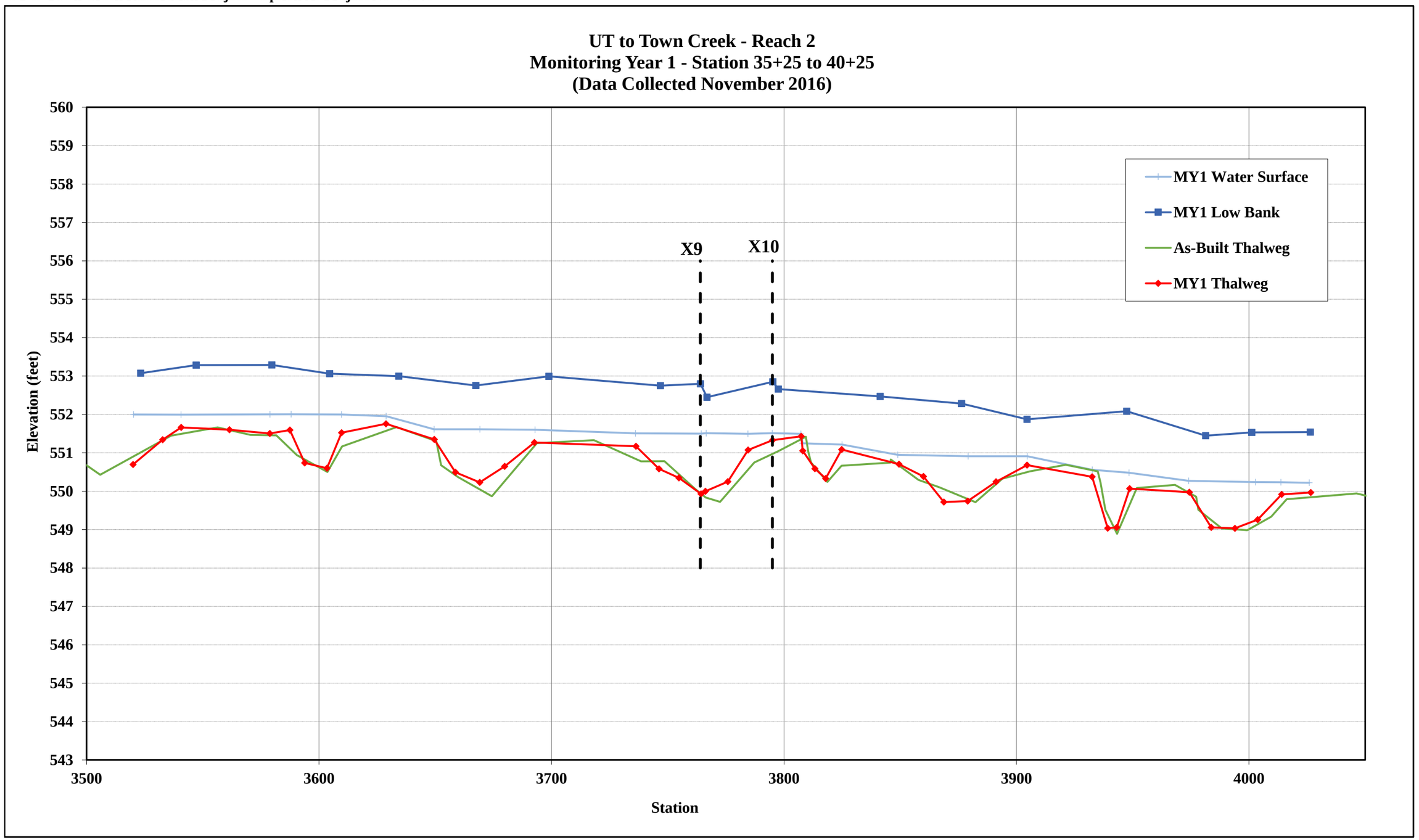


Figure 4 Cont. Year 1 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

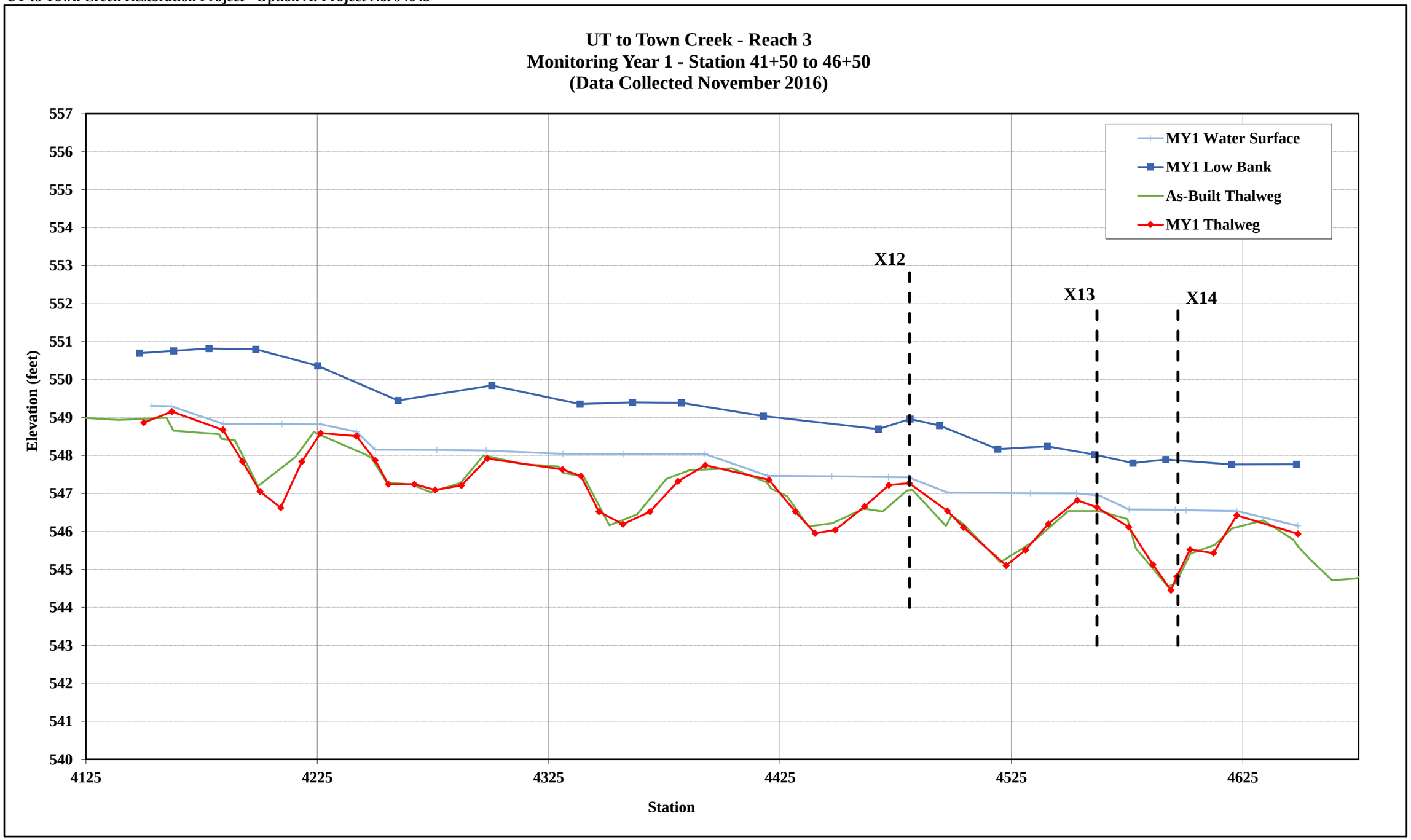


Figure 4 Cont. Year 1 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

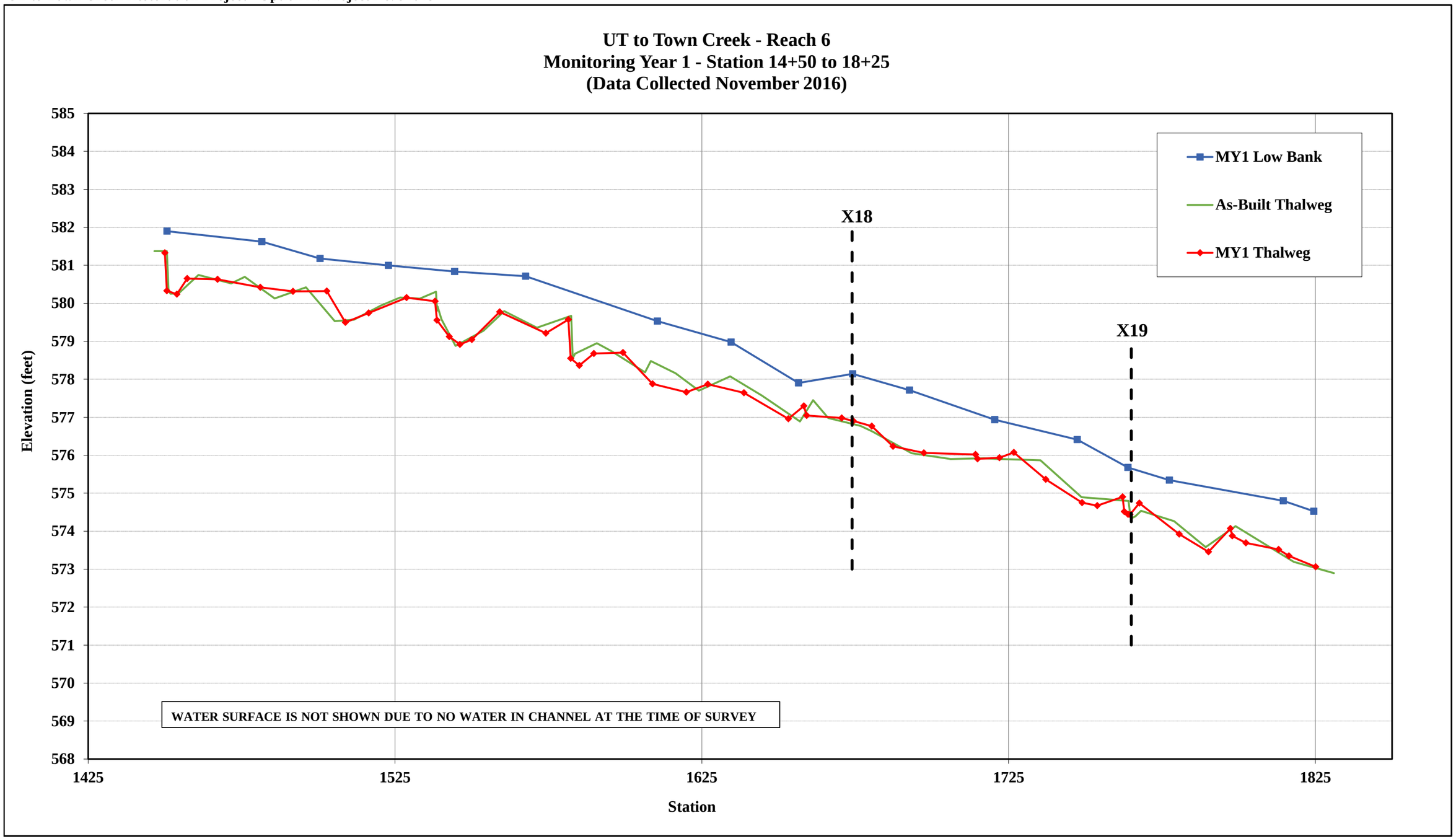


Figure 4 Cont. Year 1 Profile
UT to Town Creek Restoration Project - Option A: Project No. 94648

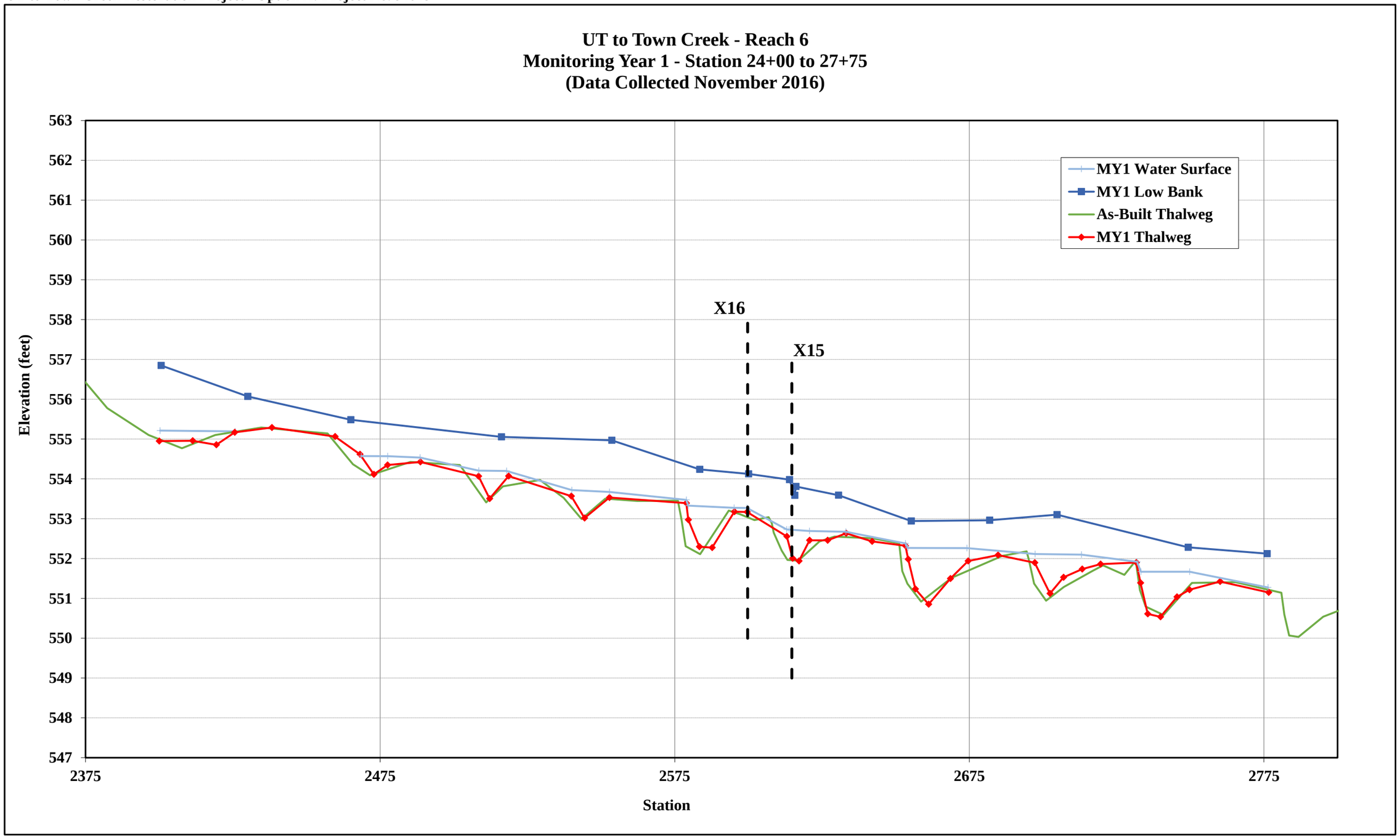


Figure 5a. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

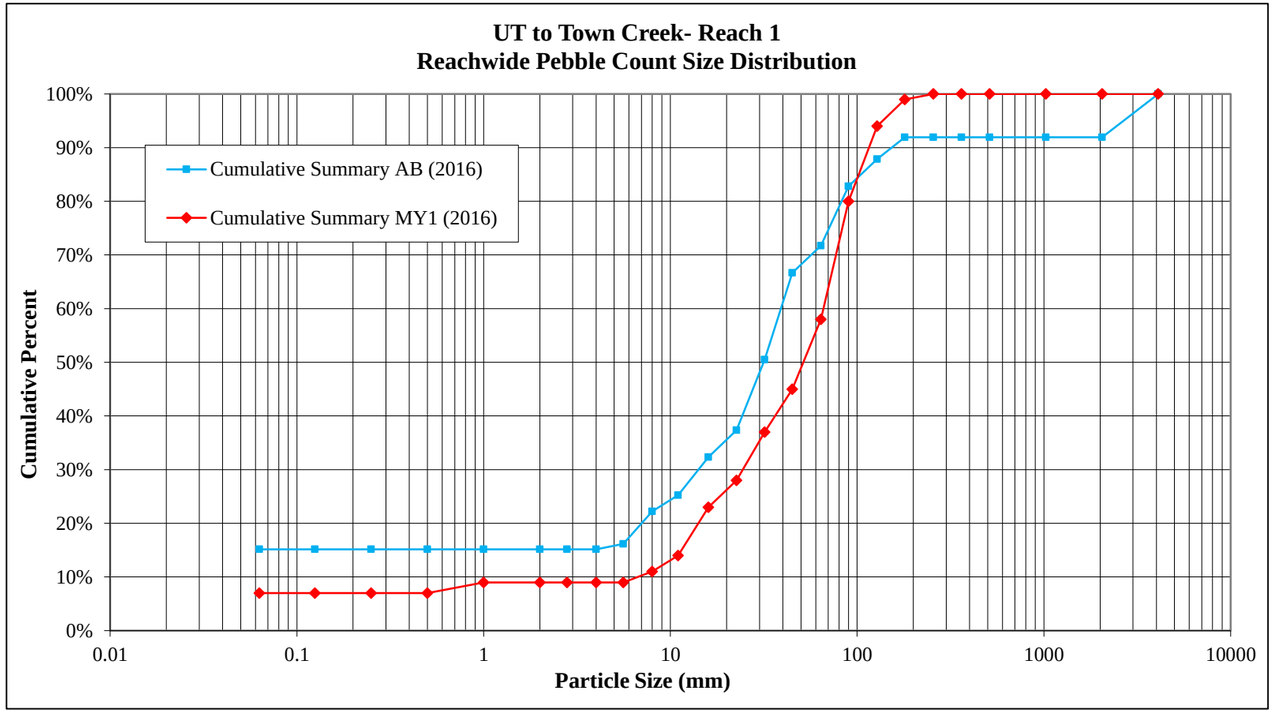
SITE OR PROJECT:	UT To Town Creek - Year 1
REACH/LOCATION:	Reach 1 (5 Riffles & 5 Pools)
DATE COLLECTED:	10/10/2016
FIELD COLLECTION BY:	RM and AP
DATA ENTERED BY:	RM

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063		7	7	7%	7%		0%	14%	14%
Sand	Very Fine	.063 - .125					7%		0%		14%
	Fine	.125 - .25					7%		0%		14%
	Medium	.25 - .50					7%		0%		14%
	Coarse	.50 - 1.0		2	2	2%	9%		0%	4%	18%
	Very Coarse	1.0 - 2.0					9%		0%		18%
Gravel	Very Fine	2.0 - 2.8					9%		0%		18%
	Very Fine	2.8 - 4.0					9%		0%		18%
	Fine	4.0 - 5.6					9%		0%		18%
	Fine	5.6 - 8.0	1	1	2	2%	11%	2%	2%	2%	20%
	Medium	8.0 - 11.0	2	1	3	3%	14%	4%	6%	2%	22%
	Medium	11.0 - 16.0	4	5	9	9%	23%	8%	14%	10%	32%
	Coarse	16.0 - 22.6	2	3	5	5%	28%	4%	18%	6%	38%
	Coarse	22.6 - 32	3	6	9	9%	37%	6%	24%	12%	50%
	Very Coarse	32 - 45	5	3	8	8%	45%	10%	34%	6%	56%
	Very Coarse	45 - 64	8	5	13	13%	58%	16%	50%	10%	66%
Cobble	Small	64 - 90	14	8	22	22%	80%	28%	78%	16%	82%
	Small	90 - 128	9	5	14	14%	94%	18%	96%	10%	92%
	Large	128 - 180	2	3	5	5%	99%	4%	100%	6%	98%
	Large	180 - 256		1	1	1%	100%		100%	2%	100%
Boulder	Small	256 - 362					100%		100%		100%
	Small	362 - 512					100%		100%		100%
	Medium	512 - 1024					100%		100%		100%
	Large-Very Large	1024 - 2048					100%		100%		100%
	Bedrock	> 2048					100%		100%		100%
		Total	**50**	**50**	**100**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Cummulative	
Channel materials	
D16 =	11.96
D35 =	29.62
D50 =	51.53
D84 =	99.53
D95 =	137.03
D100 =	180 - 256

Riffle	
Channel materials	
D16 =	19.02
D35 =	46.00
D50 =	64.00
D84 =	101.21
D95 =	125.52
D100 =	128 - 180

Pool	
Channel materials	
D16 =	0.71
D35 =	19.02
D50 =	32.00
D84 =	96.57
D95 =	151.79
D100 =	180 - 256



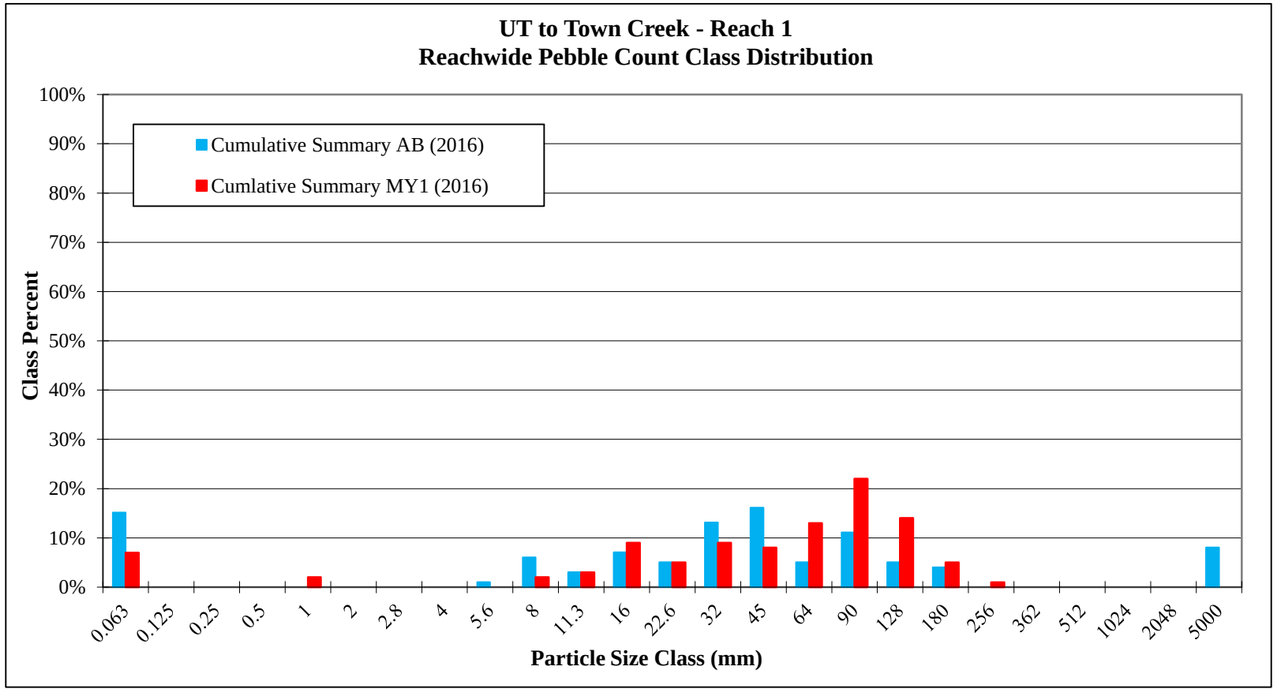


Figure 5b. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

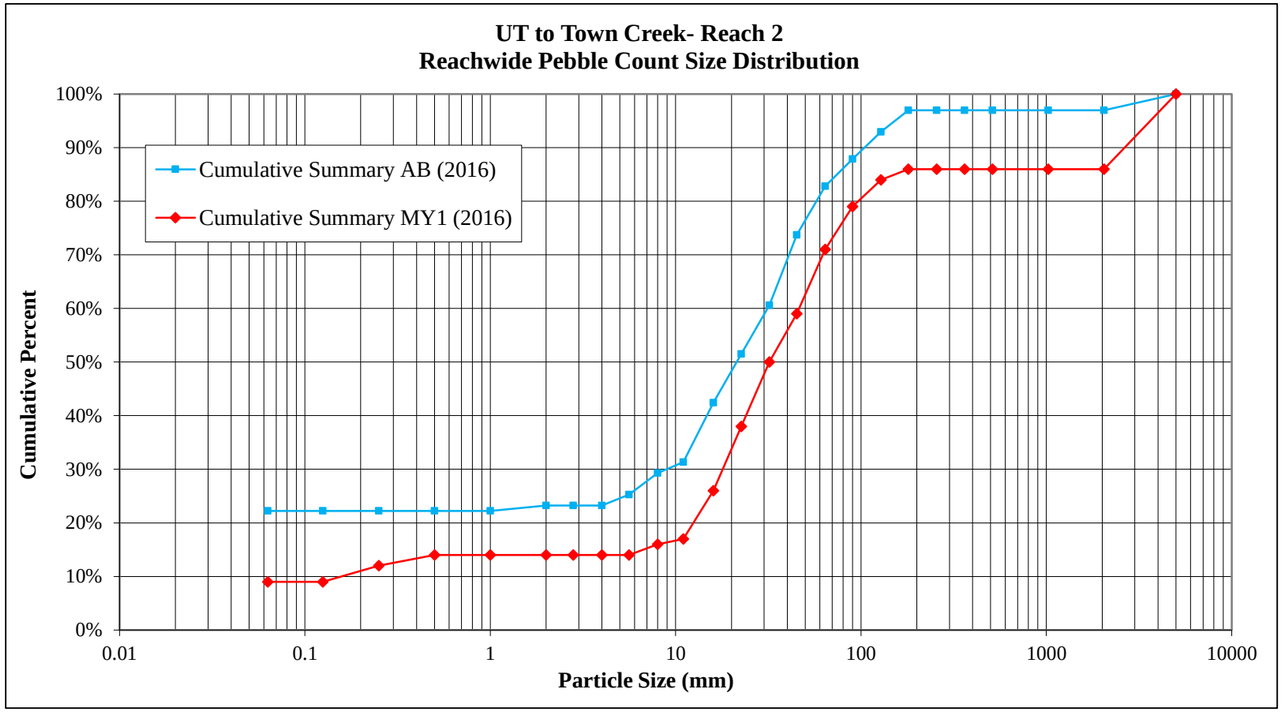
SITE OR PROJECT:	UT To Town Creek - Year 1
REACH/LOCATION:	Reach 2 (5 Riffles & 5 Pools)
DATE COLLECTED:	10/10/2016
FIELD COLLECTION BY:	RM and AP
DATA ENTERED BY:	RM

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063		9	9	9	9		0	18	18
Sand	Very Fine	.063 - .125					9		0		18
	Fine	.125 - .25	1	2	3	3	12	2	2	4	22
	Medium	.25 - .50		2	2	2	14		2	4	26
	Coarse	.50 - 1.0					14		2		26
	Very Coarse	1.0 - 2.0					14		2		26
Gravel	Very Fine	2.0 - 2.8					14		2		26
	Very Fine	2.8 - 4.0					14		2		26
	Fine	4.0 - 5.6					14		2		26
	Fine	5.6 - 8.0		2	2	2	16		2	4	30
	Medium	8.0 - 11.0	1		1	1	17	2	4		30
	Medium	11.0 - 16.0	6	3	9	9	26	12	16	6	36
	Coarse	16 - 22.6	6	6	12	12	38	12	28	12	48
	Coarse	22.6 - 32	5	7	12	12	50	10	38	14	62
	Very Coarse	32 - 45	5	4	9	9	59	10	48	8	70
	Very Coarse	45 - 64	9	3	12	12	71	18	66	6	76
Cobble	Small	64 - 90	5	3	8	8	79	10	76	6	82
	Small	90 - 128	2	3	5	5	84	4	80	6	88
	Large	128 - 180	2		2	2	86	4	84		88
	Large	180 - 256					86		84		88
Boulder	Small	256 - 362					86		84		88
	Small	362 - 512					86		84		88
	Medium	512 - 1024					86		84		88
	Large-Very Large	1024 - 2048					86		84		88
	Bedrock	> 2048	8	6	14	14	100	16	100	12	100
			50	50	100			100	100	100	100

Cummulative Channel materials	
D16 =	<0.063
D35 =	12.18
D50 =	20.93
D84 =	68.52
D95 =	151.79
D100 =	> 2048

Riffle Channel materials	
D16 =	16.95
D35 =	27.48
D50 =	37.95
D84 =	98.28
D95 =	158.40
D100 =	> 2048

Pool Channel materials	
D16 =	<0.063
D35 =	<0.063
D50 =	5.60
D84 =	36.68
D95 =	107.33
D100 =	> 2048



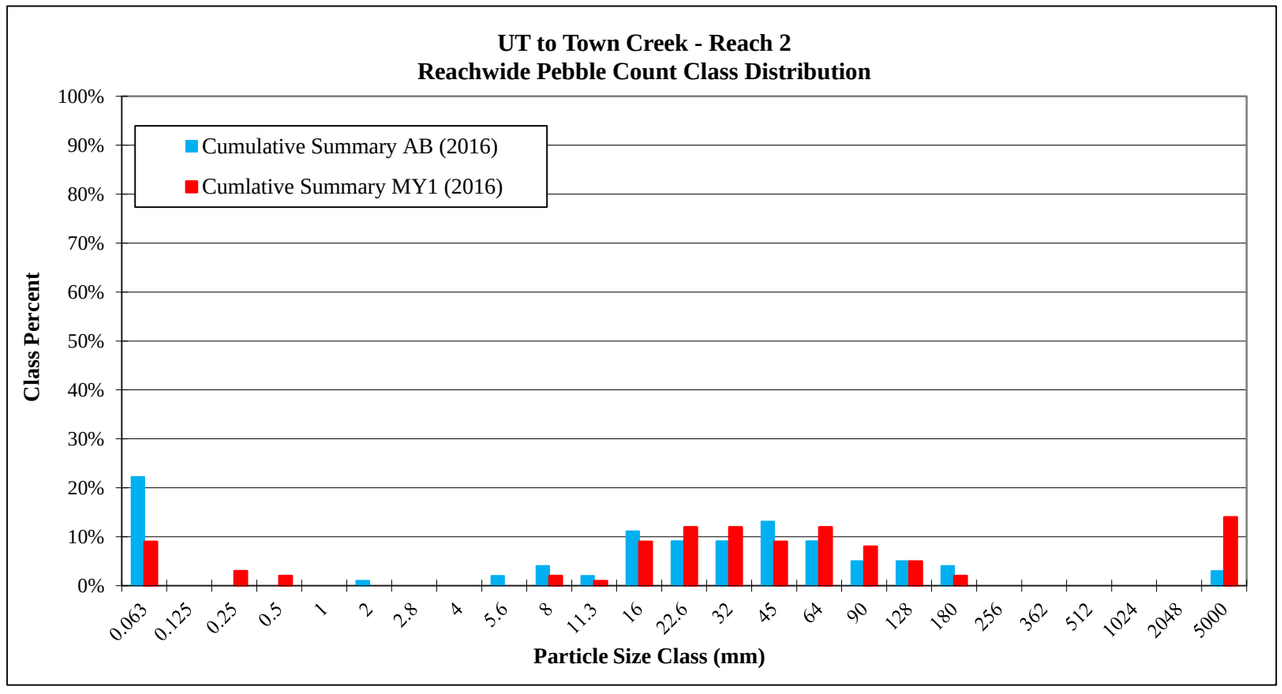


Figure 5c. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

PEBBLE COUNT DATA SHEET

SITE OR PROJECT:	UT To Town Creek - Year 1
REACH/LOCATION:	Reach 3 (5 Riffles & 5 Pools)
DATE COLLECTED:	10/10/2016
FIELD COLLECTION BY:	RM and AP
DATA ENTERED BY:	RM

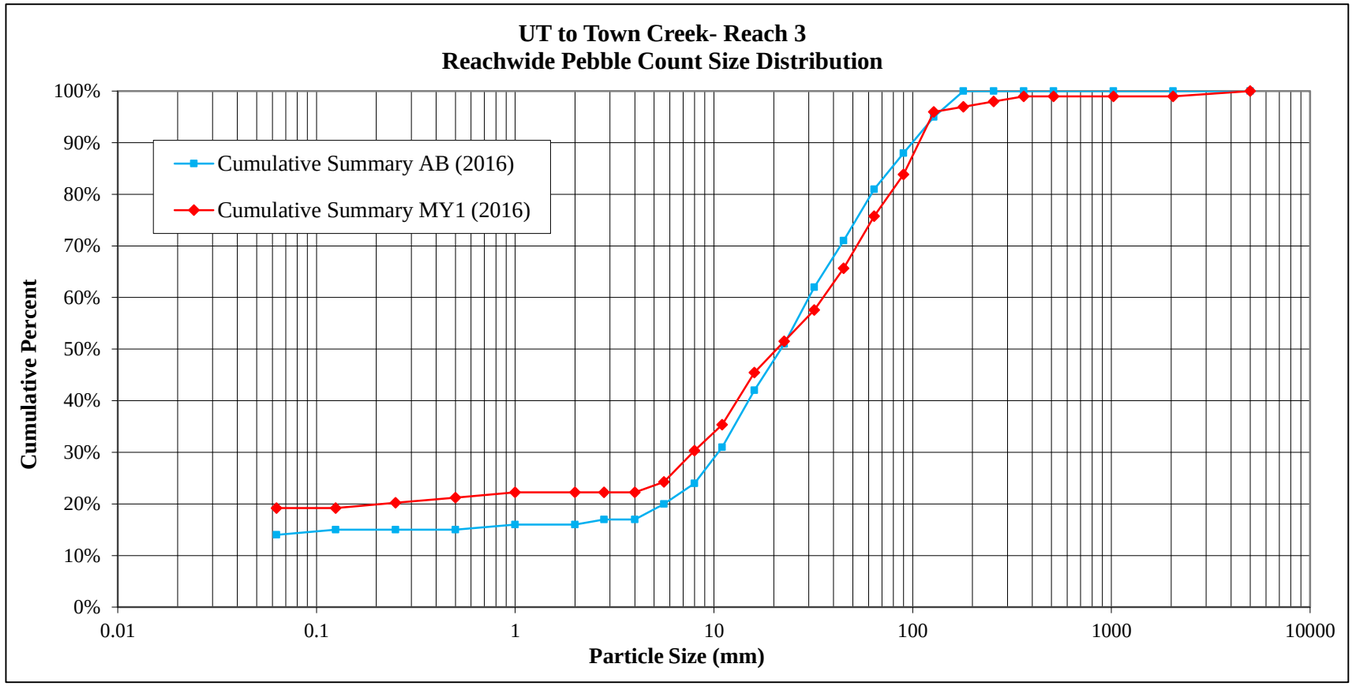
SEDIMENT ANALYSIS DATA SHEET

			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063	4	15	19	19	19	8	8	30	30
Sand	Very Fine	.063 - .125					19		8		30
	Fine	.125 - .25		1	1	1	20		8	2	32
	Medium	.25 - .50		1	1	1	21		8	2	34
	Coarse	.50 - 1.0	1		1	1	22	2	10		34
	Very Coarse	1.0 - 2.0					22		10		34
Gravel	Very Fine	2.0 - 2.8					22		10		34
	Very Fine	2.8 - 4.0	1		1	1	23	2	12		34
	Fine	4.0 - 5.6		2	2	2	25		12	4	38
	Fine	5.6 - 8.0		6	6	6	31		12	12	50
	Medium	8.0 - 11.0	1	4	5	5	36	2	14	8	58
	Medium	11.0 - 16.0	1	9	10	10	46	2	16	18	76
	Coarse	16 - 22.6	3	3	6	6	52	6	22	6	82
	Coarse	22.6 - 32	4	2	6	6	58	8	30	4	86
	Very Coarse	32 - 45	6	2	8	8	66	12	42	4	90
	Very Coarse	45 - 64	8	2	10	10	76	16	58	4	94
Cobble	Small	64 - 90	6	2	8	8	84	12	70	4	98
	Small	90 - 128	11	1	12	12	96	22	92	2	100
	Large	128 - 180	1		1	1	97	2	94		100
	Large	180 - 256	1		1	1	98	2	96		100
Boulder	Small	256 - 362	1		1	1	99	2	98		100
	Small	362 - 512					99		98		100
	Medium	512 - 1024					99		98		100
	Large-Very Large	1024 - 2048					99		98		100
	Bedrock	> 2048	1		1	1	100	2	100		100
			50	50	100			100	100	100	100

Cummulative	
Channel materials	
D_{16} =	<0.063
D_{35} =	10.32
D_{50} =	20.14
D_{84} =	90.00
D_{95} =	124.30
D_{100} =	> 2048

Riffle	
Channel materials	
D_{16} =	16.00
D_{35} =	36.88
D_{50} =	53.67
D_{84} =	112.61
D_{95} =	214.66
D_{100} =	> 2048

Pool	
Channel materials	
D_{16} =	<0.063
D_{35} =	4.35
D_{50} =	8.00
D_{84} =	26.89
D_{95} =	69.69
D_{100} =	90 - 128



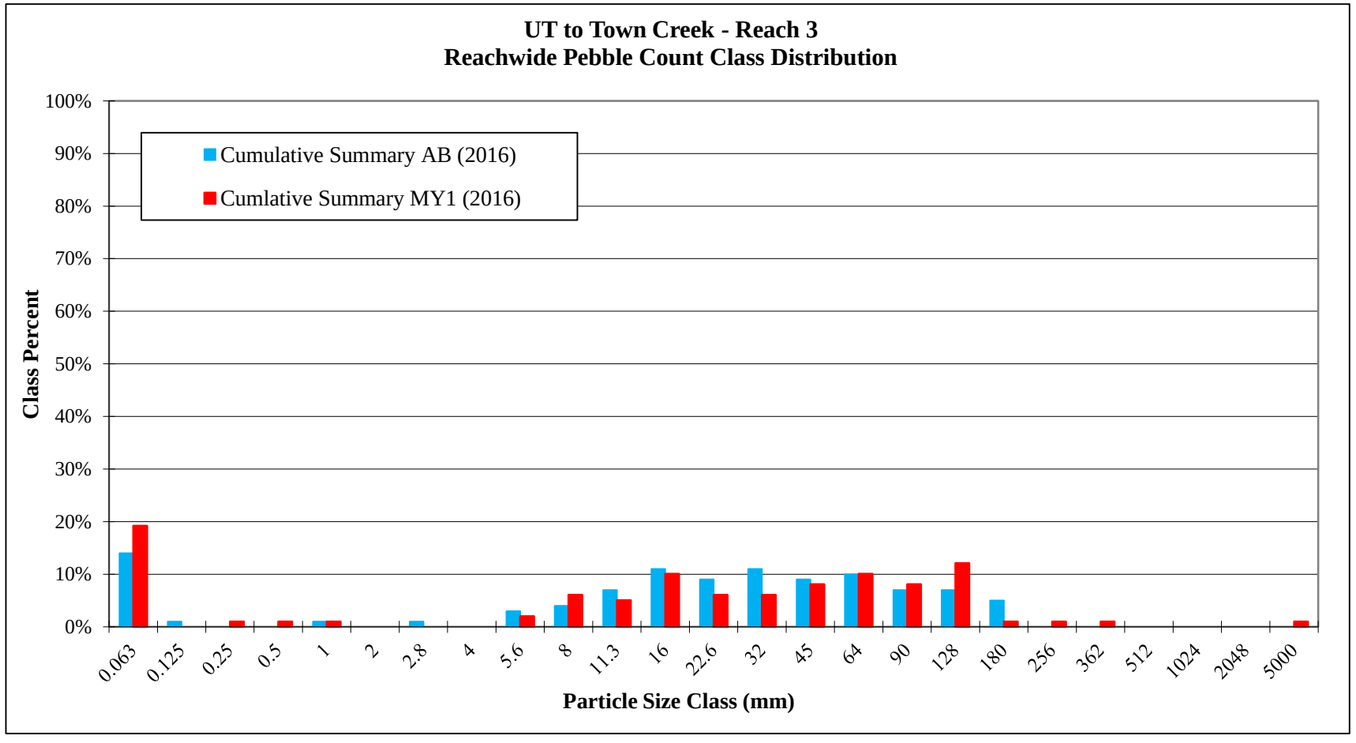


Figure 5d. Reachwide Pebble Count Distribution with Annual Overlays
UT to Town Creek Restoration Project: Project No. 94648

SITE OR PROJECT:	UT To Town Creek - Yr1
REACH/LOCATION:	Reach 6 (6 Riffles & 4 Pools)
DATE COLLECTED:	10/11/2016
FIELD COLLECTION BY:	RM and AP
DATA ENTERED BY:	RM

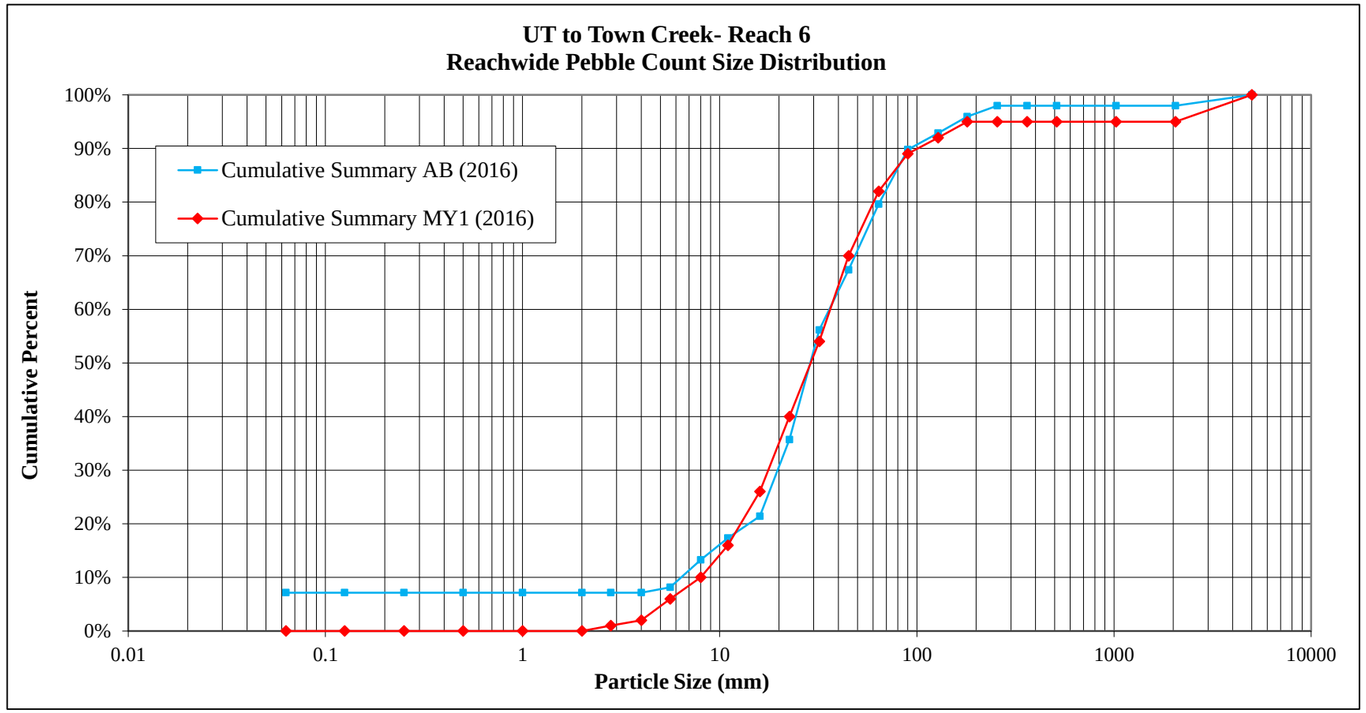
SEDIMENT ANALYSIS DATA SHEET

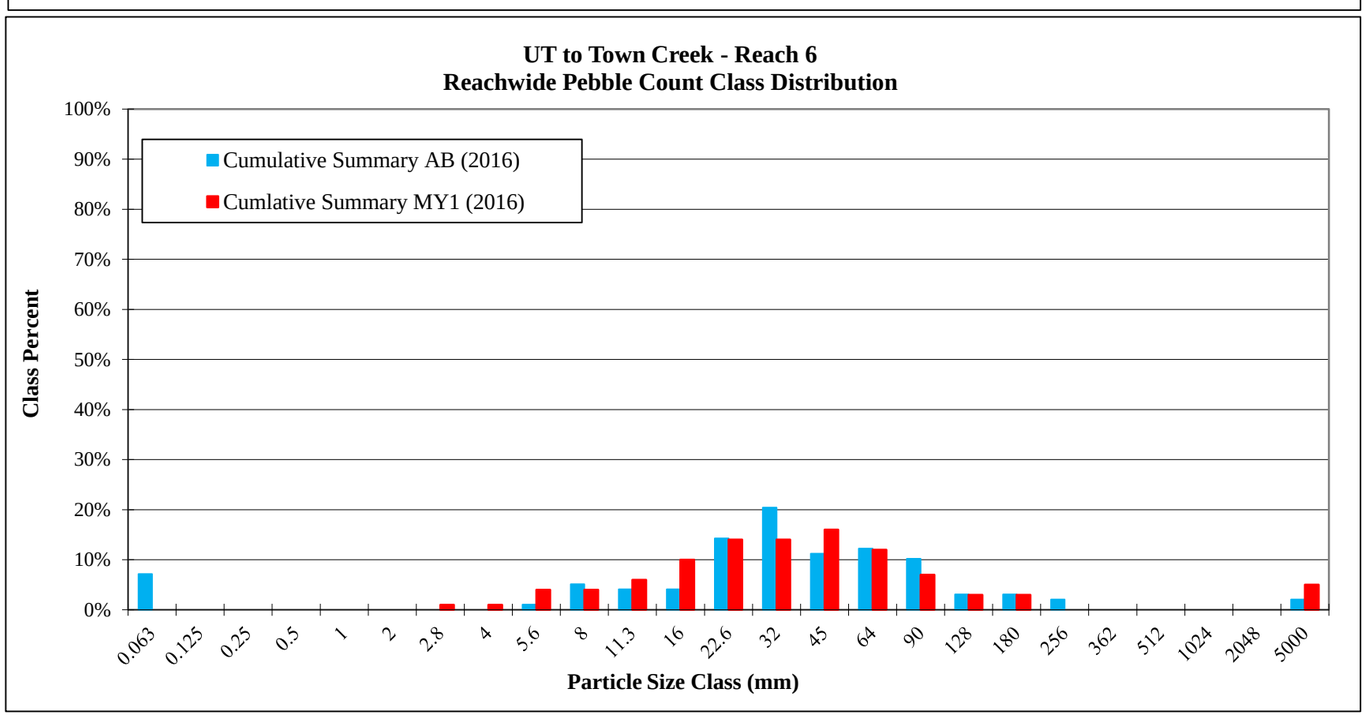
			PARTICLE CLASS			Reach Summary		Riffle Summary		Pool Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Pool	Total	Class %	% Cum	Class %	% Cum	Class %	% Cum
	Silt / Clay	< .063					0		0		0
Sand	Very Fine	.063 - .125					0		0		0
	Fine	.125 - .25					0		0		0
	Medium	.25 - .50					0		0		0
	Coarse	.50 - 1.0					0		0		0
	Very Coarse	1.0 - 2.0					0		0		0
Gravel	Very Fine	2.0 - 2.8		1	1	1	1		0	3	3
	Very Fine	2.8 - 4.0	1		1	1	2	2	2		3
	Fine	4.0 - 5.6	2	2	4	4	6	3	5	5	8
	Fine	5.6 - 8.0	1	3	4	4	10	2	7	8	15
	Medium	8.0 - 11.0	2	4	6	6	16	3	10	10	25
	Medium	11.0 - 16.0	5	5	10	10	26	8	18	13	38
	Coarse	16 - 22.6	10	4	14	14	40	17	35	10	48
	Coarse	22.6 - 32	7	7	14	14	54	12	47	18	65
	Very Coarse	32 - 45	10	6	16	16	70	17	63	15	80
	Very Coarse	45 - 64	8	4	12	12	82	13	77	10	90
Cobble	Small	64 - 90	5	2	7	7	89	8	85	5	95
	Small	90 - 128	2	1	3	3	92	3	88	3	98
	Large	128 - 180	3		3	3	95	5	93		98
	Large	180 - 256					95		93		98
Boulder	Small	256 - 362					95		93		98
	Small	362 - 512					95		93		98
	Medium	512 - 1024					95		93		98
	Large-Very Large	1024 - 2048					95		93		98
	Bedrock	> 2048	4	1	5	5	100	7	100	3	100
			60	40	100			100	100	100	100

Cummulative	
Channel materials	
D16 =	11.00
D35 =	19.98
D50 =	28.97
D84 =	70.55
D95 =	2048.00
D100 =	> 2048

Riffle	
Channel materials	
D16 =	14.41
D35 =	22.60
D50 =	34.26
D84 =	86.39
D95 =	2435.50
D100 =	> 2048

Pool	
Channel materials	
D16 =	<0.063
D35 =	14.84
D50 =	23.75
D84 =	51.81
D95 =	90.00
D100 =	> 2048





Appendix E

Hydrologic Data

Figure 6. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

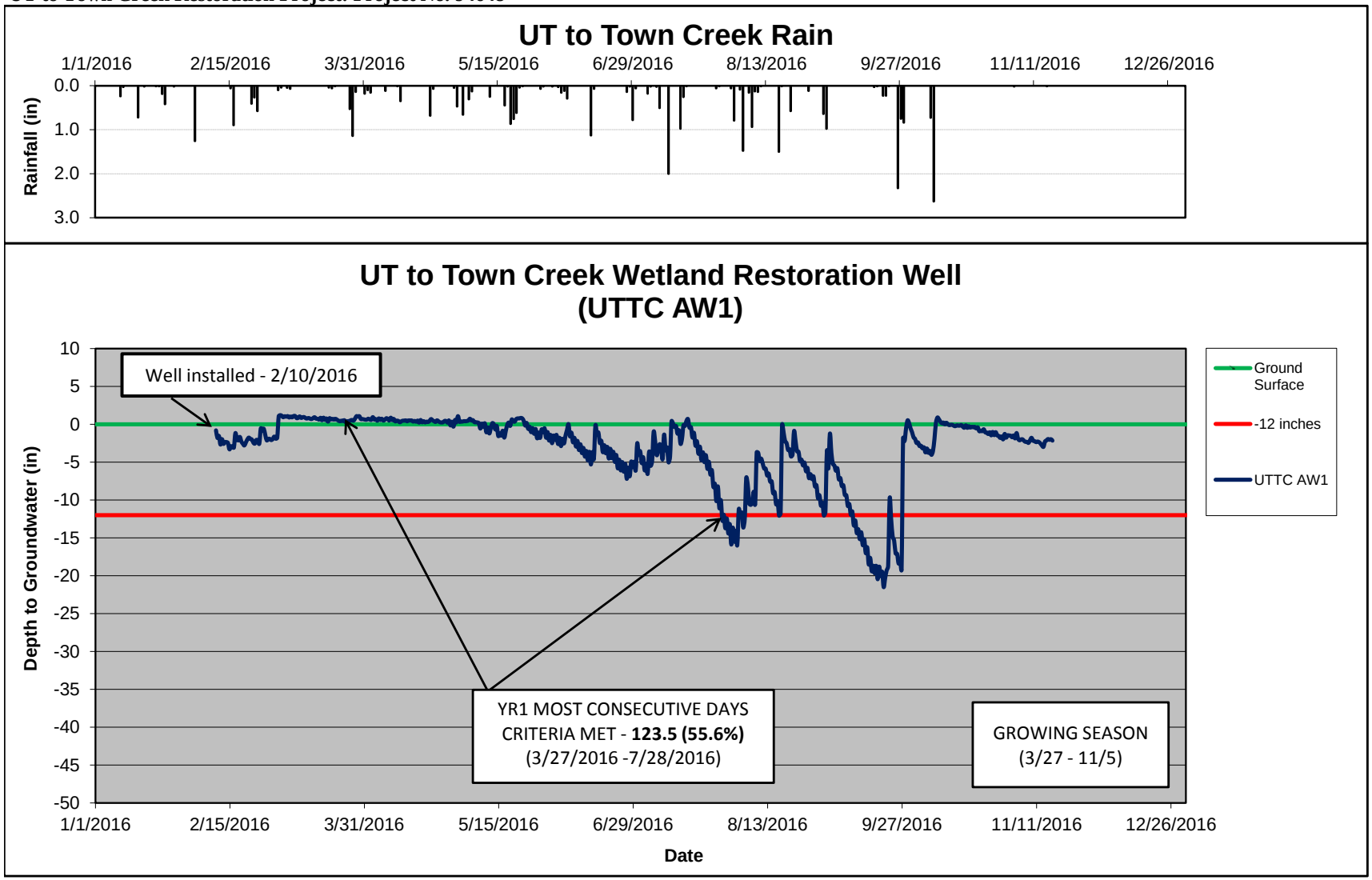


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

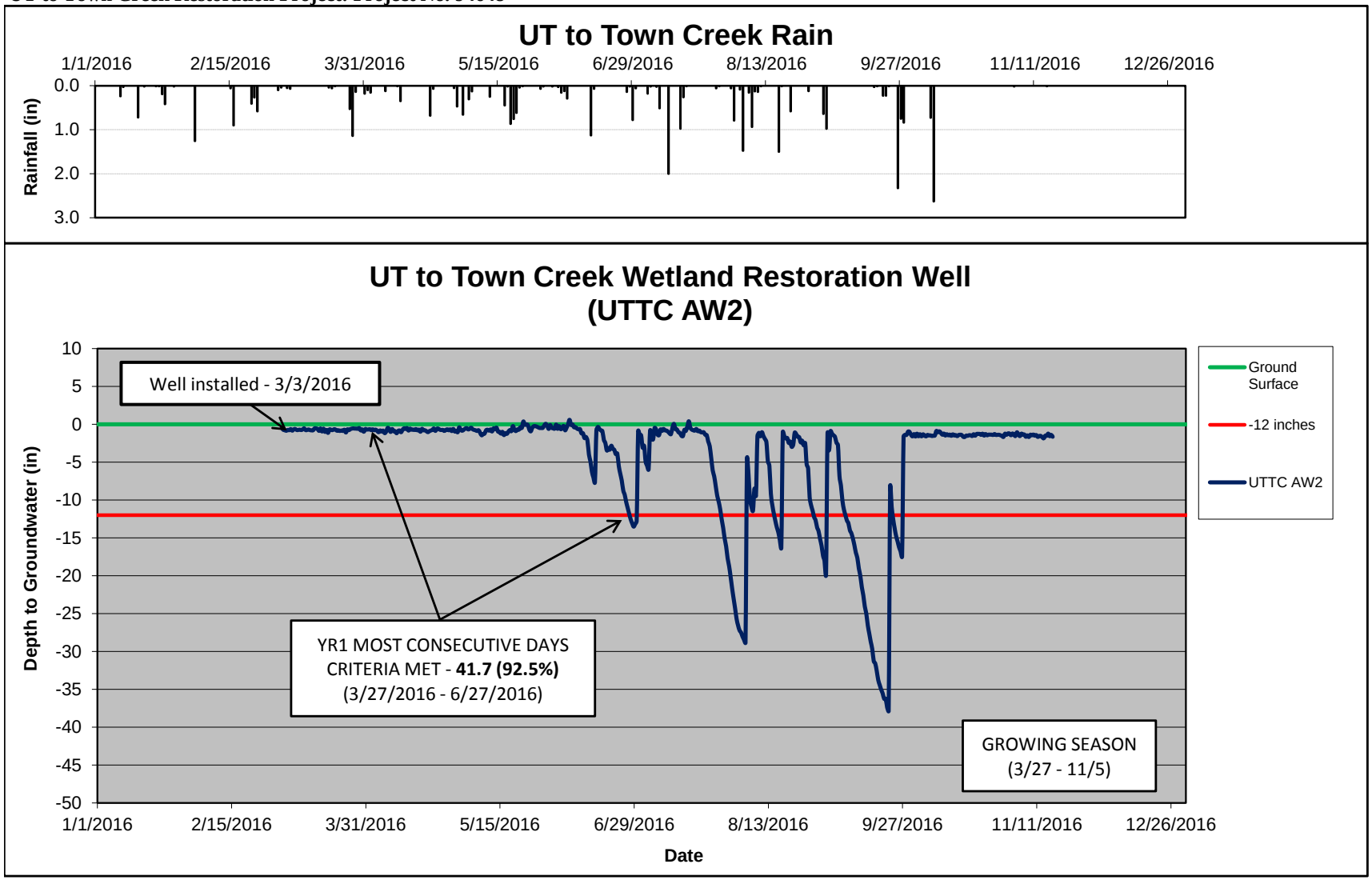


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

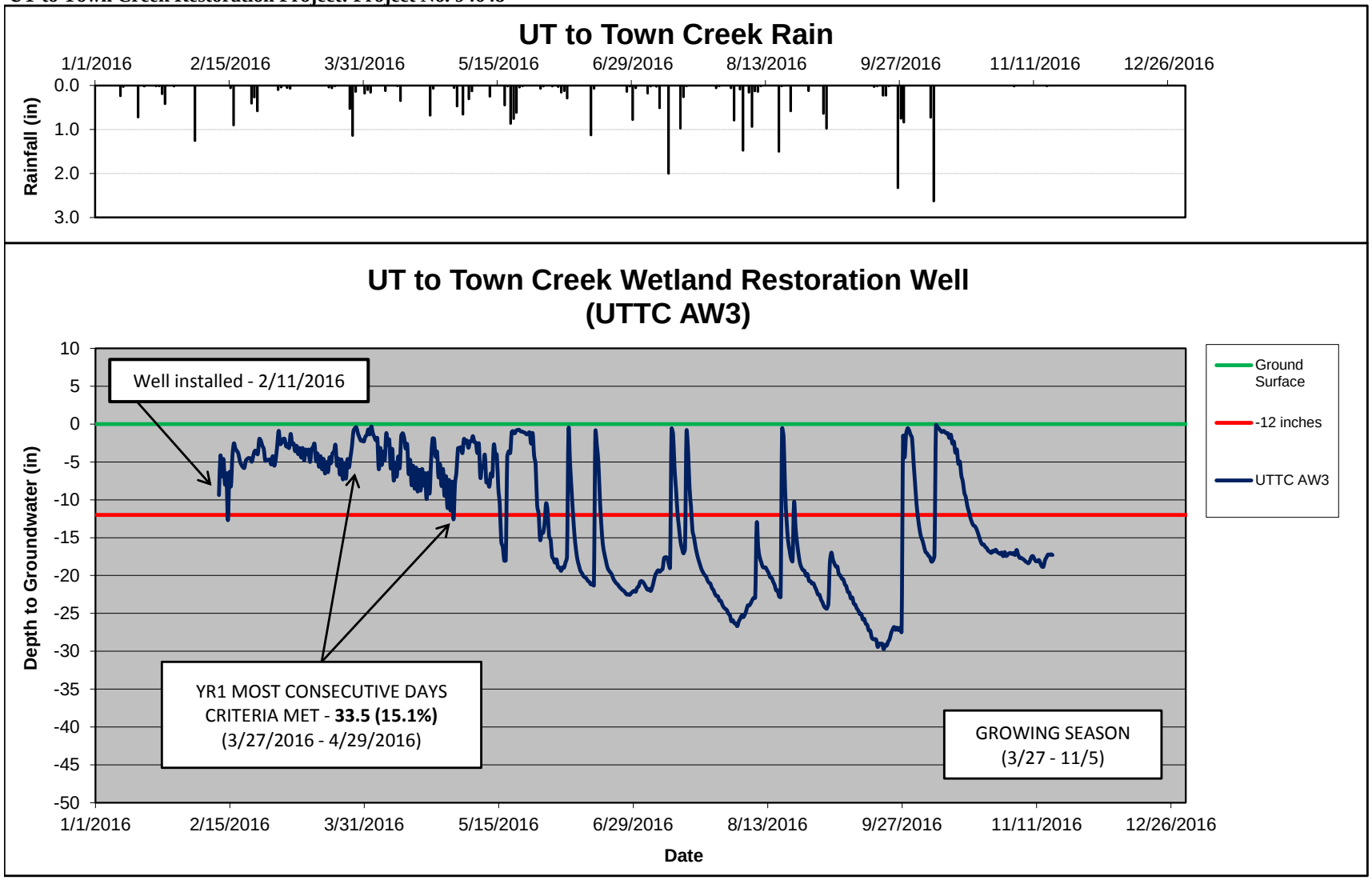


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

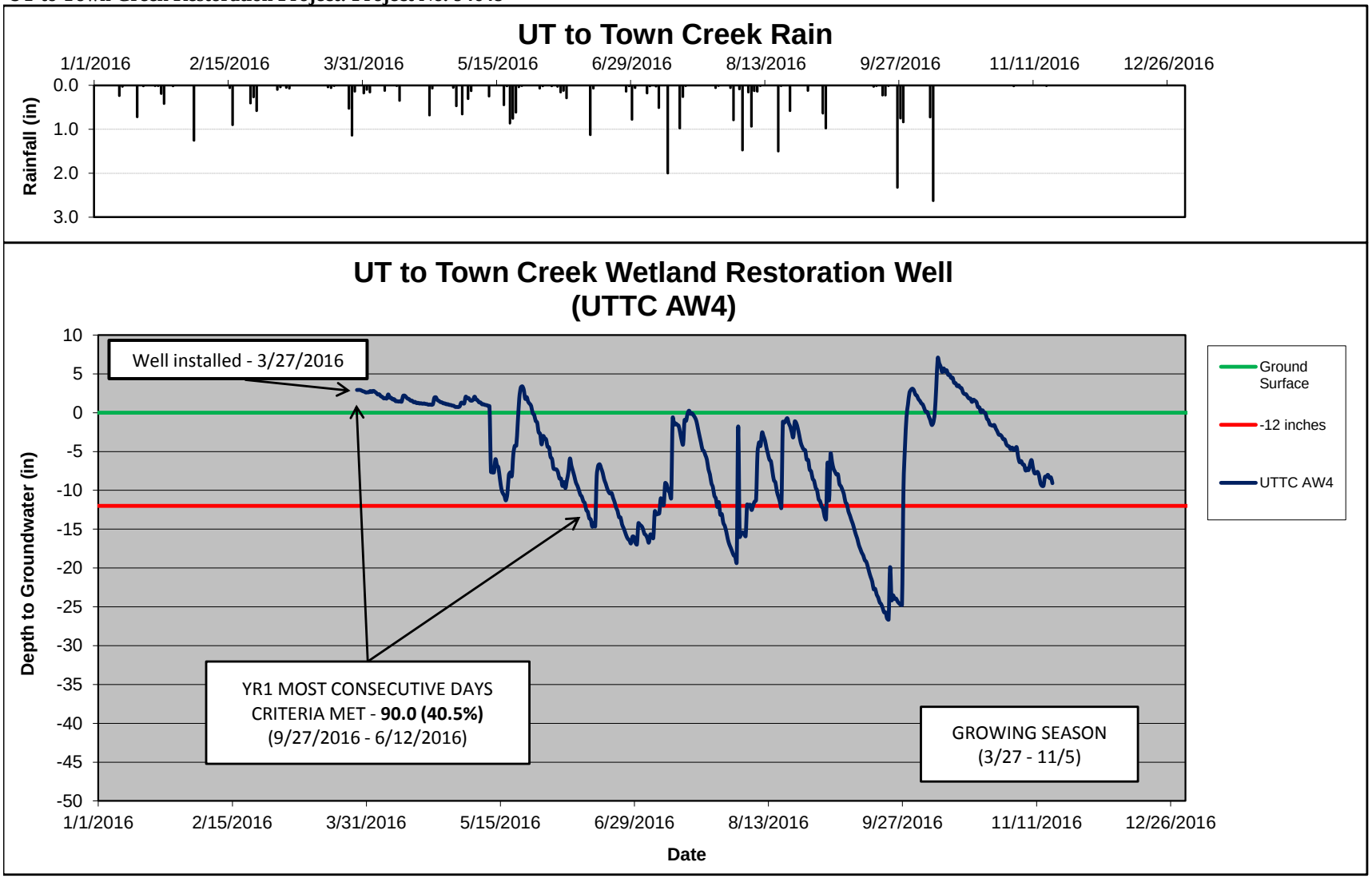


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

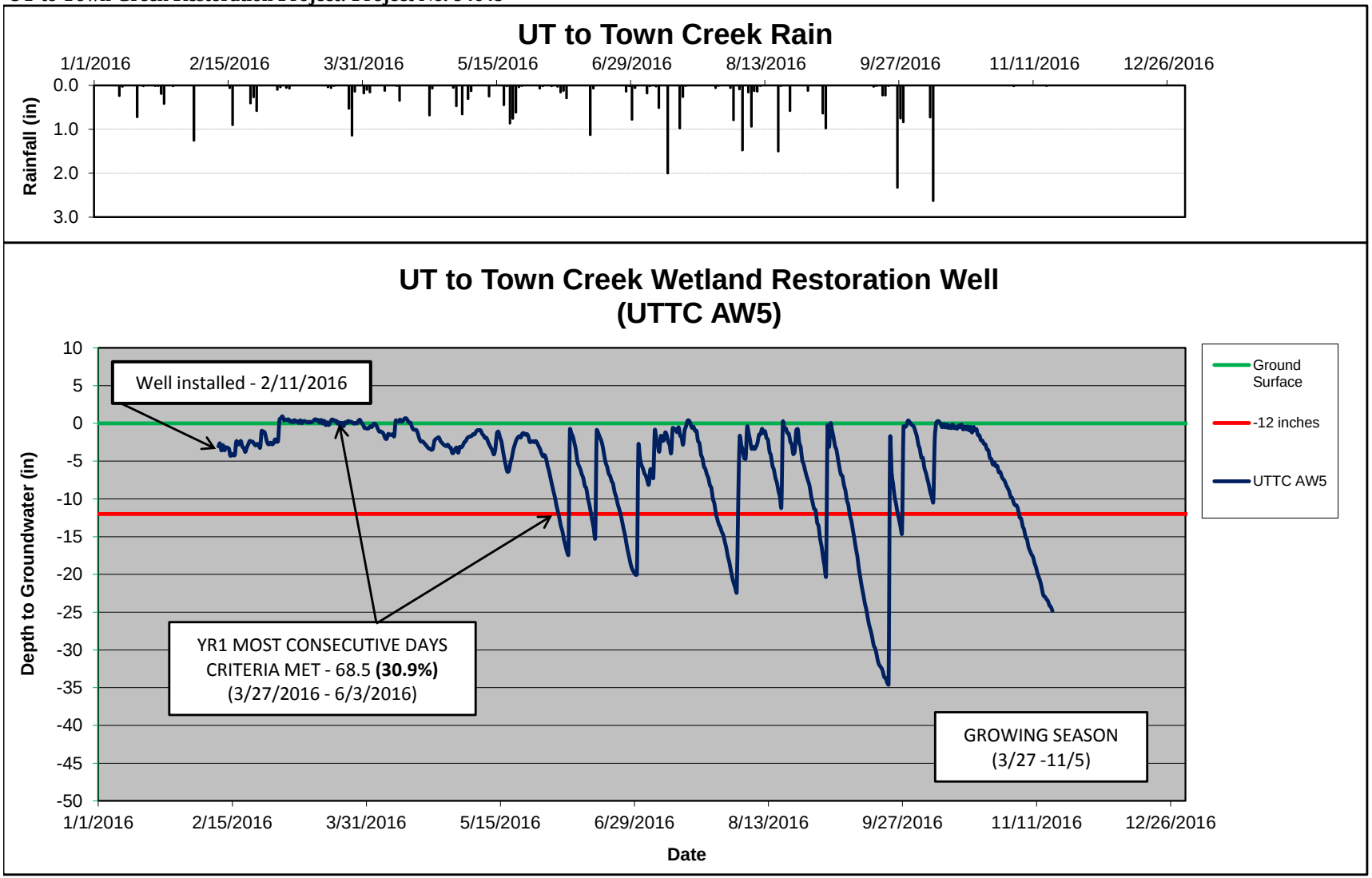


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

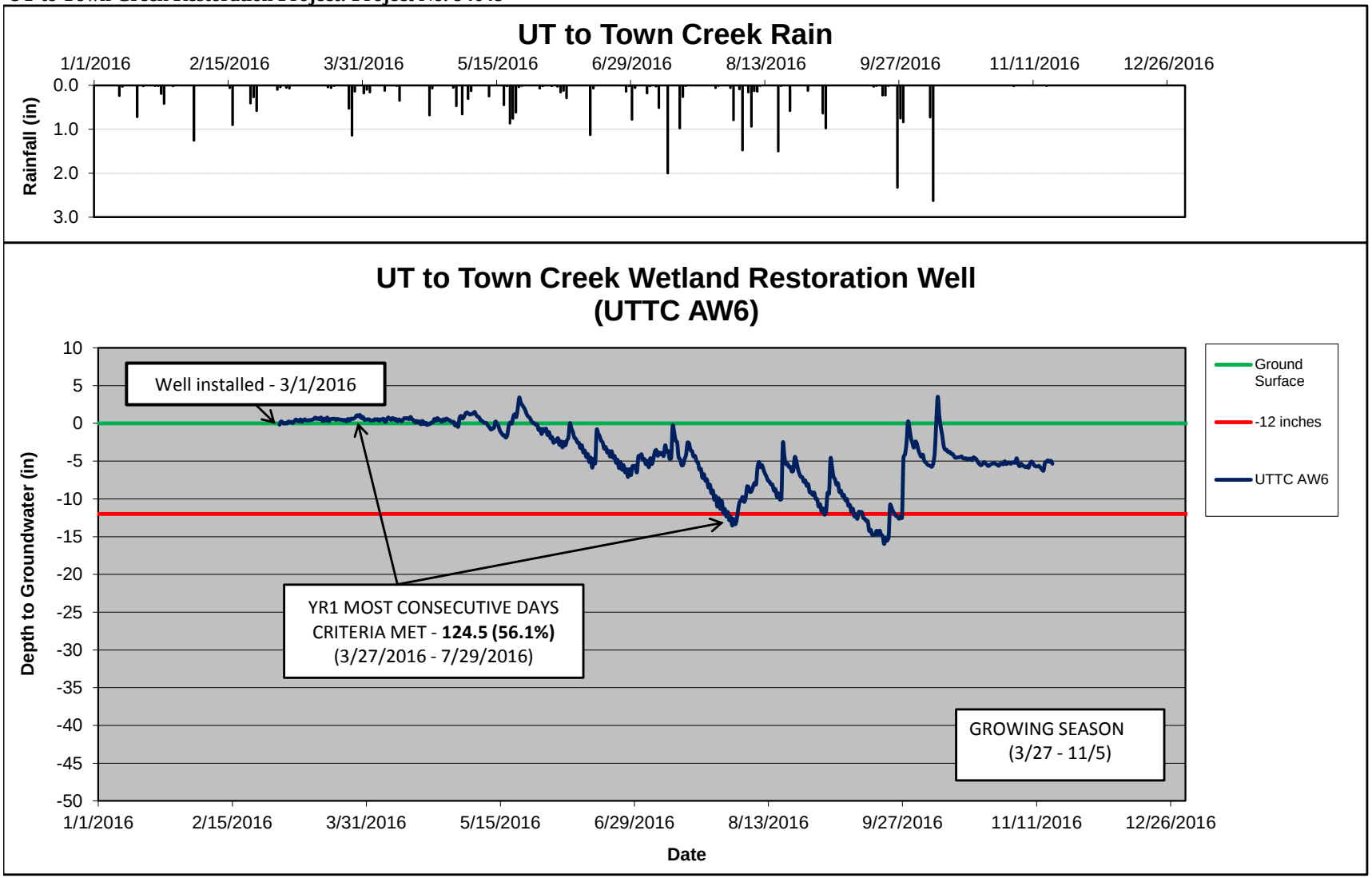


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

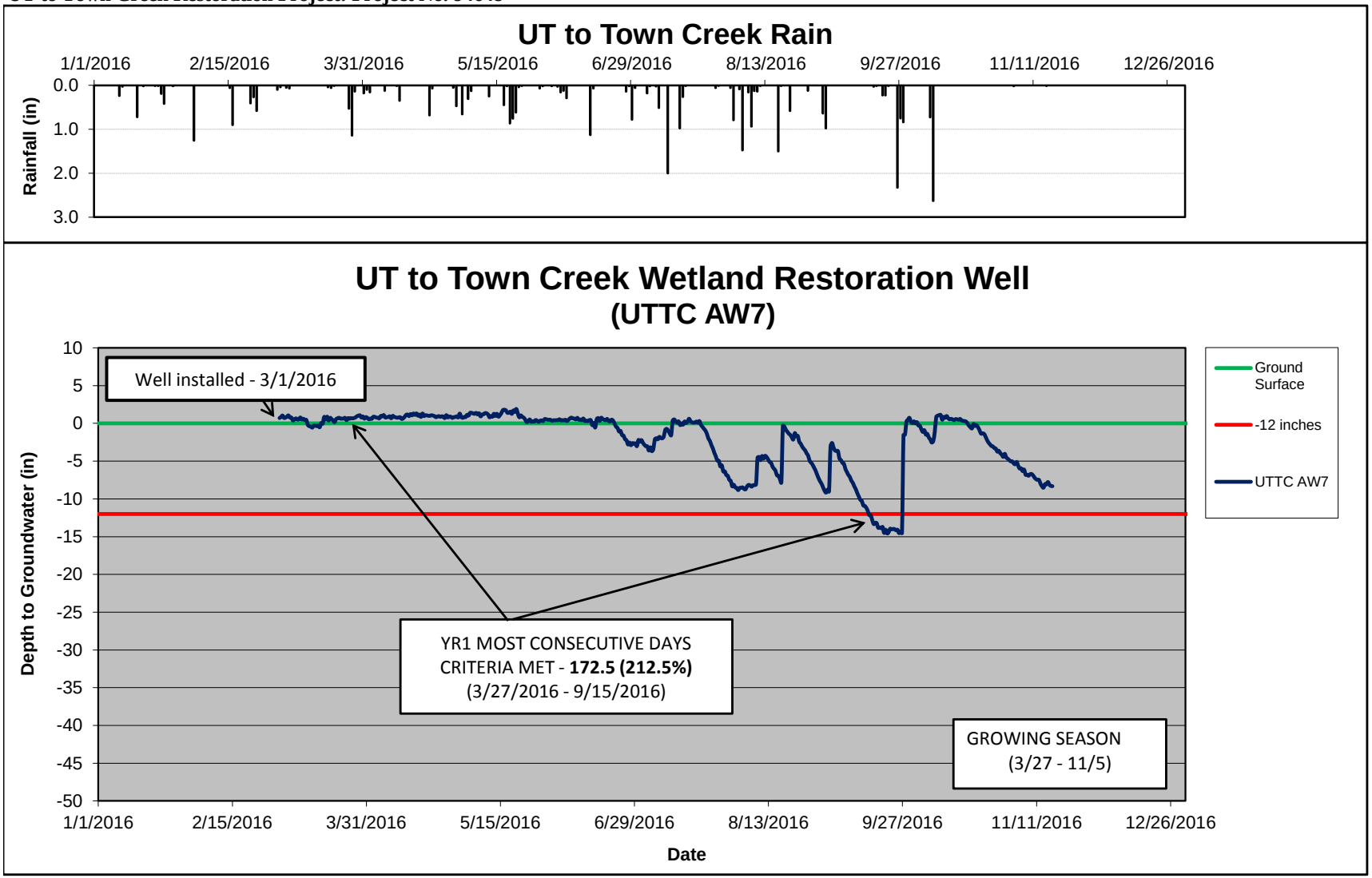


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

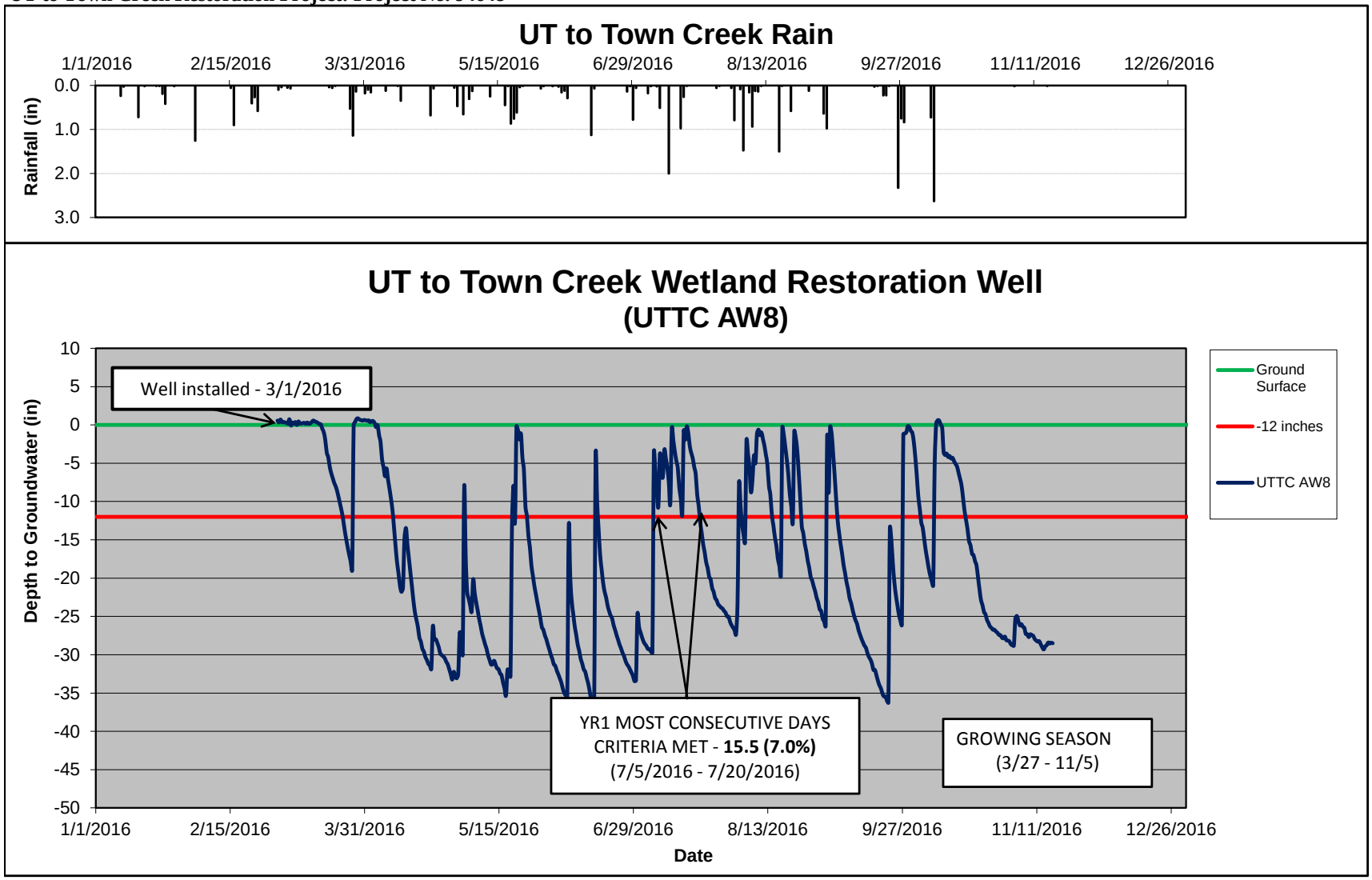


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

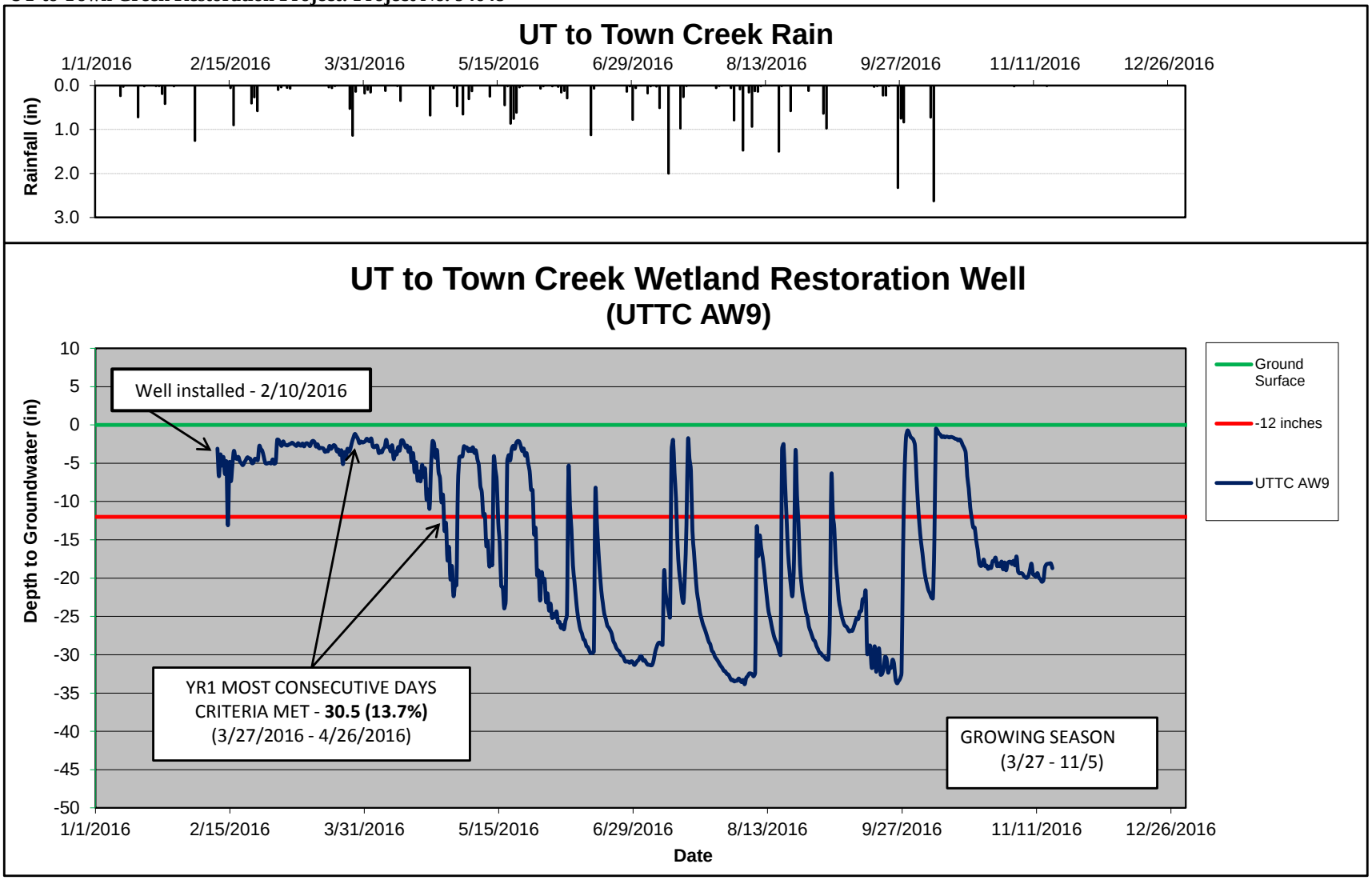


Figure 6 Cont. Wetland Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648

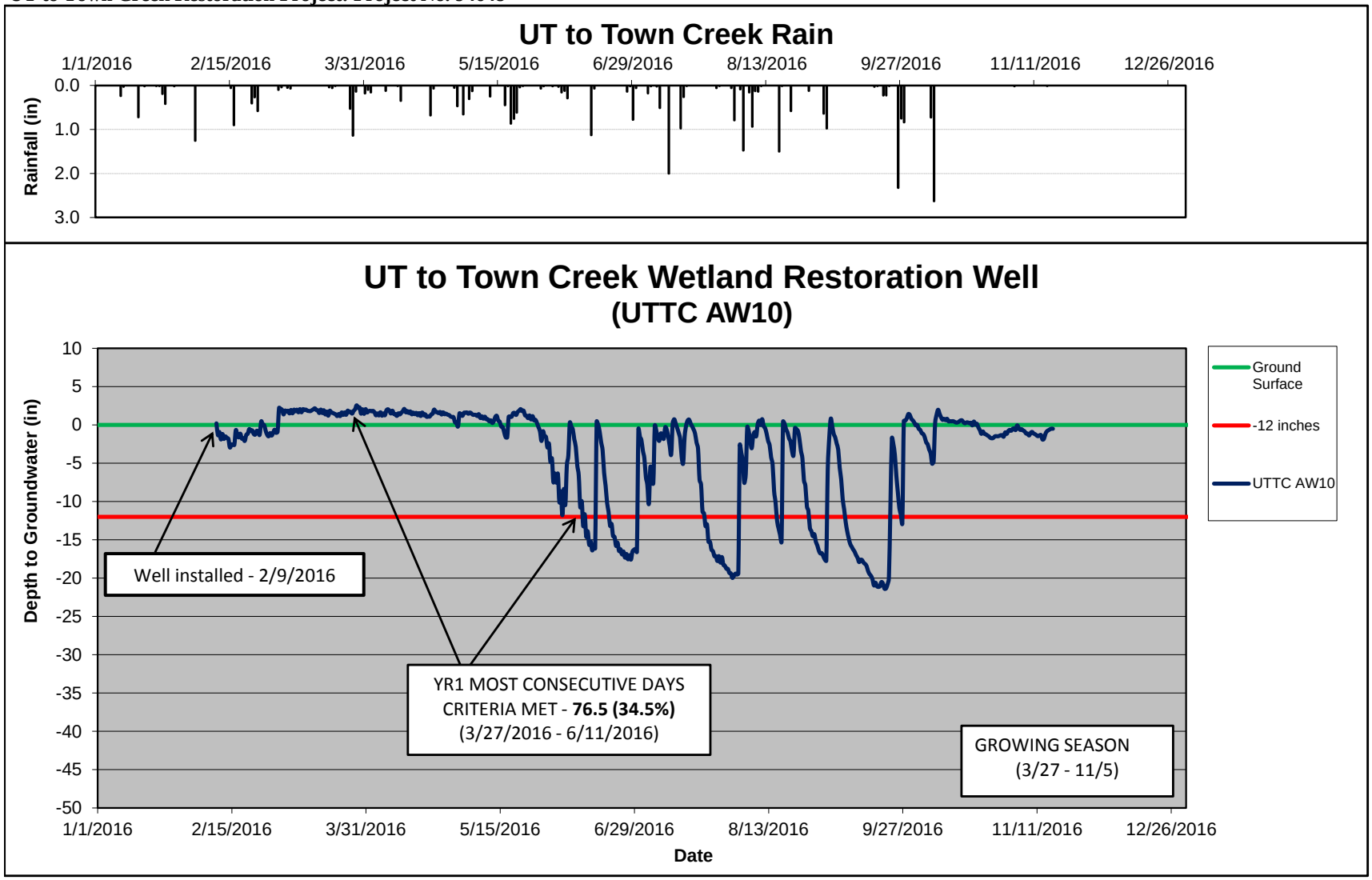
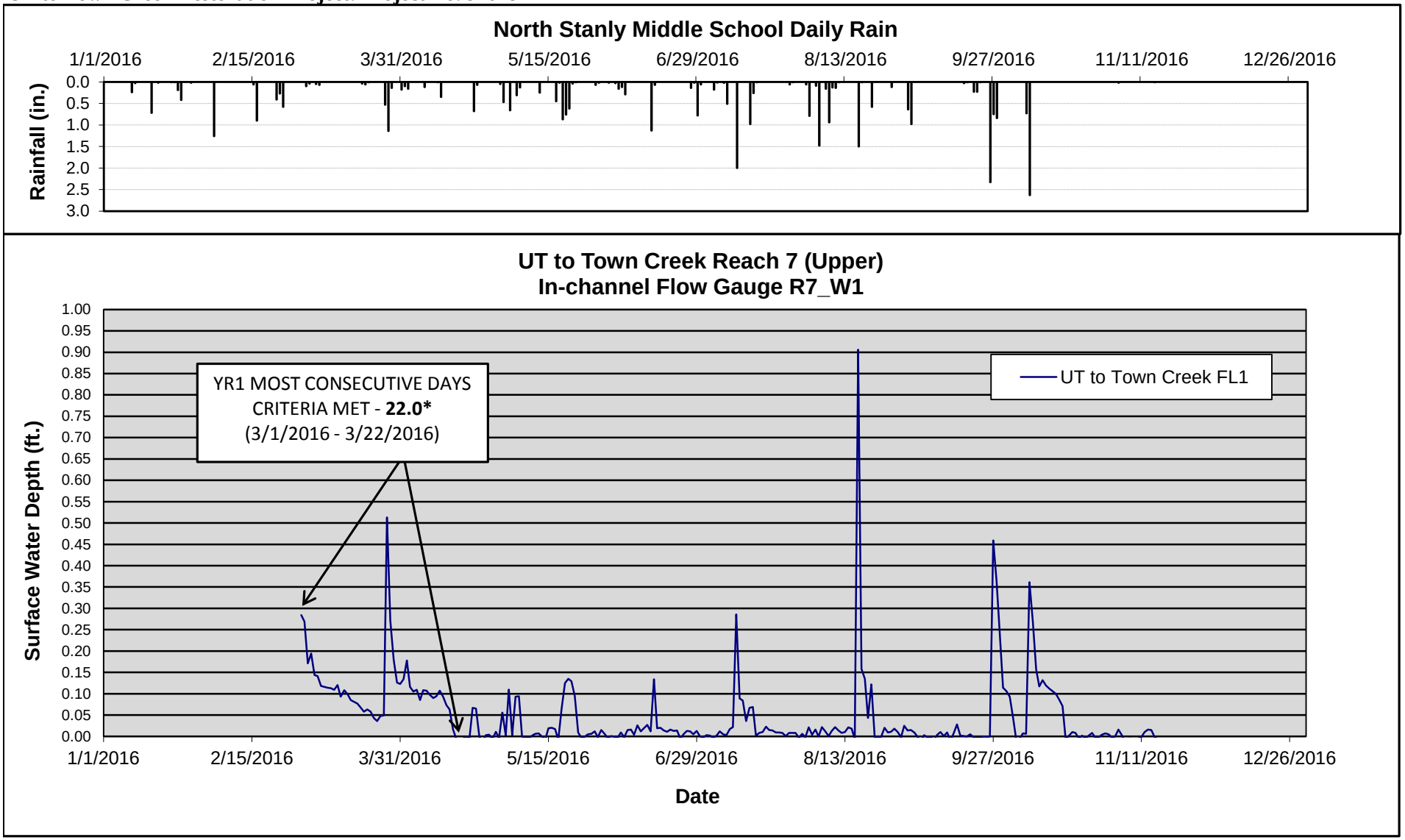
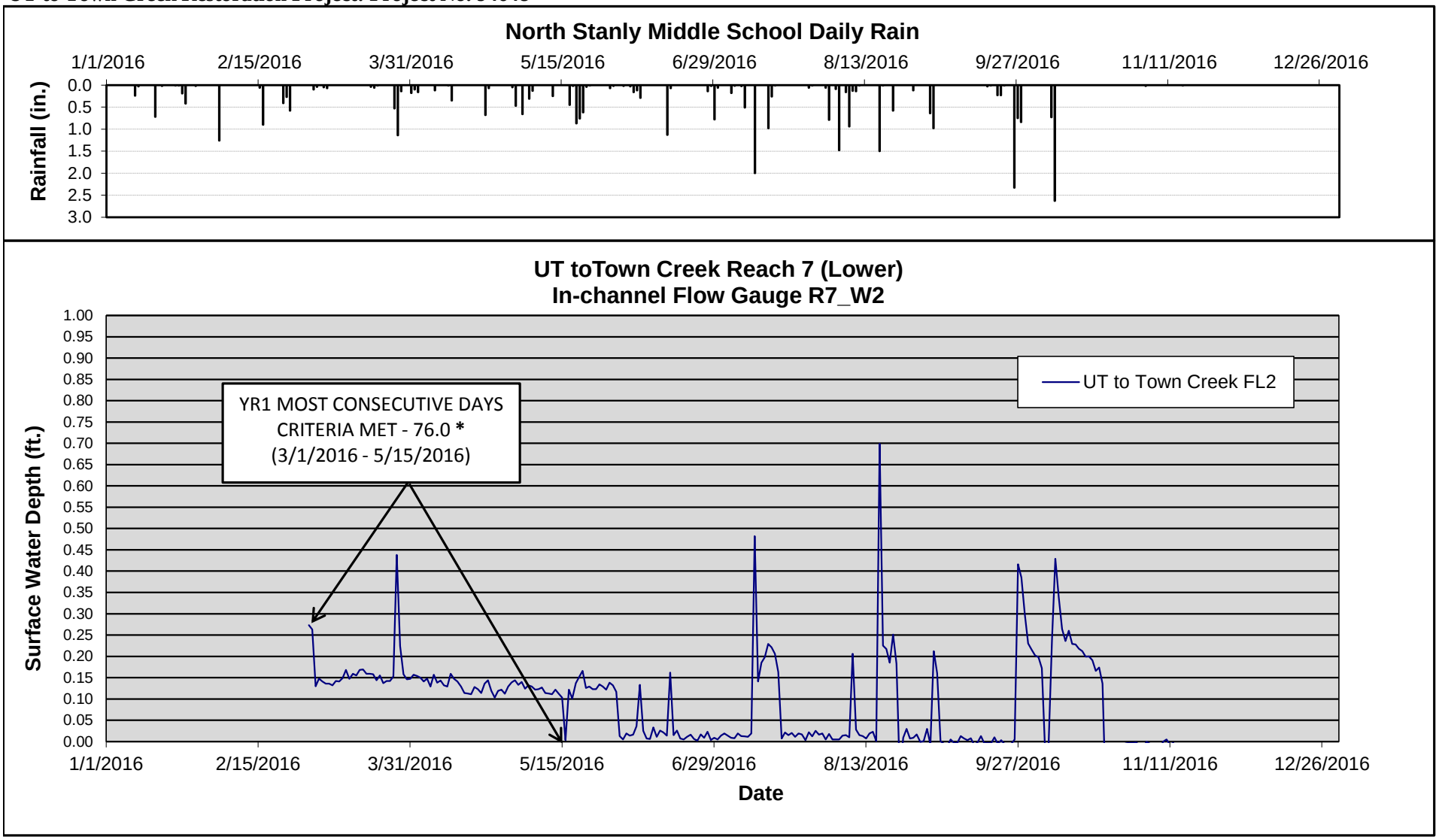


Figure 7. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648



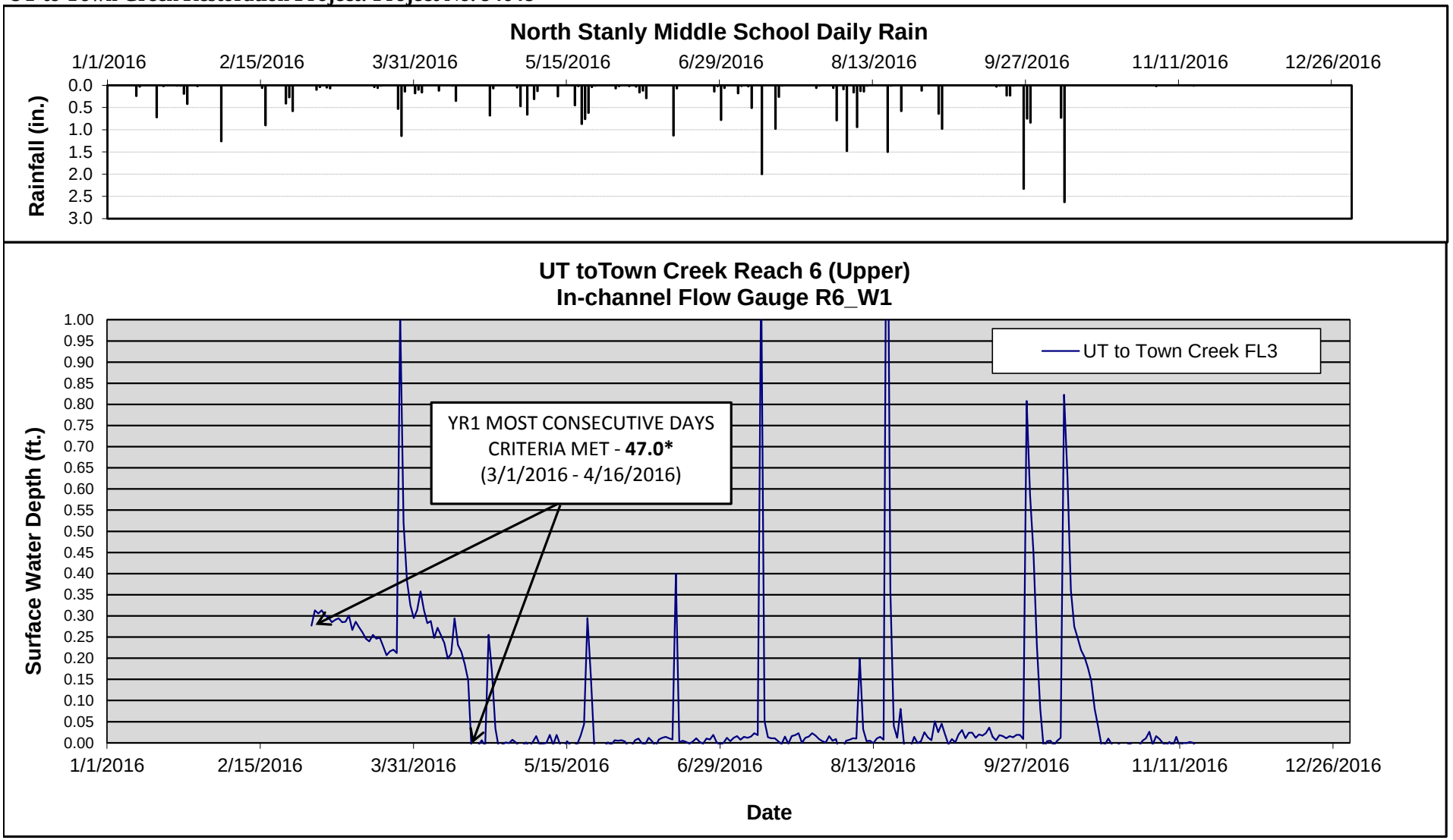
* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 7 Cont. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648



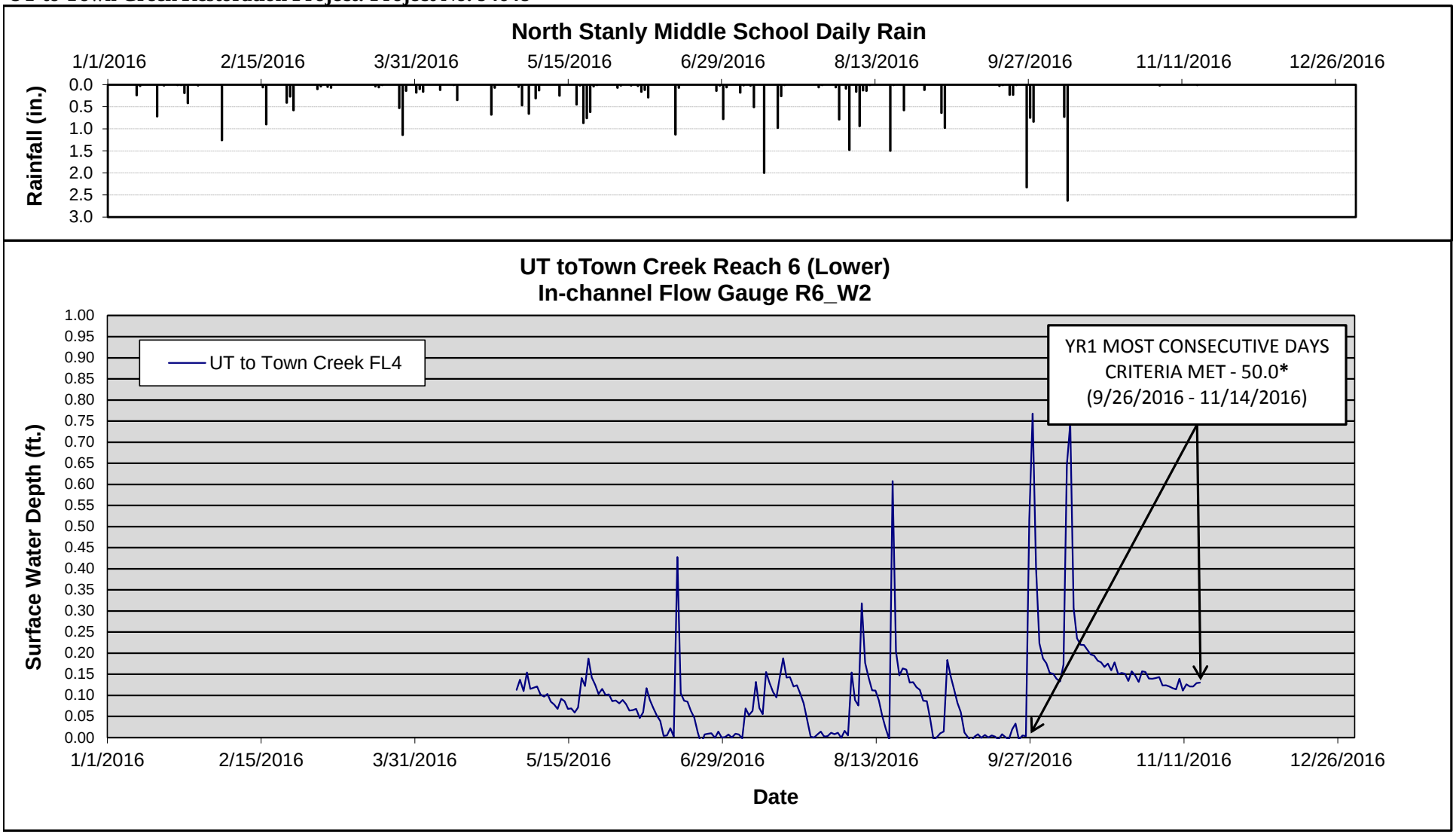
* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 7 Cont. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648



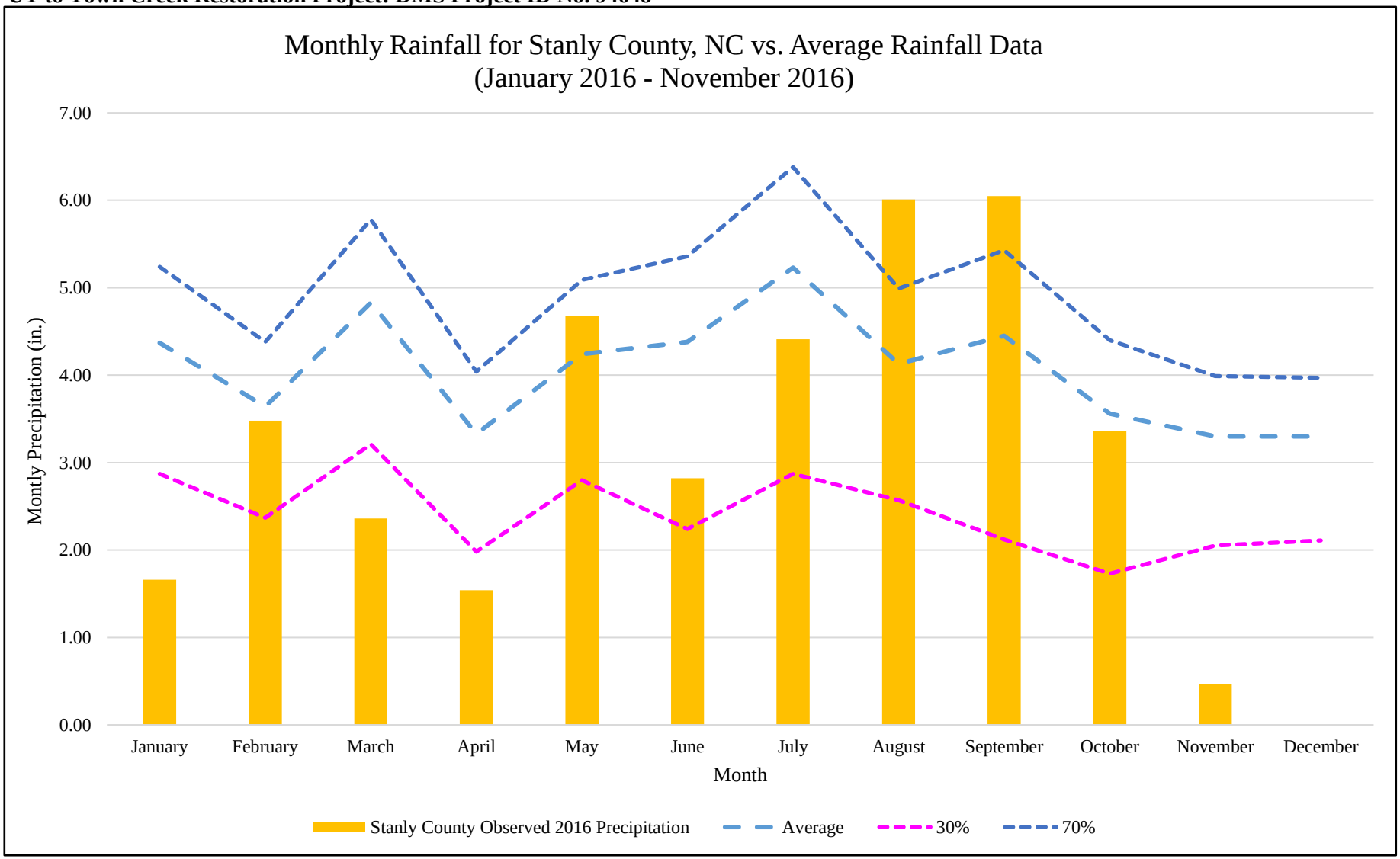
* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 7 Cont. In-stream Flow Gauge Graphs
UT to Town Creek Restoration Project: Project No. 94648



* Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 8. Monthly Rainfall Data
UT to Town Creek Restoration Project: DMS Project ID No. 94648



Historic rainfall data from WETS Station : ALBEMARLE, NC0090
Observed 2016 Precipitaion from CHRONOS Station NEWL, North Stanly Middle School

Table 12. Wetland Mitigation Area Well Success
UT to Town Creek Restoration Project: Project ID No. 94648

Well ID	Automated Well Type	Wetland Mitigation Type	*Percentage of Consecutive Days <12 inches from Ground Surface[1]	Most Consecutive Days Meeting Criteria[2]	*Percentage of Cumulative Days <12 inches from Ground Surface[1]	Cumulative Days Meeting Criteria[3]	Number of Instances where Water Table rose to <12 inches from Ground Surface[4]
Cross-sectional Well Arrays							
UTTC AW1	Reference	Jurisdictional	55.6	123.5	90.3	200.5	7
UTTC AW2	Groundwater	Restoration	41.7	92.5	84.7	188.0	7
UTTC AW3	Groundwater	Restoration	15.1	33.5	39.6	88.0	11
UTTC AW4	Groundwater	Restoration	40.5	90.0	78.4	174.0	8
UTTC AW5	Groundwater	Creation	30.9	68.5	84.0	186.5	8
UTTC AW6	Reference	Jurisdictional	56.1	124.5	93.2	207.0	6
UTTC AW7	Groundwater	Restoration	77.7	172.5	95.7	212.5	2
UTTC AW8	Groundwater	Restoration	7.0	15.5	32.0	71.0	11
UTTC AW9	Groundwater	Creation	13.7	30.5	34.5	76.5	12
UTTC AW10	Groundwater	Creation	34.5	76.5	79.1	175.5	8

Notes:

[1]Indicates the percentage of most consecutive number of days within the monitored growing season with a water 12 inches or less from the soil surface.

[2]Indicates the most consecutive number of days within the monitored growing season with a water table 12 inches or less from the soil surface.

[3]Indicates the cumulative number of days within the monitored growing season with a water table 12 inches or less from the soil surface.

[4]Indicates the number of instances within the monitored growing season when the water table rose to 12 inches or less from the soil surface.

Growing season for Stanly County is from March 27 to November 5 and is 222 days long.

Growing season percentage for success is 9% of 222 days = 20 days; where water table is 12 inches or less from the ground surface.

HIGHLIGHTED indicates wells that *did not* to meet the success criteria for the most consecutive number of days within the monitored growing season with a water 12 inches or less from the soil surface.

All In-Situ groundwater monitoring dataloggers were installed by 3/27/2016. Installation of the dataloggers was completed following construction in Spring 2016 when groundwater levels are normally closer to the ground surface.

Table 13. Verification of In-stream Flow Conditions
UT to Town Creek Restoration Project: DMS Project ID No. 94648

Flow Gauge ID	Reach Location	Consecutive Days of Flow[1]	Cumulative Days of Flow[2]
R7_W1	Reach 7 Station 10+60	22.0	80.0
R7_W2	Reach 7 Station 13+20	76.0	134.0
R6_W1	Reach 6 Station 14+80	47.0	74.0
R6_W2	Reach 6 Station 26+80	50.0	140.0

Notes:
[1]Indicates the number of consecutive days within the monitoring year where flow was measured.
[2]Indicates the number of cumulative days within the monitoring year where flow was measured.
Flow success criteria for the Site is stated as: A surface water flow event will be considered intermittent when the flow duration occurs for a minimum of 30 days.
Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Table 14. Verification of Bankfull Events
UT to Town Creek Restoration Project: DMS Project ID No. 94648

Date of Data Collection	Date of Occurrence	Method	Reach Location	Gauge Height (FT)	Photo # (if available)
10/10/2016	Between 5/2016 and 10/10/2016	Crest Gauge	Reach 3 Station 43+65	0.15	Crest Gauge Photo 1
11/3/2016	Between 10/10/2017 and 11/3/2016	Crest Gauge	Reach 3 Station 43+65	0.04	Crest Gauge Photo 2

UT to Town Creek – Hydrologic Data Photos

Crest Gauge Photo 1 (10/11/16)

Crest Gauge Photo 2 (11/03/16)

Flow Documentation Photo – R6_W2 (5/25/2016)

Flow Documentation Photo – R7_W2 (10/08/2016)