As-built Baseline Monitoring Report

Little Buffalo Creek Stream Mitigation Project

NCDENR-DMS Project Number: 94147

Contract Number: 2029

USACE Action ID: 2014-0386

DWR Permit: 14-0129

Cabarrus County, North Carolina

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Prepared for:

North Carolina Department of Environment and Natural Resources

Division of Mitigation Services

1652 Mail Service Center

Raleigh, North Carolina 27699-1652

Prepared by:

The Louis Berger Group, Inc.

1001 Wade Avenue, Suite 400

Raleigh, North Carolina 27605

Tel (919) 866-4400

Fax (919) 755-3502

Project Manager:

Ed Samanns

Tel (973) 407-1468

Fax (973) 267-6468

ESamanns@louisberger.com

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Executive Summary

The Little Buffalo Creek Stream Mitigation site is located in Cabarrus County, North Carolina, two miles southwest of the Town of Gold Hill, and 12 miles east of Kannapolis. The site encompasses approximately 47 acres of former cattle pasture, crop land and riparian forest along Little Buffalo Creek and portions of seven unnamed tributaries (Figure 1).

Through the North Carolina Ecosystem Enhancement Program full-delivery process, the Louis Berger Group, Inc. (Louis Berger) is under contract to generate a total of 6,170 stream mitigation units through stream restoration, enhancement and preservation of the above listed streams. The goal of the project is to address stressors identified in the Targeted Local Watershed (TLW) such as improving water quality, aquatic and terrestrial habitat, and flood flow attenuation. The goals were addressed by restoring stable channel morphology and sediment transport capacity, improving stream bed form and habitat, improving stream bank stabilization, removing cattle, and providing riparian buffer restoration and enhancement by re-establishing a native plant community within the easement and removing invasive plant species.

Historic land use at the site had consisted primarily of ranching activities, including cattle access to the stream and riparian zone. Several reaches of the stream have bedrock in their streambed and vertical migration of the stream has been confined to a small percentage of the project site.

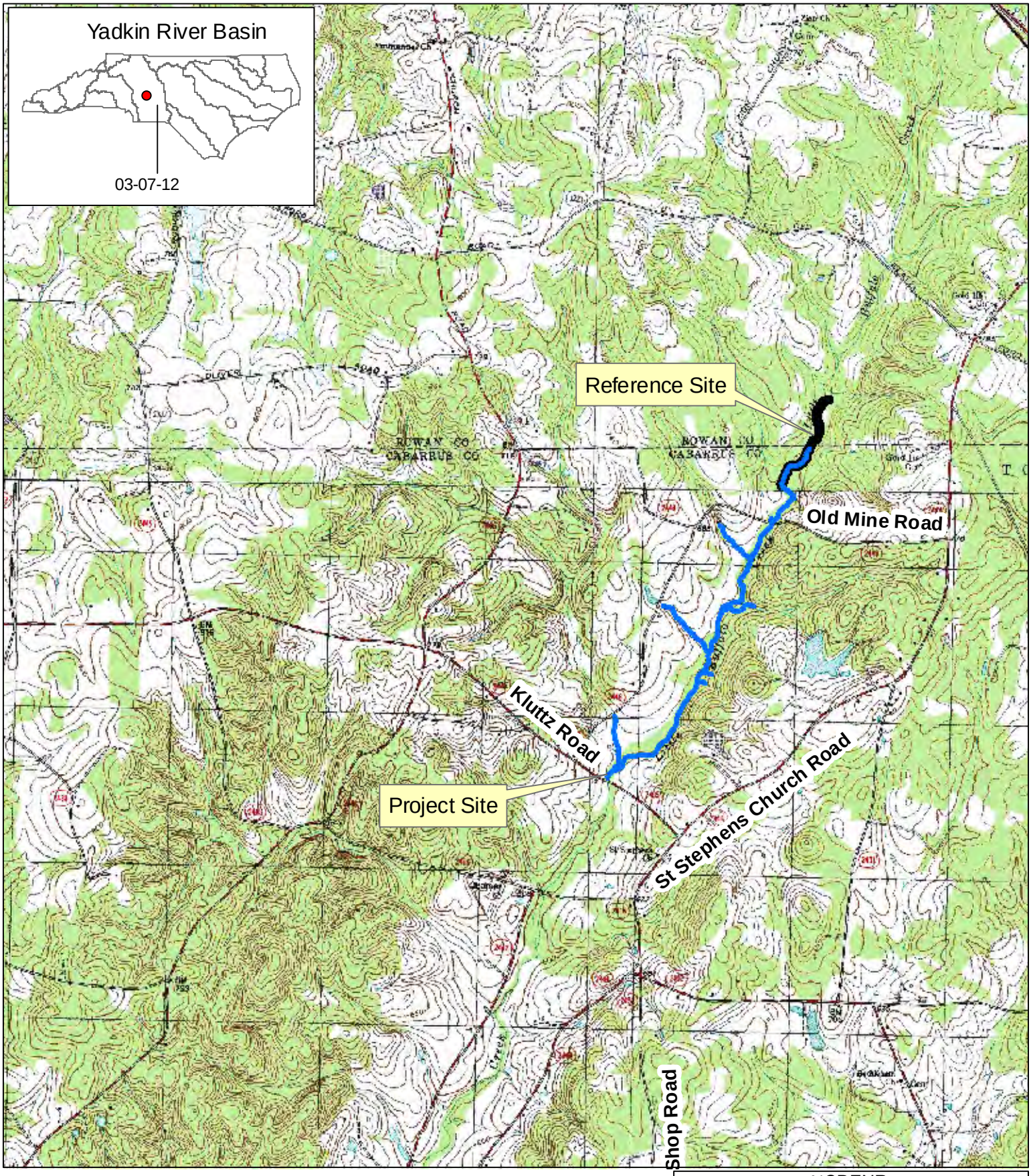
The Little Buffalo Creek Mitigation Site consists of six reaches along the mainstem and seven unnamed tributaries (UTs). The mainstem of Little Buffalo Creek as well as UT 4 and UT 7 are perennial streams. The remainders of the UTs are intermittent stream associated with groundwater seeps. This stream mitigation project includes reaches of restoration, enhancement, and preservation along the mainstem and its associated UTs. In total, the Site will provide 13,362 linear feet of restoration, enhancement, and preservation.

Restoration activities will create a new, stable stream channel with the appropriate dimension, pattern, and profile to transport perennial flow and sediment, and will re-connect the stream to its floodplain. Reestablishment of vegetation and cattle exclusion will also occur as part of the restoration activities.

Enhancement activities will include reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor and excluding cattle with fencing. In the case of enhancement level I the activities will also include reshaping or relocating the bed and banks.

Preservation will be conducted within portions of the stream corridors that have intact riparian forests and stable stream reaches.

At a 1:1 ratio for restoration, 1.5:1 for enhancement level I, 2.5:1 for enhancement level II, and a 5:1 ratio for preservation, the NCDENR-DMS will receive approximately 6,411 stream mitigation units from the Site. In addition, approximately 47 acres of riparian buffer will be protected within a conservation easement.



Legend

- Project Stream Segments
- Reference Reach

N

0 0.5 1 Miles

Source: USGS Topographic Quads: Gold Hill, Rockwell, Richfield, and Mount Pleasant, NC

NCDENR
Division of Mitigation Services

Little Buffalo Creek Creek
Stream Restoration, Cabarrus County, NC
DMS Project # 94147

Project Location Map

THE LOUIS BERGER GROUP
1001 Wade Avenue, Suite 400
Raleigh, NC 27605

Figure 1

July 2015

1.0 Project Goals

The goals of the proposed Little Buffalo Creek Stream Restoration project include, but are not limited to, the enhancement of water quality and aquatic/terrestrial habitat, stream stability improvement, and erosion reduction. The uplift of these stream functions specifically requires:

- Protecting and improving water quality through the removal or minimization of the biological, chemical, and physical stressors;
    - reducing sediment input into the stream from erosion,
    - reducing non-point pollutant impacts by removing livestock access (including restoring forested buffer,
    - protecting headwater springs
- Improving aquatic and terrestrial wildlife habitat;
    - moderating stream water temperatures by improving canopy coverage over the channel; and,
    - restoring, enhancing, reconnecting, and protecting valuable wildlife habitat.
- Restore floodplain connectivity
    - re-establishing a floodplain connection thereby dissipating energy associated with flood flows.

In addition to the ecological uplift that the project will provide to the Site through the improvement of the stream functions, this project establishes the following environmentally advantageous goals:

- providing a water source for livestock removed from the stream and riparian corridor;
- reducing the number of locations that livestock are able to cross the stream; and
- providing a safe and environmentally appropriate stream crossing points for livestock.

In order to achieve the project goals, Berger proposes to accomplish the following objectives:

- fence the cattle out of the stream and riparian corridor,
- remove invasive vegetative species from the riparian corridor,
- restore and enhance unstable portions of the stream,
- preserve the stream channel and banks through a conservation easement, and
- plant the riparian corridor with native tree and shrub vegetation.

The expected ecological benefits and goals associated with the Little Buffalo Creek site mitigation plan serve to meet objectives consistent with the resource protection objectives detailed in the Yadkin-Pee Dee River Basinwide Water Quality Plan, 2008.

2.0 Project Success Criteria

2.1 Streams

For stream hydrology, a minimum of two bankfull events must be documented within the standard 5-year monitoring period. In order for the monitoring to be considered complete, the two verification events must occur in separate monitoring years. All of the morphologic and channel stability parameters will be evaluated in the context of hydrologic events to which the system is exposed.

- Dimension – General maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will generally represent success in dimensional stability. For stream dimension, cross-sectional overlays and key parameters such as cross-sectional area, and the channel's width to depth ratios should demonstrate relative stability in order to be deemed successful.
- Pattern – Pattern features should show little adjustment over the standard 5 year monitoring period. Rates of lateral migration need to be moderate.
- Profile – For the channels' profile, the reach under assessment should not demonstrate any trends in thalweg aggradation or degradation over any significant continuous portion of its length. Over the monitoring period, the profile should also demonstrate the maintenance or development of bedform (facets) more in keeping with reference level diversity and distributions for the stream type in question. It should also provide a meaningful contrast in terms of bedform diversity against the pre-existing condition. Bedform distributions, riffle/pool lengths and slopes will vary, but should do so with maintenance around design distributions. This requires that the majority of pools are maintained at greater depths with lower water surface slopes and riffles are shallow with greater water surface slopes.
- Substrate and Sediment Transport – Substrate measurements should indicate progression towards, or maintenance of the known distributions from the design phase. Sediment Transport should be deemed successful in by absence of any significant trend in the aggradation or depositional potential of the channel.

2.2 Vegetation

Survival of woody species planted at mitigation sites should be at least 320 stems/acre through year three. A 10 percent mortality rate will be accepted in year four (288 stems/acre) and another 10 percent in year five resulting in a required survival rate of 260 trees/acre through year five. This is consistent with Wilmington District (1993) guidance for wetland mitigation (USACE 2003).

3.0 Project Description

Louis Berger is contracted with Division of Mitigation Services (DMS) to provide 6,170 stream mitigation units through the implementation of the Little Buffalo Creek Stream Mitigation Project. The Little Buffalo Creek Stream Mitigation Site (Site) is located in Cabarrus County, North Carolina, approximately 12 miles east of Kannapolis and two miles southwest of Gold Hill. The Site is located in the Rocky River basin of the Yadkin-Pee Dee River basin (Figure 1). The Mitigation Plan estimated approximately 6,679 stream mitigation units could be provided to DMS to compensate for projects occurring within the Yadkin-Pee Dee River basin. Subsequent to the Plan approval and prior to and during construction, design modifications were made that has reduced the total anticipated stream mitigation units to 6,411.

The original stream channel has been altered by years of ranching activities, including cattle access to the stream and riparian zone. Several reaches of the stream have bedrock in their streambed and vertical migration of the stream has been confined to a small percentage of the project site. The stability in the vertical direction coupled with the loss of vegetation along the stream due to cattle accessing the stream via the streambank have led to streambank failures and lateral stream migration on several stream reaches throughout the Site.

4.0 Mitigation Components

A detailed summary of the project components is available in Appendix A, Table 1, and illustrated in Appendix B: Figure 2. Restoration components are included in Reaches 1 and 3 and in UTs 2, 3, 7, and 8. Preservation components are included in Reach 6 and UT 2. Enhancement Level I components are included in Reaches 4 and 5 and in UTs 3 and 4. Enhancement Level II components are included in Reaches 1, 2, 3, 4, and 5 and in UTs 1, 2, 3, 4, 5, and 6.

5.0 Design & Approach

The project components described below are illustrated in Appendix B: Figure 2 and Appendix E. The linear feet of each stream restoration, enhancement or preservation component is summarized in Table 1.

Reach 1 – Restoration has included re-aligning the stream channel for a more natural flow for 377 feet. Two log vanes were placed along the realignment to slow the energy of the water. This restoration will bring the stream closer to its original width and landscape position, restore sinuosity, and alleviate the instability associated with the turn. The old channel has been filled. The remaining 1928 feet of the stream length has undergone enhancement level II, which included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence within the easement has been removed.

Reach 2 – Only enhancement level II is proposed for 1244 feet on this reach. This included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence within the easement has been removed.

Reach 3 – Restoration has aligned a new channel for 244 feet where the stream historically existed along the center of the valley floor. The old channel has been filled and the bank repaired. Just upstream of the restoration segment, the channel has over-widened and undercut the east bank. Root wads in two sections of the turning channel at this location of the east bank have been placed to help direct preferential flow towards the center of the channel and reinforce the bank from the velocities of the channel undercutting the bank. The remaining 839 feet of stream has undergone enhancement level II, which included removal of invasive plant species and establishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

Reach 4 – Enhancement level I is proposed for the 151 foot segment that contains concrete slabs along the right stream bank just upstream of the confluence of UT 3. The concrete has been removed and the stream bank reestablished with vegetation at a more gradual slope. The remaining 818 feet of stream has undergone enhancement level II, which included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

Reach 5 – Only enhancement level II is proposed for 826 feet on this reach. This included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

Reach 6 – Preservation is proposed for this 2,043 foot reach. The easement boundary has been fenced and any pre-existing fence has been removed from within the easement.

UT 1 – Only enhancement level II is proposed for 111 feet on this reach. This included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

UT 2 – The upper 335 feet has been preserved, and a 49 foot section has had the channel profile and banks restored with the removal of a 12-inch concrete pipe for restoration. The remaining 567 feet has undergone enhancement level II. This included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

UT 3 – This reach has short segments of restoration through a former pond and at pipe removals, followed by sections of either enhancement level I or enhancement level II. Moving from upstream to downstream, the first 215feet consists of restoration where the segment was previously ponded and there is no existing concentrated flow path. The stream's dimension, pattern, and profile have been established throughout this segment by cutting a channel through the formerly ponded area. Additionally, a pipe section has been removed from this section. The next 252 feet consists of enhancement level II and included removal of invasive plant species and establishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence within the easement has been removed. The following 555 feet consists of sections of enhancement level I and restoration. This reach had down cut severely and become entrenched. The stream banks have been laid back throughout this reach in order to reduce the shear stress along the stream banks. These actions will affect the stream's dimension and pattern. Additionally, 19 feet of restoration was performed in a section where the profile had been adjusted and a pipe section was been removed as well. In total, this 555 foot section consists of 536 feet of enhancement level I and 19 feet of restoration. The following 107 feet consists of enhancement level II followed by a section of 26 feet of restoration where a pipe was removed and the profile and stream banks were reestablished. The lower part of UT 3 consists of three sections, a 250 foot section of enhancement level II, followed by a 45 foot section of restoration for the removal of another pipe and reestablishment of the channel profile and banks, and ending with 25 feet of enhancement level II.

UT 4 – The upper 421 feet is enhancement level II. This included removal of invasive plant species and establishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence has been removed from the easement. The lower 410 feet is enhancement level I. The stream banks have been laid back throughout this reach in order to reduce the shear stress along the stream banks.

UT 5 – Only enhancement level II is proposed for 184 feet on this reach. This included removal of invasive plant species and establishing native riparian vegetation within a 50-foot easement along each

bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

UT 6 – Only enhancement level II is proposed for 151 feet on this reach. This included removal of invasive plant species and establishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing. Any pre-existing fence has been removed from the easement.

UT 7 – Enhancement level I is proposed for the first 147 feet of UT-7. The existing channel has been plugged at the downstream section of the first enhancement section, and a large pool was established to provide backwater through the culvert and establish adequate flows to remove a fish barrier at the Old Mine Road culvert. Restoration is proposed for the remaining 980 feet of UT-7. This reach had been straightened and has downcut several feet until it has reached bedrock. UT-7 has been entirely reconstructed on its original floodplain and rejoins the mainstem of Little Buffalo Creek upstream of the prior confluence. The old channel has been plugged at specified locations and filled with the dirt excavated from the new channel. Areas of existing channel have been left open between the plugs to develop new amphibian ponds. Two rock cross vanes are proposed, one along the upper section and one below the new confluence with UT-8, an unnamed tributary to UT 7. A series of 7 step pools have been installed along the lower segment for approximately 90 feet to account for the drop in elevation. The segments of enhancement and restoration included removal of invasive plant species and reestablishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor, and excluding cattle with fencing where required. Any pre-existing fence has been removed from the easement.

UT 8 – The entire 62 feet of UT 8 associated with this project is proposed as restoration. The existing UT 8 channel has been plugged, and a new channel with appropriate profile and bank connections developed at a new confluence point with UT 7 just upstream of the previously existing confluence. Restoration included removal of invasive plant species and establishing native riparian vegetation within a 50-foot easement along each bank of the stream corridor and replacing an incised channel with appropriate dimension and connection with the floodplain. Any pre-existing fence has been removed from the easement.

6.0 Timeframe

Appendix A: Table 2 presents a detailed description of the timeframe for all project activities and reporting history completed to date.

7.0 Significant Deviations & Post-Construction Issues

Several deviations from the original proposed design were necessary to address site conditions encountered during construction. The design changes included profile changes, channel re-alignments, and structure changes. These deviations were the result of:

- Changes required due to errors in the initial existing conditions survey;
- Natural site constraints such as encountering bedrock during excavation;
- Engineering design aspects that were noticed in the functioning sections of LBC that would help the functionality of the proposed restoration activities.

Reach 1- The proposed sections of enhancement level II and restoration were modified to only account for the sections of restoration in Reach 1 where grading occurred during construction. In addition, the profile of the restoration reach was raised and the max bankfull depth decreased by .19 feet (constructed max bankfull depth of 1.81 feet) within the straight and curve pools. This change occurred due to the high elevation of bedrock in the vicinity of restoration and to meet characteristic slopes of the C4 channel type on top of the bedrock table. Inner berms were also established to contain low flow conditions of the restoration channel. As construction began, it was determined that the proposed bankfull width was similar to the existing bankfull width of the channel, but functioning sections of LBC had vegetated berms within the channel that contained low flow conditions and established low flow riffle-pool patterns. Inner vegetated berms were added to the cross section to establish this existing low flow characteristic of LBC versus the overly wide designed channel bottom that would lose these pattern characteristics at normal conditions.

Reach 3 – The proposed sections of enhancement level II and restoration were modified to account for the sections of restoration in Reach 3 where grading occurred during construction. In addition, the profile of the restoration reach was raised while maintaining the original bankfull capacity within the proposed cross-sections. This change occurred due to the high elevation of bedrock in the vicinity of restoration. Inner berms were also established to contain low flow conditions of the restoration channel. As construction began, it was determined that the proposed bankfull width was similar to the existing bankfull width of the channel, but functioning sections of LBC had vegetated berms within the channel that contained low flow conditions and established low flow riffle-pool patterns. Inner vegetated berms were added to the cross section to establish this existing low flow characteristic of LBC versus the overly wide designed channel bottom that would lose these pattern characteristics at normal conditions. Lastly, two (2) root wads were used to provide bank protection and redirect flow and velocities of flood waters in the channel bend upstream of the restoration section. This area was no longer over-widened, as an inner berm had established, but the flow of high flows were severely undercutting the banks within this bend. Root wads will not only provide protection to the bank and slow/redirect flood waters within the bend, but they can provide additional habitat areas for fish and amphibians within the channel as well.

Reach 4 – The proposed channel pattern and profile were not adjusted within the section of enhancement level I where concrete slabs were removed from the channel bank. The existing pattern and profile of this area has an existing, well-established riffle-pool profile and meandering pattern. Channel dimensions were modified as the concrete slabs were removed, and channel bank slopes were cut back along the right bank.

UT 2 – A 49-foot section of enhancement level II was changed to restoration as a 12 inch concrete pipe was removed, with the channel form, profile and banks re-established.

UT 3 – Multiple segments of UT 3 have been modified to be counted as restoration instead of enhancement level I or enhancement level II for the removal of multiple concrete pipes along the tributary. The channel profile and banks were re-established where sections of pipe have been removed.

UT 7 – The length of restoration was decreased and enhancement level I is now proposed for the first 147-foot section of channel. No grading occurred in the first 147 feet of channel, but the head cut developed at the Old Mine Road culvert was removed by raising the profile of the restoration channel to

match the elevation of the culvert inlet. In addition, the UT 7 and UT 8 channel connection to LBC has been relocated to a point upstream of the original proposed design, with the channel patterns adjusted to make this connection at this upstream point. This was performed due to the proximity of the original proposed channel and LBC. Concerns that flood waters may cut a new channel in the flood plain to tie into the LBC connection that was built grew out of pre-construction site visits. Step pool structures were reduced due to the relocation of the channel connection to LBC. In addition to these deviations, the profile was raised by 2 feet to match the invert of the Old Mine Road culvert. The existing survey from 2008 listed the invert elevation incorrectly, and the error was identified during site layout of this channel.

8.0 Methods and References

Monitoring for stream stability, stream hydrology, and vegetation will be monitored annually for five years following the initial Baseline and As-Built Report. Annual monitoring requirements are based on the U.S. Army Corp of Engineers *Stream Mitigation Guidelines* document (USACE 2003) and supplemental requirements listed in the NCDENR-DMS *Ecosystem Enhancement Program Monitoring Requirements and Performance Standards for Stream and Wetland Mitigation* guidance document dated January 1, 2010 (NCEEP 2010). Establishment, collection, and summarization of data collected will be in accordance with the NCDENR-DMS guidance document *Monitoring Report Template Version 1.3 (1/15/10).*

8.1. Stream Channel Stability and Geomorphology

8.1.1 Cross sections

A total of 15 cross-sections, including 9 riffles and 6 pools, were installed upon completion of construction and will be monitored annually. The total number of cross-sections includes five on the mainstem of Little Buffalo Creek, one on Unnamed Tributary (UT) 2, four on UT 3, two on UT 4 and three on UT 7. The total number of cross-sections was reduced from the original estimate in the Mitigation Plan to be consistent with the USACE 2003 Stream Mitigation Guidelines that call for a permanent, monumented cross-section at a rate of 1 cross-section per 20 bankfull channel widths, and approximately 50% of cross-sections occurring at pools and 50% at riffles/ripples. Two additional cross-sections will be added during the initial Monitoring phase within the step-pool portion of UT 7.

8.1.2 Longitudinal Profiles

A total of approximately 2950 feet of channel along 8 longitudinal profiles will be surveyed annually. This includes 335 feet on LBC Reach 1, 225 feet on LBC Reach 3, 112 feet on LBC Reach 4, 51 feet on UT 2, 771 feet on UT 3, 411 feet on UT 4, 977 on UT 7 and 62 feet on UT 8. Data collected from annual monitoring will be compared with the as-built conditions to document the current state of the channel and any trends in the stream profile occurring throughout the monitoring period. The start and finish locations of each cross-section and longitudinal profile reach were marked with rebar and PVC conduit. Both cross-sections and longitudinal profile data will be collected using a total station.

8.2. Stream Hydrology

A total of eight water level gages were installed on site. The gages will be monitored quarterly o document highest stage for the monitoring interval and verify occurrences of bankfull events. In

addition, observations of wrack and depositional features in the floodplain will be documented with photos.

8.3 Vegetation

The CVS-DMS entry tool database was used to calculate the number of monitoring plots needed based on project acreage. Louis Berger established twelve vegetation monitoring plots across all reaches and tributaries of the project area based on guidance given in the *CVS-DMS Protocol for Recording Vegetation Version 4.2* (Lee et al. 2008). Each plot measures approximately 0.025 acres individually and were established and is staked out with bright orange painted rebar and marked with an upright section of PVC pipe. After planting had been completed Louis Berger recorded the coordinates and height of each planted stem within each plot. Photos of each plot were also collected as well as GPS coordinates for plot corners and center points. Year 0 monitoring data was then entered into the CVS-DMS database under the Little Buffalo Creek Stream Mitigation Project (Project ID 94147).

8.4. Permanent Photo Locations

Permanent photo stations were established at each cross-section to digitally document annual conditions of the left and right banks. Each vegetation monitoring plot includes a photo station taken diagonally from a plot corner towards the opposite plot corner.

8.5. Visual Assessment

Visual stream assessments will occur during annual monitoring to summarize performance percentages of morphological and structural features. Visual vegetation assessments will occur to catalog the extent and type of vegetation issue areas as compared to the total planted acreage within the project site.

8.6. Maintenance and Contingency

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

- *Stream*- Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head- cutting.
- *Vegetation*- Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
- *Site Boundaries*- Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or

conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.

- *Ford Crossing*- Ford crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.

8.7 References

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

US Army Corps of Engineers (USACE). 2003. Stream Mitigation Guidelines, April 2003, Wilmington District, NC

Appendix A. Background Tables

Table 1. Project Components and Mitigation Credits
Little Buffalo Creek Stream Mitigation Project
NCDENR- DMS Project No. 94147

Mitigation Credit Summations

	Stream	Riparian Wetland	Non-riparian Wetland	Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset			
Overall Mitigation Units	6,411	0	0						

Project Components

Reach ID	Stationing	Existing Feet (linear feet)	Restoration Footage or Acreage	Restoration Level	Restoration or Rest Equiv.	Mitigation Ratio	Stream Mitigation Units	Notes
Reach 1	10+00 to 33+05	2,305	377 R 1928 EII	Restoration Enhancement Level II	N/A	Restoration 1:1 Enhancement Level II 2.5:1	1148	
Reach 2	33+66 to 46+10	1,244	1244 EII	Enhancement Level II	N/A	Enhancement Level II 2.5:1	498	
Reach 3	46+10 to 56+93	1,083	244 R 839 EII	Restoration Enhancement Level II	N/A	Restoration 1:1 Enhancement Level II 2.5:1	580	
Reach 4	56+93 to 66+62	969	151 EI 818 EII	Enhancement Level I Enhancement Level II	N/A	Enhancement Level I 1.5:1 Enhancement Level II 2.5:1	428	
Reach 5	66+62 to 74+88	826	826 EII	Enhancement Level II	N/A	Enhancement Level II 2.5:1	330	
Reach 6	75+19 to 82+55; 91+89 to 104+96	2,043	2,043 P	Preservation	N/A	Preservation 5:1	409	
UT 1	10+00 to 11+11	111	111 EII	Enhancement Level II	N/A	Enhancement Level II 2.5:1	44	
UT 2	10+00 to 19+51	951	49 R 567 EII 335 P	Restoration Enhancement Level II Preservation	N/A	Restoration 1:1 Enhancement Level II 2.5:1 Preservation 5:1	343	
UT 3	10+00 to 24+75	1,475	305 R; 536 EI 634 EII	Restoration Enhancement Level I Enhancement Level II	N/A	Restoration 1:1 Enhancement Level I 1.5:1 Enhancement Level II 2.5:1	916	
UT 4	100+00 to 18+31	831	410 EI 421 EII	Enhancement Level I Enhancement Level II	N/A	Enhancement Level I 1.5:1 Enhancement Level II 2.5:1	442	
UT 5	10+00 to 11+84	184	184 EII	Enhancement Level II	N/A	Enhancement Level II 2.5:1	74	
UT 6	10+00 to 11+51	151	151 EII	Enhancement Level II	N/A	Enhancement Level II 2.5:1	60	
UT 7*	10+00 to 21+27	1,127	980 R 147 EI	Restoration Enhancement Level I	N/A	Restoration 1:1 Enhancement Level I 1.5:1	1078	
UT 8*	10+00 to 21+27	62	62 R	Restoration	N/A	Restoration 1:1	62	

*UT 8 to UT 7's flow was redirected to join UT 7 at new location, and to remove entrenchment of UT8.

Note: Stationing based off of proposed lengths; therefore it may not correspond to existing feet. Also, due to rounding some of the values when added may appear to be 1' short of total, this is purely a product of values being rounded to nearest linear foot

Length and Area Summations

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)			
		Riverine	Non-riverine						
Restoration	2,017	N/A	N/A	N/A	201,700	N/A			
Enhancement	N/A	N/A	N/A	N/A	N/A	N/A			
Enhancement I	1,244	N/A	N/A	N/A	124,400	N/A			
Enhancement II	7,723	N/A	N/A	N/A	772,300	N/A			
Creation	N/A	N/A	N/A	N/A	N/A	N/A			
Preservation	2,378	N/A	N/A	N/A	237,800	N/A			
High Quality Preservation	N/A	N/A	N/A	N/A	N/A	N/A			

BMP Elements

Element	Location	Purpose/Function	Notes						

Table 2: Project Activity and Reporting History		
Little Buffalo Creek Stream Mitigation Project		
NCDENR-DMS Project No. 94147		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Technical Proposal	June 2009	August 2008
Categorical Exclusion	February 2010	March 2010
Secure Conservation Easement	March 2010	July 2012
Mitigation Plan	August 2010	April 2014
Final Design – Construction Plans	N/A	May 2014
Construction	June 2014	December 2014
Fencing Installation	June 2014	December 2014
Native Species Planting	December 2014	December 2014
Mitigation Plan / As-built (Year 0 Monitoring – Baseline)	March 2015	July 2015
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3: Project Contact Table Little Buffalo Creek Stream Mitigation Project NCDENR-DMS Project No. 94147	
Designer Primary Project Design POC	The Louis Berger Group, Inc. 1001 Wade Avenue, Suite 400 Raleigh, NC 27605 Edward Samanns (973) 407-1468
Construction Contractor **Construction contractor POC**	Backwater Environmental, Doug Smith P.O. Box 1107 Eden, NC 27289
Fencing Contractor Fencing Contractor POC	Strader Fencing Inc 5434 Amick Road Julian, NC 27283
Planting Contractor Planting Contract POC	Carolina Sylvics 908 Indian Trail Edenton, NC 27932
Nursery Stock Suppliers	To be determined
Monitoring Performers	The Louis Berger Group, Inc. 1001 Wade Avenue, Suite 400 Raleigh, NC 27605
Stream Monitoring POC	Louis Berger Group, Inc., Ed Samanns, CE, PWS (973- 407-1468)
Vegetation Monitoring POC	Louis Berger Group, Inc.

Table 4 Project Information			
Project Name	Little Buffalo Creek Stream Mitigation Project		
County	Cabarrus County		
Project Area (acres)	12		
Project Coordinates (latitude and longitude)	35.491041°N, . -80.366698° W.		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Yadkin-Pee Dee River		
USGS Hydrologic Unit 8-digit	3040105	USGS Hydrologic Unit 14-digit	3040105020060
DWQ Sub-basin	03-07-12		
Project Drainage Area (acres)	4,039		
Project Drainage Area Percentage of Impervious Area	5%		
CGIA Land Use Classification	Rural		

Reach Summary Information (Mainstem)

Parameters	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6
Length of reach (linear feet)	2,305	1,244	1,083	969	826	2,043
Valley classification	Type 8	Type 8	Type 8	Type 8	Type 8	Type 8
Drainage area (acres)	1914	2146	2446	2568	2632	4039
NCDWQ stream identification score	37.5	37.5	37.5	37.5	37.5	37.5
NCDWQ Water Quality Classification	C	C	C	C	C	C
Morphological Description (stream type)	C4/F4	C4/E4	C4/F4	C4	C4/D4b	C4
Design Rosgen Stream Type	C4	C4	C4	C4	C4	C4
Evolutionary Trend						
Design Approach (P1, P2, P3, E, etc)	R; EII	EII	R; EII	EI; EII	EII	P
Underlying mapped soils	Chewacla/ Goldston	Chewacla	Chewacla	Chewacla	Chewacla	Chewacla
Drainage class	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained
Soil Hydric status	Non-hydric	Non-hydric	Non-hydric	Non-hydric	Non-hydric	Non-hydric
Slope	0.48%	0.38%	0.51%	0.39%	0.47%	0.43%
FEMA classification	N/A	N/A	N/A	N/A	N/A	N/A
Native vegetation community	Pasture	Pasture	Pasture	Pasture	Pasture	Pasture
Percent composition of exotic invasive vegetation						

Reach Summary Information (Unnamed Tributaries

Parameters	UT 1	UT 2	UT 3	UT 4	UT 5	UT 6	UT 7/UT 8
Length of reach (linear feet)	111	951	1,475	831	184	151	1,127
Valley classification	N/A	Type 2	Type 2	Type 2	N/A	N/A	Type 8
Drainage area (acres)	293	193	62	254	8	16	1222
NCDWQ stream identification score	21	20	26.5	36.5	27.5	24.8	36.5
NCDWQ Water Quality Classification	C	C	C	C	C	C	C
Morphological Description (stream type)	N/A	B6	B6/G6	B4c	N/A	N/A	F4
Design Rosgen Stream Type	No Restoration	B6	B6	B4c	No Restoration	No Restoration	C4
Evolutionary Trend							
Design Approach (P1, P2, P3, E, etc)	EII	R; EII, P	R; EI; EII	EI; EII	EII	EII	R; EI
Underlying mapped soils	Chewacla	Chewacla	Badin/Georgeville	Goldston	Goldston	Goldston	Chewacla
Drainage class	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained	Mod. Well Drained - Well Drained
Soil Hydric status	Non-hydric	Non-hydric	Non-hydric	Non-hydric	Non-hydric	Non-hydric	Non-hydric
Slope	N/A	2.45%	2.35%	2.17%	N/A	N/A	0.96%
FEMA classification	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Native vegetation community	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Percent composition of exaotic invasive vegetation	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Wetland Summary Information

Parameters	Wetland 1	Wetland 2	Wetland 3
Size of Wetland (acres)	N/A	N/A	N/A
Wetland Type (non-riparian, riparian riverine or riparian	N/A	N/A	N/A
Mapped Soil Series	N/A	N/A	N/A
Drainage class	N/A	N/A	N/A
Soil Hydric Status	N/A	N/A	N/A
Source of Hydrology	N/A	N/A	N/A
Hydrologic Impairment	N/A	N/A	N/A
Native vegetation community	N/A	N/A	N/A
Percent composition of exotic invasive vegetation	N/A	N/A	N/A

Regulatory Considerations

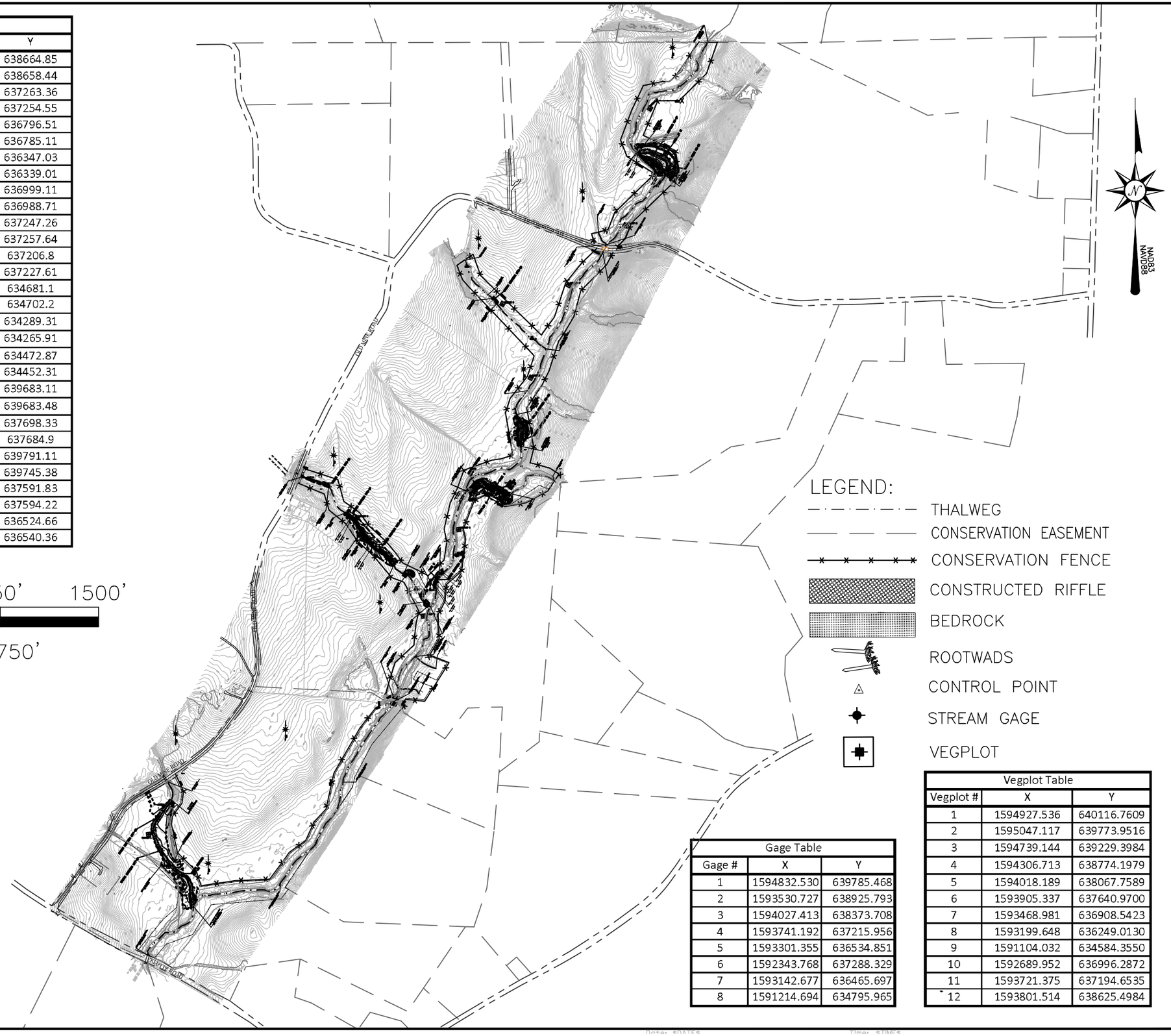
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Y	Y	Permit 2014-00386
Waters of the United States – Section 401	Y	Y	Letter from NCDENR dated February 24, 2015 Nationwide Permit Number 27
Endangered Species Act	Y	Y	Letter to USFWS dated November 16, 2009
Historic Preservation Act	Y	Y	Letter from NC SHPO dated February 2, 2010
Coastal Zone Management Act (CZMA)/ Coastal Area Management	N	N/A	N/A
FEMA Floodplain Compliance	Y	Y	FEMA Floodplain Checklist Restoration Plan Appendix 9
Essential Fisheries Habitat	N	N/A	N/A

Appendix B. Visual Assessment Data

Stream Crossing Table		
Stream Crossing	X	Y
Xsec UT-2 1R Left	1593738.95	638664.85
Xsec UT-2 1R Right	1593732.02	638658.44
Xsec UT-3 1R Left	1592433.99	637263.36
Xsec UT-3 1R Right	1592433.59	637254.55
Xsec UT-3 2R Left	1592829.75	636796.51
Xsec UT-3 2R Right	1592819.33	636785.11
Xsec UT-3 3R Left	1593222.11	636347.03
XsecUT-3 3R Right	1593217.91	636339.01
Xsec UT-3 2P Left	1592661.48	636999.11
Xsec UT-3 2P Right	1592653.78	636988.71
Xsec UT-4 4R Left	1593604.59	637247.26
Xsec UT-4 4R Right	1593593.76	637257.64
Xsec UT-4 4P Left	1593740.62	637206.8
Xsec UT-4 4P Right	1593748.10	637227.61
Xsec UT-7 1R Left	1591172.68	634681.1
Xsec UT-7 1R Right	1591141.15	634702.2
Xsec UT-7 2R Left	1591364.05	634289.31
Xsec UT-7 2R Right	1591351.15	634265.91
Xsec UT-7 1P Left	1591207.99	634472.87
Xsec UT-7 1P Right	1591170.91	634452.31
Xsec MS-1R Left	1595087.16	639683.11
Xsec MS-1R Right	1595050.59	639683.48
Xsec MS-2R Right	1593958.47	637698.33
Xsec MS-2R Left	1593916.09	637684.9
Xsec MS-1P Left	1594967.71	639791.11
Xsec MS-1P Right	1594947.07	639745.38
Xsec MS-2P Left	1593963.42	637591.83
Xsec MS-2P Right	1593917.94	637594.22
Xsec MS-3P Left	1593320.09	636524.66
Xsec MS-3P Right	1593289.67	636540.36

750’ 0’ 750’ 1500’

SCALE: 1”= 750’



Gage Table		
Gage #	X	Y
1	1594832.530	639785.468
2	1593530.727	638925.793
3	1594027.413	638373.708
4	1593741.192	637215.956
5	1593301.355	636534.851
6	1592343.768	637288.329
7	1593142.677	636465.697
8	1591214.694	634795.965

Vegplot Table		
Vegplot #	X	Y
1	1594927.536	640116.7609
2	1595047.117	639773.9516
3	1594739.144	639229.3984
4	1594306.713	638774.1979
5	1594018.189	638067.7589
6	1593905.337	637640.9700
7	1593468.981	636908.5423
8	1593199.648	636249.0130
9	1591104.032	634584.3550
10	1592689.952	636996.2872
11	1593721.375	637194.6535
12	1593801.514	638625.4984

NO.	REVISIONS	DRN	CHK	DATE

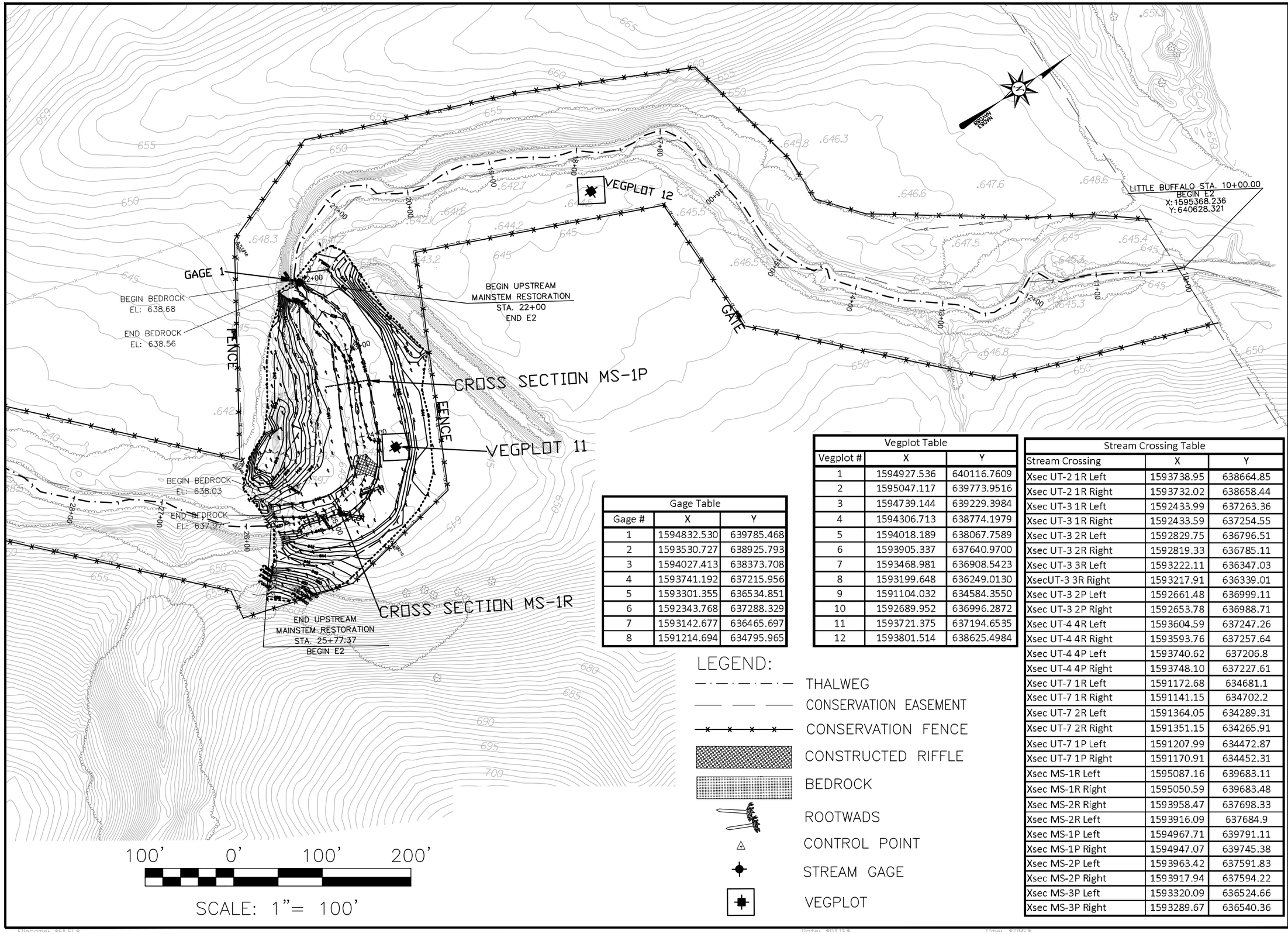
NCDENR-DMS

THE LOUIS BERGER GROUP, Inc.
1001 Wade Avenue
Raleigh, North Carolina 27605

LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

CURRENT CONDITIONS PLAN VIEW

DATE JUNE 2015
PROJECT NO. 94147
FIGURE 1 OF 10



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11	1593721.375	637194.6535
12	1593801.514	638625.4984

LEGEND:

- THALWEG
- CONSERVATION EASEMENT
- CONSERVATION FENCE
- CONSTRUCTED RIFFLE
- BEDROCK
- ROOTWADS
- CONTROL POINT
- STREAM GAGE
- VEGPLOT

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CURRENT CONDITIONS PLAN VIEW

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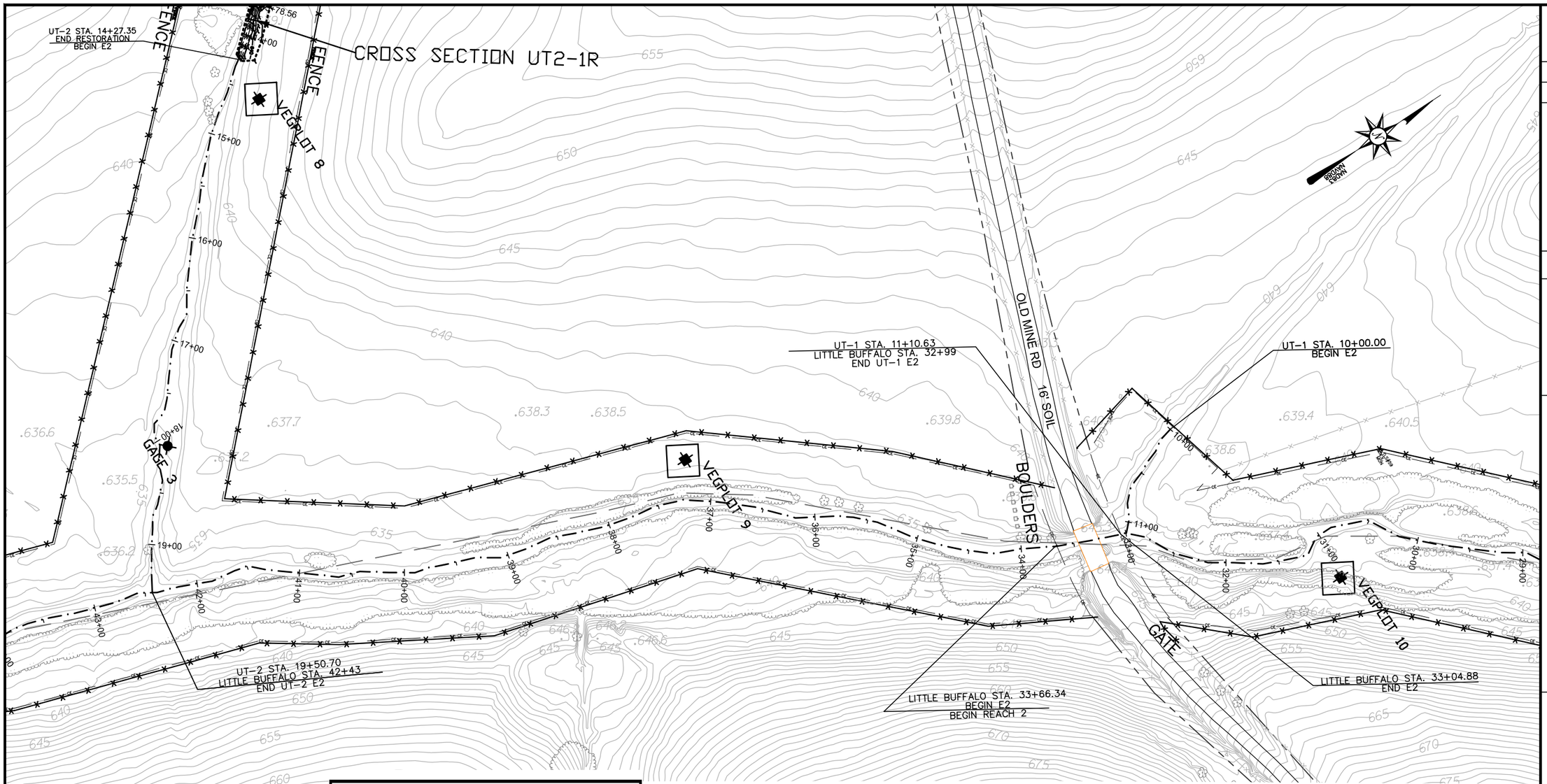
FIGURE 2 OF 10



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Stream Crossing	X	Y
Xsec UT-7 1R Left	1591172.68	634681.1
Xsec UT-7 1R Right	1591141.15	634702.2
Xsec UT-7 2R Left	1591364.05	634289.31
Xsec UT-7 2R Right	1591351.15	634265.91
Xsec UT-7 1P Left	1591207.99	634472.87
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LEGEND:

- THALWEG
- CONSERVATION EASEMENT
- CONSERVATION FENCE
- CONSTRUCTED RIFFLE
- BEDROCK
- ROOTWADS
- CONTROL POINT
- STREAM GAGE
- VEGPLOT

100’ 0’ 100’ 200’

SCALE: 1”= 100’

Gage Table		
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1	1594832.530	639785.468
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8	1593199.648	636249.0130
9	1591104.032	634584.3550
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11	1593721.375	637194.6535
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NO.	REVISIONS	DRN	CHK	DATE

NCDENR-DMS

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LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

CURRENT CONDITIONS PLAN VIEW

DATE JUNE 2015
PROJECT NO. 94147
FIGURE 3 OF 10

LEGEND:

- THALWEG
- CONSERVATION EASEMENT
- CONSERVATION FENCE
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- BEDROCK
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100' 0' 100' 200'

SCALE: 1"= 100'

GAGE 2

GAGE 1

VEGPLOT 8

FENCE

FENCE

CROSS SECTION UT2-1R

UT-2 STA. 10+00.00
BEGIN PRESERVATION

UT-2 STA. 13+78.56
END E2
BEGIN RESTORATION

UT-2 STA. 13+34.67
END PRESERVATION
BEGIN E2

UT-2 STA. 14+27.35
END RESTORATION
BEGIN E2

UT-1 STA. 11+10.63
LITTLE BUFFALO STA. 32+99
END UT-1 E2

BROWN
EBON

10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00

NO.	REVISIONS	DRN	CHK	DATE

NCDENR-DMS

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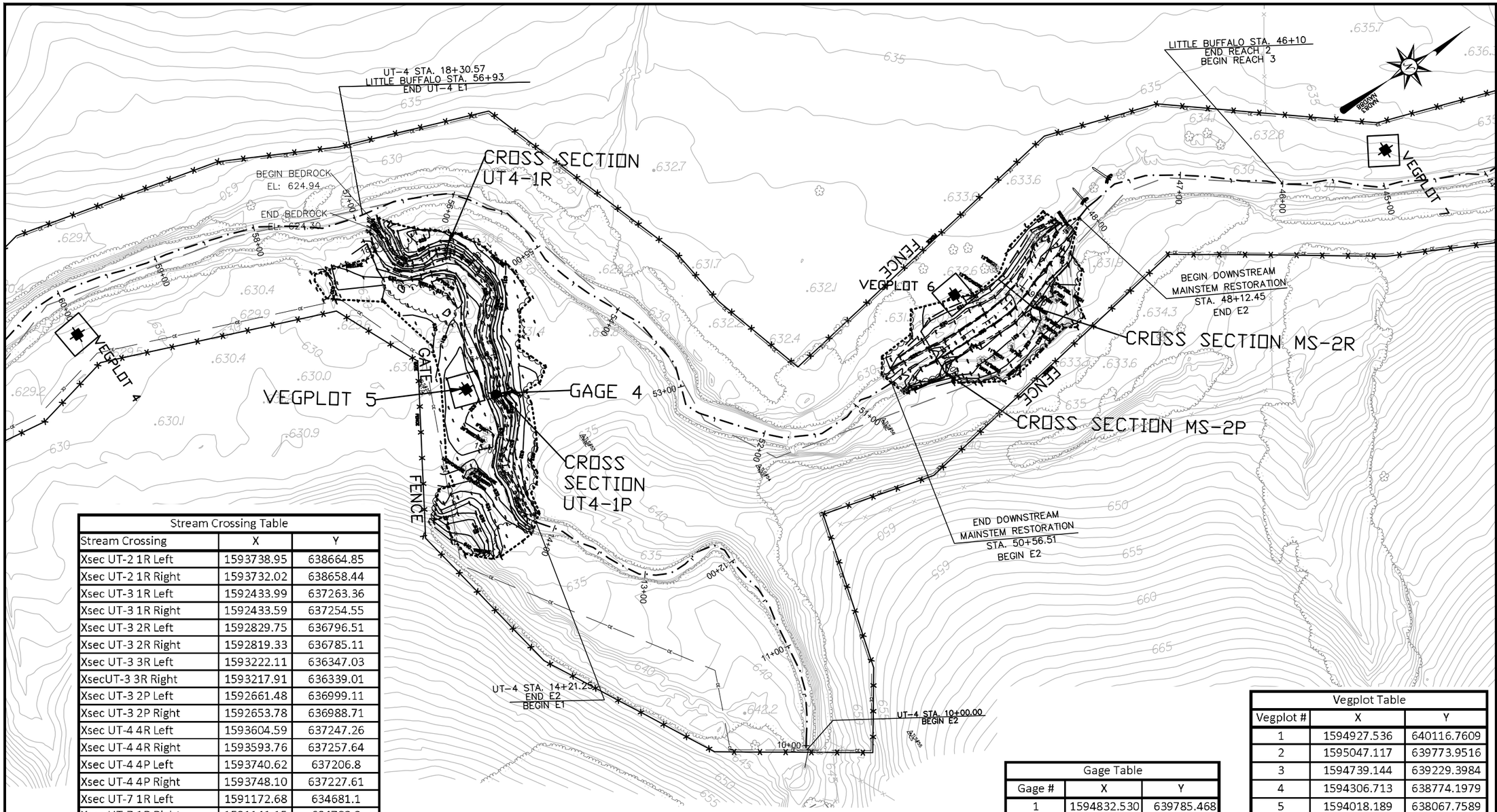
FIGURE 4 OF 10



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LEGEND:

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4	1593741.192	637215.956
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6	1592343.768	637288.329
7	1593142.677	636465.697
8	1591214.694	634795.965

Vegplot Table		
Vegplot #	X	Y
1	1594927.536	640116.7609
2	1595047.117	639773.9516
3	1594739.144	639229.3984
4	1594306.713	638774.1979
5	1594018.189	638067.7589
6	1593905.337	637640.9700
7	1593468.981	636908.5423
8	1593199.648	636249.0130
9	1591104.032	634584.3550
10	1592689.952	636996.2872
11	1593721.375	637194.6535
12	1593801.514	638625.4984

100' 0' 100' 200'

SCALE: 1"= 100'

NO.	REVISIONS	DRN	CHK	DATE

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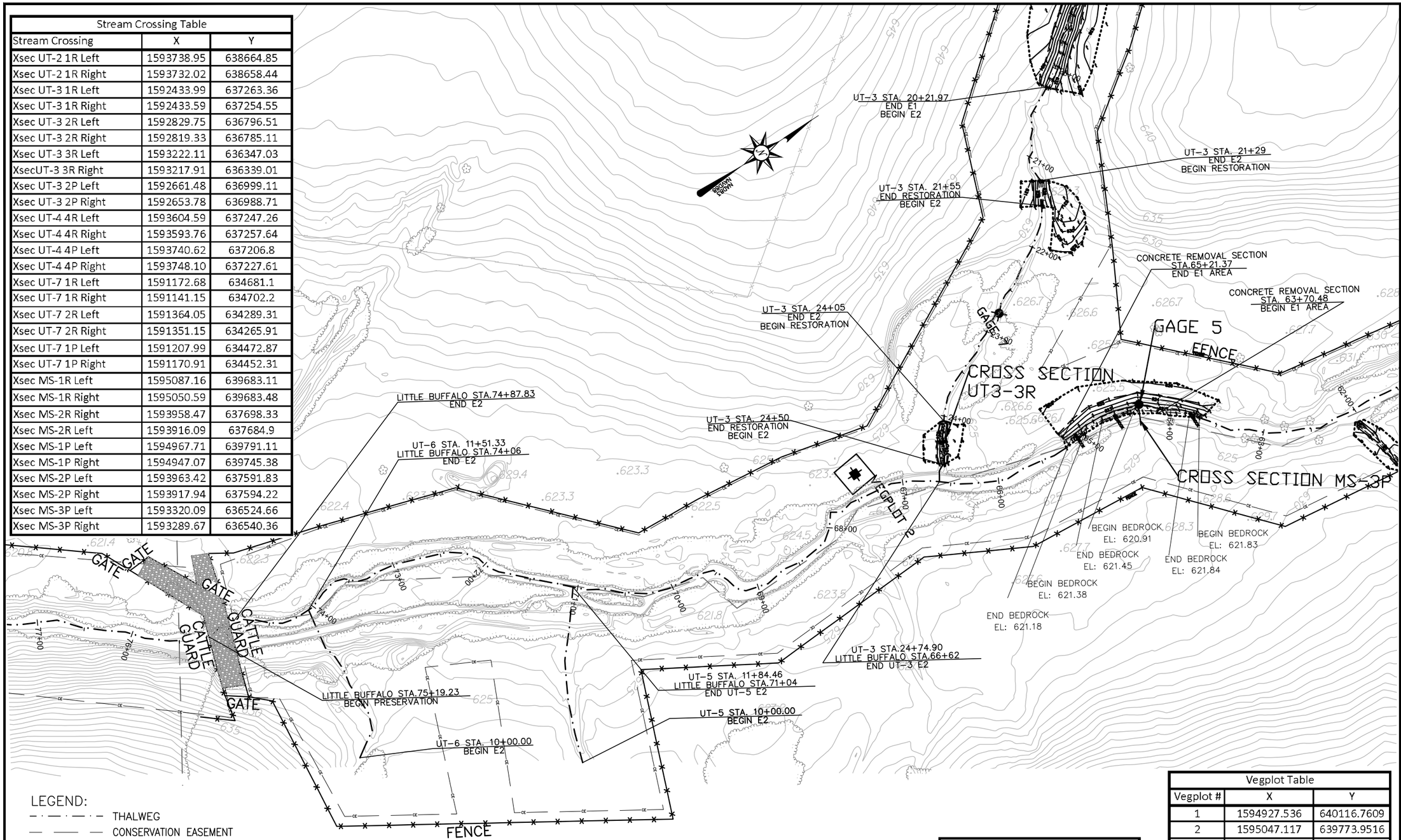
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

CURRENT CONDITIONS PLAN VIEW

DATE JUNE 2015
PROJECT NO. 94147
FIGURE 5 OF 10

Stream Crossing Table		
Stream Crossing	X	Y
Xsec UT-2 1R Left	1593738.95	638664.85
Xsec UT-2 1R Right	1593732.02	638658.44
Xsec UT-3 1R Left	1592433.99	637263.36
Xsec UT-3 1R Right	1592433.59	637254.55
Xsec UT-3 2R Left	1592829.75	636796.51
Xsec UT-3 2R Right	1592819.33	636785.11
Xsec UT-3 3R Left	1593222.11	636347.03
XsecUT-3 3R Right	1593217.91	636339.01
Xsec UT-3 2P Left	1592661.48	636999.11
Xsec UT-3 2P Right	1592653.78	636988.71
Xsec UT-4 4R Left	1593604.59	637247.26
Xsec UT-4 4R Right	1593593.76	637257.64
Xsec UT-4 4P Left	1593740.62	637206.8
Xsec UT-4 4P Right	1593748.10	637227.61
Xsec UT-7 1R Left	1591172.68	634681.1
Xsec UT-7 1R Right	1591141.15	634702.2
Xsec UT-7 2R Left	1591364.05	634289.31
Xsec UT-7 2R Right	1591351.15	634265.91
Xsec UT-7 1P Left	1591207.99	634472.87
Xsec UT-7 1P Right	1591170.91	634452.31
Xsec MS-1R Left	1595087.16	639683.11
Xsec MS-1R Right	1595050.59	639683.48
Xsec MS-2R Right	1593958.47	637698.33
Xsec MS-2R Left	1593916.09	637684.9
Xsec MS-1P Left	1594967.71	639791.11
Xsec MS-1P Right	1594947.07	639745.38
Xsec MS-2P Left	1593963.42	637591.83
Xsec MS-2P Right	1593917.94	637594.22
Xsec MS-3P Left	1593320.09	636524.66
Xsec MS-3P Right	1593289.67	636540.36



LEGEND:

- THALWEG
- CONSERVATION EASEMENT
- CONSERVATION FENCE
- CONSTRUCTED RIFFLE
- BEDROCK
- ROOTWADS
- CONTROL POINT
- STREAM GAGE
- VEGPLOT

100' 0' 100' 200'

SCALE: 1"= 100'

Gage Table		
Gage #	X	Y
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2	1593530.727	638925.793
3	1594027.413	638373.708
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6	1592343.768	637288.329
7	1593142.677	636465.697
8	1591214.694	634795.965

Vegplot Table		
Vegplot #	X	Y
1	1594927.536	640116.7609
2	1595047.117	639773.9516
3	1594739.144	639229.3984
4	1594306.713	638774.1979
5	1594018.189	638067.7589
6	1593905.337	637640.9700
7	1593468.981	636908.5423
8	1593199.648	636249.0130
9	1591104.032	634584.3550
10	1592689.952	636996.2872
11	1593721.375	637194.6535
12	1593801.514	638625.4984

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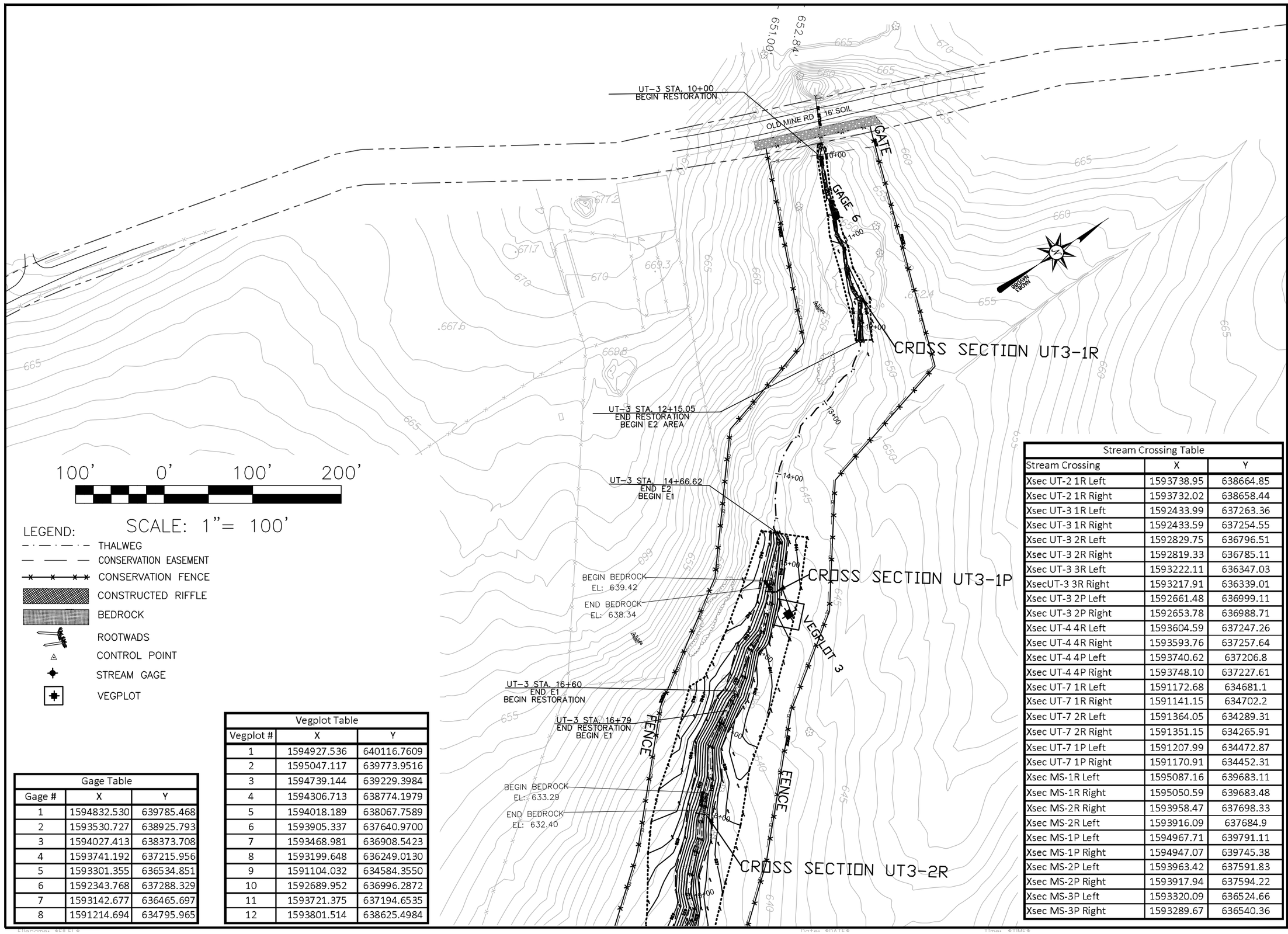
DIVISION OF MITIGATION SERVICES

CURRENT CONDITIONS PLAN VIEW

DATE JUNE 2015
PROJECT NO. 94147
FIGURE 6 OF 10

Filename: &FILE&
Date: &DATE&
Time: &TIME&



Gage Table		
Gage #	X	Y
1	1594832.530	639785.468
2	1593530.727	638925.793
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2	1595047.117	639773.9516
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Xsec UT-4 4P Right	1593748.10	637227.61
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Xsec MS-2R Left	1593916.09	637684.9
Xsec MS-1P Left	1594967.71	639791.11
Xsec MS-1P Right	1594947.07	639745.38
Xsec MS-2P Left	1593963.42	637591.83
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Xsec MS-3P Left	1593320.09	636524.66
Xsec MS-3P Right	1593289.67	636540.36

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STREAM RESTORATION PROJECT
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DIVISION OF MITIGATION SERVICES

CURRENT CONDITIONS PLAN VIEW

DATE JUNE 2015
PROJECT NO. 94147
FIGURE 7 OF 10

Stream Crossing Table		
Stream Crossing	X	Y
Xsec UT-2 1R Left	1593738.95	638664.85
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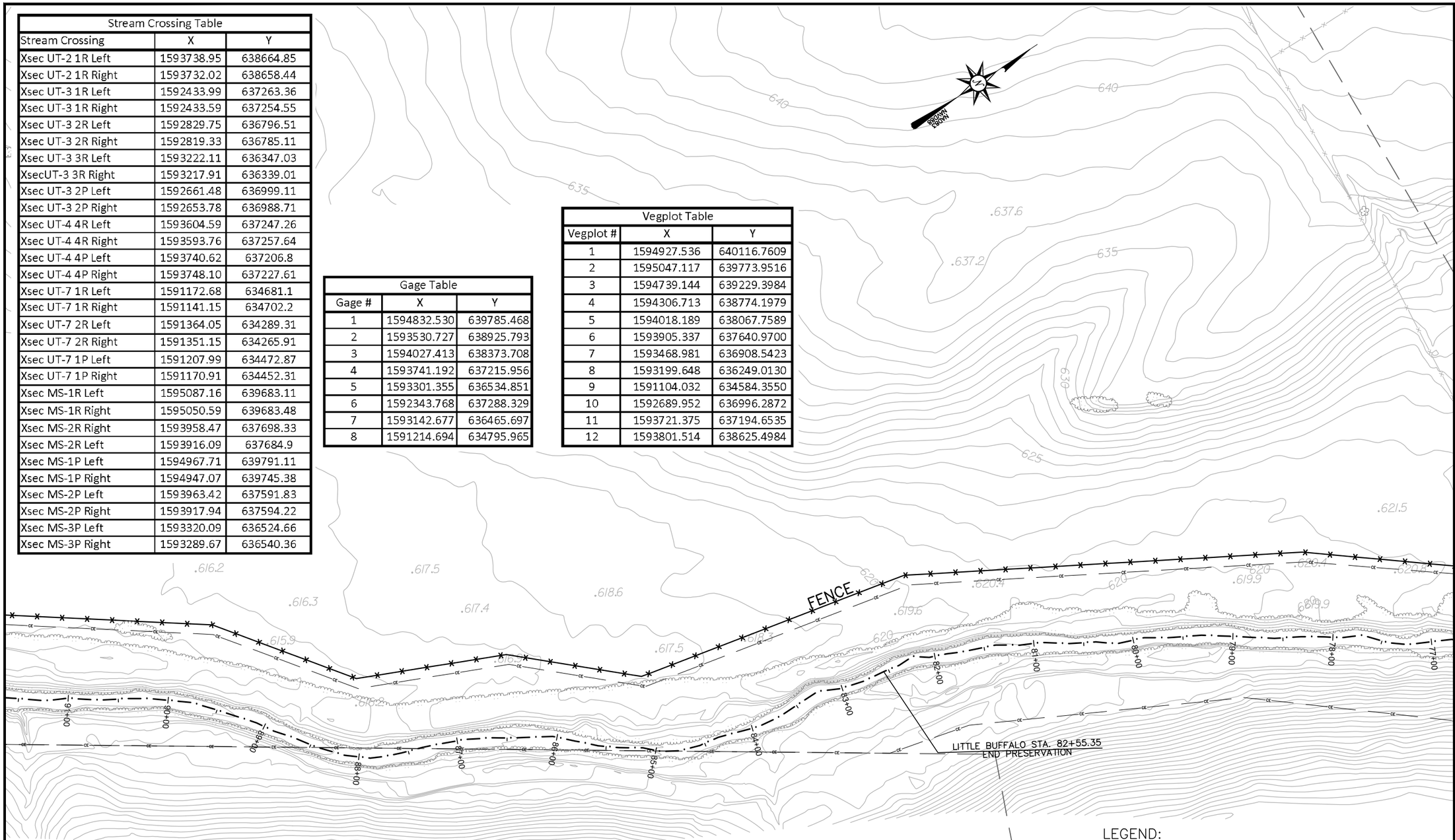

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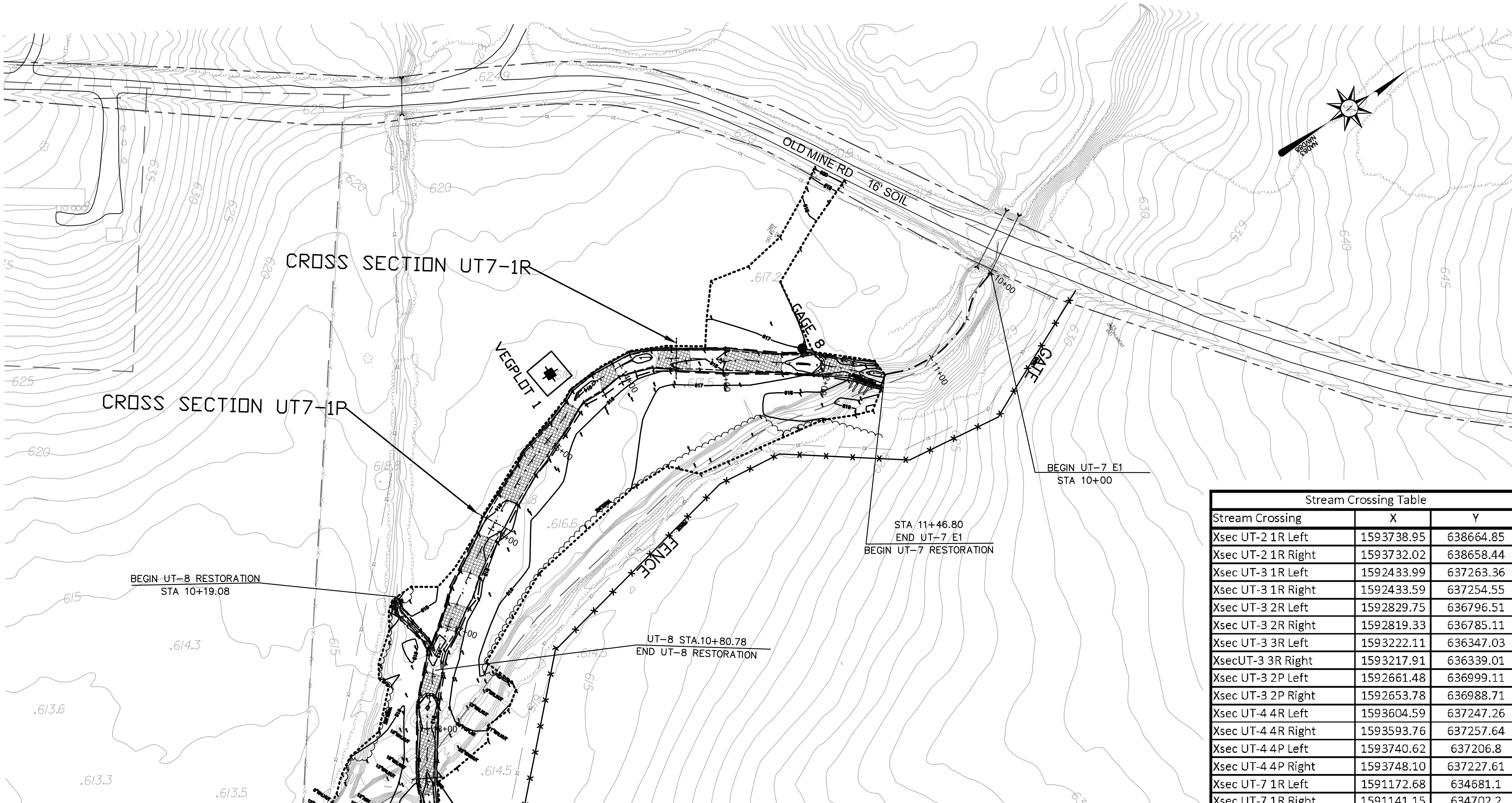
CURRENT CONDITIONS PLAN VIEW

DATE JUNE 2015
PROJECT NO. 94147
FIGURE 8 OF 10



LEGEND:

- THALWEG
- CONSERVATION EASEMENT
- CONSERVATION FENCE
- CONSTRUCTED RIFFLE
- BEDROCK
- ROOTWADS
- CONTROL POINT
- STREAM GAGE
- VEGPLOT

100' 0' 100' 200'

SCALE: 1"= 100'

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FIGURE 9 OF 10

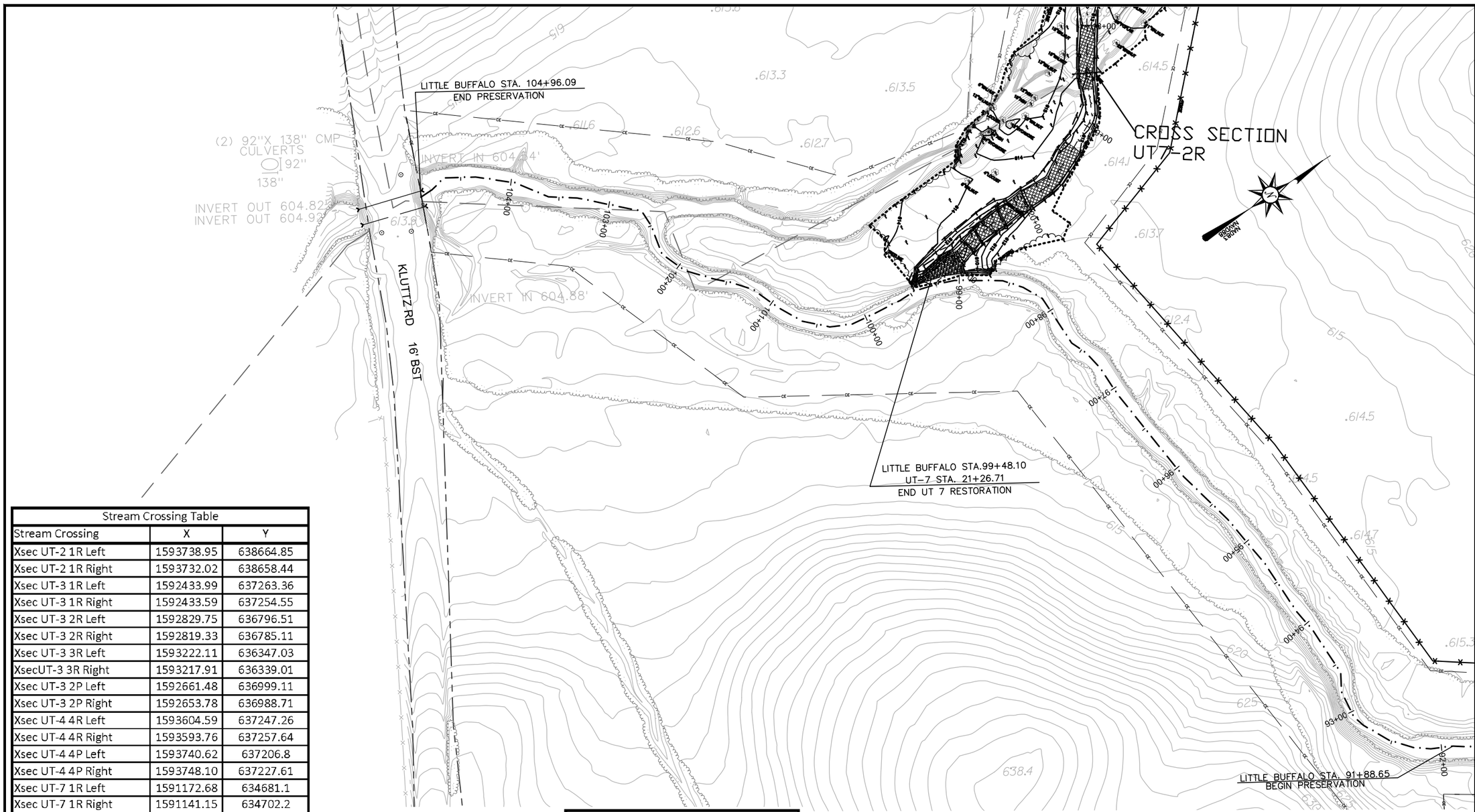

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FIGURE 10 OF 10

Appendix B
Stream Photos

Photo 1: Mainstem, Reach 1

Photo 2: Mainstem, Reach 4, UT 3

Photo 3: Mainstem. Reach 6

Vegetation Plot Photos

Photo 1: Veg Plot 1, Post Construction Dec 2014

Photo 2: Veg Plot 2, Post Construction Dec 2014

Photo 3: Veg Plot 3, Post Construction Dec 2014

Photo 4: Veg Plot 4, Post Construction Dec 2014

Photo 5: Veg Plot 5, Post Construction Dec 2014

Photo 6: Veg Plot 6, Post Construction Dec 2014

Photo 7: Veg Plot 7, Post Construction Dec 2014

Photo 8: Veg Plot 8, Post Construction Dec 2014

Photo 9: Veg Plot 9, Post Construction Dec 2014

Photo 10: Veg Plot 10, Post Construction Dec 2014

Photo 11: Veg Plot 11, Post Construction Dec 2014

Photo 12: Veg Plot 12, Post Construction Dec 2014

Appendix C. Vegetation Plot Data

Scientific Name	Common Name	Nursery	Nursery Address	Type	Plot 1 94147-01-0001	Plot 2 94147-01-0002	Plot 3 94147-01-0003	Plot 4 94147-01-0004	Plot 5 94147-01-0005	Plot 6 94147-01-0006	Plot 7 94147-01-0007	Plot 8 94147-01-0008	Plot 9 94147-01-0009	Plot 10 94147-01-0010	Plot 11 94147-01-0011	Plot 12 94147-01-0012	AB Mean
Alnus serrulata	hazel alder	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Shrub Tree	1	1	1		4	2	2	1				1	1.63
Carpinus caroliniana	American hornbeam			Shrub Tree					1	2		1	1	5	1		1.83
Celtis laevigata	sugarberry			Shrub Tree	2	7	6	5	3	1		4	3	1	1	3	3.27
Cercis canadensis	eastern redbud	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Shrub Tree	4	1										2	2.33
Fraxinus pennsylvanica	green ash	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Tree	1	1	2	3	3	2			1	1	5		2.11
Liriodendron tulipifera	tulip tree	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Tree		2	2	3	1	2	5	1	2	2			2.22
Platanus occidentalis	American sycamore	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Tree				2		3	1	1		2			1.80
Quercus falcata	southern red oak	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Tree	2			1	1				1			2	1.40
Quercus michauxii	swamp chestnut oak	Arborgen	2011 Broadbank Court Ridgeville, SC 29472	Tree	1			1		2	1	2	3			1	1.57
Viburnum dentatum	aouthern arrowwood			Tree							1		2	2	5		2.50
unknown				Shrub Tree													
				Plot Area (acres)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
				Species Count	7	5	4	6	6	7	5	6	7	6	4	5	5.67
				Stem Count	11	12	11	15	13	14	10	10	13	13	12	9	11.92
				Stems per Acre	440.00	480.00	440.00	600.00	520.00	560.00	400.00	400.00	520.00	520.00	480.00	360.00	476.67

Appendix D. Stream Measurement and Geomorphology Data

Table 10a. Baseline Stream Data Summary
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 1

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					45.55	56.61	52.02	82.98	14.98	5	43	52		64	8.60	4	36	36	36	35.21	35.21	35.21	35.21		1
Floodprone Width (ft)					67.73	106.50	96.36	177.28	43.15	5						4	>88	>88	>88	>80	>80	>80	>80		1
Bankfull Mean Depth (ft)					0.65	1.18	1.24	1.60	0.35	5	0.98	1.16		1.98	0.44	4	0.96	0.96	0.96	1.23	1.23	1.23	1.23		1
[1]Bankfull Max Depth (ft)					2.54	3.04	2.80	3.83	0.58	5						4	1.5	1.5	1.5	1.79	1.79	1.79	1.79		1
Bankfull Cross Sectional Area (ft^2)					53.58	63.29	59.12	83.09	11.52	5	55	59		65	4.11	4	34.38	34.38	34.38	43.15	43.15	43.15	43.15		1
Width/Depth Ratio					32.51	56.56	40.56	127.66	40.14	5	31	47		64	13.47	4	37.5	37.5	37.5	28.73	28.73	28.73	28.73		1
Entrenchment Ratio					1.49	1.84	1.92	2.17	0.33	5	>2.2	>2.2		>2.2		4	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2		1
[1]Bank Height Ratio					0.91	1.09		1.37								4	1	1	1	1.00	1.00	1.00	1.00		1
Profile																									
Riffle Length (ft)																	35.00	40.00	50.00	7.73	23.71	22.04	38.44		
Riffle Slope (ft/ft)																	0.003	0.014	0.028	0.000	0.026	0.022	0.076		
Pool Length (ft)																	10.00	20.00	20.00	4.21	25.43	17.55	83.20		
Pool Max Depth (ft)																	1.50	1.81	1.81	1.96	2.71	2.48	3.76		
Pool Spacing (ft)																	80.00	125.00	170.00	29.95	48.64	39.06	91.87		
Pattern																									
Channel Belwidth (ft)																	84.00	84.00	84.00	59.64	105.83	92.68	165.18		
Radius of Curvature (ft)																	57.62	79.30	100.98	72.97	83.15	79.01	97.49		
RC: Bankfull Width (ft/ft)																	35.24	36.00	69.62	27.95	35.60	36.13	46.36		
Meander Wavelength (ft)																									
Meander Width Ratio																	1.21	2.33	2.38	1.29	3.04	2.57	5.91		
Transport Parameters																									
Reach Shear Stress (competency) (lb/ft^2)						0.334												0.320			0.322				
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (transport capacity) (W/m^2)																									
Additional Research Parameters																									
Rosgen Classification						C4						C4						C4			C4				
Bankfull Velocity (fps)						1.82												4.36			3.48				
Bankfull Discharge (cfs)						115																			
Valley Length (ft)																									
Channel Thalweg Length (ft)																		2293.33			2299.79				
Sinuosity (ft/ft)						1.05						1.25						1.05			1.05				
Water Surface Slope (Channel) (ft/ft)												0.38													
BF Slope (ft/ft)												0.38													
[3]Bankfull Floodplain Area (acres)																		0.45			0.3959				
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = For projects with a proximal USGS guage in-line with the project reach (added bankfull verification - rare).
3 = Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of the bank to the toe of the terrace rise/slope
4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.
5 = Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 3

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					34.42	41.48	41.54	48.48	7.03	3	43	52		64	8.60	4	40	40	40	38.31	38.31	38.31	38.31		1
Floodprone Width (ft)					258.20	265.42	265.43	272.62	7.21	3						4	>88	>88	>88	>90	>90	>90	>90		1
Bankfull Mean Depth (ft)					1.20	1.47	1.42	1.80	0.30	3	0.98	1.16		1.98	0.44	4	1.58	1.58	1.58	1.26	1.26	1.26	1.26		1
[1]Bankfull Max Depth (ft)					2.47	2.78	2.79	3.09	0.31	3						4	2.00	2.00	2.00	1.90	1.90	1.90	1.90		1
Bankfull Cross Sectional Area (ft[2])					58.33	59.79	58.96	62.09	2.01	3	55	59		65	4.11	4	63	63	63	48.23	48.23	48.23	48.23		1
Width/Depth Ratio					19.12	29.59	29.25	40.40	10.64	3	31	47		64	13.47	4	39.87	39.87	39.87	30.43	30.43	30.43	30.43		1
Entrenchment Ratio					5.33	6.53	6.56	7.71	1.19	3	>2.2	>2.2		>2.2		4	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2		1
[1]Bank Height Ratio					1.94	2.19		2.43								4	1	1	1	0.94	0.94	0.94	0.94		1
Profile																									
Riffle Length (ft)																	15	30	65	11.30	18.65	20.99	21.31		
Riffle Slope (ft/ft)																	0.017	0.027	0.033	0.018	0.050	0.024	0.134		
Pool Length (ft)																	10	15	20	6.32	12.33	10.63	21.53		
Pool Max Depth (ft)																	2	2.25	2.5	0.50	1.13	1.26	1.69		
Pool Spacing (ft)																	70	70	70	36.04	45.42	46.77	53.33		
Pattern																									
Channel Belwidth (ft)																				58.77	58.77	58.77	58.77		
Radius of Curvature (ft)																				83.80	83.80	83.80	83.80		
RC: Bankfull Width (ft/ft)																				4.58	15.65	16.52	23.05		
Meander Wavelength (ft)																									
Meander Width Ratio																				2.55	5.20	3.56	12.83		
Transport Parameters																									
Reach Shear Stress (competency) (lb/ft[2])						0.619												0.516			0.199				
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (transport capacity) (W/m[2])																									
Additional Research Parameters																									
Rosgen Classification						C4												C4			C4				
Bankfull Velocity (fps)						2.73												3.03			3.96				
Bankfull Discharge (cfs)						163																			
Valley Length (ft)																									
Channel Thalweg Length (ft)																		1030.85			1079.45				
Sinuosity (ft/ft)						1.13												1.05			1.01				
Water Surface Slope (Channel) (ft/ft)																									
BF Slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																		0.49			0.074				
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in
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2 = For projects with a proximal USGS guage in-line with the project reach (added bankfull verification - rare).
3 = Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of the bank to the toe of the terrace rise/slope
4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.
5 = Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT2

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)																	4.00	4.00	4.00	3.52	3.52	3.52	3.52		1
Floodprone Width (ft)																	7.00	7.00	7.00	8.34	8.34	8.34	8.34		1
Bankfull Mean Depth (ft)																	0.47	0.47	0.47	0.52	0.52	0.52	0.52		1
[1]Bankfull Max Depth (ft)																	0.75	0.75	0.75	0.72	0.72	0.72	0.72		1
Bankfull Cross Sectional Area (ft^2)																	1.88	1.88	1.88	1.82	1.82	1.82	1.82		1
Width/Depth Ratio																	8.51	8.51	8.51	6.82	6.82	6.82	6.82		1
Entrenchment Ratio																	1.75	1.75	1.75	2.37	2.37	2.37	2.37		1
[1]Bank Height Ratio																	1.00	1.00	1.00	1.01	1.01	1.01	1.01		1
Profile																									
Riffle Length (ft)																	51.74	51.74	51.74	6.98	13.52	13.52	20.07		
Riffle Slope (ft/ft)																	0.024	0.024	0.024	0.010	0.013	0.013	0.016		
Pool Length (ft)																				12.76	12.76	12.76	12.76		
Pool Max Depth (ft)																				0.89	0.89	0.89	0.89		
Pool Spacing (ft)																				30.63	30.63	30.63	30.63		
Pattern																									
Channel Belwidth (ft)																									
Radius of Curvature (ft)																									
RC: Bankfull Width (ft/ft)																									
Meander Wavelength (ft)																									
Meander Width Ratio																									
Transport Parameters																									
Reach Shear Stress (competency) (lb/f^2)																	0.571			0.249					
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (transport capacity) (W/m^2)																									
Additional Research Parameters																									
Rosgen Classification																				B6					
Bankfull Velocity (fps)																				1.66					
Bankfull Discharge (cfs)																									
Valley Length (ft)																									
Channel Thalweg Length (ft)																				951.37					
Sinuosity (ft/ft)																				0.96					
Water Surface Slope (Channel) (ft/ft)																									
BF Slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = For projects with a proximal USGS guage in-line with the project reach (added bankfull verification - rare).
3 = Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of the bank to the toe of the terrace rise/slope
4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.
5 = Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT3

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)																	4.00	4.00	4.00	3.50	4.38	3.73	5.91		3
Floodprone Width (ft)																	7.00	7.00	7.00	6.35	14.65	13.14	24.45		3
Bankfull Mean Depth (ft)																	0.47	0.47	0.47	0.20	0.34	0.29	0.53		3
[1]Bankfull Max Depth (ft)																	0.75	0.75	0.75	0.31	0.58	0.61	0.82		3
Bankfull Cross Sectional Area (ft^2)																	1.88	1.88	1.88	0.75	1.43	1.69	1.84		3
Width/Depth Ratio																	8.51	8.51	8.51	6.66	15.31	18.61	20.67		3
Entrenchment Ratio																	1.75	1.75	1.75	1.70	3.64	2.22	6.99		3
[4]Bank Height Ratio																	1.00	1.00	1.00	0.54	0.64	0.64	0.74		3
Profile																									
Riffle Length (ft)																	197.12	355.90	514.68	57.25	107.81	89.01	215.05		
Riffle Slope (ft/ft)																	0.006	0.012	0.044	0.011	0.017	0.014	0.029		
Pool Length (ft)																				1.50	12.97	6.04	31.37		
Pool Max Depth (ft)																				4.14	4.46	4.61	4.62		
Pool Spacing (ft)																				114.27	133.63	143.31	143.31		
Pattern																									
Channel Belwidth (ft)																	50.42	59.15	61.2	13.40	34.20	42.73	46.46		
Radius of Curvature (ft)																				21.64	35.62	35.15	50.55		
RC: Bankfull Width (ft/ft)																				2.38	15.62	14.63	30.84		
Meander Wavelength (ft)																									
Meander Width Ratio																				0.43	5.37	2.44	19.52		
Transport Parameters																									
Reach Shear Stress (competency) (lb/ft^2)																		0.285				0.290			
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (transport capacity) (W/m^2)																									
Additional Research Parameters																									
Rosgen Classification																					B6				
Bankfull Velocity (fps)																					1.47				
Bankfull Discharge (cfs)																									
Valley Length (ft)																									
Channel Thalweg Length (ft)																					1469.07				
Sinuosity (ft/ft)																					0.95				
Water Surface Slope (Channel) (ft/ft)																					0.019				
BF Slope (ft/ft)																					0.019				
[3]Bankfull Floodplain Area (acres)																					0.84				
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

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2 = For projects with a proximal USGS guage in-line with the project reach (added bankfull verification - rare).
3 = Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of the bank to the toe of the terrace rise/slope
4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.
5 = Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT4

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)																				13.32	13.32	13.32	13.32		1
Floodprone Width (ft)																				>50	>50	>50	>50		1
Bankfull Mean Depth (ft)																				0.91	0.91	0.91	0.91		1
[1]Bankfull Max Depth (ft)																				1.71	1.71	1.71	1.71		1
Bankfull Cross Sectional Area (ft^2)																				12.13	12.13	12.13	12.13		1
Width/Depth Ratio																				14.63	14.63	14.63	14.63		1
Entrenchment Ratio																				>2.2	>2.2	>2.2	>2.2		1
[1]Bank Height Ratio																				0.60	0.60	0.60	0.60		1
Profile																									
Riffle Length (ft)																				4.74	19.81	21.81	30.73		
Riffle Slope (ft/ft)																				0.0121	0.0271	0.0184	0.0738		
Pool Length (ft)																				6.99	12.56	9.10	26.02		
Pool Max Depth (ft)																				1.89	2.28	2.32	2.70		
Pool Spacing (ft)																				50.06	56.72	55.31	68.08		
Pattern																									
Channel Belwidth (ft)																				80.13	98.47	98.47	116.81		
Radius of Curvature (ft)																				36.70	47.23	49.01	56.95		
RC: Bankfull Width (ft/ft)																				16.34	19.23	18.89	23.76		
Meander Wavelength (ft)																				221.95	221.95	221.95	221.95		
Meander Width Ratio																				3.37	5.19	4.91	7.15		
Transport Parameters																									
Reach Shear Stress (competency) (lb/f^2)																				1.350					
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (transport capacity) (W/m^2)																									
Additional Research Parameters																									
Rosgen Classification																				C4b					
Bankfull Velocity (fps)																				4.23					
Bankfull Discharge (cfs)																									
Valley Length (ft)																									
Channel Thalweg Length (ft)																				830.01					
Sinuosity (ft/ft)																				0.806					
Water Surface Slope (Channel) (ft/ft)																									
BF Slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																				0.03					
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

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2 = For projects with a proximal USGS guage in-line with the project reach (added bankfull verification - rare).
3 = Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of the bank to the toe of the terrace rise/slope
4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.
5 = Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT7

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					20.47	26.07	26.81	30.18	4.06	4	43	52		64	8.60	4	25.00	25.00	25.00	18.58	19.65	19.65	20.71		2
Floodprone Width (ft)					39.20	54.40	43.82	90.77	24.57	4						4	>55	>55	>55	>80			>100		2
Bankfull Mean Depth (ft)					0.85	1.00	1.00	1.17	0.13	4	0.98	1.16		1.98	0.44	4	0.98	0.98	0.98	0.96	1.07	1.07	1.17		2
[1]Bankfull Max Depth (ft)					1.79	2.16	1.94	2.95	0.54	4						4	1.13	1.13	1.13	1.17	1.43	1.43	1.69		2
Bankfull Cross Sectional Area (ft[2])					19.96	26.07	26.67	31.00	5.47	4	55	59		65	4.11	4	24.44	24.44	24.44	19.93	20.81	20.81	21.68		2
Width/Depth Ratio					20.89	26.33	26.30	31.81	5.33	4	31	47		64	13.47	4	25.51	25.51	25.51	15.92	18.72	18.72	21.52		2
Entrenchment Ratio					1.45	2.07	1.92	3.01	0.75	4	>2.2	>2.2		>2.2		4	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2		2
[4]Bank Height Ratio																4	1.00	1.00	1.00	0.78	0.85	0.85	0.92		2
Profile																									
Riffle Length (ft)																	10	35	60	9.79	36.53	37.12	54.31		
Riffle Slope (ft/ft)																	0.008	0.01	0.01	0.001	0.014	0.013	0.039		
Pool Length (ft)																	10	10	20	8.16	15.87	13.77	28.95		
Pool Max Depth (ft)																	1.5	2	2	1.00	2.05	2.04	2.85		
Pool Spacing (ft)																	15	55	100	13.27	54.36	56.47	130.67		
Pattern																									
Channel Belwidth (ft)																	201	201.0	201	154.56	209.27	209.27	263.98		
Radius of Curvature (ft)																	50	137.5	686	90.88	194.28	125.65	434.94		
RC: Bankfull Width (ft/ft)																	28	31.5	31	15.71	20.53	21.99	22.62		
Meander Wavelength (ft)																	720	720	720	687.90	687.90	687.90	687.90		
Meander Width Ratio																	6.48	6.38	7.18	9.838	10.191	9.514	11.670		
Transport Parameters																									
Reach Shear Stress (competency) (lb/f[2])					0.479												0.407			0.358					
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (transport capacity) (W/m[2])																									
Additional Research Parameters																									
Rosgen Classification					F4/C4						C4						C4			C4					
Bankfull Velocity (fps)					3.7												3.93			4.61					
Bankfull Discharge (cfs)					96																				
Valley Length (ft)																									
Channel Thalweg Length (ft)																	1110.53			1126.71					
Sinuosity (ft/ft)											1.25						1.21			1.23					
Water Surface Slope (Channel) (ft/ft)											0.38						0.006			0.006					
BF Slope (ft/ft)											0.38						0.006			0.005					
[3]Bankfull Floodplain Area (acres)																	0.459			5.35					
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

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2 = For projects with a proximal USGS guage in-line with the project reach (added bankfull verification - rare).
3 = Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of the bank to the toe of the terrace rise/slope
4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.
5 = Of value/needed only if the n exceeds 3

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 1

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{P} / di^{SP} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

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

ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 3

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{P} / di^{SP} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

The intent here is to provide the reader/consumer of fesign and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitaed states as well as comparisons to the reference distributions.
with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 4

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{vp} / di^{sp} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

The intent here is to provide the reader/consumer of fesign and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitaed states as well as comparisons to the reference distributions.
with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: UT2

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{vp} / di^{sp} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

The intent here is to provide the reader/consumer of fesign and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitaed states as well as comparisons to the reference distributions.
with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: UT3

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{vr} / di^{SP} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

The intent here is to provide the reader/consumer of fesign and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitaed states as well as comparisons to the reference distributions.
with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: UT4

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{vr} / di^{SP} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

The intent here is to provide the reader/consumer of fesign and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitaed states as well as comparisons to the reference distributions.
with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Banks, and Hydrologic Containment Parameter Distribution)
Little Buffalo Creek (94147) Segment/Reach: UT7

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																												
[1]SC% / Sa% / G% / C% / B% / Be%																												
[1]d16 / d35 / d50 / d84 / d95 / di^{P} / di^{SP} (mm)																												
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

Shaded cells indicate that these will typically not be filled in

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

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

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

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

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

BI and BH have been addressed in prior submissions as a subsample (cross sections as part of the design measurements), however, these subsamples have been focused entirely on facilitating design without providing a thorough pre-construction distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longiudinal prfile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 1

	Cross Section 1 (Pool)-1P							Cross Section 2 (Riffle)-1R						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	640.24							640.21						
Bankfull Width (ft)	35.77							35.21						
Floodprone Width (ft)	>80							>80						
Bankfull Mean Depth (ft)	1.11							1.23						
[1]Bankfull Max Depth (ft)	2.48							1.79						
Bankfull Cross Sectional Area (ft²)	39.80							43.15						
Bankfull Width/Depth Ratio	32.15							28.73						
Bankfull Entrenchment Ratio	>2.2							>2.2						
Bankfull Bank Height Ratio	0.73							1.00						
Cross Sectional Area between end pins (ft²)	85.42							77.79						
d50 (mm)	5.00							15.90						

Shaded cells indicate that these will typically not be filled in

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

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 3

	Cross Section 1 (Riffle) -2R							Cross Section 2 (Pool)-2P						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	630.92							629.80						
Bankfull Width (ft)	38.31							39.59						
Floodprone Width (ft)	>90							>90						
Bankfull Mean Depth (ft)	1.26							1.11						
[1]Bankfull Max Depth (ft)	1.90							2.44						
Bankfull Cross Sectional Area (ft²)	48.23							43.79						
Bankfull Width/Depth Ratio	30.43							35.79						
Bankfull Entrenchment Ratio	>2.2							>2.2						
Bankfull Bank Height Ratio	0.94							0.69						
Cross Sectional Area between end pins (ft²)	116.34							89.91						
d50 (mm)	31.00							6.7						

Shaded cells indicate that these will typically not be filled in

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

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 4

	Cross Section 1 (Pool)-3P						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	624.26						
Bankfull Width (ft)	29.35						
Floodprone Width (ft)	>65						
Bankfull Mean Depth (ft)	1.87						
[1]Bankfull Max Depth (ft)	3.12						
Bankfull Cross Sectional Area (ft^2)	54.90						
Bankfull Width/Depth Ratio	15.69						
Bankfull Entrenchment Ratio	>2.2						
Bankfull Bank Height Ratio	0.70						
Cross Sectional Area between end pins (ft^2)	106.25						
d50 (mm)	3.40						

Shaded cells indicate that these will typically not be filled in

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

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: UT2

	Cross Section 1 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	639.34						
Bankfull Width (ft)	3.52						
Floodprone Width (ft)	8.34						
Bankfull Mean Depth (ft)	0.52						
[1]Bankfull Max Depth (ft)	0.72						
Bankfull Cross Sectional Area (ft^2)	1.82						
Bankfull Width/Depth Ratio	6.82						
Bankfull Entrenchment Ratio	2.37						
Bankfull Bank Height Ratio	1.01						
Cross Sectional Area between end pins (ft^2)	20.73						
d50 (mm)	5.00						

Shaded cells indicate that these will typically not be filled in

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

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: UT3

	Cross Section 1 (Riffle) -R1							Cross Section 2 (Pool)- 1P							Cross Section 3 (Riffle)- 2R							Cross Section 4 (Riffle)-3R						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	647.14							638.72							632.79							622.92						
Bankfull Width (ft)	3.50							4.06							5.91							3.73						
Floodprone Width (ft)	24.45							8.28							13.14							6.35						
Bankfull Mean Depth (ft)	0.53							0.25							0.29							0.20						
[1]Bankfull Max Depth (ft)	0.82							0.46							0.61							0.31						
Bankfull Cross Sectional Area (ft^2)	1.84							1.01							1.69							0.75						
Bankfull Width/Depth Ratio	6.66							16.32							20.67							18.61						
Bankfull Entrenchment Ratio	6.99							2.04							2.22							1.70						
Bankfull Bank Height Ratio	0.74							0.54							0.57							0.71						
Cross Sectional Area between end pins (ft^2)	13.50							27.61							26.63							15.64						
d50 (mm)	silt/clay							silt/clay							4.50							0.11						

Shaded cells indicate that these will typically not be filled in

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

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: UT4

	Cross Section 1 (Pool)-1P							Cross Section 2 (Riffle)-1R						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	629.84							627.41						
Bankfull Width (ft)	20.38							13.32						
Floodprone Width (ft)	>100							>50						
Bankfull Mean Depth (ft)	1.34							0.91						
[1]Bankfull Max Depth (ft)	2.71							1.71						
Bankfull Cross Sectional Area (ft^2)	27.37							12.13						
Bankfull Width/Depth Ratio	15.18							14.63						
Bankfull Entrenchment Ratio	>2.2							>2.2						
Bankfull Bank Height Ratio	0.63							0.60						
Cross Sectional Area between end pins (ft^2)	54.73							29.20						
d50 (mm)	7.00							8.90						

Shaded cells indicate that these will typically not be filled in

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

Table 11a. Monitoring data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Little Buffalo Creek (94147) Segment/Reach: UT7

	Cross Section 1 (Riffle)-1R							Cross Section 2 (Pool)-1P							Cross Section 3 (Riffle)-2R						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	615.87							614.93							613.60						
Bankfull Width (ft)	20.71							27.10							18.58						
Floodprone Width (ft)	>100							>80							>80						
Bankfull Mean Depth (ft)	0.96							0.96							1.17						
[1]Bankfull Max Depth (ft)	1.17							1.29							1.69						
Bankfull Cross Sectional Area (ft^2)	19.93							25.98							21.68						
Bankfull Width/Depth Ratio	21.52							28.27							15.92						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	0.78							0.67							0.92						
Cross Sectional Area between end pins (ft^2)	66.61							76.83							52.17						
d50 (mm)	23.00							silt/clay							0.50						

Shaded cells indicate that these will typically not be filled in

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

Table 11b. Monitoring Data - Stream Reach Data Summary
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 1

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	35.21	35.21	35.21	35.21		1.00																														
Floodprone Width (ft)	>80	>80	>80	>80		1.00																														
Bankfull Mean Depth (ft)	1.23	1.23	1.23	1.23		1.00																														
[4]Bankfull Max Depth (ft)	1.79	1.79	1.79	1.79		1.00																														
Bankfull Cross Sectional Area (ft^2)	43.15	43.15	43.15	43.15		1.00																														
Width/Depth Ratio	28.73	28.73	28.73	28.73		1.00																														
Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2		1.00																														
[4]Bank Height Ratio	1.00	1.00	1.00	1.00		1.00																														
Profile																																				
Riffle Length (ft)	7.73	23.71	22.04	38.44																																
Riffle Slope (ft/ft)	0.000	0.026	0.022	0.076																																
Pool Length (ft)	4.21	25.43	17.55	83.20																																
Pool Max Depth (ft)	1.96	2.71	2.48	3.76																																
Pool Spacing (ft)	29.95	48.64	39.06	91.87																																
Pattern																																				
Channel Belwidth (ft)	59.64	105.83	92.68	165.18																																
Radius of Curvature (ft)	72.965	83.153	79.01	97.485																																
RC: Bankfull Width (ft/ft)	27.95	35.603	36.13	46.36																																
Meander Wavelength (ft)																																				
Meander Width Ratio	1.2865	3.037	2.5652	5.9098																																
Additional Research Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	2299.79																																			
Sinuosity (ft/ft)	1.05																																			
Water Surface Slope (Channel) (ft/ft)																																				
BF Slope (ft/ft)																																				
[1]Ri% / Ru% / P% / G% / S%																																				
[1]SC% / Sa% / G% / C% / B% / Be%																																				
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{SP} (mm)																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in

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2 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data.

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

5 = Of value/needed only if the n exceeds 3

Table 11b. Monitoring Data - Stream Reach Data Summary
Little Buffalo Creek (94147) Segment/Reach: Mainstem Reach 3

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	38.31	38.31	38.31	38.31		1																														
Floodprone Width (ft)	>90	>90	>90	>90		1																														
Bankfull Mean Depth (ft)	1.26	1.26	1.26	1.26		1																														
[1]Bankfull Max Depth (ft)	1.90	1.90	1.90	1.90		1																														
Bankfull Cross Sectional Area (ft^2)	48.23	48.23	48.23	48.23		1																														
Width/Depth Ratio	30.43	30.43	30.43	30.43		1																														
Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2		1																														
[1]Bank Height Ratio	0.94	0.94	0.94	0.94		1																														
Profile																																				
Riffle Length (ft)	11.30	18.65	20.99	21.31																																
Riffle Slope (ft/ft)	0.0182	0.0502	0.0241	0.1345																																
Pool Length (ft)	6.32	12.33	10.63	21.53																																
Pool Max Depth (ft)	0.50	1.13	1.26	1.69																																
Pool Spacing (ft)	36.04	45.42	46.77	53.33																																
Pattern																																				
Channel Belwidth (ft)	58.77	58.77	58.77	58.77																																
Radius of Curvature (ft)	83.8	83.8	83.8	83.8																																
RC: Bankfull Width (ft/ft)	4.58	15.654	16.52	23.05																																
Meander Wavelength (ft)																																				
Meander Width Ratio	2.5497	5.1978	3.5575	12.832																																
Additional Research Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	1079.45																																			
Sinuosity (ft/ft)	1.01																																			
Water Surface Slope (Channel) (ft/ft)																																				
BF Slope (ft/ft)																																				
[1]Ri% / Ru% / P% / G% / S%																																				
[1]SC% / Sa% / G% / C% / B% / Be%																																				
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{SP} (mm)																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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5 = Of value/needed only if the n exceeds 3

Table 11b. Monitoring Data - Stream Reach Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT2

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	3.52	3.52	3.52	3.52		1																														
Floodprone Width (ft)	8.34	8.34	8.34	8.34		1																														
Bankfull Mean Depth (ft)	0.52	0.52	0.52	0.52		1																														
[1]Bankfull Max Depth (ft)	0.72	0.72	0.72	0.72		1																														
Bankfull Cross Sectional Area (ft^2)	1.82	1.82	1.82	1.82		1																														
Width/Depth Ratio	6.82	6.82	6.82	6.82		1																														
Entrenchment Ratio	2.37	2.37	2.37	2.37		1																														
[1]Bank Height Ratio	1.01	1.01	1.01	1.01		1																														
Profile																																				
Riffle Length (ft)	6.98	13.52	13.52	20.07																																
Riffle Slope (ft/ft)	0.010	0.013	0.013	0.016																																
Pool Length (ft)	12.76	12.76	12.76	12.76																																
Pool Max Depth (ft)	0.89	0.89	0.89	0.89																																
Pool Spacing (ft)	30.63	30.63	30.63	30.63																																
Pattern																																				
Channel Belwidth (ft)																																				
Radius of Curvature (ft)																																				
RC: Bankfull Width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Research Parameters																																				
Rosgen Classification	B6																																			
Channel Thalweg Length (ft)	951.37																																			
Sinuosity (ft/ft)	0.96																																			
Water Surface Slope (Channel) (ft/ft)																																				
BF Slope (ft/ft)																																				
[1]Ri% / Ru% / P% / G% / S%																																				
[1]SC% / Sa% / G% / C% / B% / Be%																																				
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{SP} (mm)																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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5 = Of value/needed only if the n exceeds 3

Table 11b. Monitoring Data - Stream Reach Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT3

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	3.50	4.38	3.73	5.91		3																														
Floodprone Width (ft)	6.35	14.65	13.14	24.45		3																														
Bankfull Mean Depth (ft)	0.20	0.34	0.29	0.53		3																														
[1]Bankfull Max Depth (ft)	0.31	0.58	0.61	0.82		3																														
Bankfull Cross Sectional Area (ft^2)	0.75	1.43	1.69	1.84		3																														
Width/Depth Ratio	6.66	15.31	18.61	20.67		3																														
Entrenchment Ratio	1.70	3.64	2.22	6.99		3																														
[1]Bank Height Ratio	0.57	0.67	0.71	0.74		3																														
Profile																																				
Riffle Length (ft)	57.25	107.81	89.01	215.05																																
Riffle Slope (ft/ft)	0.011	0.017	0.014	0.029																																
Pool Length (ft)	1.50	12.97	6.04	31.37																																
Pool Max Depth (ft)	4.14	4.46	4.61	4.62																																
Pool Spacing (ft)	114.27	133.63	143.31	143.31																																
Pattern																																				
Channel Belwidth (ft)	13.40	34.20	42.73	46.46																																
Radius of Curvature (ft)	21.64	35.62	35.15	50.55																																
RC: Bankfull Width (ft/ft)	2.38	15.62	14.63	30.84																																
Meander Wavelength (ft)																																				
Meander Width Ratio	0.43	5.37	2.44	19.52																																
Additional Research Parameters																																				
Rosgen Classification	B6																																			
Channel Thalweg Length (ft)	1469.07																																			
Sinuosity (ft/ft)	0.95																																			
Water Surface Slope (Channel) (ft/ft)	0.019																																			
BF Slope (ft/ft)	0.019																																			
[1]Ri% / Ru% / P% / G% / S%																																				
[1]SC% / Sa% / G% / C% / B% / Be%																																				
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{SP} (mm)																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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Table 11b. Monitoring Data - Stream Reach Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT4

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	13.32	13.32	13.32	13.32		1																														
Floodprone Width (ft)	>50	>50	>50	>50		1																														
Bankfull Mean Depth (ft)	0.91	0.91	0.91	0.91		1																														
[1]Bankfull Max Depth (ft)	1.71	1.71	1.71	1.71		1																														
Bankfull Cross Sectional Area (ft^2)	12.13	12.13	12.13	12.13		1																														
Width/Depth Ratio	14.63	14.63	14.63	14.63		1																														
Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2		1																														
[1]Bank Height Ratio	0.60	0.60	0.60	0.60		1																														
Profile																																				
Riffle Length (ft)	4.74	19.81	21.81	30.73																																
Riffle Slope (ft/ft)	0.012	0.027	0.018	0.074																																
Pool Length (ft)	6.99	12.56	9.10	26.02																																
Pool Max Depth (ft)	1.89	2.28	2.32	2.70																																
Pool Spacing (ft)	50.06	56.72	55.31	68.08																																
Pattern																																				
Channel Belwidth (ft)	80.13	98.47	98.47	116.81																																
Radius of Curvature (ft)	36.70	47.23	49.01	56.95																																
RC: Bankfull Width (ft/ft)	16.34	19.23	18.89	23.76																																
Meander Wavelength (ft)	221.95	221.95	221.95	221.95																																
Meander Width Ratio	3.37	5.19	4.91	7.15																																
Additional Research Parameters																																				
Rosgen Classification	C4b																																			
Channel Thalweg Length (ft)	830.01																																			
Sinuosity (ft/ft)	0.81																																			
Water Surface Slope (Channel) (ft/ft)																																				
BF Slope (ft/ft)																																				
[1]Ri% / Ru% / P% / G% / S%																																				
[1]SC% / Sa% / G% / C% / B% / Be%																																				
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{SP} (mm)																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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Table 11b. Monitoring Data - Stream Reach Data Summary
Little Buffalo Creek (94147) Segment/Reach: UT7

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD°	n	Min	Mean	Med	Max	SD°	n	Min	Mean	Med	Max	SD°	n	Min	Mean	Med	Max	SD°	n	Min	Mean	Med	Max	SD°	n	Min	Mean	Med	Max	SD°	n
Bankfull Width (ft)	18.58	19.65	19.65	20.71		2																														
Floodprone Width (ft)	>80			>100		2																														
Bankfull Mean Depth (ft)	0.96	1.07	1.07	1.17		2																														
[1]Bankfull Max Depth (ft)	1.17	1.43	1.43	1.69		2																														
Bankfull Cross Sectional Area (ft^2)	19.93	20.81	20.81	21.68		2																														
Width/Depth Ratio	15.92	18.72	18.72	21.52		2																														
Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2		2																														
[1]Bank Height Ratio	0.78	0.85	0.85	0.92		2																														
Profile																																				
Riffle Length (ft)	9.79	36.53	37.12	54.31																																
Riffle Slope (ft/ft)	0.001	0.014	0.013	0.039																																
Pool Length (ft)	8.16	15.87	13.77	28.95																																
Pool Max Depth (ft)	1.00	2.05	2.04	2.85																																
Pool Spacing (ft)	13.27	54.36	56.47	130.67																																
Pattern																																				
Channel Belwidth (ft)	154.56	209.27	209.27	263.98																																
Radius of Curvature (ft)	90.88	194.28	125.65	434.94																																
RC: Bankfull Width (ft/ft)	15.71	20.53	21.99	22.62																																
Meander Wavelength (ft)	687.90	687.90	687.90	687.90																																
Meander Width Ratio	9.8383	10.191	9.5145	11.67																																
Additional Research Parameters																																				
Rosgen Classification	C4																																			
Channel Thalweg Length (ft)	1126.71																																			
Sinuosity (ft/ft)	1.23																																			
Water Surface Slope (Channel) (ft/ft)	0.006																																			
BF Slope (ft/ft)	0.005																																			
[1]Ri% / Ru% / P% / G% / S%																																				
[1]SC% / Sa% / G% / C% / B% / Be%																																				
[1]d16 / d35 / d50 / d84 / d95 / di^P / di^{SP} (mm)																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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Cross Section Plot Exhibit

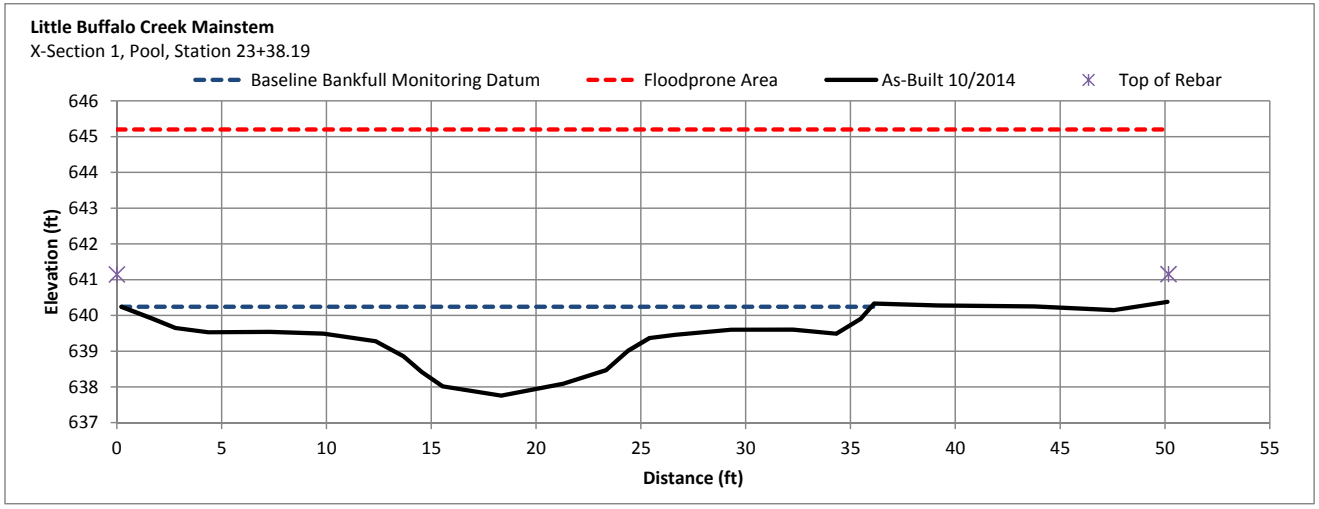
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	MS-1P
Drainage Area (sq mi):	2.99
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	641.15
0.219	640.24
1.695	639.91
2.776	639.65
4.355	639.53
7.311	639.54
9.854	639.49
12.346	639.28
13.669	638.86
14.543	638.42
15.544	638.02
18.338	637.76
21.28	638.09
23.335	638.47
24.378	639.01
25.412	639.37
26.627	639.46
29.304	639.6
32.257	639.6
34.327	639.49
35.476	639.9
36.121	640.33
39.169	640.28
43.769	640.25
47.545	640.15
50.119	640.38
50.166	641.16

SUMMARY DATA	
Bankfull Elevation:	640.24
Bankfull Cross-Sectional Area:	39.80
Bankfull Width:	35.77
Flood Prone Area Elevation:	645.20
Flood Prone Width:	>80
Max Depth at Bankfull:	2.48
Mean Depth at Bankful:	1.11
W/D Ratio:	32.15
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.73

Stream Type	C4

Station and description	23+38.19 MS-1P Looking Upstream



Cross Section Plot Exhibit

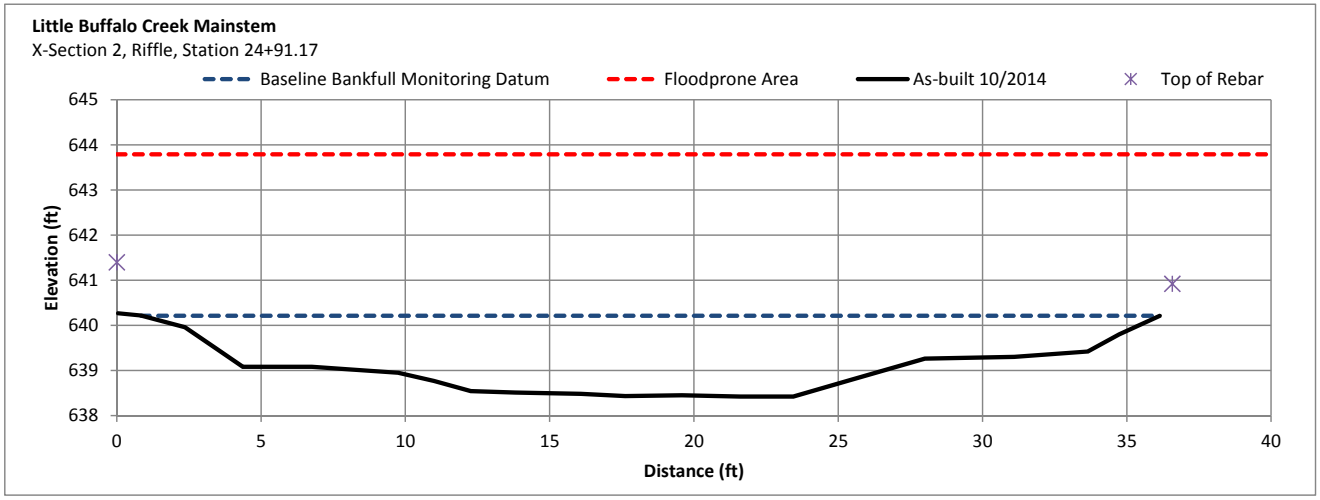
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	MS-1R
Drainage Area (sq mi):	2.99
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	641.4
0.043	640.27
0.839	640.22
2.358	639.96
3.454	639.48
4.371	639.08
6.76	639.08
9.755	638.95
10.99	638.77
12.277	638.54
13.81	638.51
16.079	638.48
17.614	638.43
19.581	638.45
21.6	638.42
23.432	638.42
25.423	638.79
27.987	639.26
31.095	639.3
33.642	639.42
34.731	639.8
36.137	640.21
36.574	640.92

SUMMARY DATA	
Bankfull Elevation:	640.21
Bankfull Cross-Sectional Area:	43.15
Bankfull Width:	35.21
Flood Prone Area Elevation:	643.79
Flood Prone Width:	>80
Max Depth at Bankfull:	1.79
Mean Depth at Bankful:	1.23
W/D Ratio:	28.73
Entrenchment Ratio:	>2.2
Bank Height Ratio:	1.00

Stream Type	C4

Station and description	24+91.17 MS-1R Looking Upstream



Cross Section Plot Exhibit

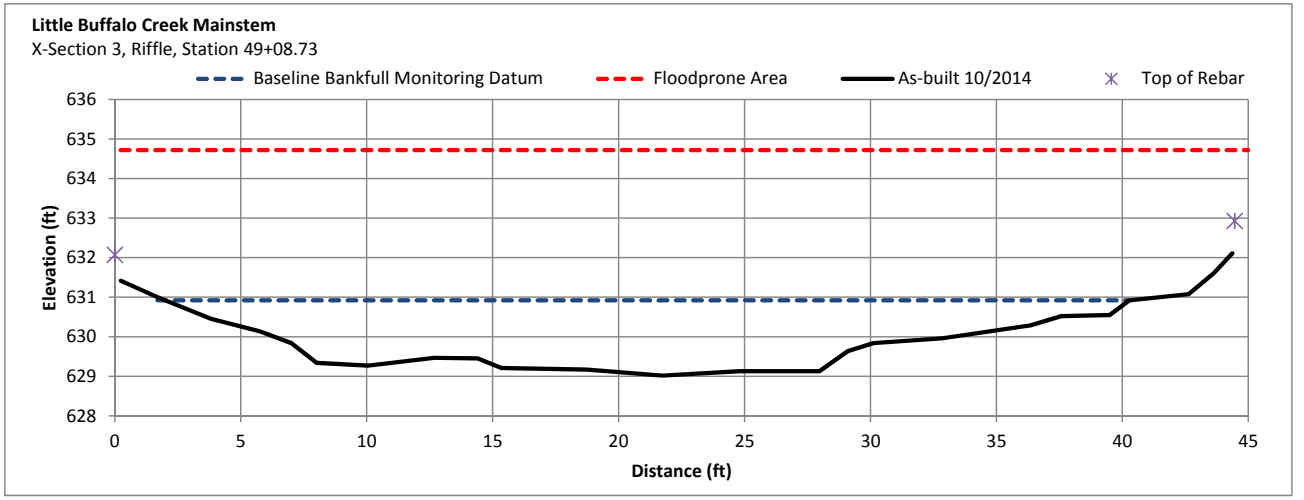
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	MS-2R
Drainage Area (sq mi):	2.82
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	632.07
0.233	631.42
1.694	631
3.826	630.45
5.749	630.14
7.006	629.84
8.015	629.34
10.035	629.27
12.676	629.47
14.4	629.45
15.347	629.21
18.736	629.17
21.728	629.02
24.808	629.13
27.966	629.13
29.1	629.64
30.115	629.84
32.846	629.96
36.356	630.29
37.559	630.52
39.491	630.55
40.275	630.92
42.626	631.08
43.628	631.61
44.363	632.11
44.458	632.93

SUMMARY DATA	
Bankfull Elevation:	630.92
Bankfull Cross-Sectional Area:	48.23
Bankfull Width:	38.31
Flood Prone Area Elevation:	634.72
Flood Prone Width:	>90
Max Depth at Bankfull:	1.90
Mean Depth at Bankful:	1.26
W/D Ratio:	30.43
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.94

Stream Type	C4

Station and description	4908.73 MS-2R Looking Upstream



Cross Section Plot Exhibit

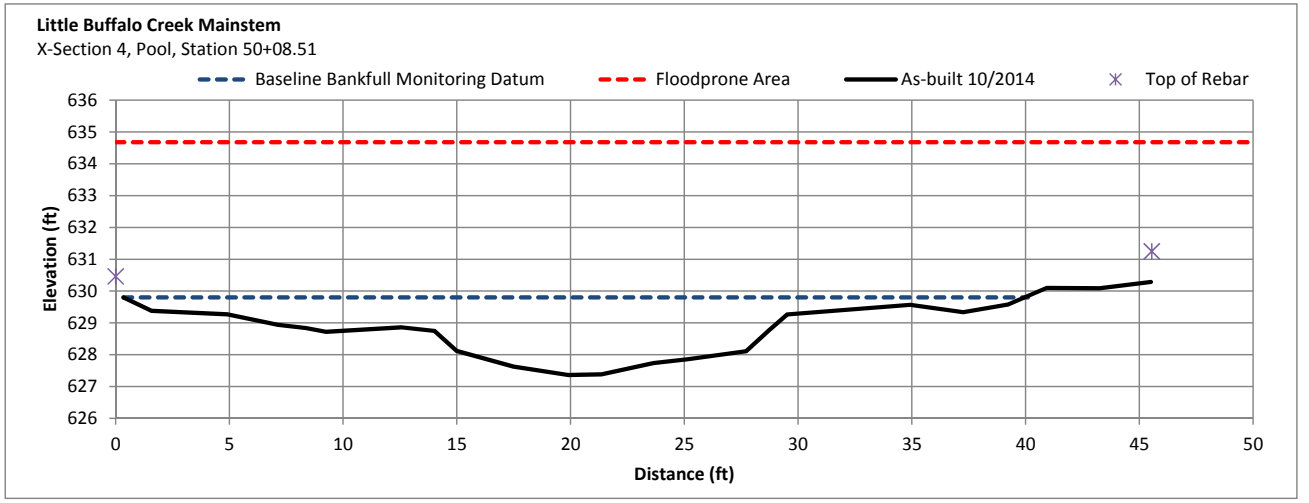
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	MS-2P
Drainage Area (sq mi):	2.82
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	630.46
0.35	629.8
1.583	629.38
4.933	629.27
7.132	628.94
8.358	628.84
9.263	628.72
12.574	628.86
14.01	628.75
14.991	628.12
17.487	627.63
19.911	627.36
21.338	627.38
23.639	627.74
25.15	627.86
27.713	628.11
28.7	628.76
29.52	629.27
34.925	629.57
37.252	629.34
39.223	629.58
40.915	630.1
43.25	630.09
45.501	630.29
45.541	631.25

SUMMARY DATA	
Bankfull Elevation:	629.80
Bankfull Cross-Sectional Area:	43.79
Bankfull Width:	39.59
Flood Prone Area Elevation:	634.68
Flood Prone Width:	>90
Max Depth at Bankfull:	2.44
Mean Depth at Bankful:	1.11
W/D Ratio:	35.79
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.69

Stream Type	C4

Station and description	5008.51 MS-2P Looking Upstream



Cross Section Plot Exhibit

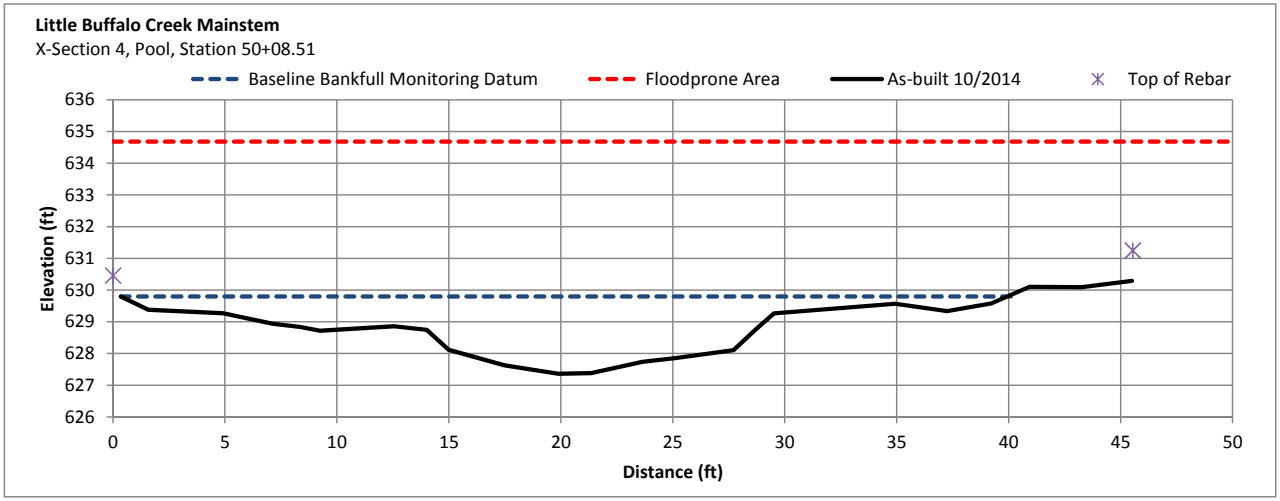
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	MS-3P
Drainage Area (sq mi):	4.01
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	625.57
0.168	624.54
1.295	624.26
2.105	623.68
3.062	623.15
5.449	622.63
6.71	622.34
7.331	622.08
8.524	621.92
9.616	621.87
11.355	621.38
12.668	621.28
14.262	621.27
15.592	621.14
17.481	621.36
18.951	621.71
20.154	621.9
21.64	622.35
24.433	622.92
26.557	623.45
29.144	623.84
31.416	624.48
33.255	624.84
34.227	626.05
34.275	625.08

SUMMARY DATA	
Bankfull Elevation:	624.26
Bankfull Cross-Sectional Area:	54.90
Bankfull Width:	29.35
Flood Prone Area Elevation:	630.50
Flood Prone Width:	>65
Max Depth at Bankfull:	3.12
Mean Depth at Bankful:	1.87
W/D Ratio:	15.69
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.70

Stream Type	C4

Station and description	6433.12 MS-3P Looking Upstream



Cross Section Plot Exhibit

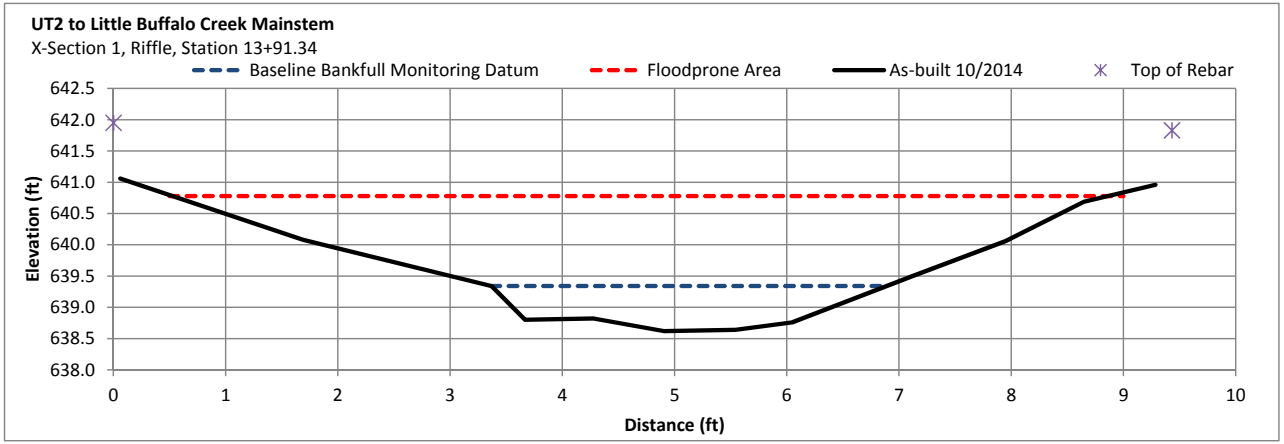
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT2-1R
Drainage Area (sq mi):	0.3
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	641.95
0.061	641.06
1.69	640.08
3.369	639.34
3.668	638.8
4.28	638.82
4.91	638.62
5.543	638.64
6.047	638.76
7.104	639.49
7.949	640.06
8.648	640.69
9.284	640.96
9.431	641.83

SUMMARY DATA	
Bankfull Elevation:	639.34
Bankfull Cross-Sectional Area:	1.82
Bankfull Width:	3.52
Flood Prone Area Elevation:	640.78
Flood Prone Width:	8.34
Max Depth at Bankfull:	0.72
Mean Depth at Bankful:	0.52
W/D Ratio:	6.82
Entrenchment Ratio:	2.37
Bank Height Ratio:	1.01

Stream Type	B6

Station and description	1391.34 UT2-1R Looking Upstream



Cross Section Plot Exhibit

River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT3-1R
Drainage Area (sq mi):	0.097
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

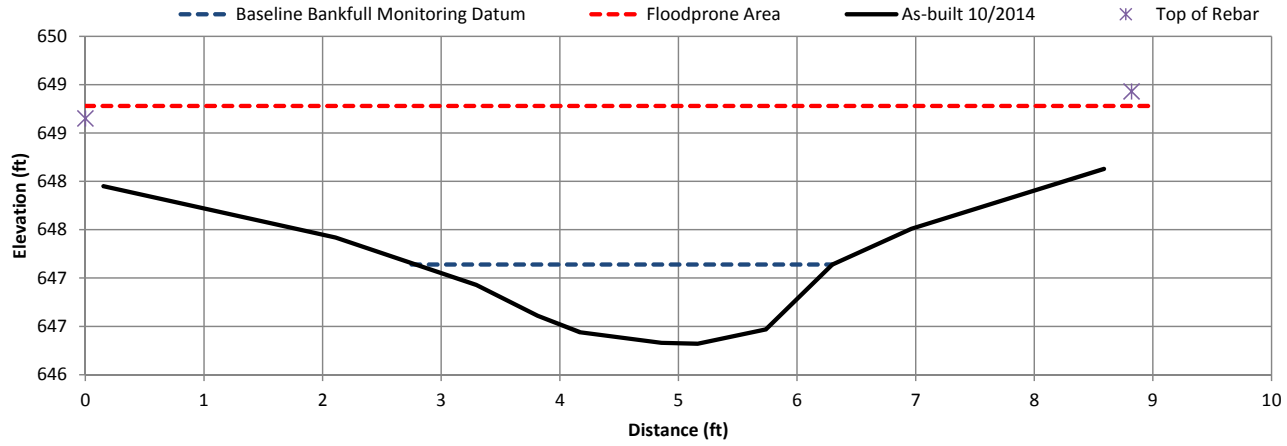
Station	Elevation
0	648.65
0.152	647.95
2.109	647.42
3.295	646.93
3.813	646.61
4.17	646.44
4.855	646.33
5.159	646.32
5.736	646.47
6.296	647.14
6.964	647.51
8.586	648.13
8.819	648.93

SUMMARY DATA	
Bankfull Elevation:	647.14
Bankfull Cross-Sectional Area:	1.84
Bankfull Width:	3.50
Flood Prone Area Elevation:	648.78
Flood Prone Width:	24.45
Max Depth at Bankfull:	0.82
Mean Depth at Bankful:	0.53
W/D Ratio:	6.66
Entrenchment Ratio:	6.99
Bank Height Ratio:	0.39

Stream Type	B6

Station and description	1166.28 UT3-1R Looking Upstream

UT3 to Little Buffalo Creek Mainstem
X-Section 1, Riffle, Station 11+66.28



Cross Section Plot Exhibit

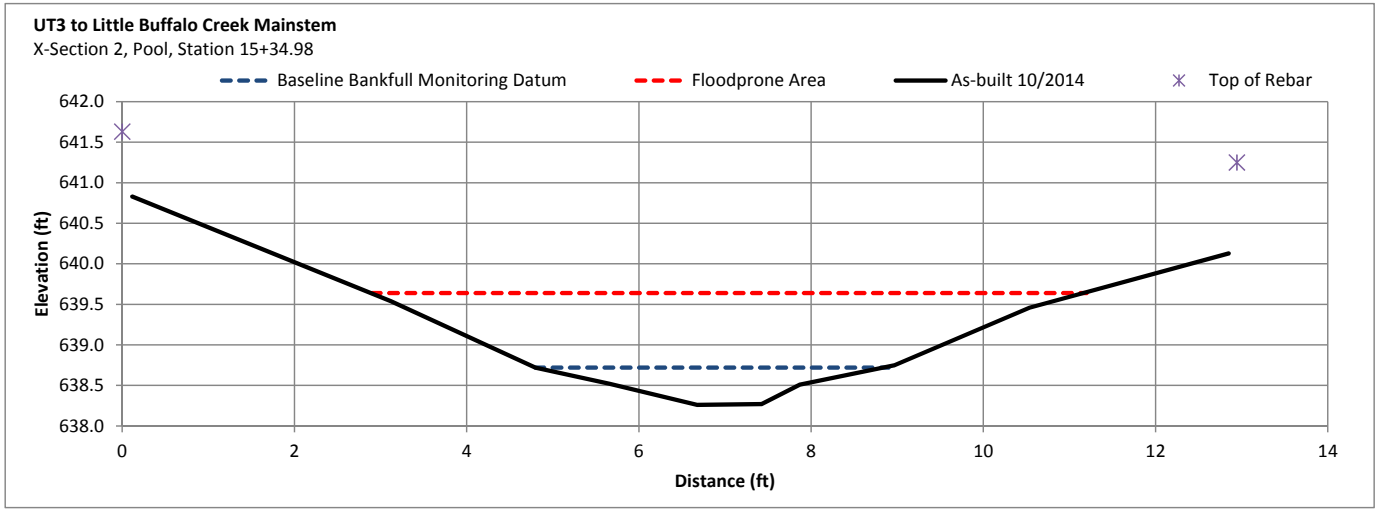
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT3-2P
Drainage Area (sq mi):	0.097
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	641.63
0.116	640.83
3.12	639.54
4.798	638.72
5.66	638.52
6.679	638.26
7.423	638.27
7.868	638.51
8.966	638.75
10.536	639.46
12.848	640.13
12.944	641.25

SUMMARY DATA	
Bankfull Elevation:	638.72
Bankfull Cross-Sectional Area:	1.01
Bankfull Width:	4.06
Flood Prone Area Elevation:	639.64
Flood Prone Width:	8.28
Max Depth at Bankfull:	0.46
Mean Depth at Bankful:	0.25
W/D Ratio:	16.32
Entrenchment Ratio:	2.04
Bank Height Ratio:	0.43

Stream Type	B6

Station and description	1534.98 UT3-2P Looking Upstream



Cross Section Plot Exhibit

River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT3-2R
Drainage Area (sq mi):	0.097
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

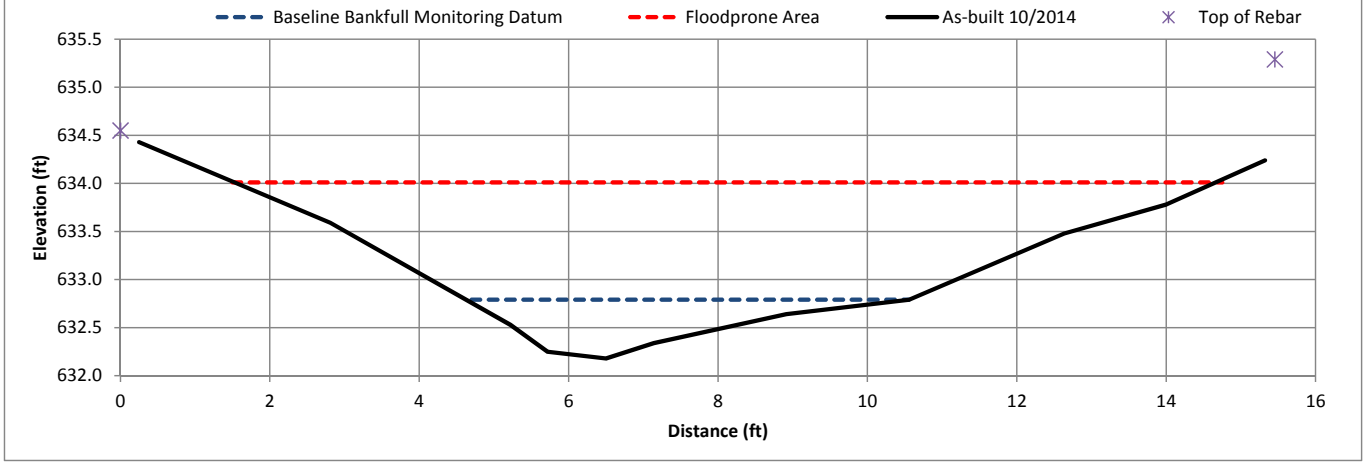
Station	Elevation
0	634.55
0.249	634.43
2.808	633.59
5.22	632.53
5.717	632.25
6.499	632.18
7.14	632.34
8.914	632.64
10.557	632.79
12.635	633.48
13.999	633.78
15.322	634.24
15.455	635.29

SUMMARY DATA	
Bankfull Elevation:	632.79
Bankfull Cross-Sectional Area:	1.69
Bankfull Width:	5.91
Flood Prone Area Elevation:	634.01
Flood Prone Width:	13.14
Max Depth at Bankfull:	0.61
Mean Depth at Bankful:	0.29
W/D Ratio:	20.67
Entrenchment Ratio:	2.22
Bank Height Ratio:	0.46

Stream Type	B6

Station and description	1802.03 UT3-2R Looking Upstream

UT3 to Little Buffalo Creek Mainstem
X-Section 3, Riffle, Station 18+02.03



Cross Section Plot Exhibit

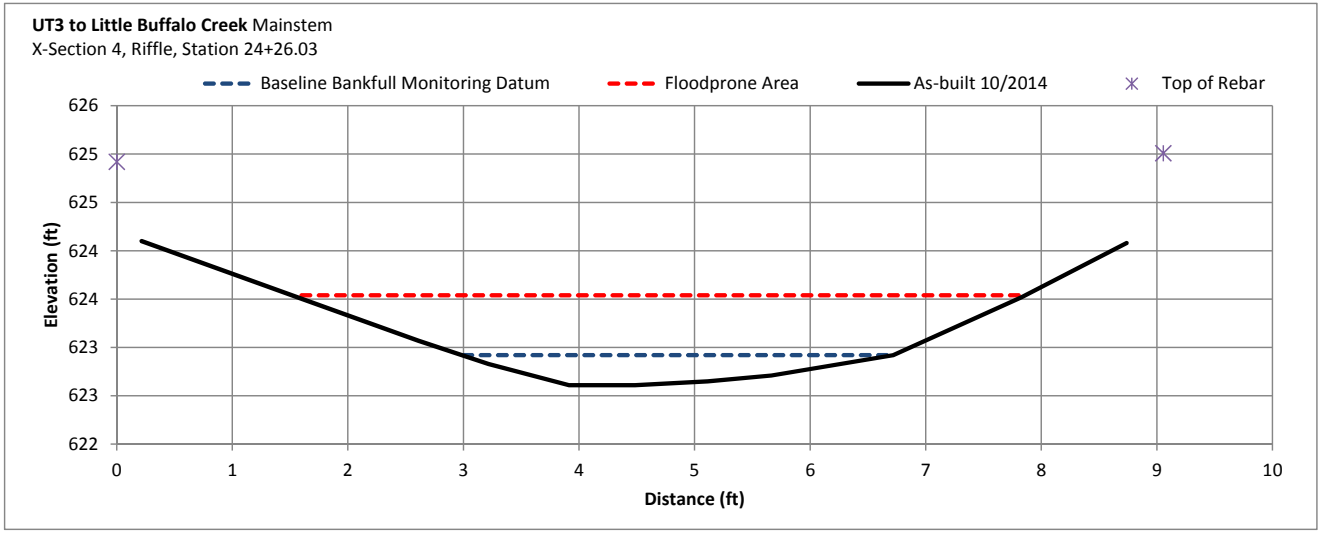
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT3-3R
Drainage Area (sq mi):	0.097
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	624.92
0.215	624.1
1.609	623.5
2.611	623.07
3.217	622.83
3.915	622.61
4.484	622.61
5.113	622.65
5.664	622.71
6.718	622.92
7.828	623.52
8.738	624.08
9.055	625.01

SUMMARY DATA	
Bankfull Elevation:	622.92
Bankfull Cross-Sectional Area:	0.75
Bankfull Width:	3.73
Flood Prone Area Elevation:	623.54
Flood Prone Width:	6.35
Max Depth at Bankfull:	0.31
Mean Depth at Bankful:	0.20
W/D Ratio:	18.61
Entrenchment Ratio:	1.70
Bank Height Ratio:	0.68

Stream Type	B6

Station and description	2426.03 UT3-3R Looking Upstream



Cross Section Plot Exhibit

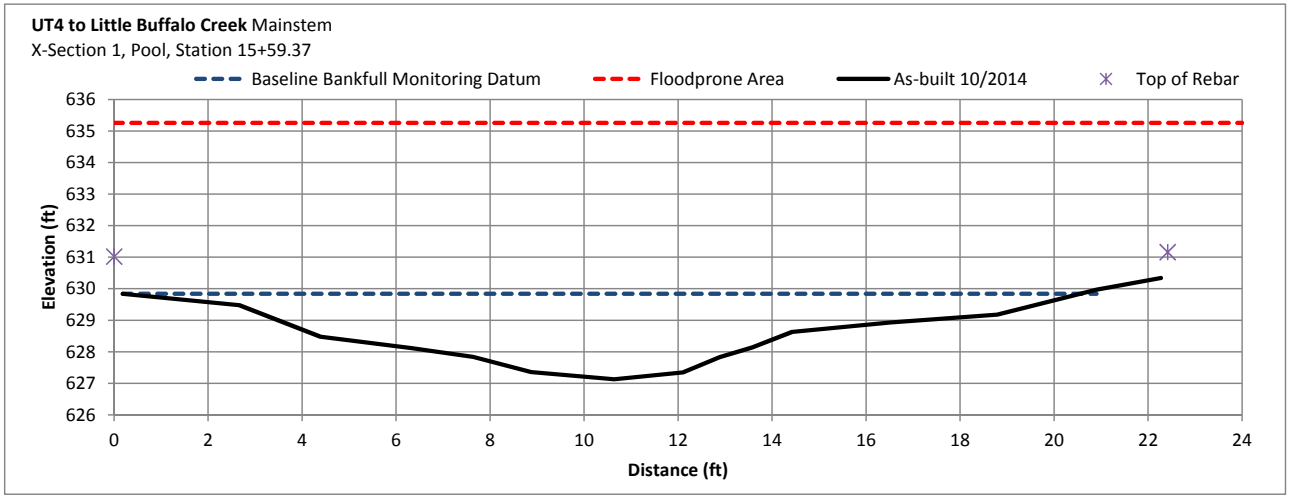
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT4-1P
Drainage Area (sq mi):	0.4
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	631.02
0.185	629.84
2.663	629.48
4.388	628.48
6.318	628.12
7.638	627.84
8.873	627.36
10.639	627.13
12.106	627.35
12.886	627.83
13.576	628.14
14.426	628.63
16.518	628.93
18.789	629.18
20.905	629.97
22.273	630.34
22.416	631.16

SUMMARY DATA	
Bankfull Elevation:	629.84
Bankfull Cross-Sectional Area:	27.37
Bankfull Width:	20.38
Flood Prone Area Elevation:	635.26
Flood Prone Width:	>100
Max Depth at Bankfull:	2.71
Mean Depth at Bankful:	1.34
W/D Ratio:	15.18
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.63

Stream Type	C4b

Station and description	1559.37 UT4-1P Looking Upstream



Cross Section Plot Exhibit

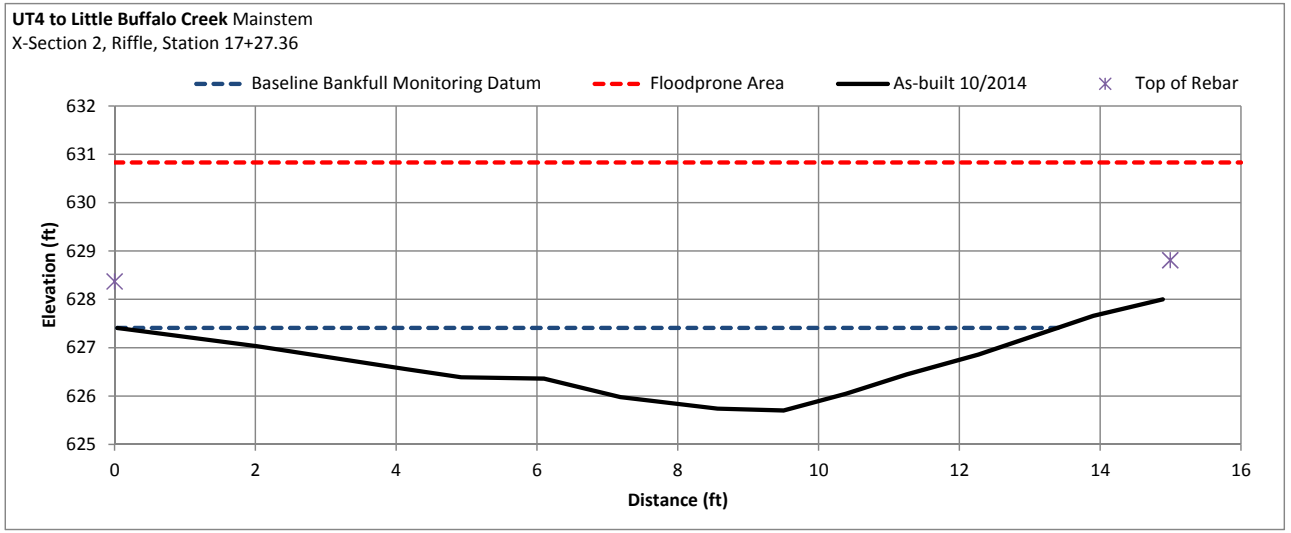
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT4-1R
Drainage Area (sq mi):	0.4
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	628.37
0.04	627.41
2.026	627.03
4.124	626.56
4.924	626.39
6.105	626.36
7.184	625.98
8.564	625.74
9.5	625.70
10.389	626.05
11.253	626.45
12.27	626.86
13.902	627.66
14.888	628
14.994	628.81

SUMMARY DATA	
Bankfull Elevation:	627.41
Bankfull Cross-Sectional Area:	12.13
Bankfull Width:	13.32
Flood Prone Area Elevation:	630.83
Flood Prone Width:	>50
Max Depth at Bankfull:	1.71
Mean Depth at Bankful:	0.91
W/D Ratio:	14.63
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.60

Stream Type	C4b

Station and description	1727.36 UT4-1R Looking Upstream



Cross Section Plot Exhibit

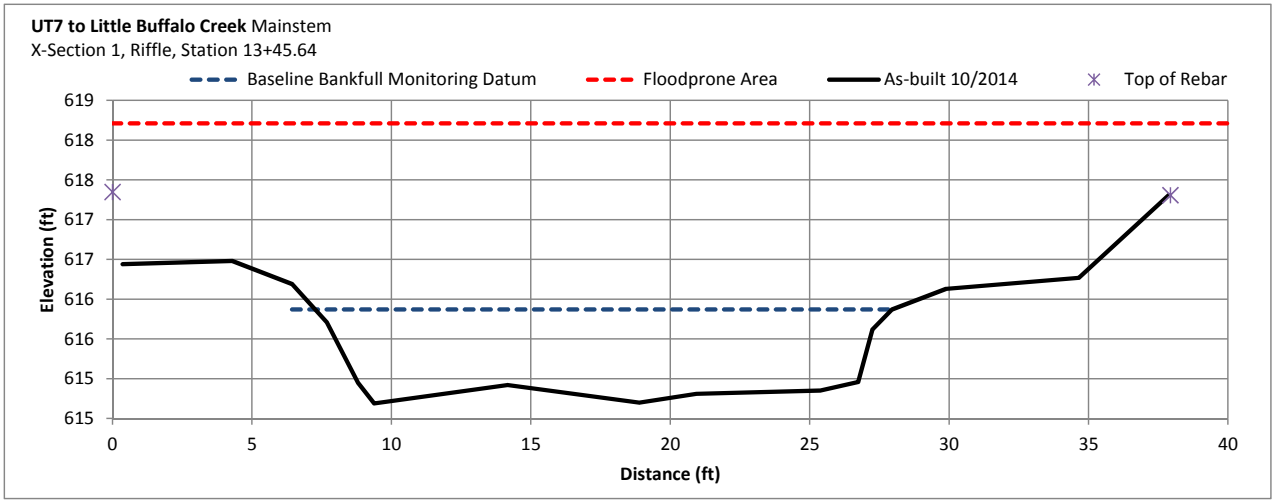
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT7-1R
Drainage Area (sq mi):	1.91
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	617.35
0.363	616.44
4.299	616.48
6.438	616.19
7.683	615.71
8.803	614.95
9.379	614.69
14.168	614.92
18.89	614.7
20.937	614.81
25.368	614.85
26.738	614.96
27.25	615.62
27.95	615.87
29.887	616.13
34.651	616.27
37.874	617.31
37.934	617.31

SUMMARY DATA	
Bankfull Elevation:	615.87
Bankfull Cross-Sectional Area:	19.93
Bankfull Width:	20.71
Flood Prone Area Elevation:	618.21
Flood Prone Width:	>100
Max Depth at Bankfull:	1.17
Mean Depth at Bankful:	0.96
W/D Ratio:	21.52
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.78

Stream Type	C4

Station and description	1345.64 UT7-1R Looking Upstream



Cross Section Plot Exhibit

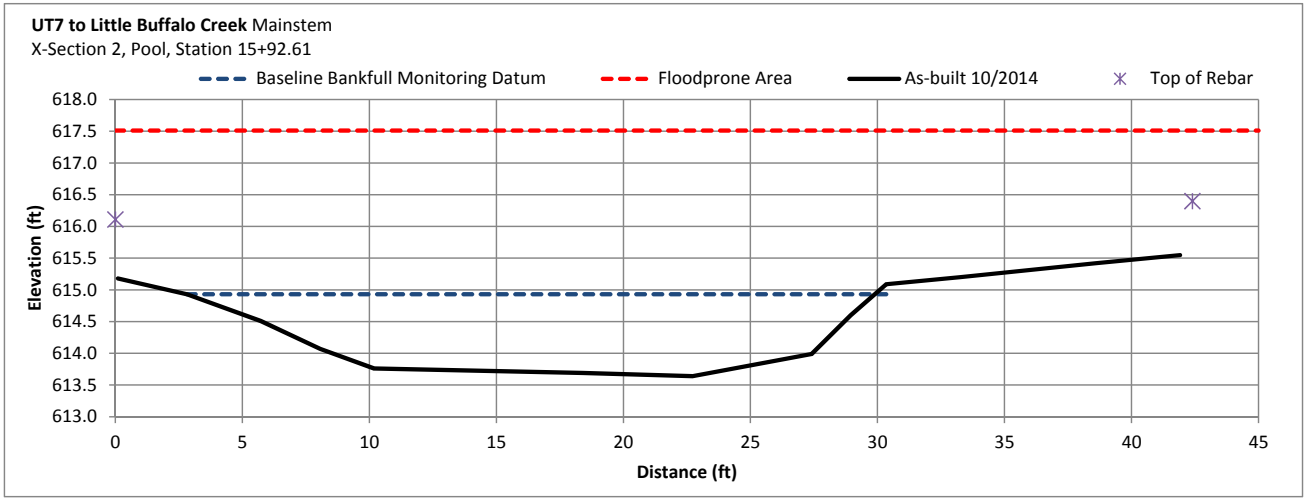
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT7-1P
Drainage Area (sq mi):	1.91
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	616.11
0.1	615.18
2.82	614.93
5.726	614.51
8.059	614.07
10.188	613.76
18.394	613.69
22.713	613.64
27.409	613.99
28.947	614.6
30.345	615.09
33.239	615.2
38.568	615.42
41.907	615.55
42.395	616.4

SUMMARY DATA	
Bankfull Elevation:	614.93
Bankfull Cross-Sectional Area:	25.98
Bankfull Width:	27.1
Flood Prone Area Elevation:	617.51
Flood Prone Width:	>80
Max Depth at Bankfull:	1.29
Mean Depth at Bankful:	0.96
W/D Ratio:	28.27
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.67

Stream Type	C4

Station and description	1592.61 UT7-1P Looking Upstream



Cross Section Plot Exhibit

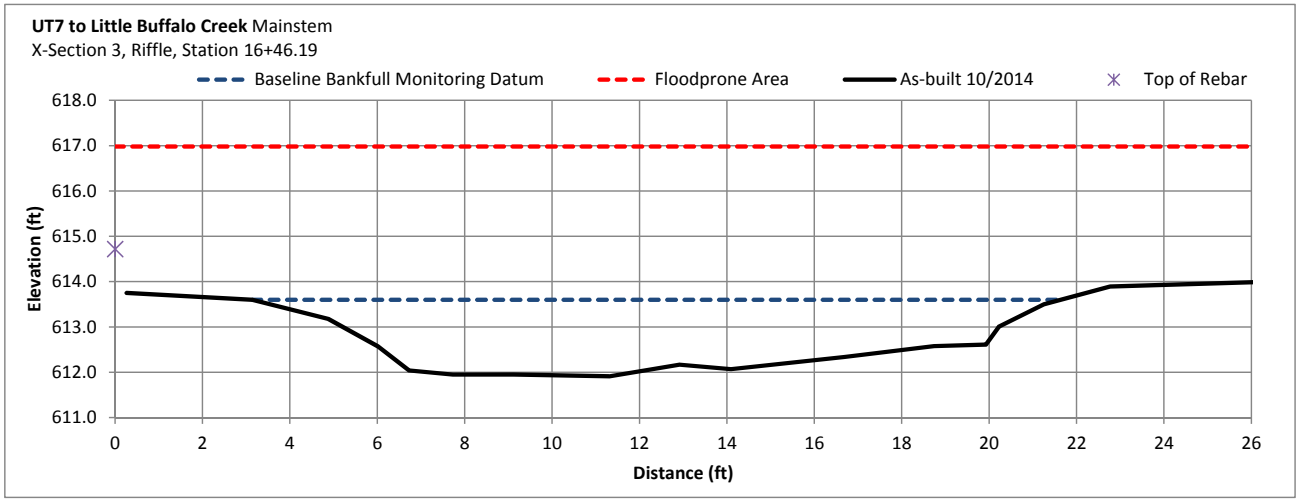
River Basin:	Yadkin-Pee Dee River
Watershed:	Little Buffalo Creek
XS ID:	UT7-2R
Drainage Area (sq mi):	1.91
Date:	6/5/2015
Field Crew:	David Turner, Turner Land Surveying

Station	Elevation
0	614.72
0.265	613.75
3.147	613.6
4.878	613.18
6.016	612.57
6.725	612.04
7.73	611.95
9.116	611.95
11.31	611.91
12.912	612.17
14.091	612.07
16.683	612.34
18.738	612.58
19.923	612.61
20.224	613.01
21.248	613.5
22.761	613.89
26.532	614
26.726	614.91

SUMMARY DATA	
Bankfull Elevation:	613.6
Bankfull Cross-Sectional Area:	21.68
Bankfull Width:	18.58
Flood Prone Area Elevation:	616.98
Flood Prone Width:	>80
Max Depth at Bankfull:	1.69
Mean Depth at Bankful:	1.17
W/D Ratio:	15.92
Entrenchment Ratio:	>2.2
Bank Height Ratio:	0.92

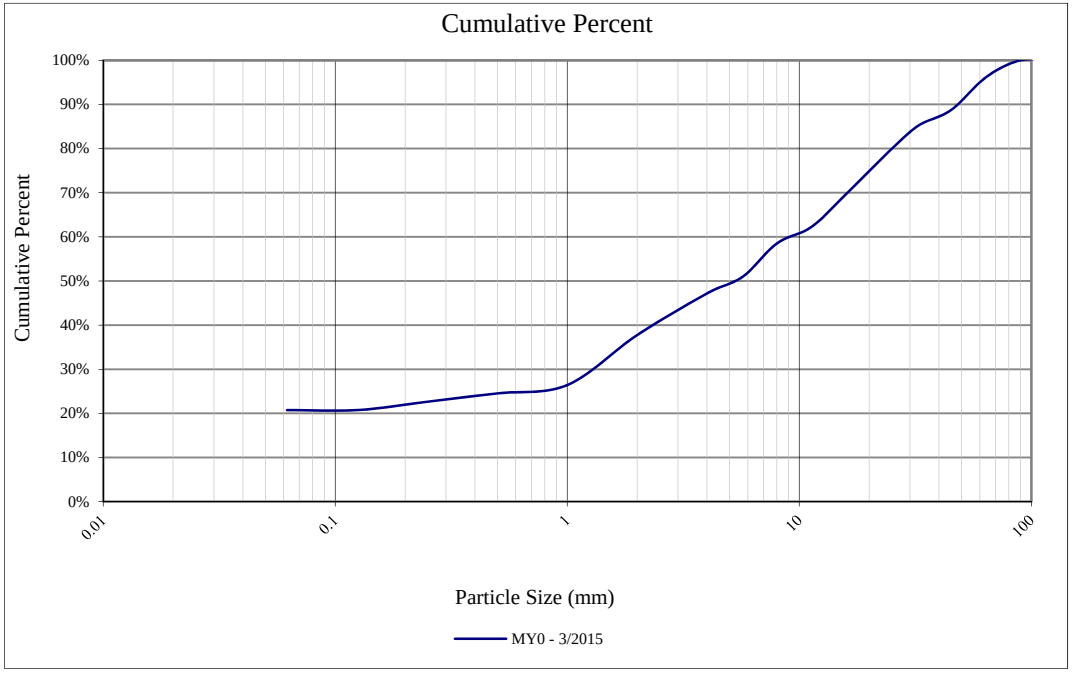
Stream Type	C4

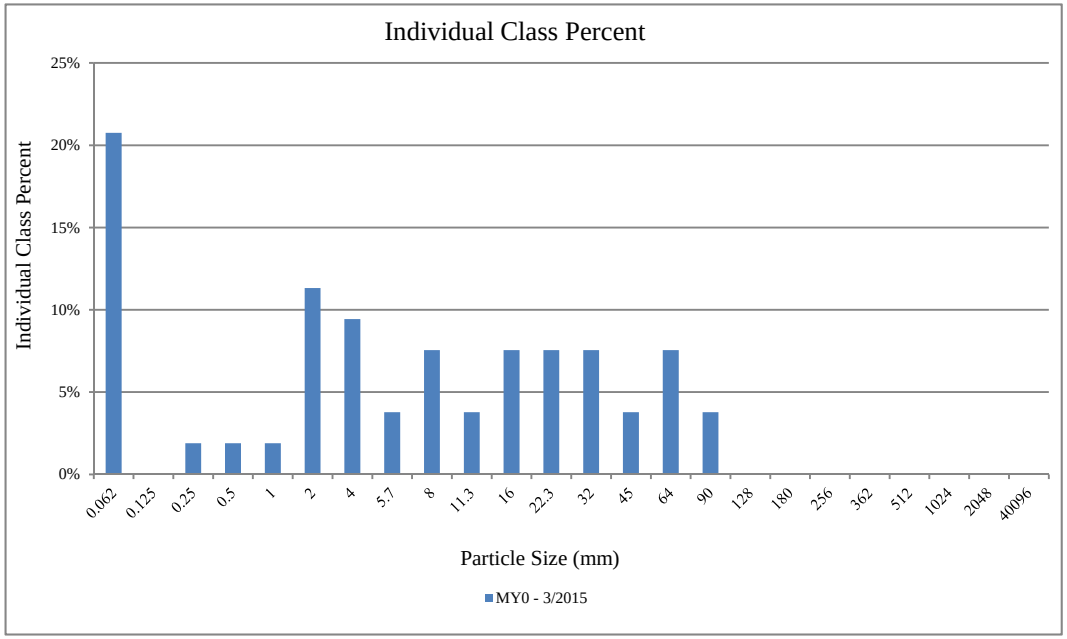
Station and description	1846.19 UT7-2R Looking Upstream



Project Name: Little Buffalo Creek					
Cross-Section: MS-1P					
Feature: Pool					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	11	21%	21%
Sand	very fine sand	0.125	0	0%	21%
	fine sand	0.250	1	2%	23%
	medium sand	0.50	1	2%	25%
	coarse sand	1.00	1	2%	26%
	very coarse sand	2.0	6	11%	38%
Gravel	very fine gravel	4.0	5	9%	47%
	fine gravel	5.7	2	4%	51%
	fine gravel	8.0	4	8%	58%
	medium gravel	11.3	2	4%	62%
	medium gravel	16.0	4	8%	70%
	coarse gravel	22.3	4	8%	77%
	coarse gravel	32.0	4	8%	85%
	very coarse gravel	45	2	4%	89%
	very coarse gravel	64	4	8%	96%
Cobble	small cobble	90	2	4%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			53	100%	100%

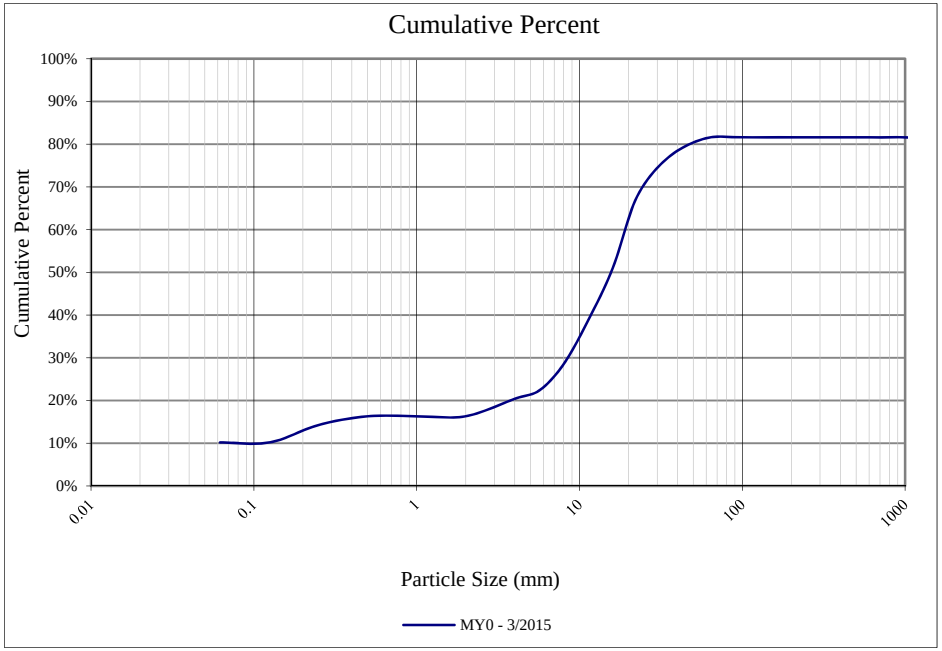
Summary Data	
D16	0
D35	1.75
D50	5
D84	31
D95	60
D100	89

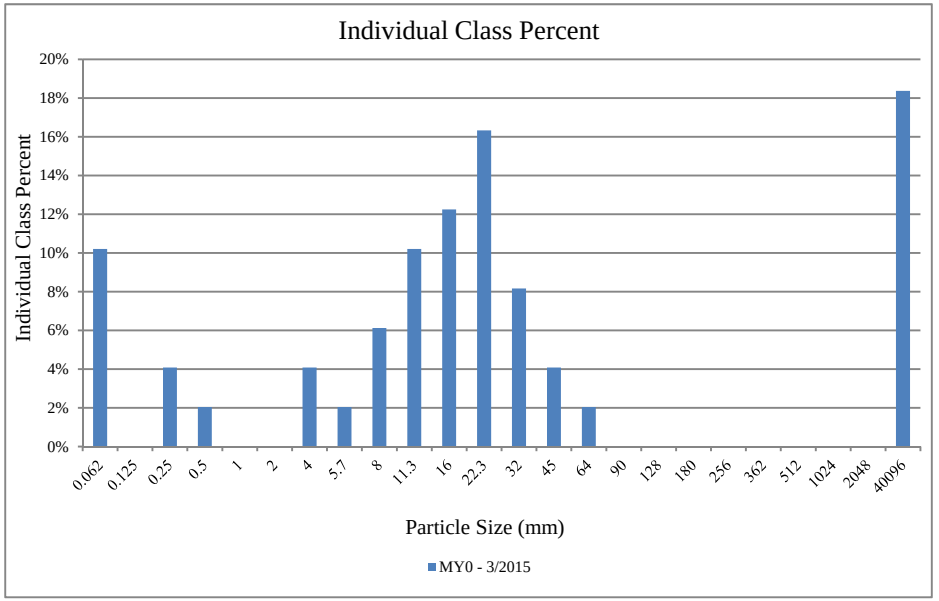




Project Name: Little Buffalo Creek					
Cross-Section: MS-1R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	5	10%	10%
Sand	very fine sand	0.125	0	0%	10%
	fine sand	0.250	2	4%	14%
	medium sand	0.50	1	2%	16%
	coarse sand	1.00	0	0%	16%
	very coarse sand	2.0	0	0%	16%
Gravel	very fine gravel	4.0	2	4%	20%
	fine gravel	5.7	1	2%	22%
	fine gravel	8.0	3	6%	29%
	medium gravel	11.3	5	10%	39%
	medium gravel	16.0	6	12%	51%
	coarse gravel	22.3	8	16%	67%
	coarse gravel	32.0	4	8%	76%
	very coarse gravel	45	2	4%	80%
	very coarse gravel	64	1	2%	82%
Cobble	small cobble	90	0	0%	82%
	medium cobble	128	0	0%	82%
	large cobble	180	0	0%	82%
	very large cobble	256	0	0%	82%
Boulder	small boulder	362	0	0%	82%
	small boulder	512	0	0%	82%
	medium boulder	1024	0	0%	82%
	large boulder	2048	0	0%	82%
Bedrock	bedrock	40096	9	18%	100%
TOTAL % of whole count			49	100%	100%

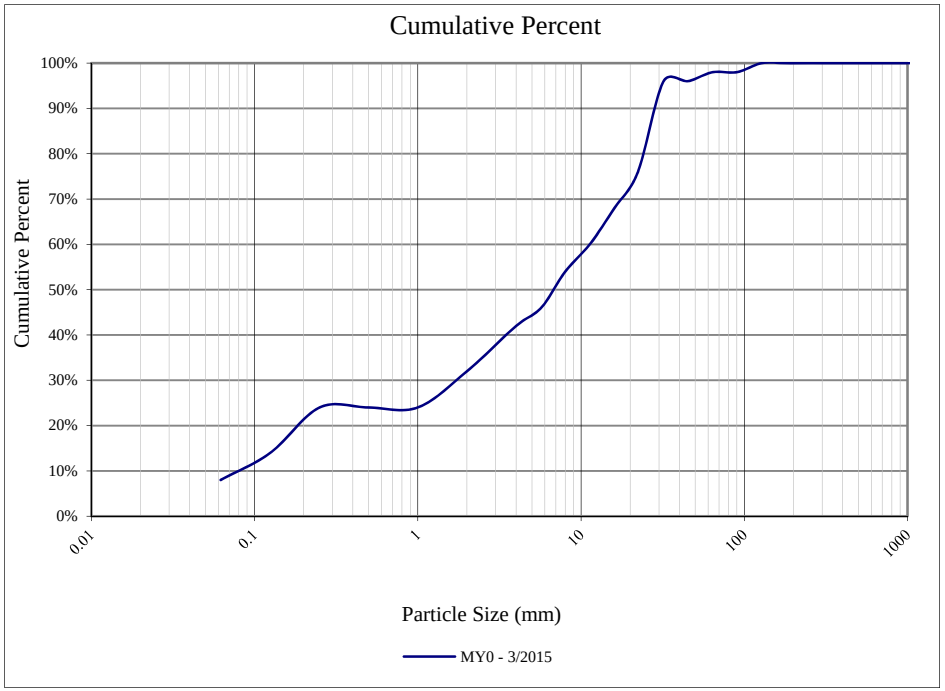
Summary Data	
D16	0.50
D35	10.00
D50	15.90
D84	100.00
D95	800.00
D100	Bedrock

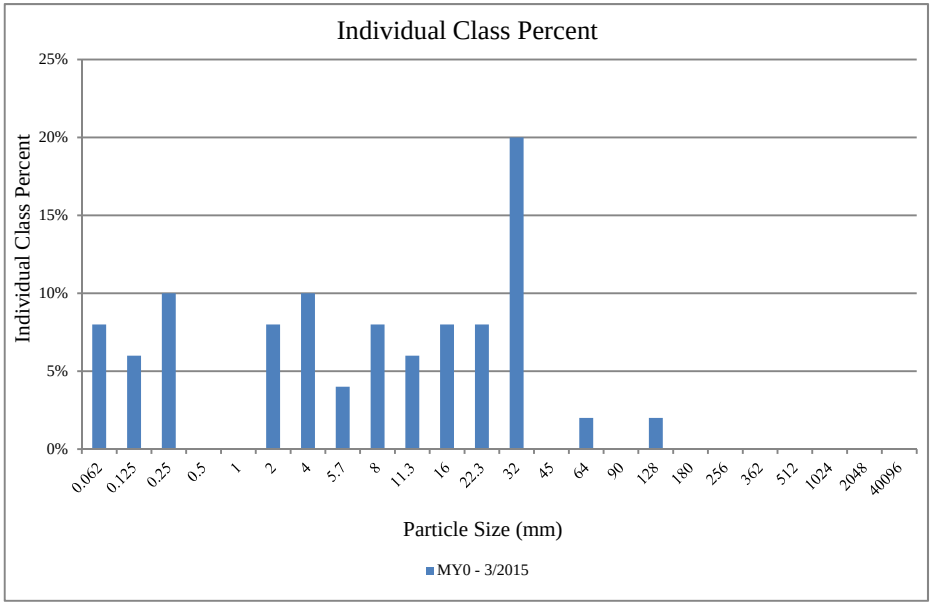




Project Name: Little Buffalo Creek					
Cross-Section: MS-2P					
Feature: Pool					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	4	8%	8%
Sand	very fine sand	0.125	3	6%	14%
	fine sand	0.250	5	10%	24%
	medium sand	0.50	0	0%	24%
	coarse sand	1.00	0	0%	24%
	very coarse sand	2.0	4	8%	32%
Gravel	very fine gravel	4.0	5	10%	42%
	fine gravel	5.7	2	4%	46%
	fine gravel	8.0	4	8%	54%
	medium gravel	11.3	3	6%	60%
	medium gravel	16.0	4	8%	68%
	coarse gravel	22.3	4	8%	76%
	coarse gravel	32.0	10	20%	96%
	very coarse gravel	45	0	0%	96%
	very coarse gravel	64	1	2%	98%
Cobble	small cobble	90	0	0%	98%
	medium cobble	128	1	2%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			50	100%	100%

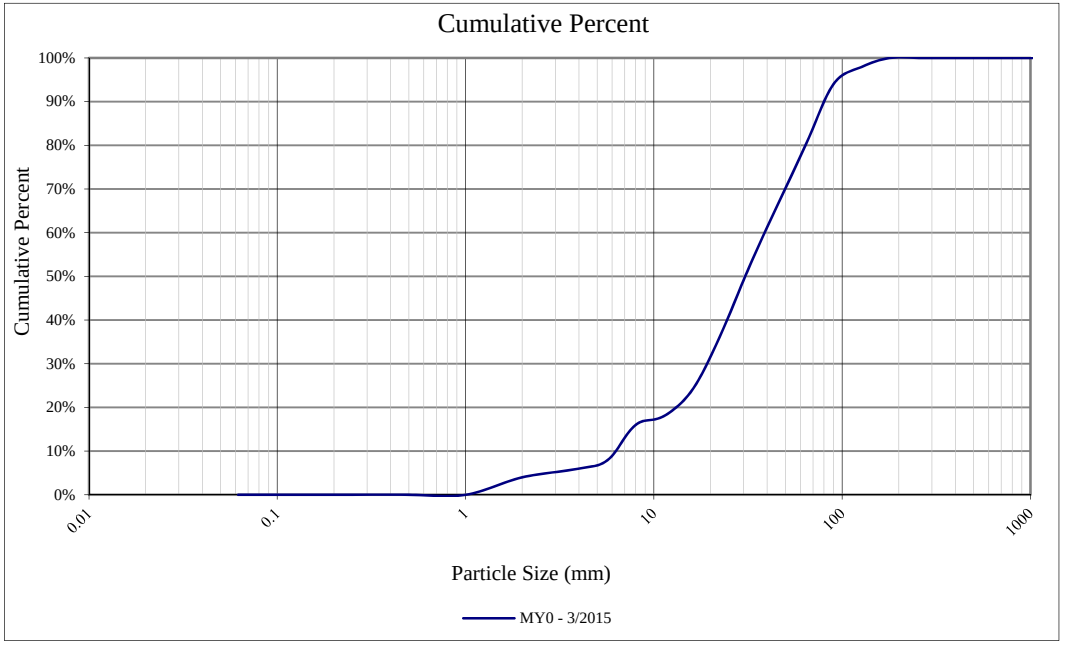
Summary Data	
D16	0.15
D35	2.50
D50	6.70
D84	26.00
D95	31.00
D100	128.00

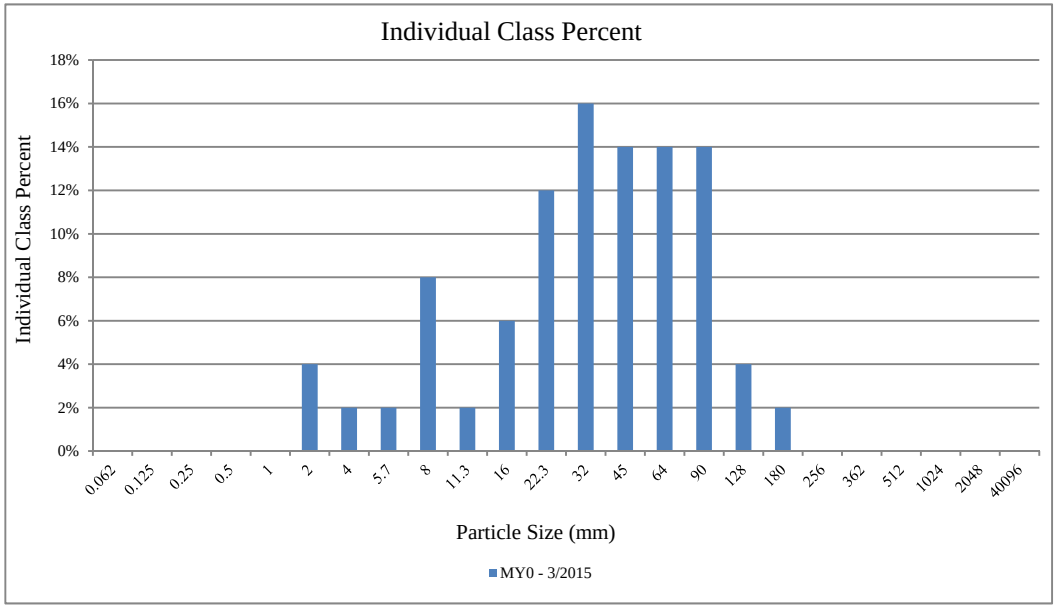




Project Name: Little Buffalo Creek					
Cross-Section: MS-2R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.250	0	0%	0%
	medium sand	0.50	0	0%	0%
	coarse sand	1.00	0	0%	0%
	very coarse sand	2.0	2	4%	4%
Gravel	very fine gravel	4.0	1	2%	6%
	fine gravel	5.7	1	2%	8%
	fine gravel	8.0	4	8%	16%
	medium gravel	11.3	1	2%	18%
	medium gravel	16.0	3	6%	24%
	coarse gravel	22.3	6	12%	36%
	coarse gravel	32.0	8	16%	52%
	very coarse gravel	45	7	14%	66%
	very coarse gravel	64	7	14%	80%
Cobble	small cobble	90	7	14%	94%
	medium cobble	128	2	4%	98%
	large cobble	180	1	2%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			50	100%	100%

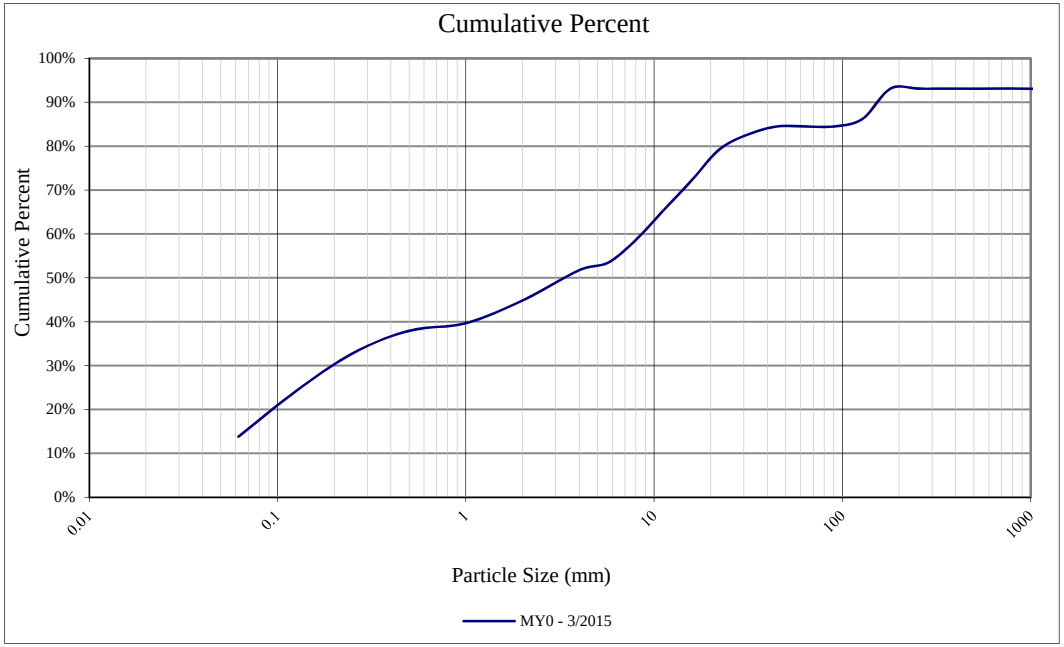
Summary Data	
D16	8
D35	22.5
D50	31
D84	71
D95	100
D100	180

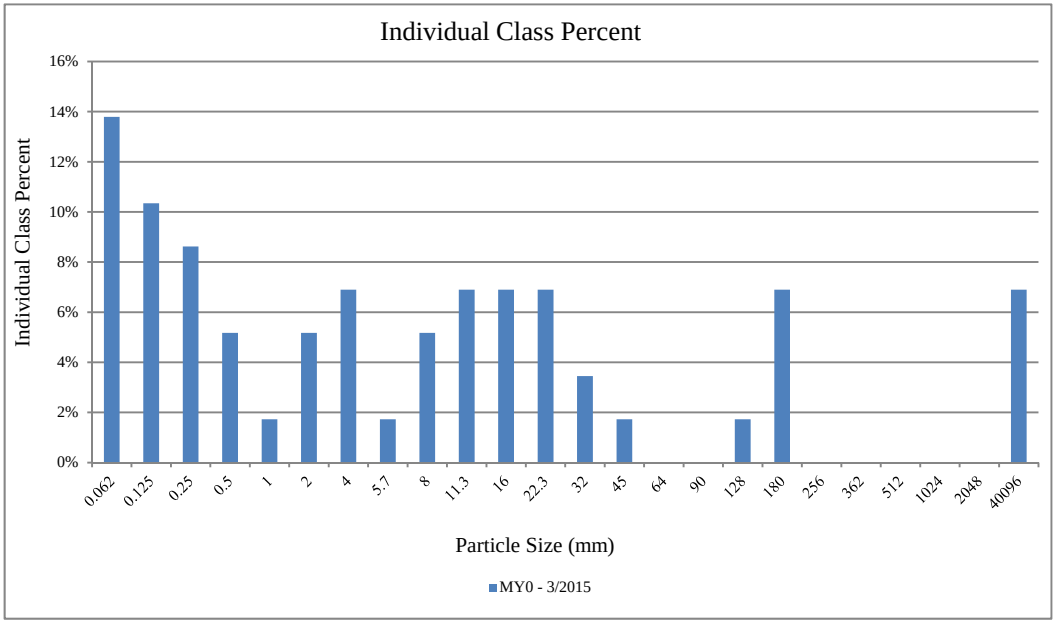




Project Name: Little Buffalo Creek					
Cross-Section: MS-3P					
Feature: Pool					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	8	14%	14%
Sand	very fine sand	0.125	6	10%	24%
	fine sand	0.250	5	9%	33%
	medium sand	0.50	3	5%	38%
	coarse sand	1.00	1	2%	40%
	very coarse sand	2.0	3	5%	45%
Gravel	very fine gravel	4.0	4	7%	52%
	fine gravel	5.7	1	2%	53%
	fine gravel	8.0	3	5%	59%
	medium gravel	11.3	4	7%	66%
	medium gravel	16.0	4	7%	72%
	coarse gravel	22.3	4	7%	79%
	coarse gravel	32.0	2	3%	83%
	very coarse gravel	45	1	2%	84%
	very coarse gravel	64	0	0%	84%
Cobble	small cobble	90	0	0%	84%
	medium cobble	128	1	2%	86%
	large cobble	180	4	7%	93%
	very large cobble	256	0	0%	93%
Boulder	small boulder	362	0	0%	93%
	small boulder	512	0	0%	93%
	medium boulder	1024	0	0%	93%
	large boulder	2048	0	0%	93%
Bedrock	bedrock	40096	4	7%	100%
TOTAL % of whole count			58	100%	100%

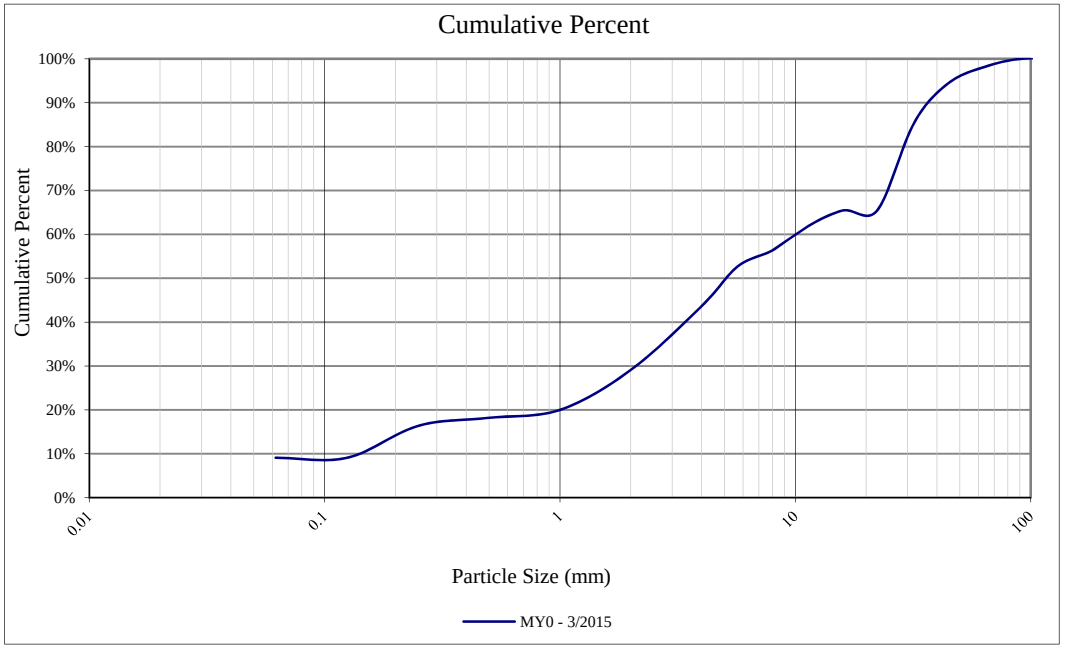
Summary Data	
D16	0.07
D35	0.35
D50	3.4
D84	40
D95	340
D100	Bedrock

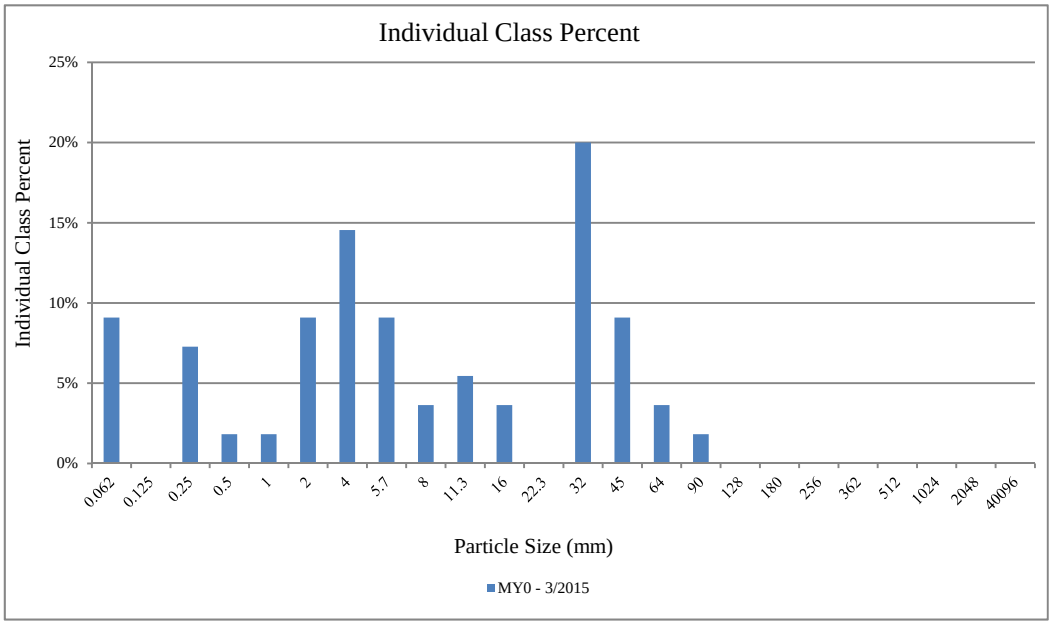




Project Name: Little Buffalo Creek					
Cross-Section: UT2-1R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	5	9%	9%
Sand	very fine sand	0.125	0	0%	9%
	fine sand	0.250	4	7%	16%
	medium sand	0.50	1	2%	18%
	coarse sand	1.00	1	2%	20%
	very coarse sand	2.0	5	9%	29%
Gravel	very fine gravel	4.0	8	15%	44%
	fine gravel	5.7	5	9%	53%
	fine gravel	8.0	2	4%	56%
	medium gravel	11.3	3	5%	62%
	medium gravel	16.0	2	4%	65%
	coarse gravel	22.3	0	0%	65%
	coarse gravel	32.0	11	20%	85%
	very coarse gravel	45	5	9%	95%
	very coarse gravel	64	2	4%	98%
Cobble	small cobble	90	1	2%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			55	100%	100%

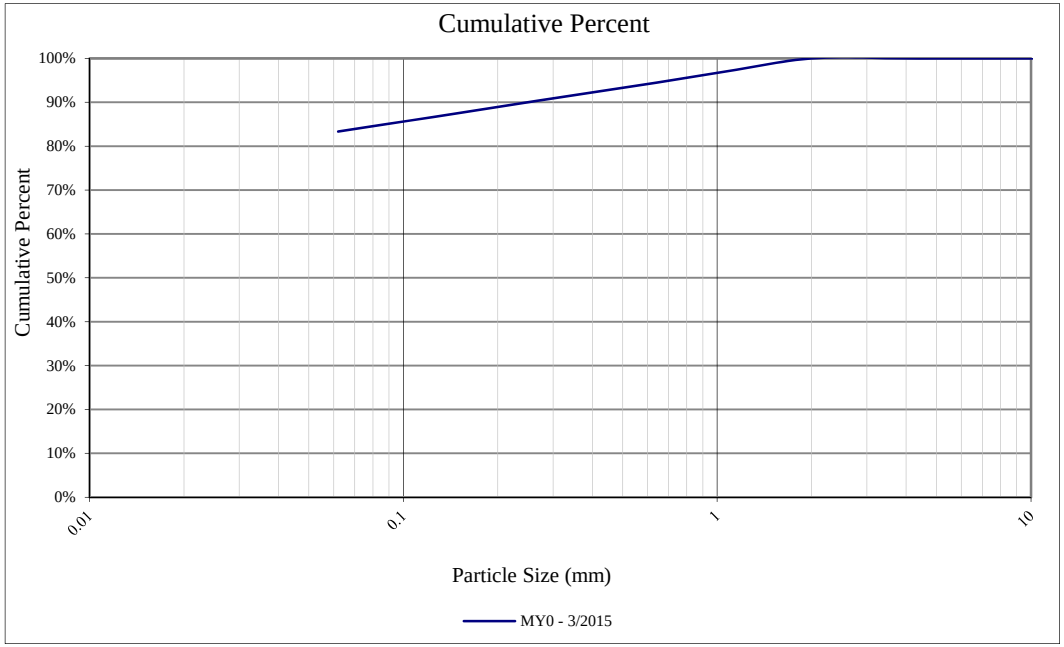
Summary Data	
D16	0.25
D35	2.7
D50	5
D84	30
D95	45
D100	90

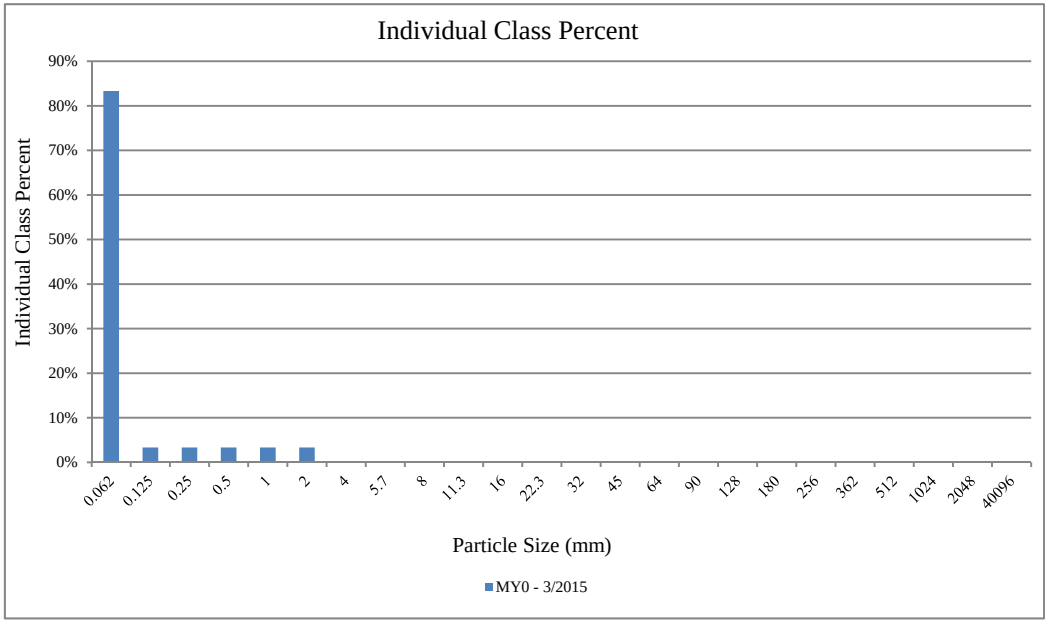




Project Name: Little Buffalo Creek					
Cross-Section: UT3-1R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	25	83%	83%
Sand	very fine sand	0.125	1	3%	87%
	fine sand	0.250	1	3%	90%
	medium sand	0.50	1	3%	93%
	coarse sand	1.00	1	3%	97%
	very coarse sand	2.0	1	3%	100%
Gravel	very fine gravel	4.0	0	0%	100%
	fine gravel	5.7	0	0%	100%
	fine gravel	8.0	0	0%	100%
	medium gravel	11.3	0	0%	100%
	medium gravel	16.0	0	0%	100%
	coarse gravel	22.3	0	0%	100%
	coarse gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			30	100%	100%

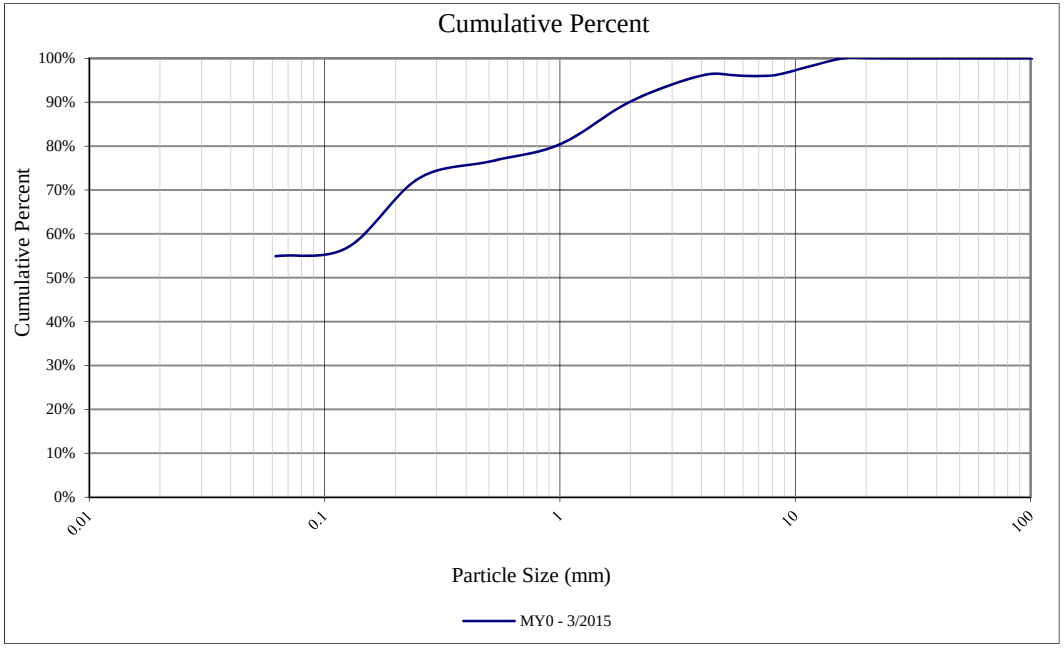
Summary Data	
D16	0.00
D35	0.00
D50	0.00
D84	0.00
D95	0.70
D100	2.00

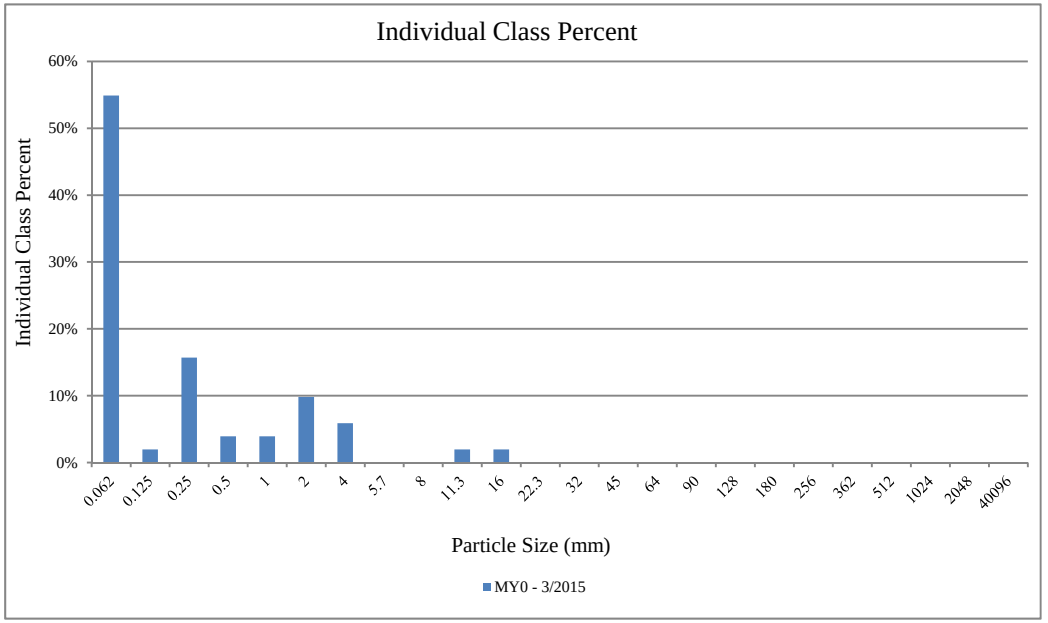




Project Name: Little Buffalo Creek					
Cross-Section: UT3-1P					
Feature: Pool					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	28	55%	55%
Sand	very fine sand	0.125	1	2%	57%
	fine sand	0.250	8	16%	73%
	medium sand	0.50	2	4%	76%
	coarse sand	1.00	2	4%	80%
	very coarse sand	2.0	5	10%	90%
Gravel	very fine gravel	4.0	3	6%	96%
	fine gravel	5.7	0	0%	96%
	fine gravel	8.0	0	0%	96%
	medium gravel	11.3	1	2%	98%
	medium gravel	16.0	1	2%	100%
	coarse gravel	22.3	0	0%	100%
	coarse gravel	32.0	0	0%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			51	100%	100%

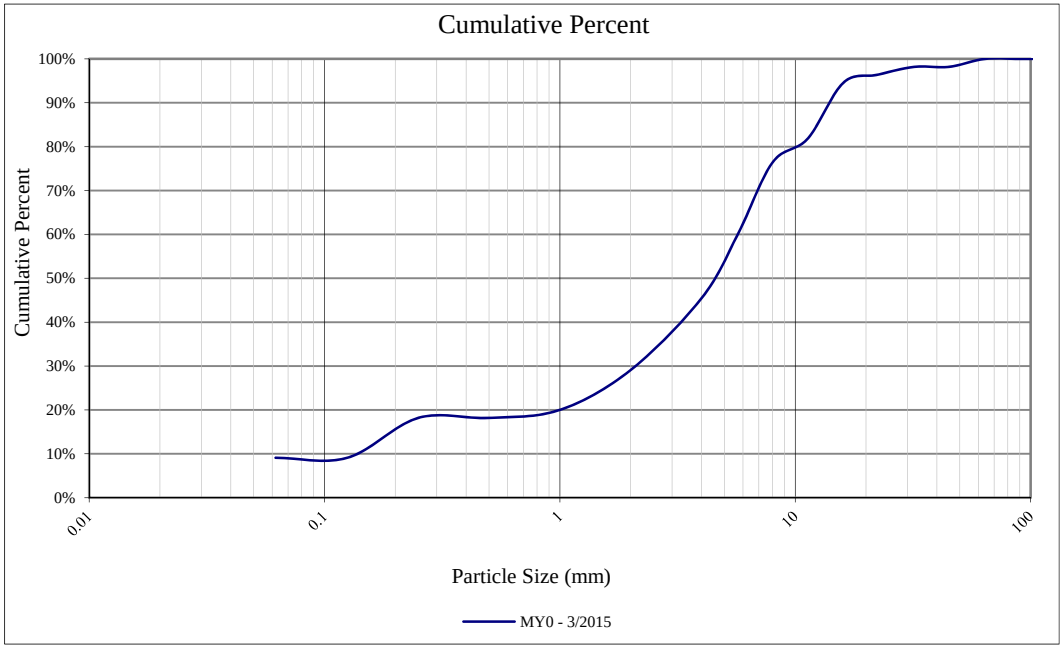
Summary Data	
D16	0.00
D35	0.00
D50	0.00
D84	1.30
D95	3.50
D100	16.00

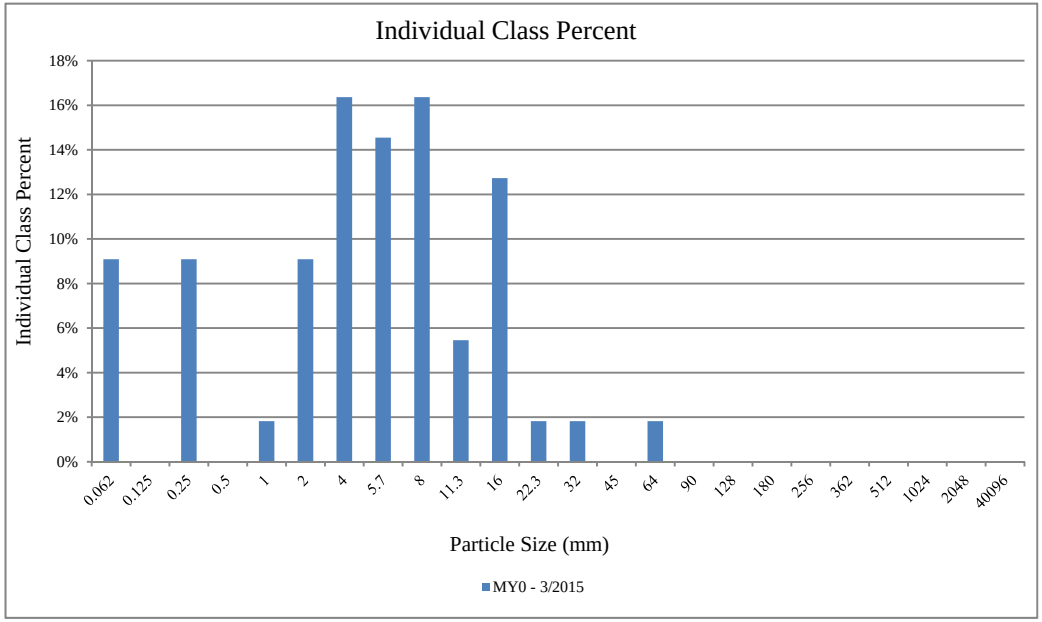




Project Name: Little Buffalo Creek					
Cross-Section: UT3-2R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	5	9%	9%
Sand	very fine sand	0.125	0	0%	9%
	fine sand	0.250	5	9%	18%
	medium sand	0.50	0	0%	18%
	coarse sand	1.00	1	2%	20%
	very coarse sand	2.0	5	9%	29%
Gravel	very fine gravel	4.0	9	16%	45%
	fine gravel	5.7	8	15%	60%
	fine gravel	8.0	9	16%	76%
	medium gravel	11.3	3	5%	82%
	medium gravel	16.0	7	13%	95%
	coarse gravel	22.3	1	2%	96%
	coarse gravel	32.0	1	2%	98%
	very coarse gravel	45	0	0%	98%
	very coarse gravel	64	1	2%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			55	100%	100%

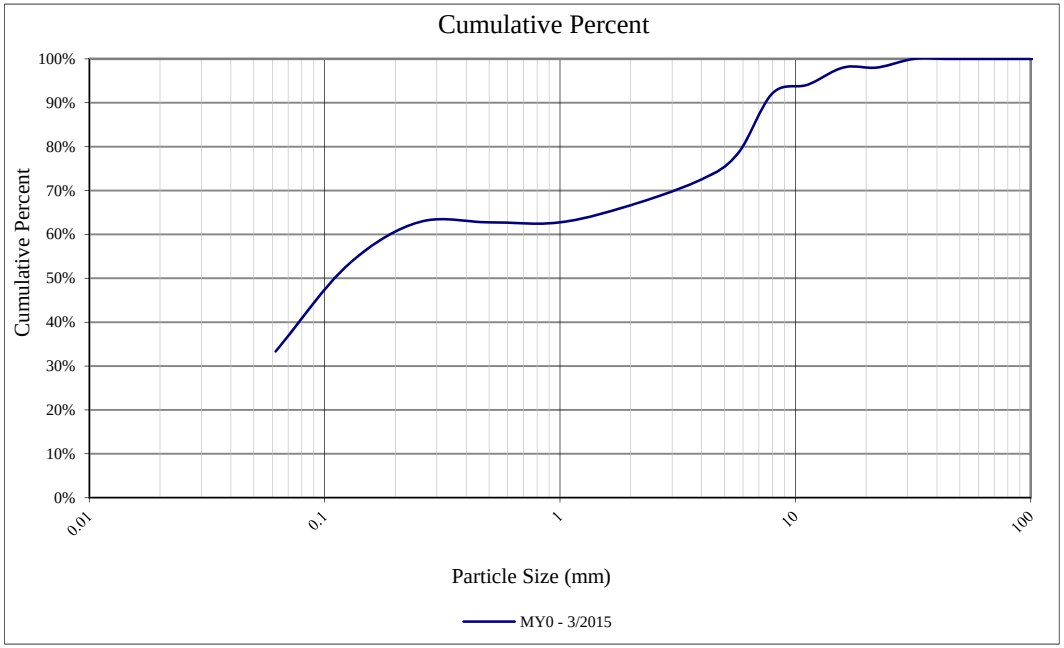
Summary Data	
D16	0.18
D35	2.55
D50	4.50
D84	12.00
D95	18.00
D100	64.00

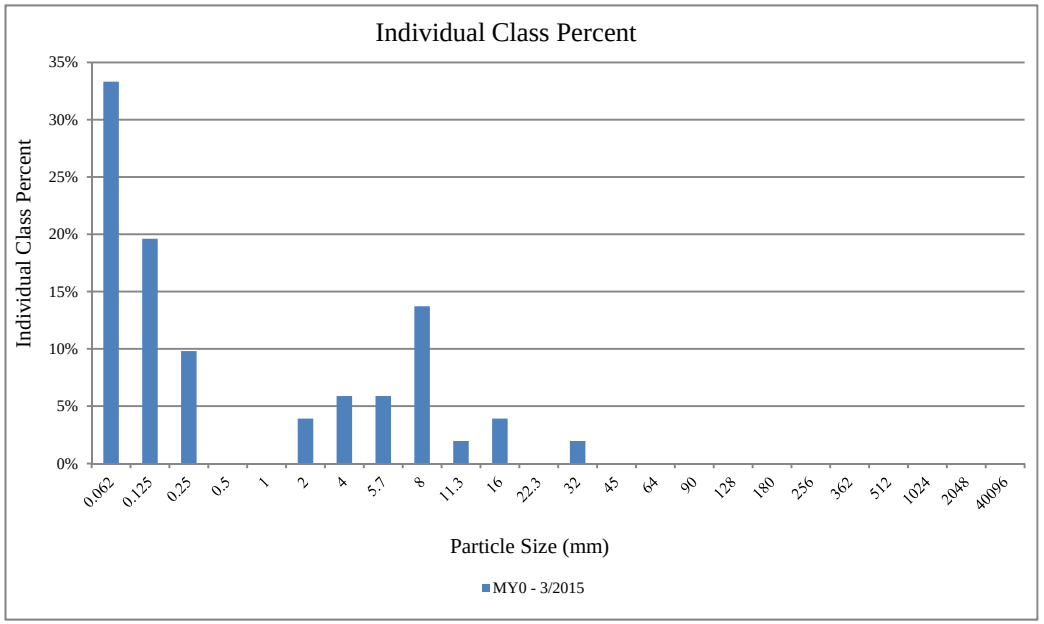




Project Name: Little Buffalo Creek					
Cross-Section: UT3-3R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	17	33%	33%
Sand	very fine sand	0.125	10	20%	53%
	fine sand	0.250	5	10%	63%
	medium sand	0.50	0	0%	63%
	coarse sand	1.00	0	0%	63%
	very coarse sand	2.0	2	4%	67%
Gravel	very fine gravel	4.0	3	6%	73%
	fine gravel	5.7	3	6%	78%
	fine gravel	8.0	7	14%	92%
	medium gravel	11.3	1	2%	94%
	medium gravel	16.0	2	4%	98%
	coarse gravel	22.3	0	0%	98%
	coarse gravel	32.0	1	2%	100%
	very coarse gravel	45	0	0%	100%
	very coarse gravel	64	0	0%	100%
Cobble	small cobble	90	0	0%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			51	100%	100%

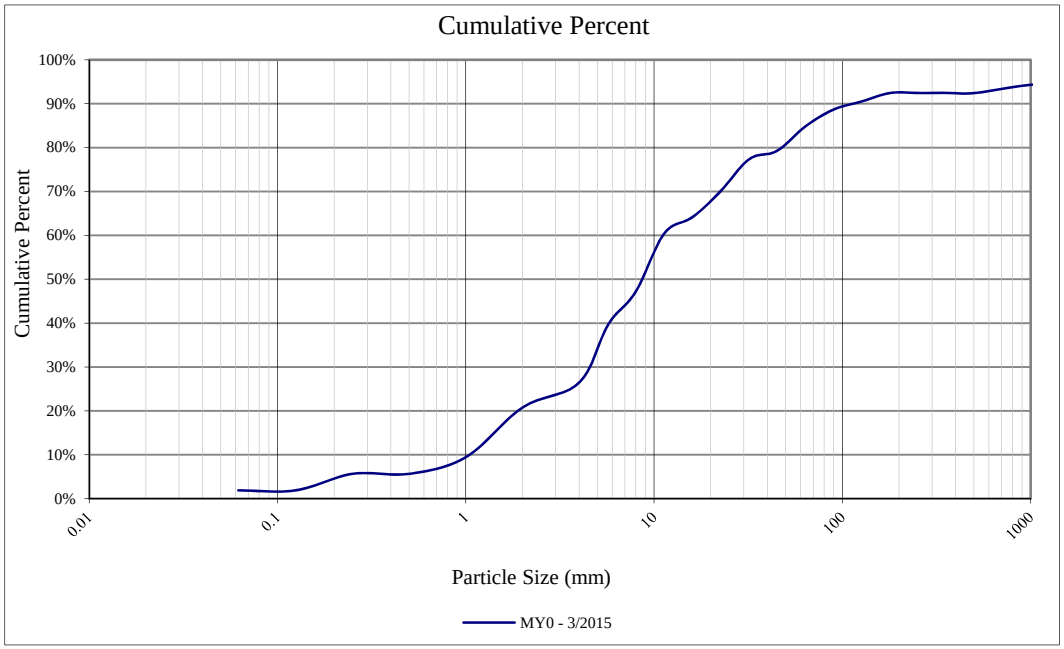
Summary Data	
D16	0.00
D35	0.07
D50	0.11
D84	6.50
D95	13.00
D100	32.00

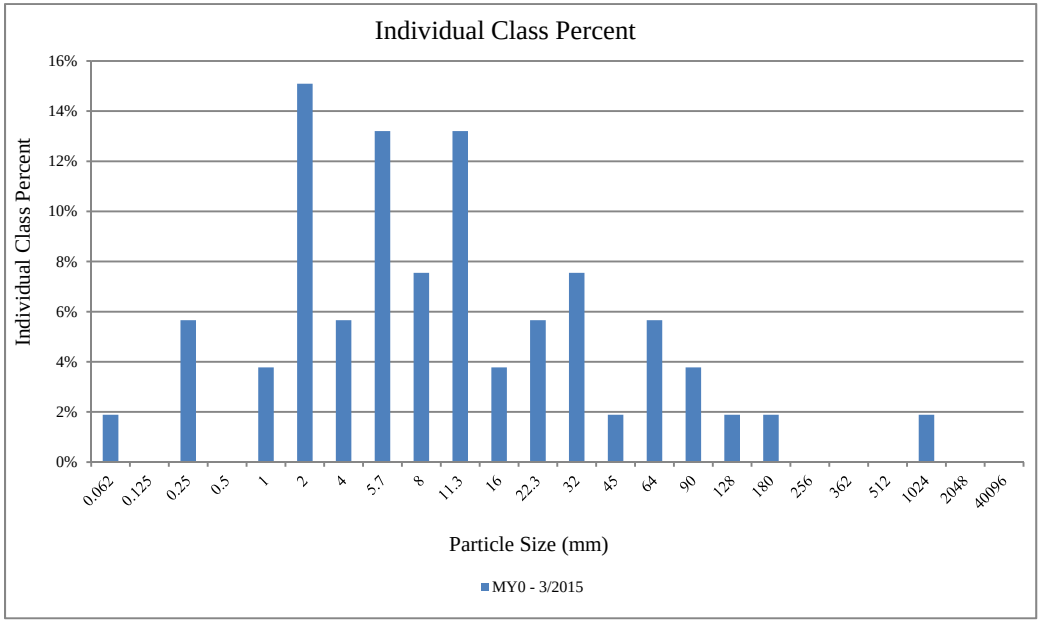




Project Name: Little Buffalo Creek					
Cross-Section: UT4-1P					
Feature: Pool					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	1	2%	2%
Sand	very fine sand	0.125	0	0%	2%
	fine sand	0.250	3	6%	6%
	medium sand	0.50	0	0%	6%
	coarse sand	1.00	2	4%	9%
	very coarse sand	2.0	8	15%	21%
Gravel	very fine gravel	4.0	3	6%	26%
	fine gravel	5.7	7	13%	40%
	fine gravel	8.0	4	8%	47%
	medium gravel	11.3	7	13%	60%
	medium gravel	16.0	2	4%	64%
	coarse gravel	22.3	3	6%	70%
	coarse gravel	32.0	4	8%	77%
	very coarse gravel	45	1	2%	79%
	very coarse gravel	64	3	6%	85%
Cobble	small cobble	90	2	4%	89%
	medium cobble	128	1	2%	91%
	large cobble	180	1	2%	92%
	very large cobble	256	0	0%	92%
Boulder	small boulder	362	0	0%	92%
	small boulder	512	0	0%	92%
	medium boulder	1024	1	2%	94%
	large boulder	2048	0	0%	94%
Bedrock	bedrock	40096	0	0%	94%
TOTAL % of whole count			53	100%	100%

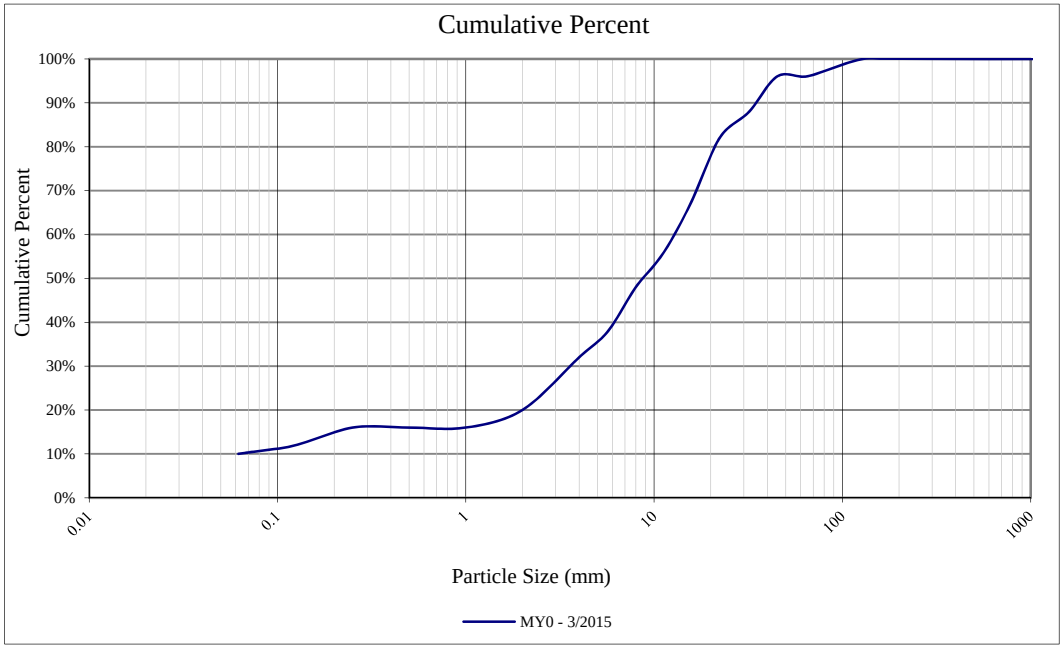
Summary Data	
D16	1.30
D35	4.40
D50	7.00
D84	40.00
D95	100.00
D100	1024.00

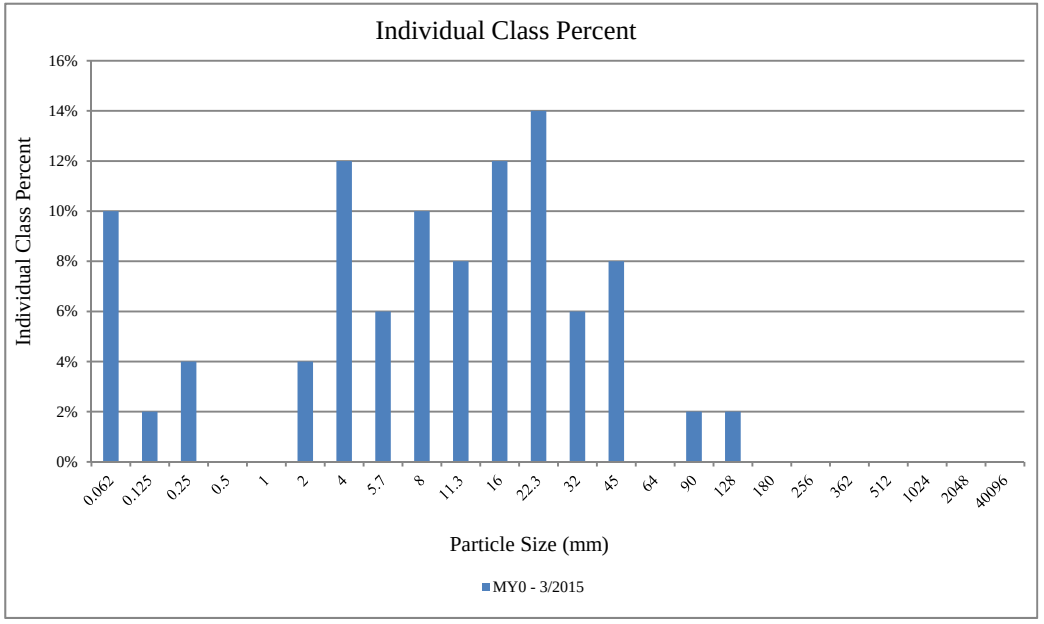




Project Name: Little Buffalo Creek					
Cross-Section: UT4-1R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	5	10%	10%
Sand	very fine sand	0.125	1	2%	12%
	fine sand	0.250	2	4%	16%
	medium sand	0.50	0	0%	16%
	coarse sand	1.00	0	0%	16%
	very coarse sand	2.0	2	4%	20%
Gravel	very fine gravel	4.0	6	12%	32%
	fine gravel	5.7	3	6%	38%
	fine gravel	8.0	5	10%	48%
	medium gravel	11.3	4	8%	56%
	medium gravel	16.0	6	12%	68%
	coarse gravel	22.3	7	14%	82%
	coarse gravel	32.0	3	6%	88%
	very coarse gravel	45	4	8%	96%
	very coarse gravel	64	0	0%	96%
Cobble	small cobble	90	1	2%	98%
	medium cobble	128	1	2%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			50	100%	100%

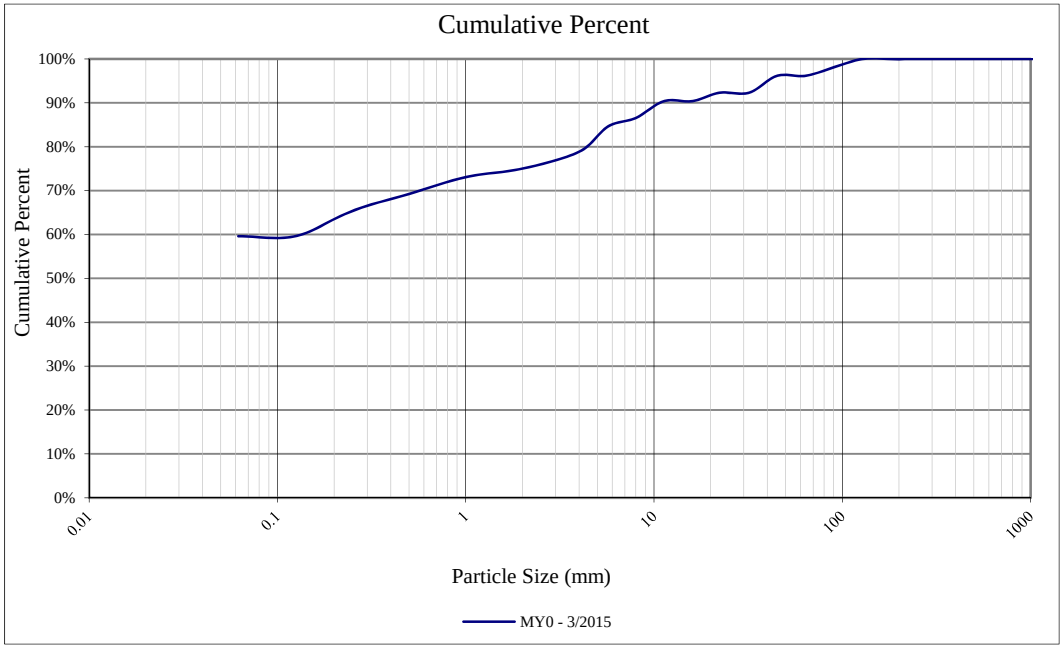
Summary Data	
D16	0.25
D35	4.80
D50	8.90
D84	26.00
D95	44.00
D100	128.00

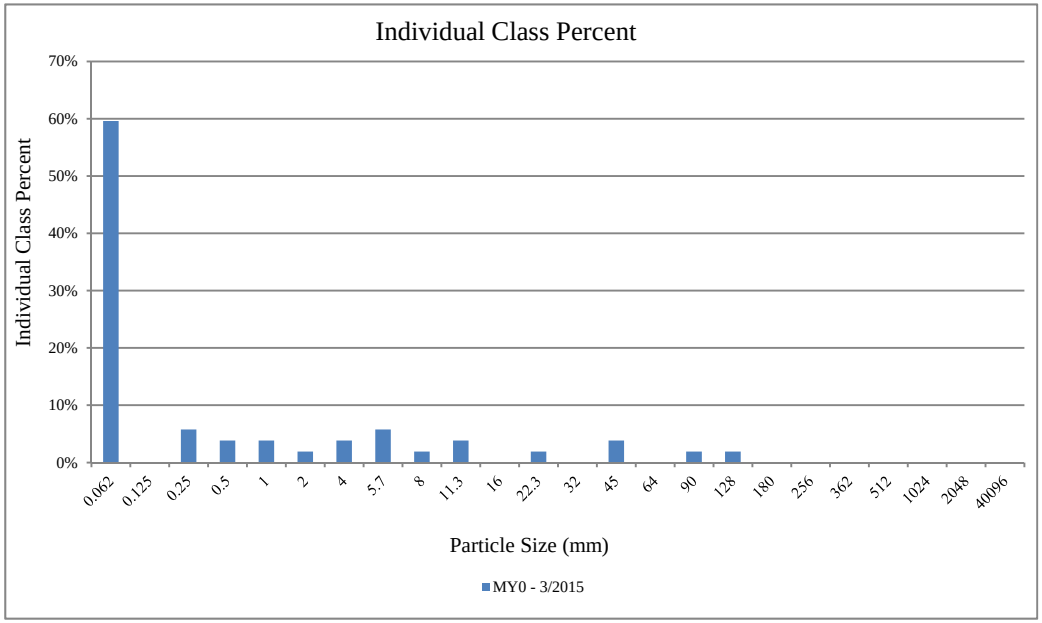




Project Name: Little Buffalo Creek					
Cross-Section: UT7-1P					
Feature: Pool					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	31	60%	60%
Sand	very fine sand	0.125	0	0%	60%
	fine sand	0.250	3	6%	65%
	medium sand	0.50	2	4%	69%
	coarse sand	1.00	2	4%	73%
	very coarse sand	2.0	1	2%	75%
Gravel	very fine gravel	4.0	2	4%	79%
	fine gravel	5.7	3	6%	85%
	fine gravel	8.0	1	2%	87%
	medium gravel	11.3	2	4%	90%
	medium gravel	16.0	0	0%	90%
	coarse gravel	22.3	1	2%	92%
	coarse gravel	32.0	0	0%	92%
	very coarse gravel	45	2	4%	96%
	very coarse gravel	64	0	0%	96%
Cobble	small cobble	90	1	2%	98%
	medium cobble	128	1	2%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			52	100%	100%

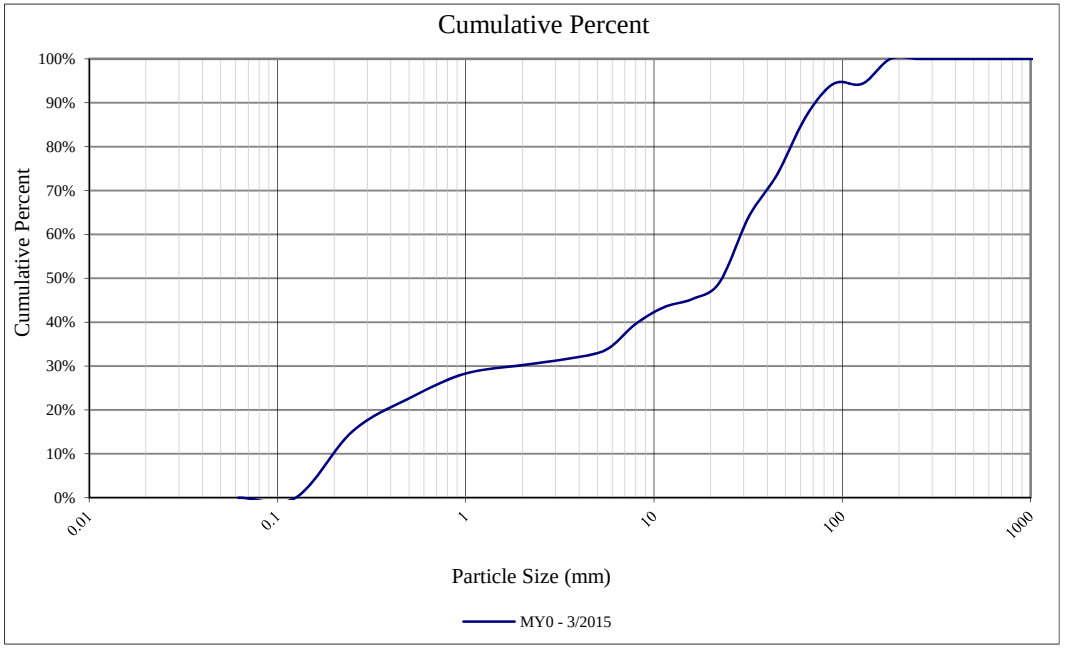
Summary Data	
D16	0.00
D35	0.00
D50	0.00
D84	3.90
D95	36.00
D100	128.00

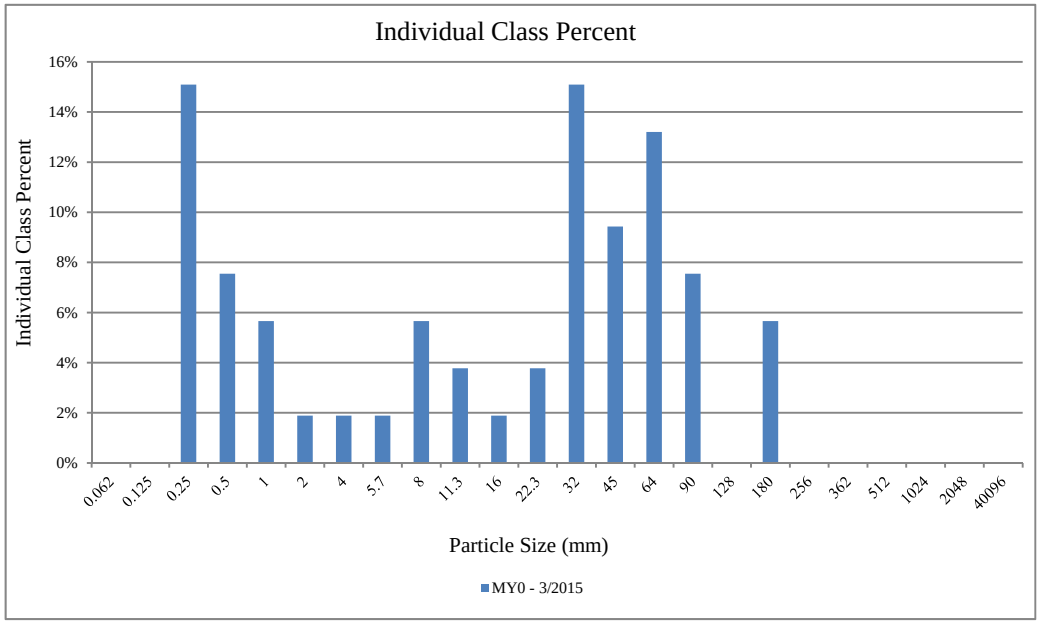




Project Name: Little Buffalo Creek					
Cross-Section: UT7-1R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.250	8	15%	15%
	medium sand	0.50	4	8%	23%
	coarse sand	1.00	3	6%	28%
	very coarse sand	2.0	1	2%	30%
Gravel	very fine gravel	4.0	1	2%	32%
	fine gravel	5.7	1	2%	34%
	fine gravel	8.0	3	6%	40%
	medium gravel	11.3	2	4%	43%
	medium gravel	16.0	1	2%	45%
	coarse gravel	22.3	2	4%	49%
	coarse gravel	32.0	8	15%	64%
	very coarse gravel	45	5	9%	74%
	very coarse gravel	64	7	13%	87%
Cobble	small cobble	90	4	8%	94%
	medium cobble	128	0	0%	94%
	large cobble	180	3	6%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			53	100%	100%

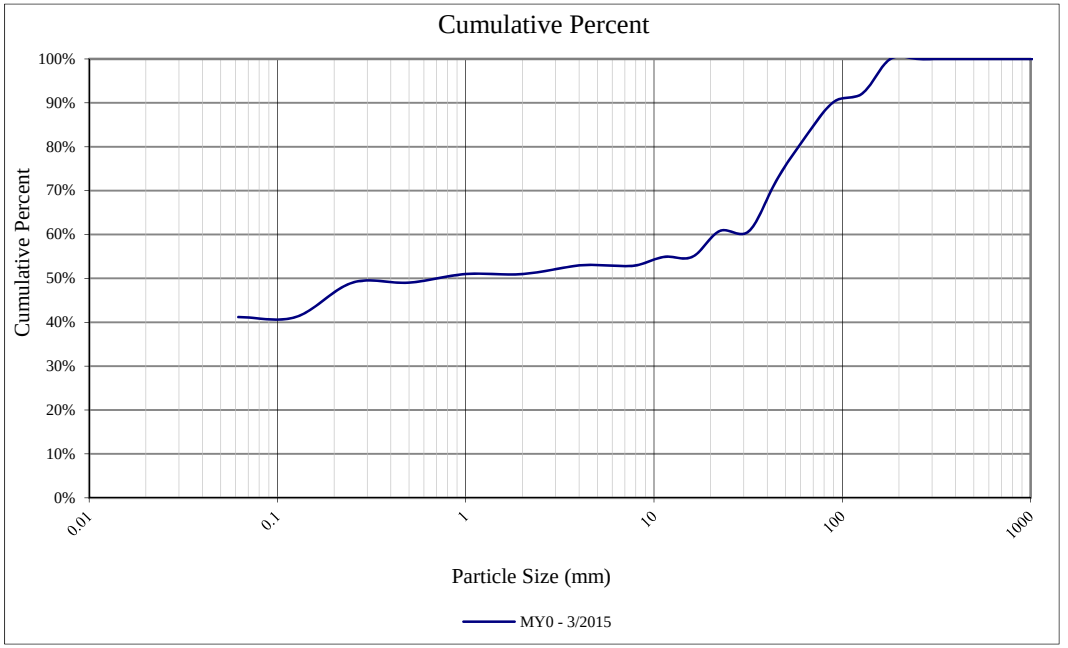
Summary Data	
D16	0.27
D35	6.10
D50	23.00
D84	60.00
D95	95.00
D100	180.00

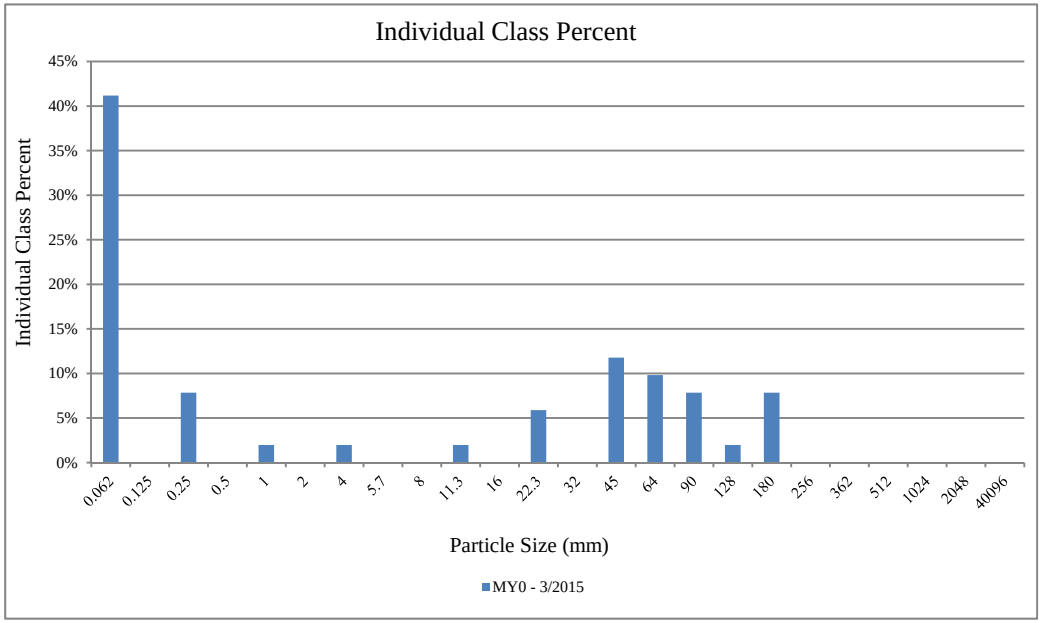




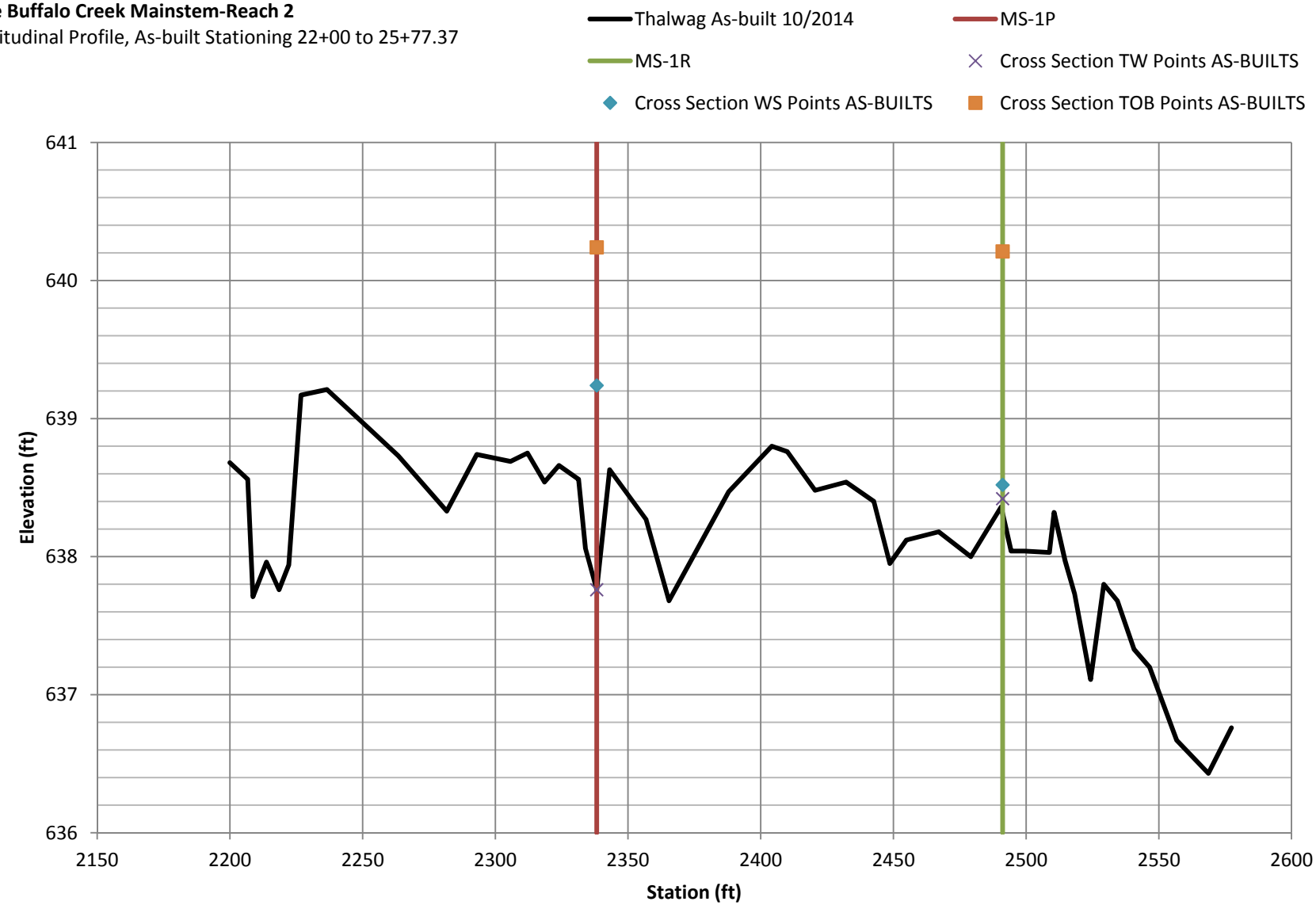
Project Name: Little Buffalo Creek					
Cross-Section: UT7-2R					
Feature: Riffle					
			2015		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	21	41%	41%
Sand	very fine sand	0.125	0	0%	41%
	fine sand	0.250	4	8%	49%
	medium sand	0.50	0	0%	49%
	coarse sand	1.00	1	2%	51%
	very coarse sand	2.0	0	0%	51%
Gravel	very fine gravel	4.0	1	2%	53%
	fine gravel	5.7	0	0%	53%
	fine gravel	8.0	0	0%	53%
	medium gravel	11.3	1	2%	55%
	medium gravel	16.0	0	0%	55%
	coarse gravel	22.3	3	6%	61%
	coarse gravel	32.0	0	0%	61%
	very coarse gravel	45	6	12%	73%
	very coarse gravel	64	5	10%	82%
Cobble	small cobble	90	4	8%	90%
	medium cobble	128	1	2%	92%
	large cobble	180	4	8%	100%
	very large cobble	256	0	0%	100%
Boulder	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	bedrock	40096	0	0%	100%
TOTAL % of whole count			51	100%	100%

Summary Data	
D16	0.00
D35	0.00
D50	0.50
D84	69.00
D95	150.00
D100	180.00



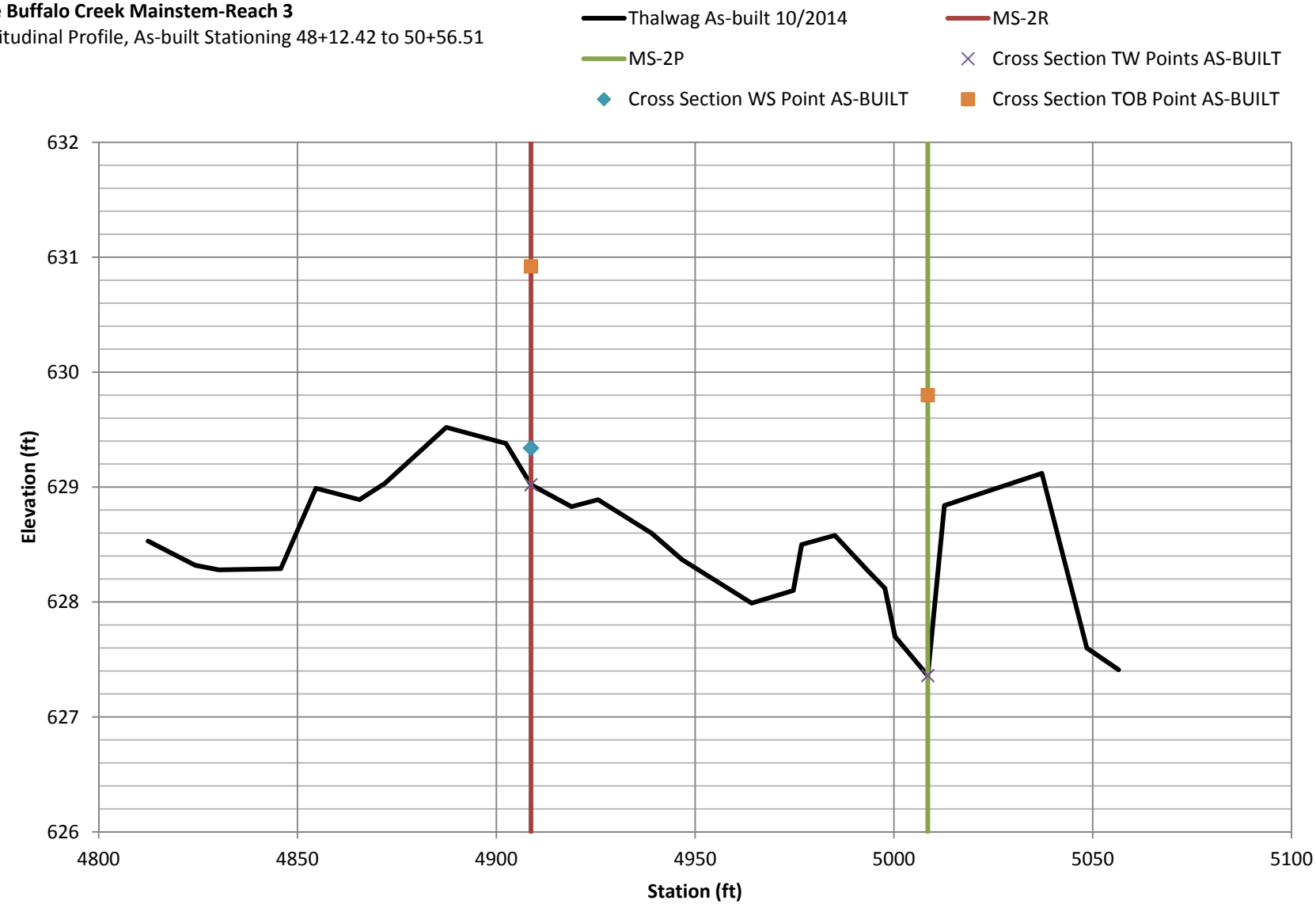


Little Buffalo Creek Mainstem-Reach 2
Longitudinal Profile, As-built Stationing 22+00 to 25+77.37



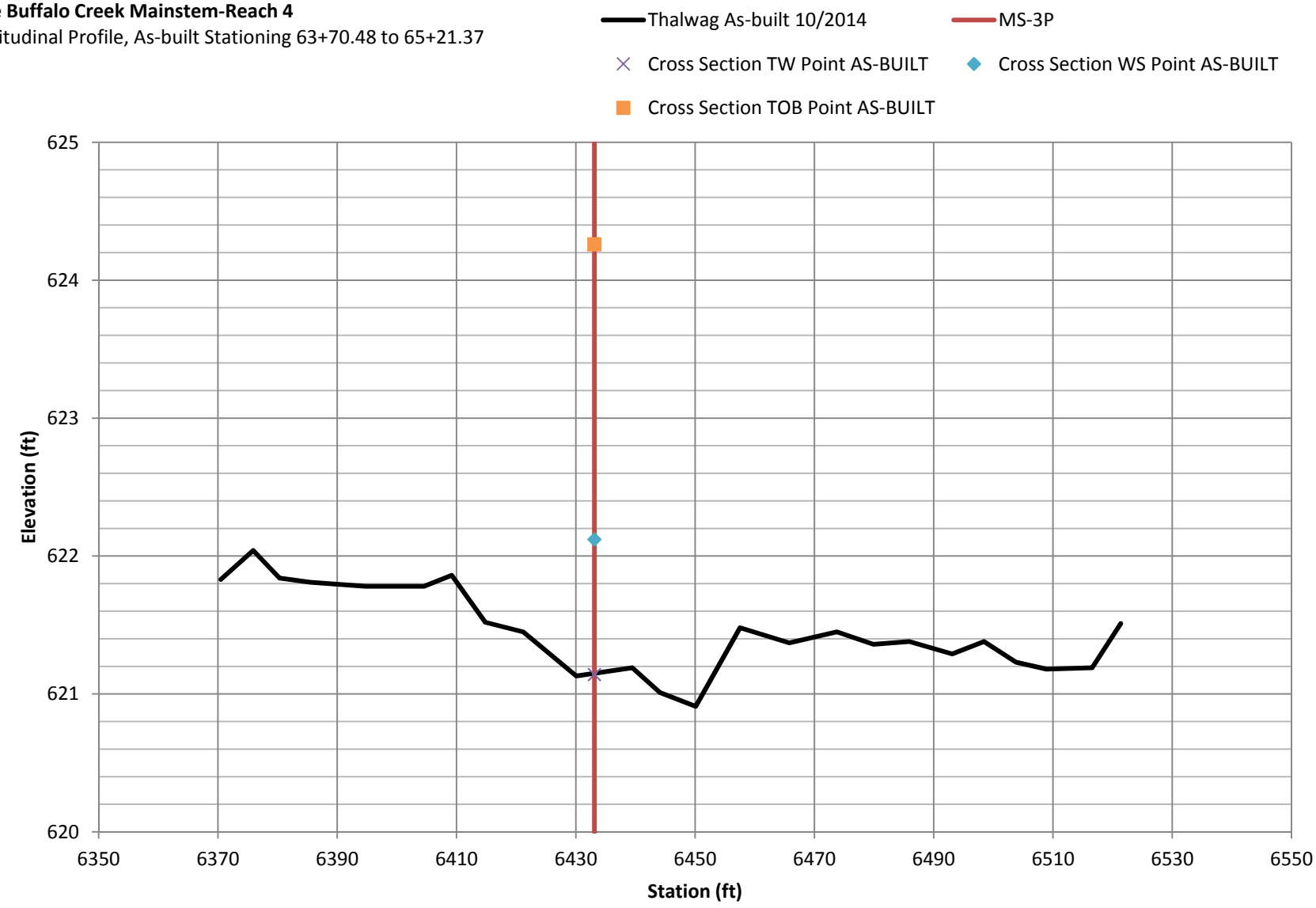
Little Buffalo Creek Mainstem-Reach 3

Longitudinal Profile, As-built Stationing 48+12.42 to 50+56.51



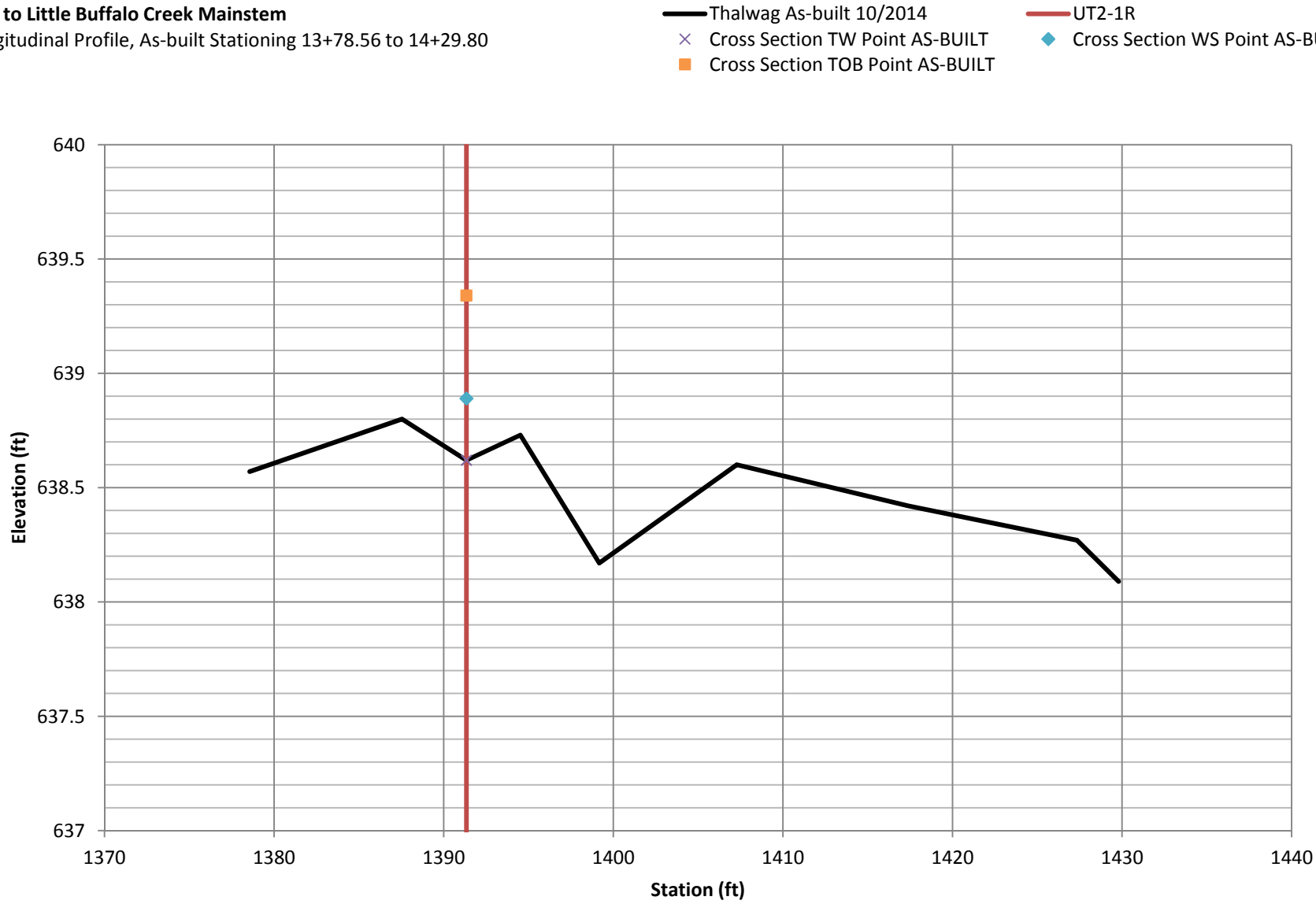
Little Buffalo Creek Mainstem-Reach 4

Longitudinal Profile, As-built Stationing 63+70.48 to 65+21.37

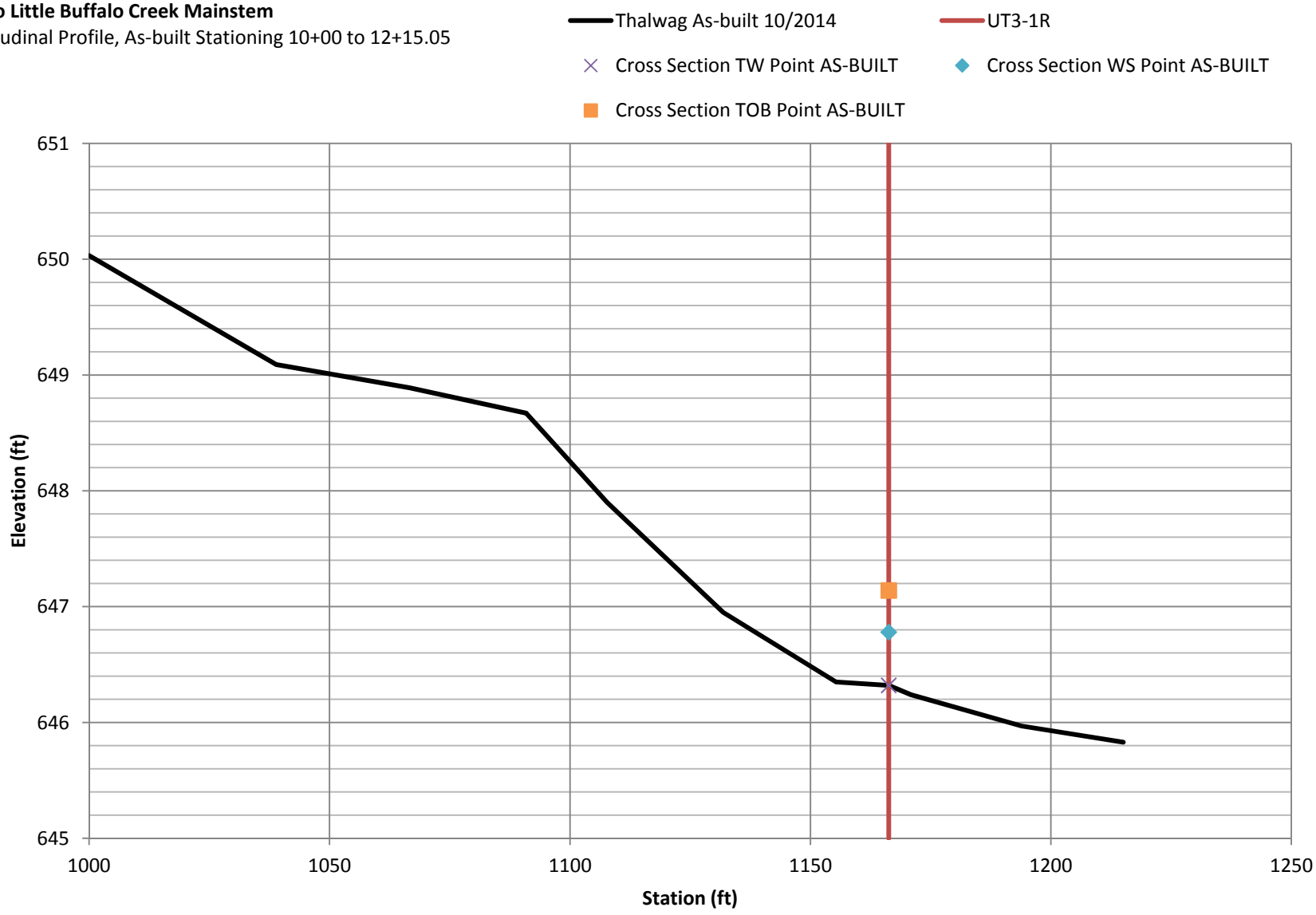


UT2 to Little Buffalo Creek Mainstem

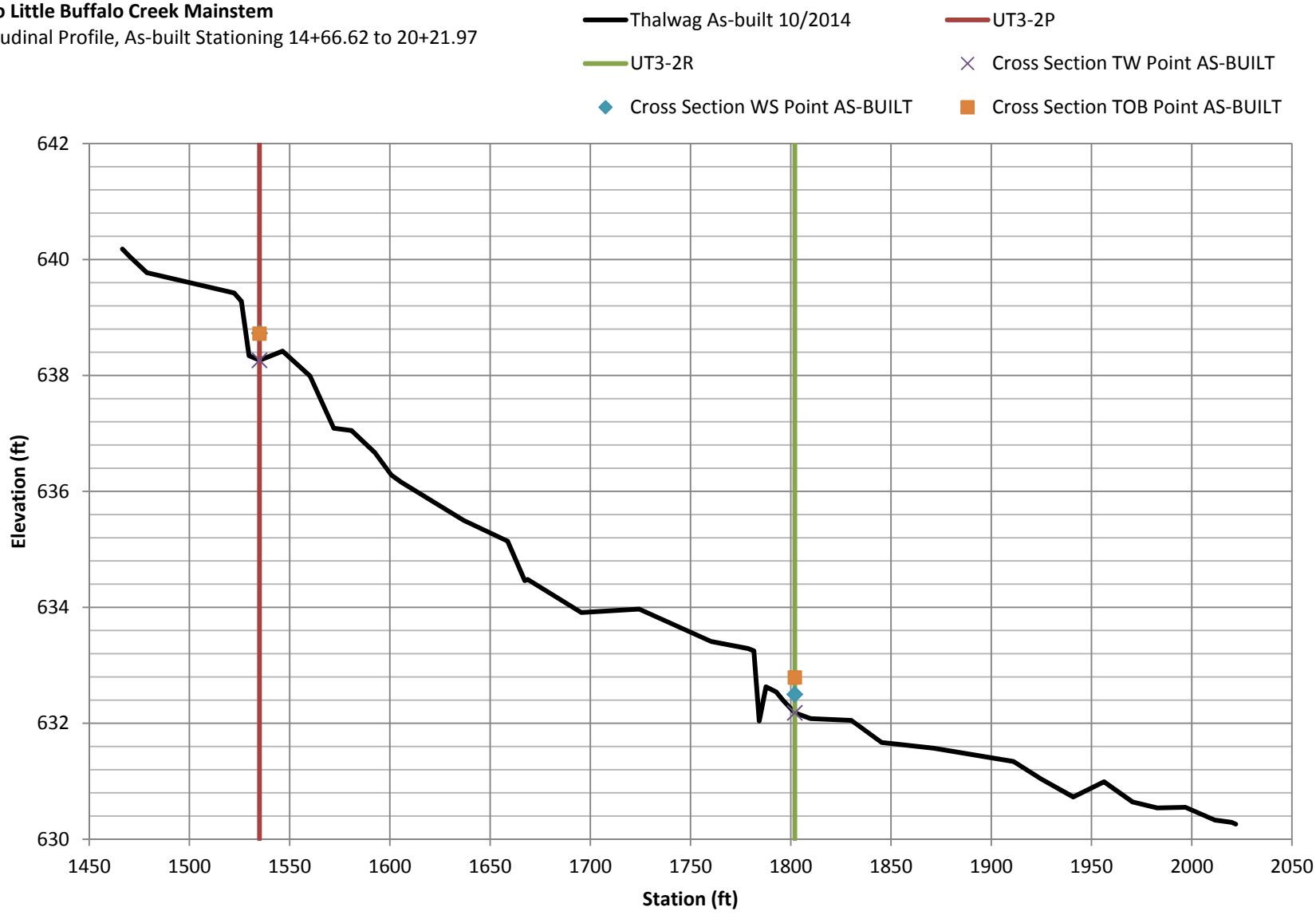
Longitudinal Profile, As-built Stationing 13+78.56 to 14+29.80



UT3 to Little Buffalo Creek Mainstem
Longitudinal Profile, As-built Stationing 10+00 to 12+15.05

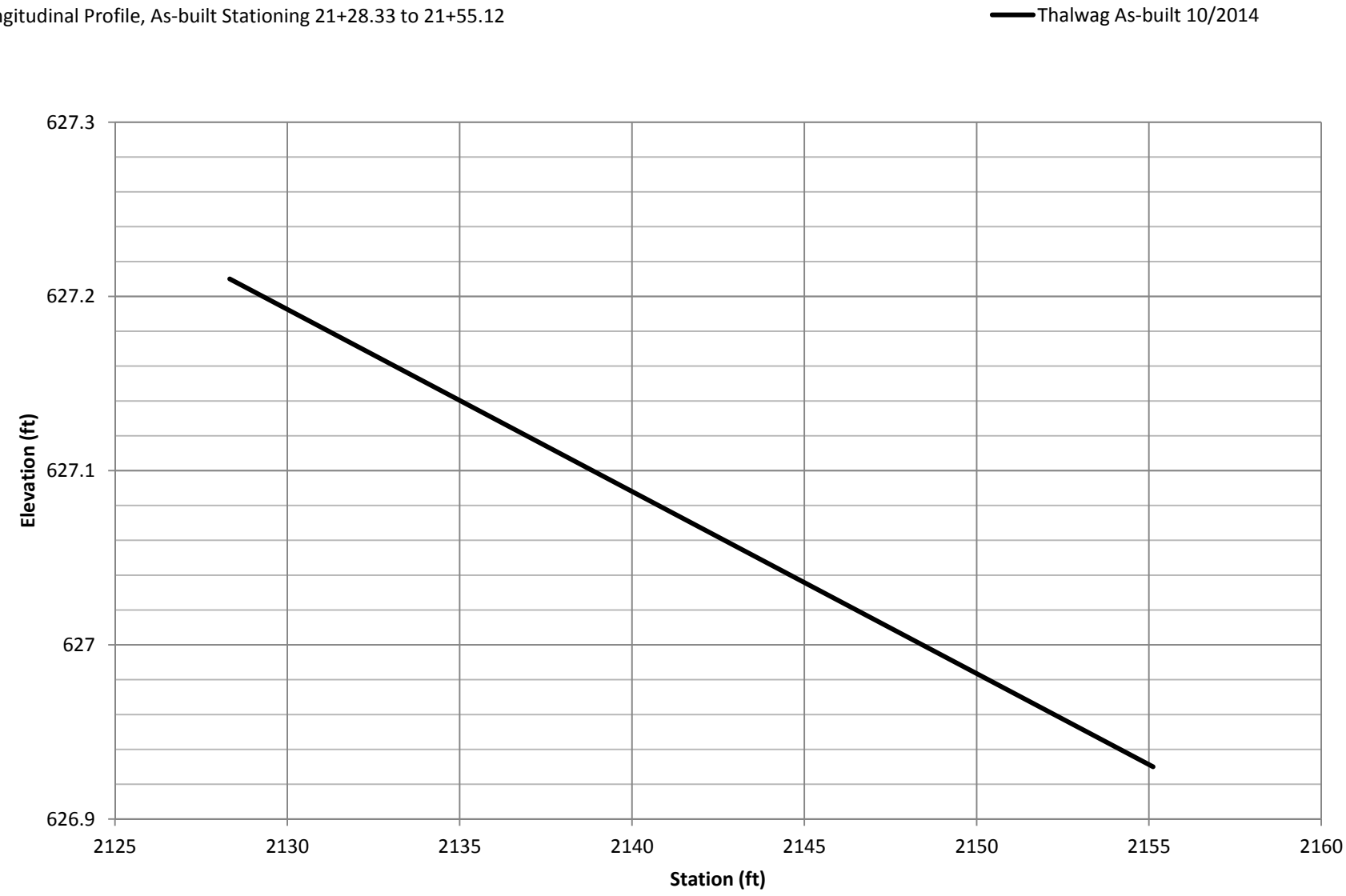


UT3 to Little Buffalo Creek Mainstem
Longitudinal Profile, As-built Stationing 14+66.62 to 20+21.97

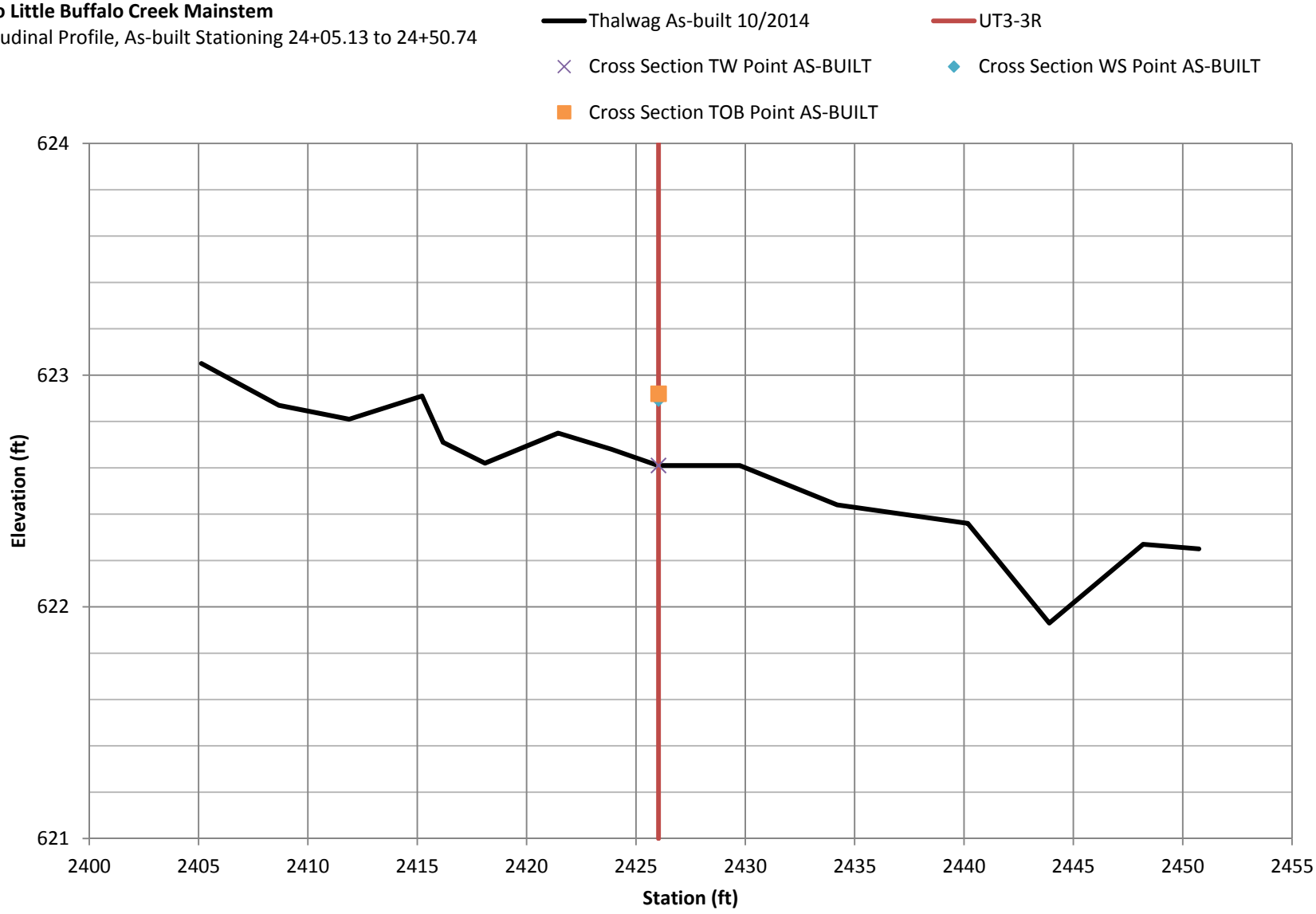


UT3 to Little Buffalo Creek Mainstem

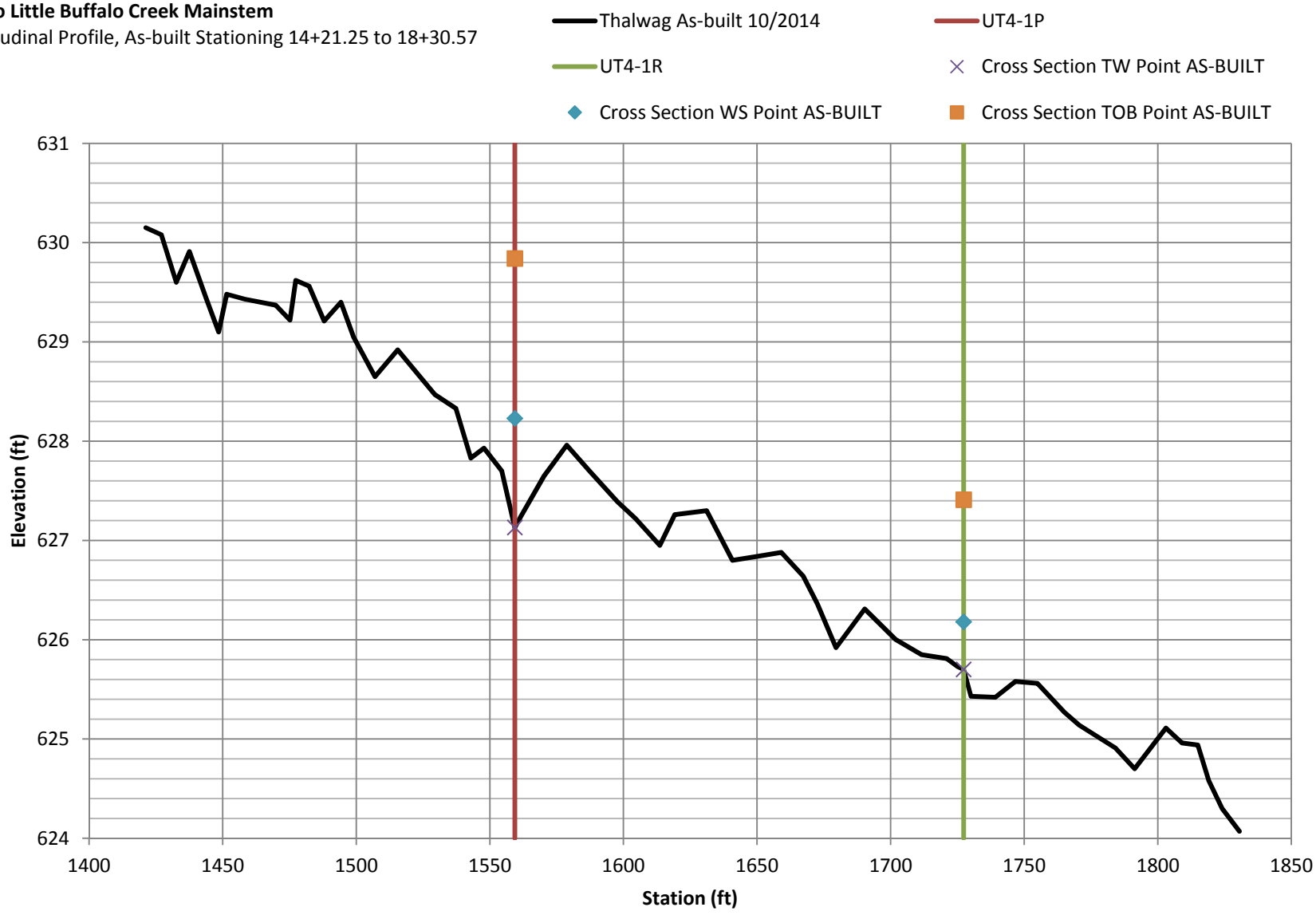
Longitudinal Profile, As-built Stationing 21+28.33 to 21+55.12



UT3 to Little Buffalo Creek Mainstem
Longitudinal Profile, As-built Stationing 24+05.13 to 24+50.74

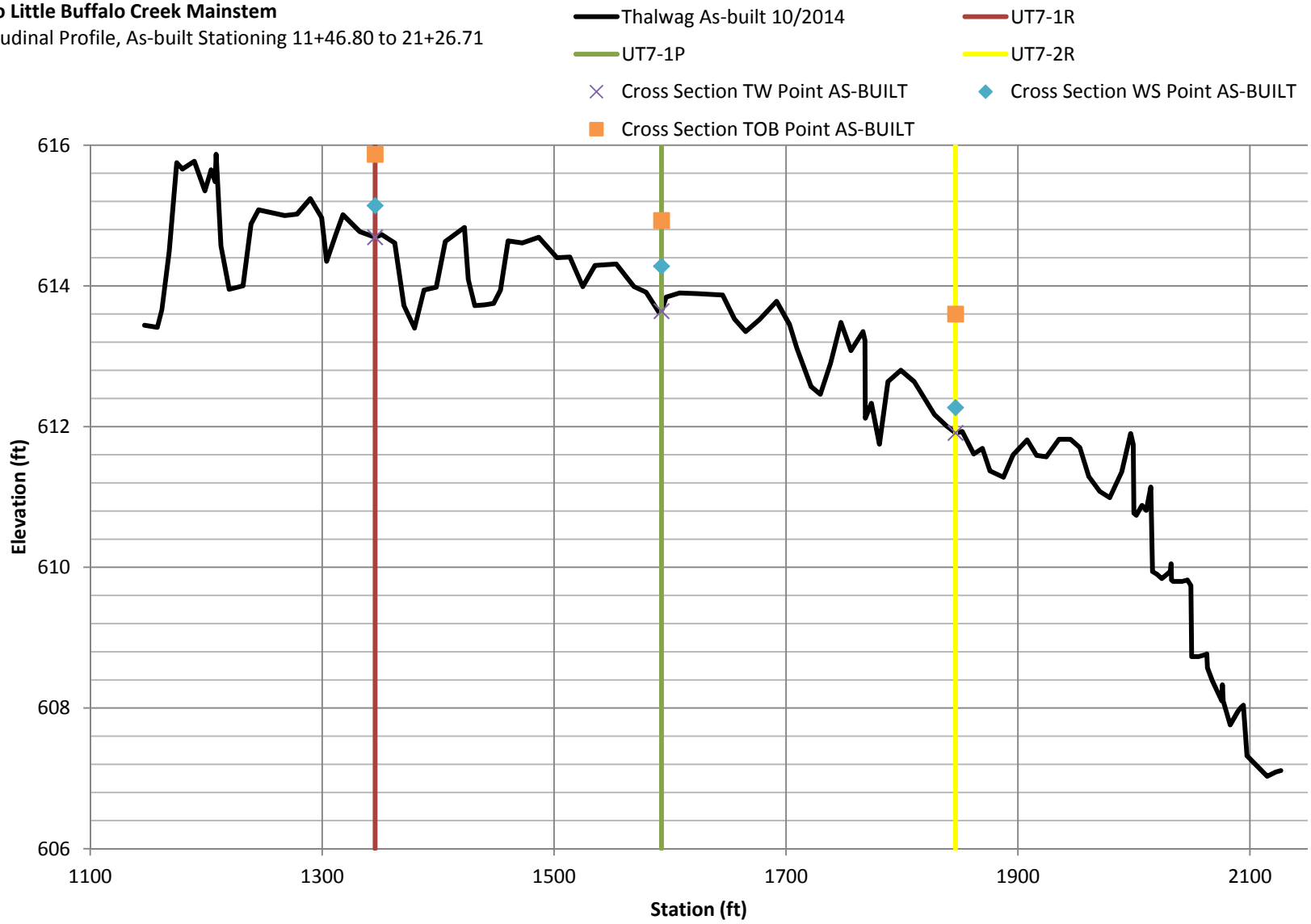


UT4 to Little Buffalo Creek Mainstem
Longitudinal Profile, As-built Stationing 14+21.25 to 18+30.57



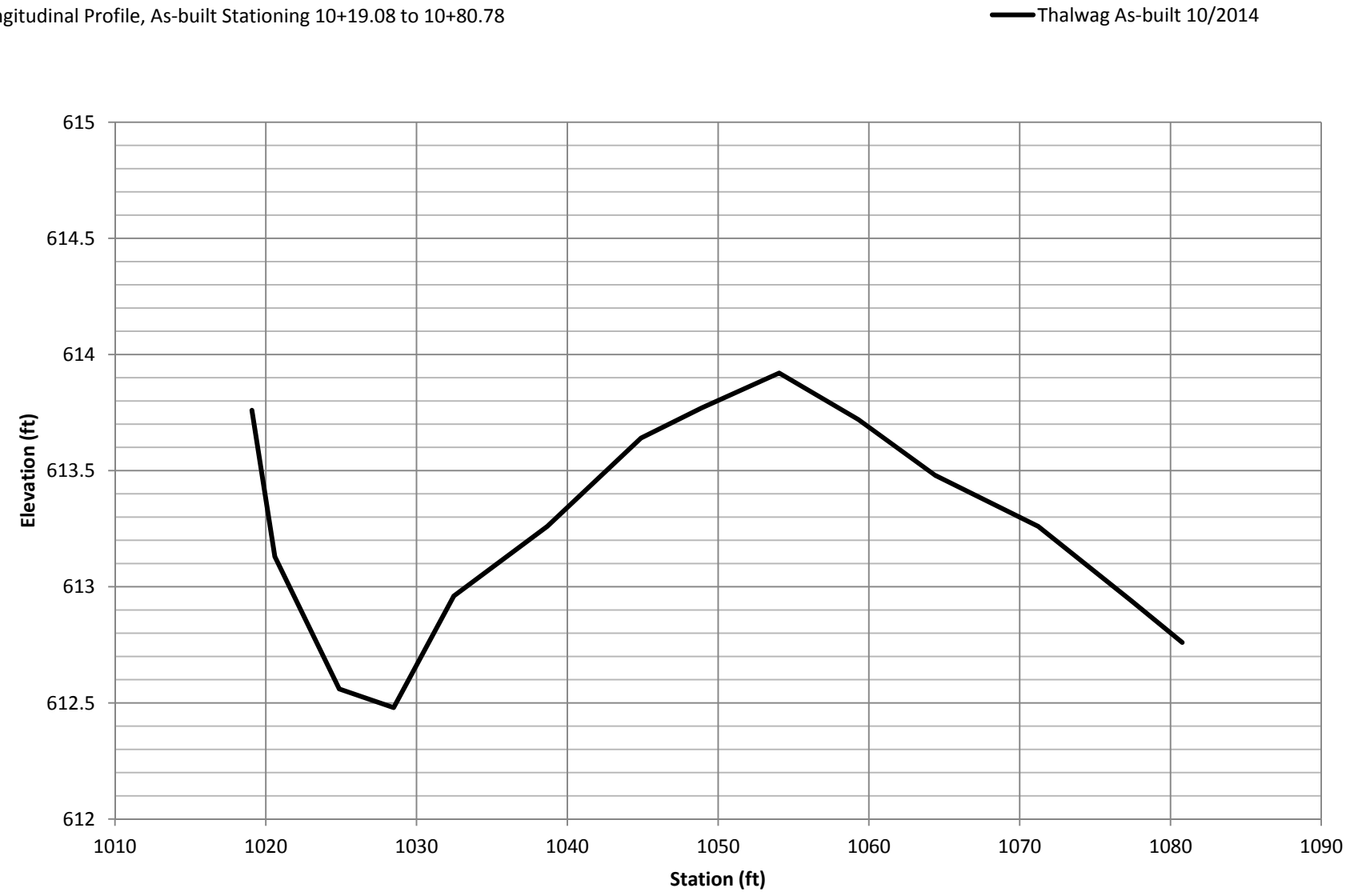
UT7 to Little Buffalo Creek Mainstem

Longitudinal Profile, As-built Stationing 11+46.80 to 21+26.71



UT8 to UT7

Longitudinal Profile, As-built Stationing 10+19.08 to 10+80.78



Appendix E. As-built Plan Sheets

LITTLE BUFFALO CREEK

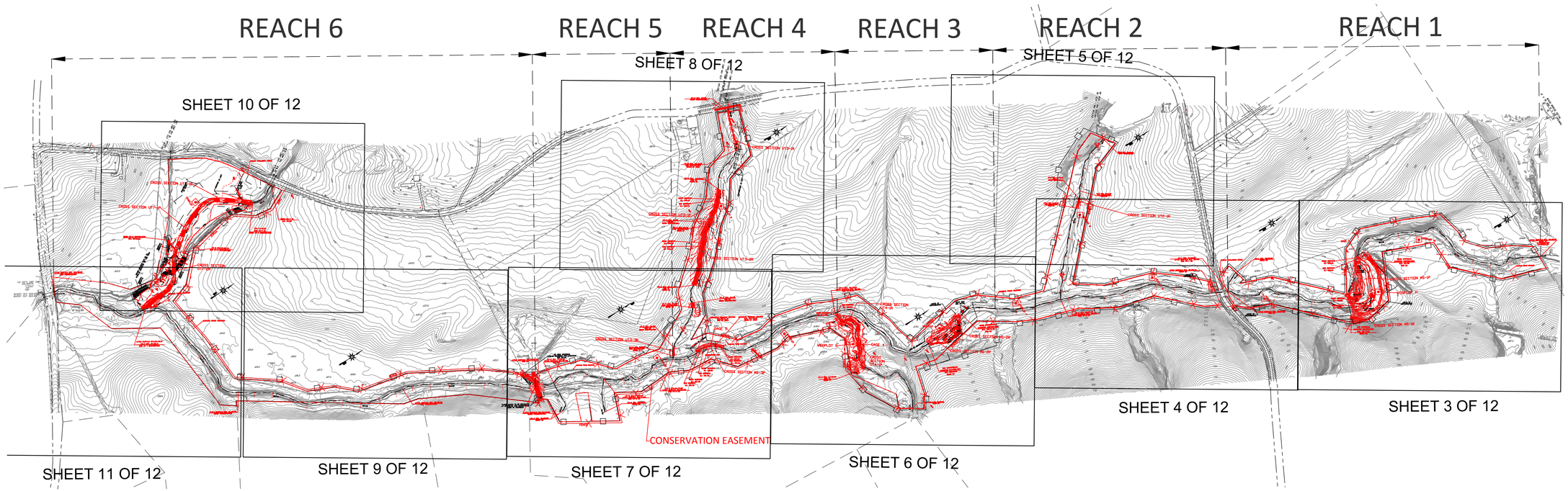
STREAM RESTORATION PROJECT

CABARRUS COUNTY

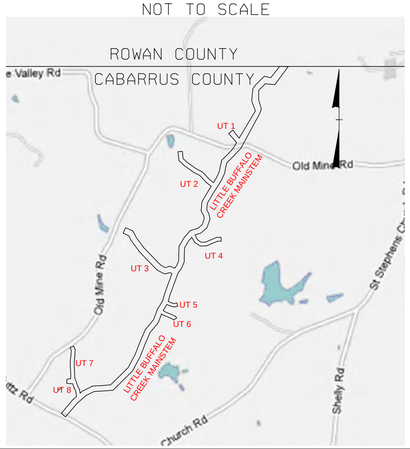
JULY 2015

PROJECT NO. 94147

AS BUILT – DESIGN PLAN



NOT TO SCALE



300' 0' 300' 600'

SCALE: 1"= 300' @ 22x34
1"= 600' @ 11x17

INDEX OF SHEETS	
1	TITLE SHEET
2	LEGEND & SYMBOLS
3 - 11	AS BUILT / DESIGN PLAN
12 - 13	AS BUILT PROFILES

LOUIS BERGER PROJECT MANAGER: EDWARD SAMANNS
CONTACT EMAIL: ESAMANNS@LOUISBERGER.COM

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

NO.	REVISIONS	DRN	CHK	DATE

NCDENR-DMS

THE LOUIS BERGER GROUP, Inc.
1001 Wade Avenue
Raleigh, North Carolina 27605

LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

TITLE SHEET

DATE JULY 2015
PROJECT NO. 94147
SHEET 1 OF 13

Filename: $FILE$ Date: $DATE$ Time: $TIME$

EXISTING PLAN LEGEND

- PROPERTY LINE
- TREE LINES / WOODS
- SINGLE TREE
- SHRUB
- EIP EXISTING IRON PIPE
- EIR EXISTING IRON ROD
- POLE
- CULVERT
- FENCE
- CONCRETE MONUMENT

PROPOSED PLAN LEGEND

- OPTIONAL CONSERVATION EASEMENT FENCING
- CONSERVATION EASEMENT
- 10+00 STREAM ALIGNMENT
- LIMITS OF DISTURBANCE
- PROPOSED DITCH PLUG
- PROPOSED LOG VANES
- PROPOSED ROOT WAD
- PROPOSED ROCK CROSS VANE
- PROPOSED LIVESTOCK CROSSING

AS BUILT LEGEND

- THALWEG
- CONSERVATION EASEMENT
- CONSERVATION FENCE
- PUBLIC EXCLUSION FENCE
- CONSTRUCTED RIFFLE
- BEDROCK
- ROOTWADS
- CONTROL POINT
- STREAM GAGE
- VEGPLOT

MAINSTEM RESTORATION PLAN INDEX

ALIGNMENT	MITIGATION ACTIVITY	START STATION	END STATION
MAINSTEM	ENHANCEMENT LEVEL 2	10+00	22+00.00
	RESTORATION	22+00.00	25+77.37
	ENHANCEMENT LEVEL 2	25+77.37	33+04.88
	ENHANCEMENT LEVEL 2	33+66.34	48+12.45
	RESTORATION	48+12.45	50+56.51
	ENHANCEMENT LEVEL 2	50+56.51	63+70.48
	ENHANCEMENT LEVEL 1	63+70.48	65+21.37
	ENHANCEMENT LEVEL 2	65+21.37	74+87.83
	PRESERVATION	75+19.23	82+55.35
	PRESERVATION	91+88.65	104+96.09

MITIGATION ACTIVITY	GENERAL DESCRIPTION
RESTORATION	CHANNEL RE-ALIGNMENT AND CREATION. DITCH PLUG INSTALLATION. IN-STREAM STRUCTURE INSTALLATION, INCLUDING LOG VANES, ROCK CROSS VANES, STEP POOLS AND ROOT WADS. STREAM BANK RE-GRADING. PLANTING AND INVASIVE PLANT REMOVAL.
ENHANCEMENT LEVEL I (E1)	*STREAM BANK GRADING. MINOR CHANNEL REGRADING. CONCRETE REMOVAL FROM CHANNEL. PLANTING AND INVASIVE PLANT REMOVAL.*
ENHANCEMENT LEVEL 2 (E2)	*PLANTING AND INVASIVE PLANT REMOVAL.*

TRIBUTARY RESTORATION PLAN INDEX

ALIGNMENT	MITIGATION ACTIVITY	START STATION	END STATION
UT-1	ENHANCEMENT LEVEL 2	10+00	11+10.63
UT-2	PRESERVATION	10+00	13+34.67
UT-2	ENHANCEMENT LEVEL 2	13+34.67	13+78.56
UT-2	RESTORATION	13+78.56	14+27.35
UT-2	ENHANCEMENT LEVEL 2	14+27.35	19+50.70
UT-3	RESTORATION	10+00	12+15.05
UT-3	ENHANCEMENT LEVEL 2	12+15.05	14+66.62
UT-3	ENHANCEMENT LEVEL 1	14+66.62	16+60
UT-3	RESTORATION	16+60	16+79
UT-3	ENHANCEMENT LEVEL 1	16+79	20+21.97
UT-3	ENHANCEMENT LEVEL 2	20+21.97	21+29
UT-3	RESTORATION	21+29	21+55
UT-3	ENHANCEMENT LEVEL 2	21+55	24+05
UT-3	RESTORATION	24+05	24+50
UT-3	ENHANCEMENT LEVEL 2	24+50	24+74.90
UT-4	ENHANCEMENT LEVEL 2	10+00	14+21.25
UT-4	ENHANCEMENT LEVEL 1	14+21.25	18+30.57
UT-5	ENHANCEMENT LEVEL 2	10+00	11+84.46
UT-6	ENHANCEMENT LEVEL 2	10+00	11+51.33
UT-7	ENHANCEMENT LEVEL 1	10+00	11+46.80
UT-7	RESTORATION	11+46.80	21+26.71
UT-8	RESTORATION	10+19.08	10+80.78

NOTE: REFER TO PROPOSED CONDITIONS AND PLANTING PLANS FOR SPECIFIC ACTIVITIES AS PART OF THIS PROJECT. ADDITIONAL PROJECT COMPONENTS INCLUDE REMOVAL OF EXISTING FENCING, FENCE INSTALLATION, INSTALLATION OF TWO CATTLE CROSSINGS AND FLOOD GATES AS SHOWN ON THE PLANS.

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

NO.	REVISIONS	DRN	CHK	DATE

NCDENR-DMS

THE LOUIS BERGER GROUP, Inc.
1001 Wade Avenue
Raleigh, North Carolina 27605

LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

LEGENDS AND SYMBOLS

DATE JULY 2015
PROJECT NO. 94147
SHEET 2 OF 13

MATCHLINE SEE SHEET 4 OF 12

GAGE 1

BEGIN BEDROCK
EL: 638.68

END BEDROCK
EL: 638.56

BEGIN UPSTREAM
MAINSTEM RESTORATION
STA. 22+00
END E2

VEGPLOT 12

LITTLE BUFFALO STA. 10+00.00
BEGIN E2
X:1595368.236
Y:640628.321

EXISTING FENCE REMOVED

PLUGGED CHANNEL

CROSS SECTION MS-1P

UPSTREAM MAINSTEM RESTORATION

VEGPLOT 11

BEGIN BEDROCK
EL: 638.03

END BEDROCK
EL: 637.97

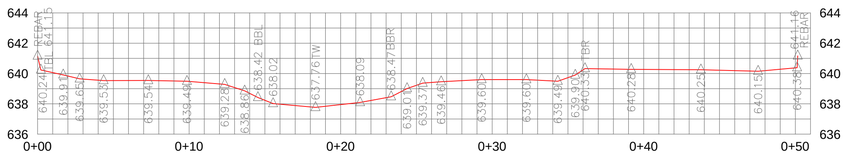
LIMITS OF DISTURBANCE

J-HOOK VANES
SEE DETAILS

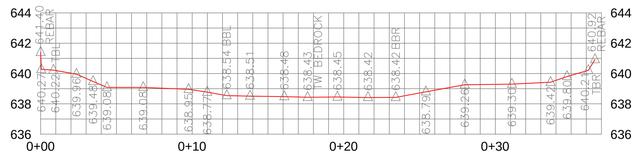
CROSS SECTION MS-1R

END UPSTREAM
MAINSTEM RESTORATION
STA. 25+77.37
BEGIN E2

MS-1P
CROSS SECTION
STATION 23+38.19



MS-1R
CROSS SECTION
STATION 24+91.17



CROSS SECTION SCALE
HORIZONTAL: 1"=5'(22x34)
1"=10'(11x17)
VERTICAL: 1"=5'(22x34)
1"=10'(11x17)
TBL=LEFT TOP OF BANK
TBR=RIGHT TOP OF BANK
BBL=LEFT BANK TOE
BBR=RIGHT BANK TOE
TW=THALWEG

50' 0' 50' 100'

SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

NO.	REVISIONS	DRN	CHK	DATE

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Raleigh, North Carolina 27605

LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

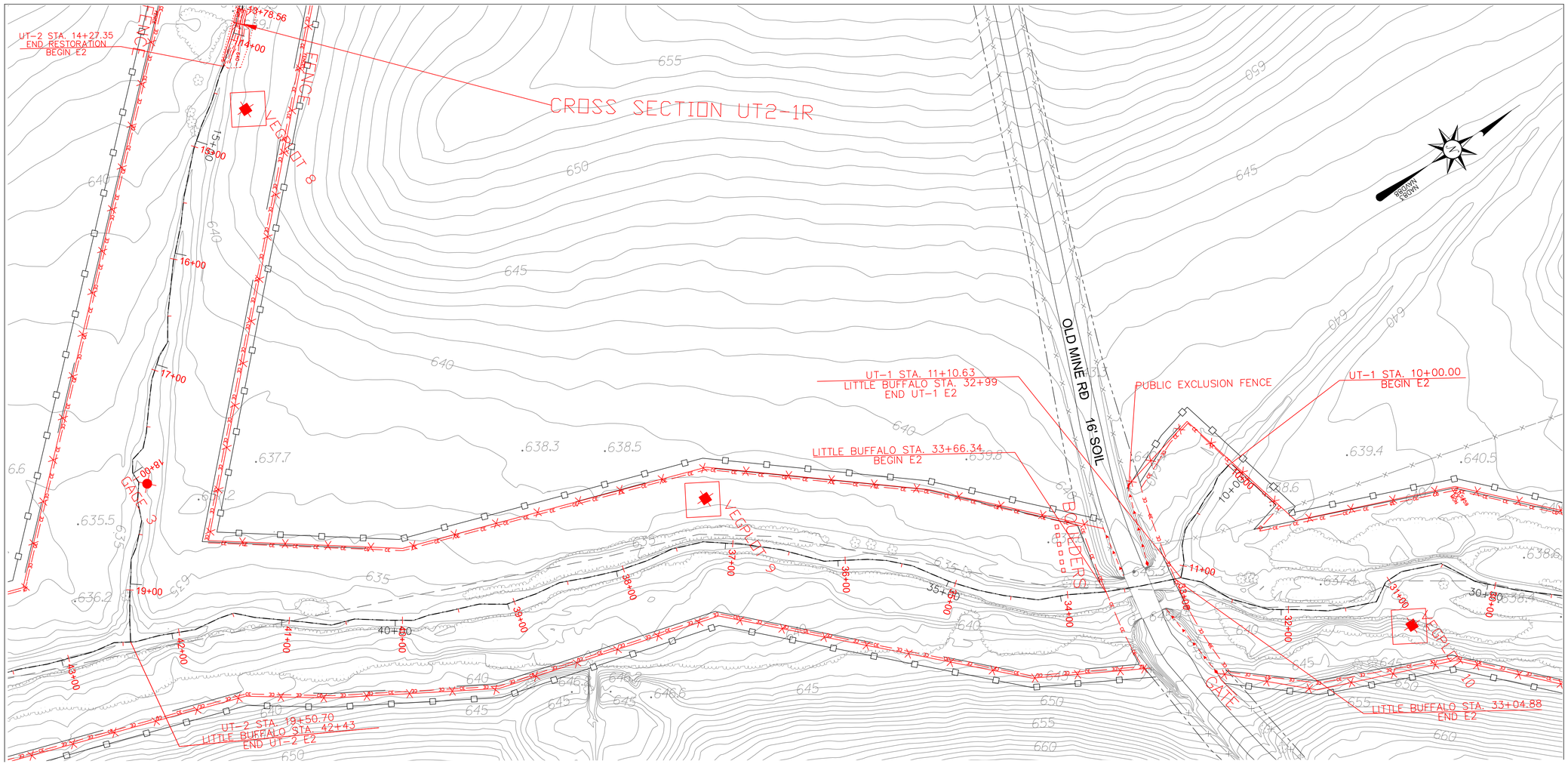
AS BUILT – DESIGN PLAN

DATE	JULY 2015
PROJECT NO.	94147
SHEET	3 OF 13

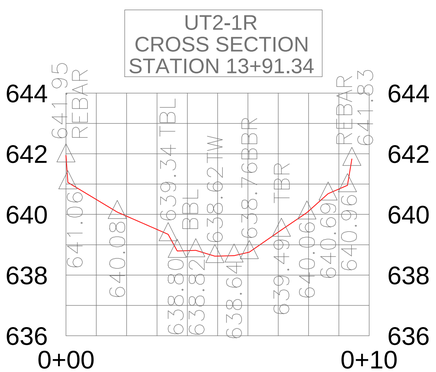
MATCHLINE SEE SHEET 5 OF 12

MATCHLINE SEE SHEET 6 OF 12

MATCHLINE SEE SHEET 3 OF 12



UT2-1R
CROSS SECTION
STATION 13+91.34



CROSS SECTION SCALE

HORIZONTAL: 1"=2.5' 22x34)

VERTICAL: 1"=2.5' (22x34)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG

50' 0' 50' 100'

SCALE: 1"= 50'@ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

NO.	REVISIONS	DRN	CHK	DATE

NCDENR-DMS

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LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

AS BUILT – DESIGN PLAN

DATE JULY 2015
PROJECT NO. 94147
SHEET 4 OF 13

UT-2 STA. 10+00.00
BEGIN PRESERVATION

UT-2 STA. 13+78.56
END E2
BEGIN RESTORATION

UT-2 STA. 13+34.67
END PRESERVATION
BEGIN E2

UT-2 STA. 14+27.35
END RESTORATION
BEGIN E2

CROSS SECTION UT2-1R

FENCE

FENCE

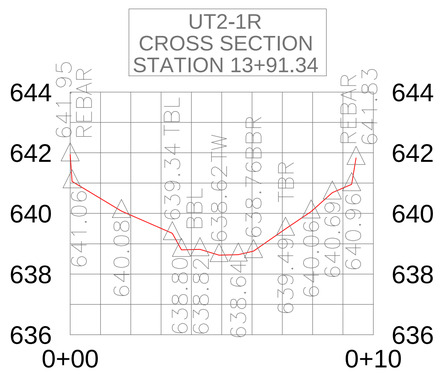
OLD M

SEWAY ROAD

MATCHLINE SEE SHEET 6 OF 12

MATCHLINE SEE SHEET 4 OF 12

UT2-1R
CROSS SECTION
STATION 13+91.34



CROSS SECTION SCALE

HORIZONTAL: 1"=2.5' 22x34)

VERTICAL: 1"=2.5' (22x34)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG

50' 0' 50' 100'

SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

NO.	REVISIONS	DRN	CHK	DATE

NCDENR-DMS

THE LOUIS BERGER GROUP, Inc.
1001 Wade Avenue
Raleigh, North Carolina 27605

LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

AS BUILT – DESIGN PLAN

DATE JULY 2015
PROJECT NO. 94147
SHEET 5 OF 13

Filename: $FILE$ Date: $DATE$ Time: $TIME$

MATCHLINE SEE SHEET 7 OF 12

MATCHLINE SEE SHEET 4 OF 12

UT-4 STA. 18+30.57
LITTLE BUFFALO STA. 56+93
END UT-4 E1

END BEDROCK
EL. 624.94

BEGIN BEDROCK
EL. 624.30

CROSS SECTION
UT4-1R

DOWNSTREAM
MAINSTEM RESTORATION
VEGPLOT 6

EXISTING FENCE REMOVED

ROOT WAD
SEE DETAIL

LOG VANE

BEGIN DOWNSTREAM
MAINSTEM RESTORATION
STA. 48+12.45
END E2

CROSS SECTION MS-2R

PLUGGED
CHANNEL

FENCE

LIMIT OF GRADING

VEGPLOT 5

GAGE 4

CROSS
SECTION
UT4-1P

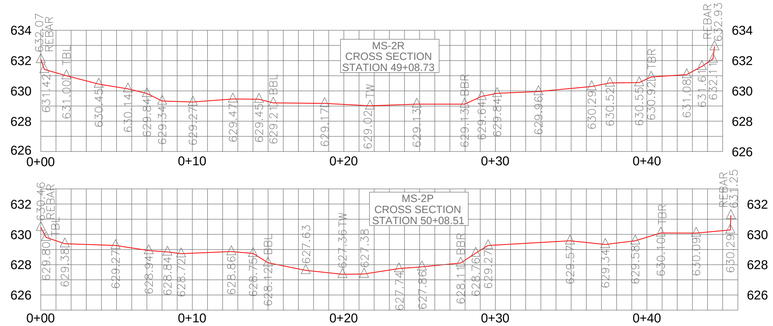
CROSS SECTION MS-2P

END DOWNSTREAM
MAINSTEM RESTORATION
STA. 50+56.51
BEGIN E2

UT-4 STA. 14+21.25
END E2
BEGIN E1

UT-4 STA. 10+00.00
BEGIN E2

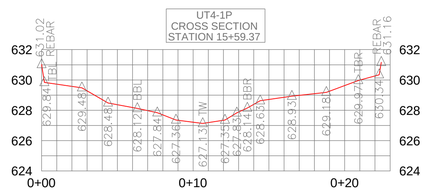
Base

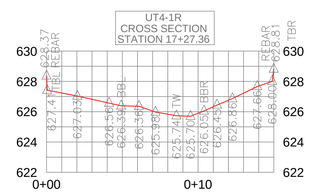


CROSS SECTION SCALE

HORIZONTAL: 1"=5'(22x34)
VERTICAL: 1"=5'(22x34)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG





50' 0' 50' 100'

SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEANO HATFIELD

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CABARRUS COUNTY
DIVISION OF MITIGATION SERVICES

AS BUILT – DESIGN PLAN

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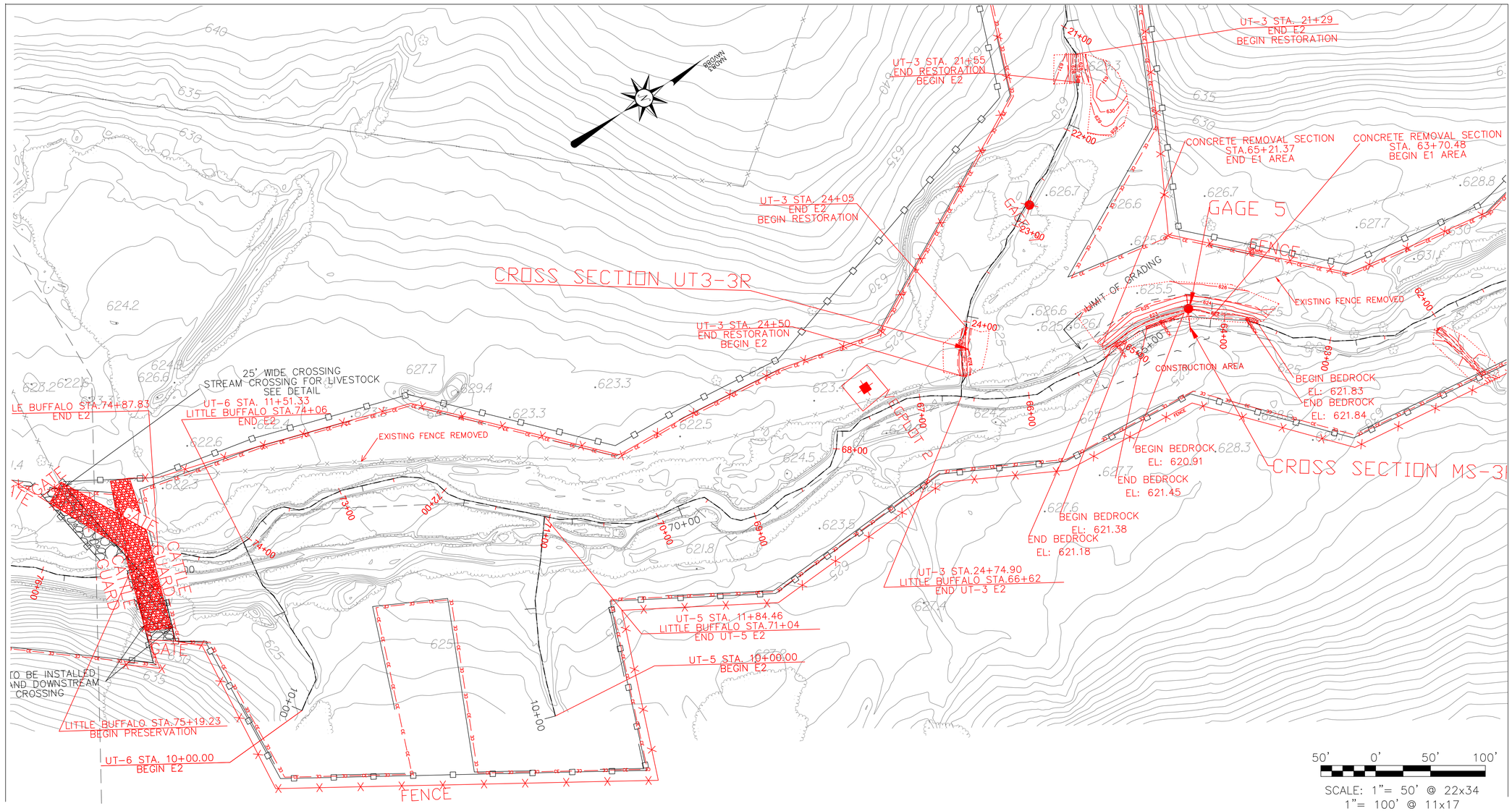
PROJECT NO. 94147
SHEET 6 OF 13

Filename: $FILEL$ Date: $DATE$ Time: $TIME$

MATCHLINE SEE SHEET 8 OF 12

MATCHLINE SEE SHEET 9 OF 12

MATCHLINE SEE SHEET 6 OF 12



CROSS SECTION SCALE

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VERTICAL: 1"=2.5'(22x34)

TBL–LEFT TOP OF BANK
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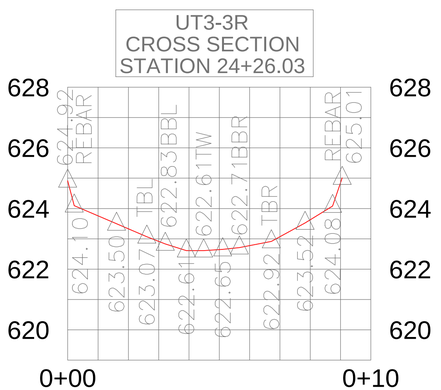

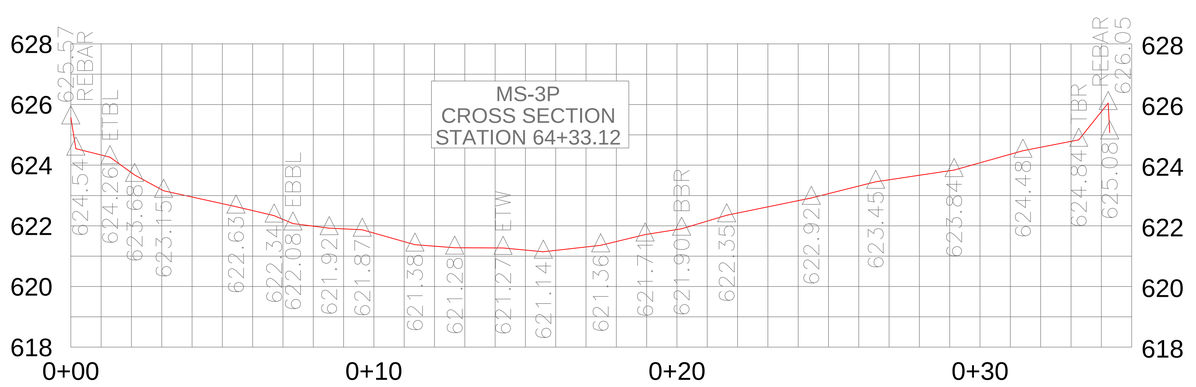

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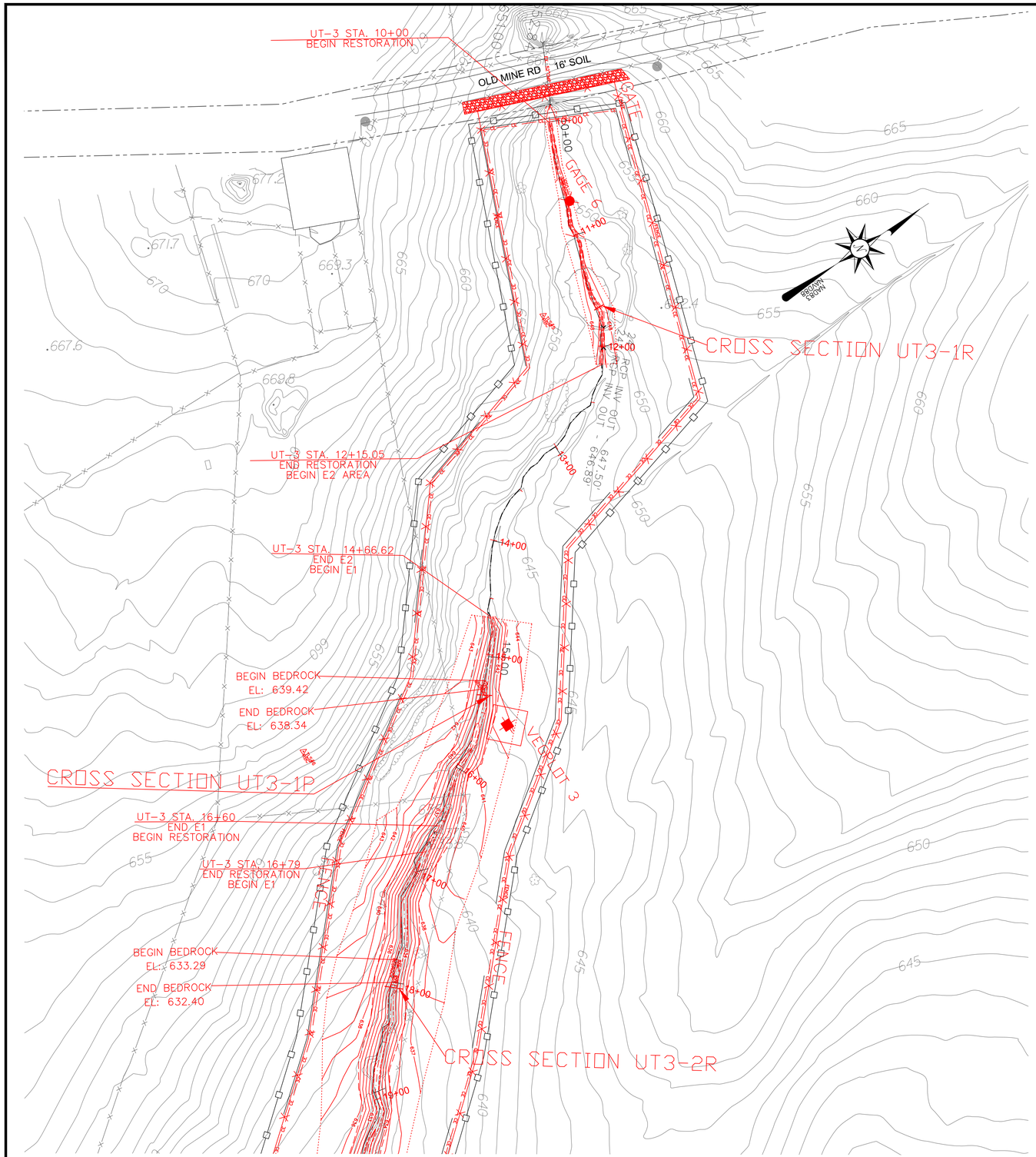

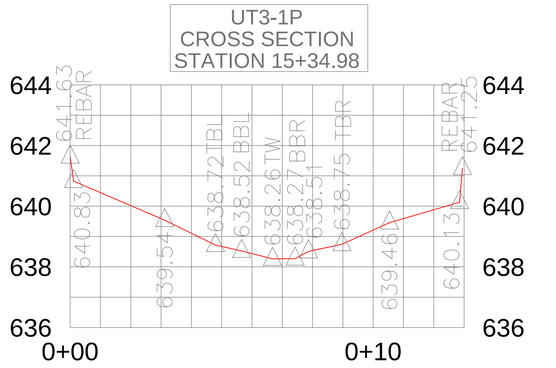

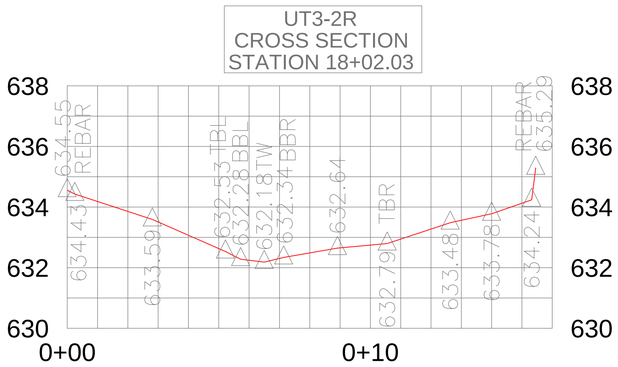

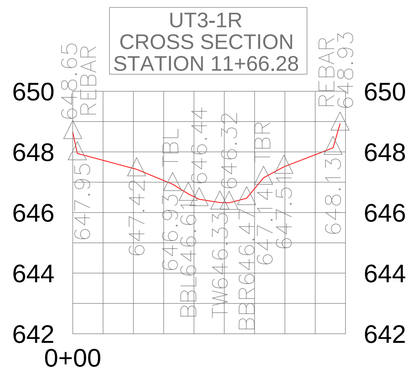

CROSS SECTION SCALE

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VERTICAL: 1"=2.5'(22x34)

TBL–LEFT TOP OF BANK
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BBR–RIGHT BANK TOE
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50' 0' 50' 100'

SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

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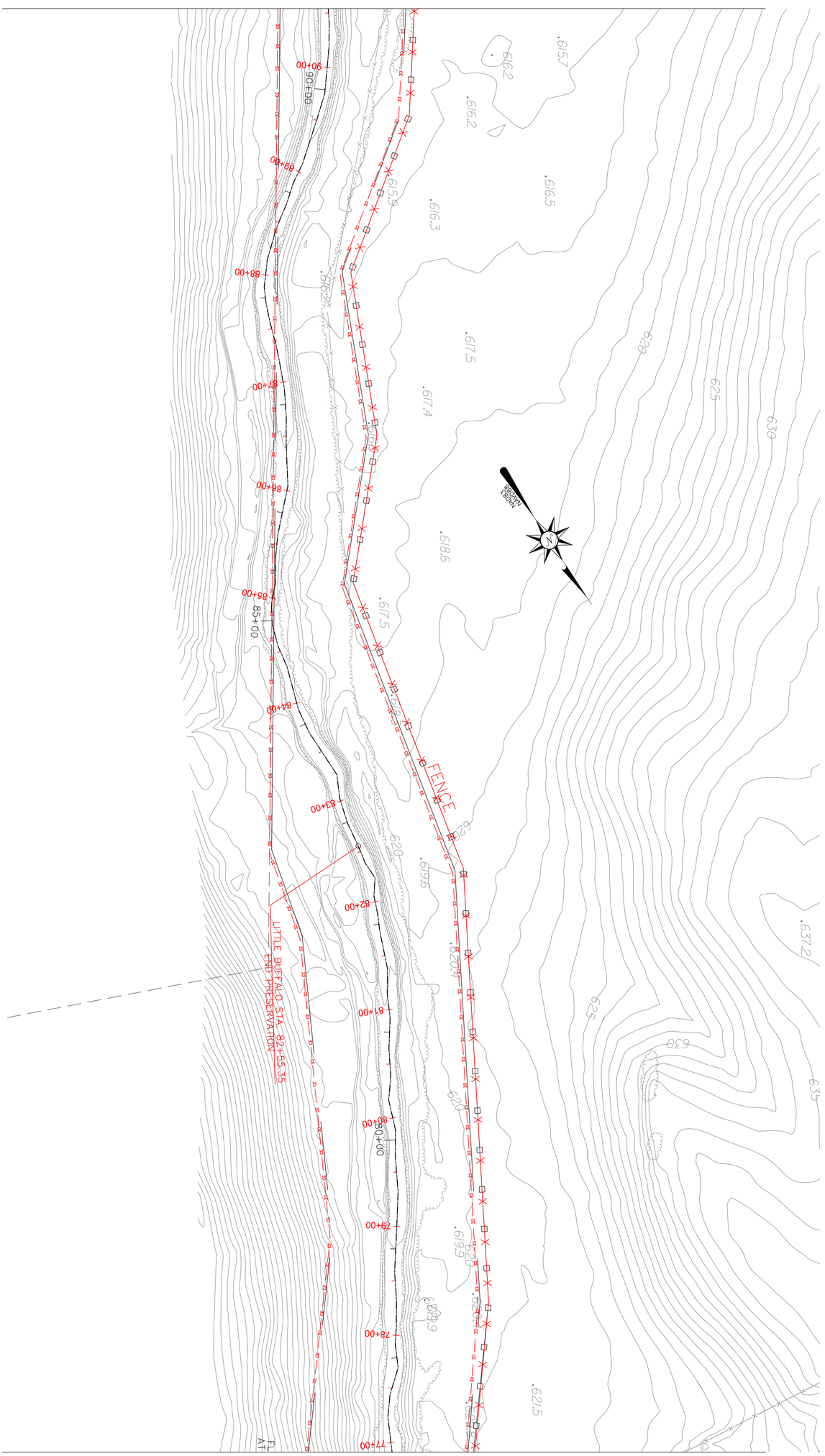
MATCHLINE SEE SHEET 11 OF 12



MATCHLINE SEE SHEET 7 OF 12

SCALE: 1" = 50' @ 22x34
1" = 100' @ 11x17
50' 0' 50' 100'

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 16003 DAVID HARTER

LITTLE BUFFALO CREEK
STREAM RESTORATION PROJECT
CABARRUS COUNTY
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AS BUILT – DESIGN PLAN

THE LOUIS BERGER GROUP, Inc.
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CROSS SECTION UT7-1R

CROSS SECTION UT7-1P

OLD MINE RD - 16' SOIL

PUBLIC EXCLUSION FENCE

LIMIT OF GRADING

VEGPLOT

CROSS SECTION SEE DETAILS

PLUGGED CHANNEL

FENCE

BEGIN UT-7 E1
STA 10+00

STA 11+46.80
END UT-7 E1
BEGIN UT-7 RESTORATION

BEGIN UT-8 RESTORATION
STA 10+19.08

UT-8 STA 10+80.78
END UT-8 RESTORATION

AREA TO TIE INTO EXISTING GRADE

CROSS SECTION
UT7-2R

LITTLE BUFFALO STA. 104+96.09
END PRESERVATION

INVERT IN 604.84'

TOS+19.75

EXISTING FENCE REMOVED

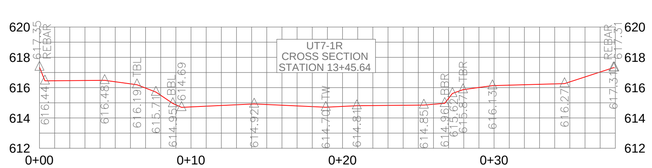
MATCHLINE SEE SHEET 11 OF 12

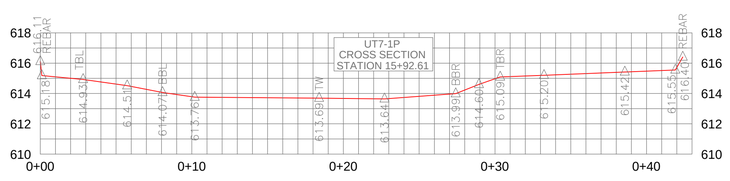
MATCHLINE SEE SHEET 9 OF 12

CROSS SECTION SCALE

HORIZONTAL: 1"=5'(22x34)
VERTICAL: 1"=5'(22x34)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG





50' 0' 50' 100'

SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

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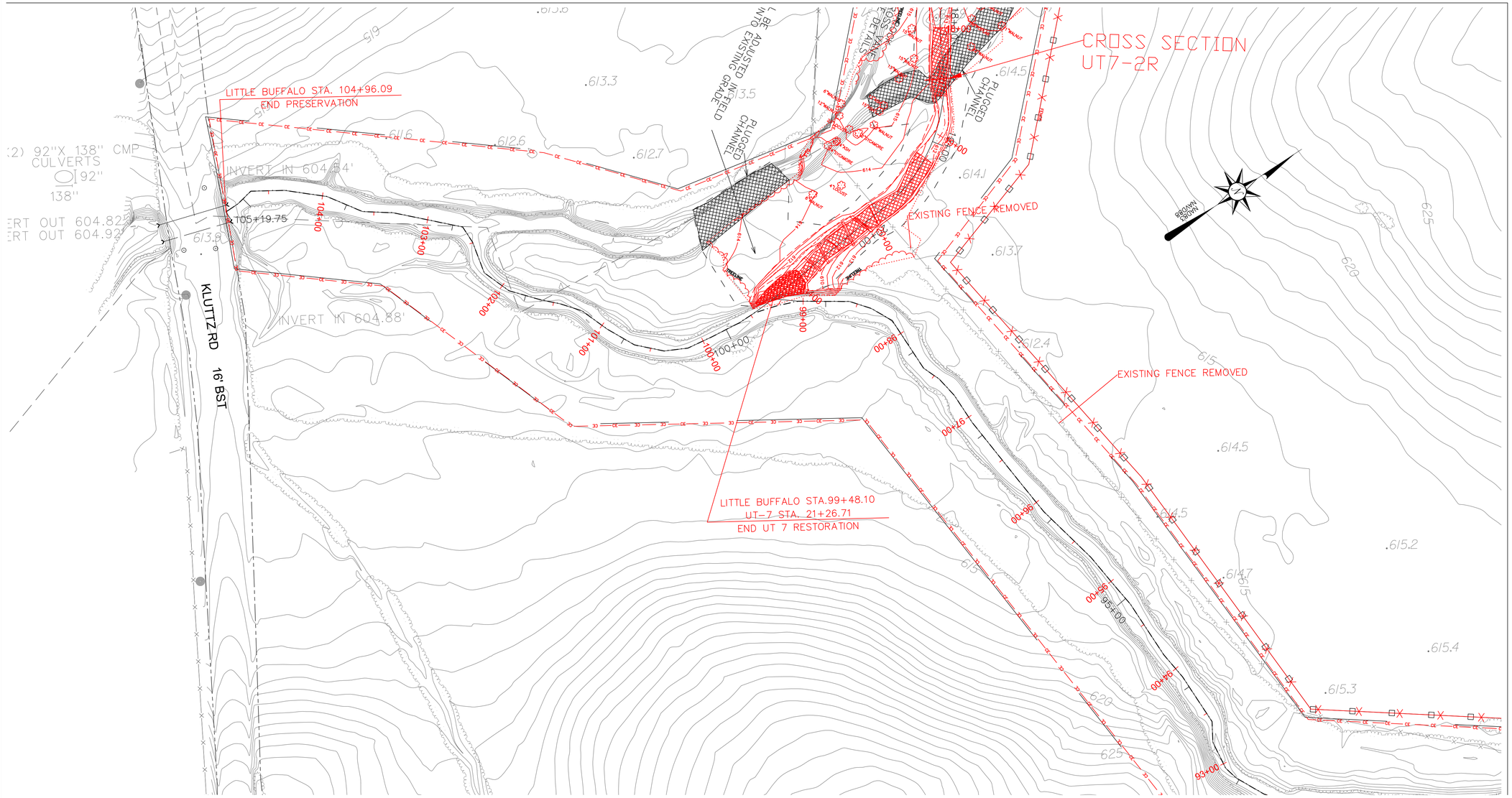
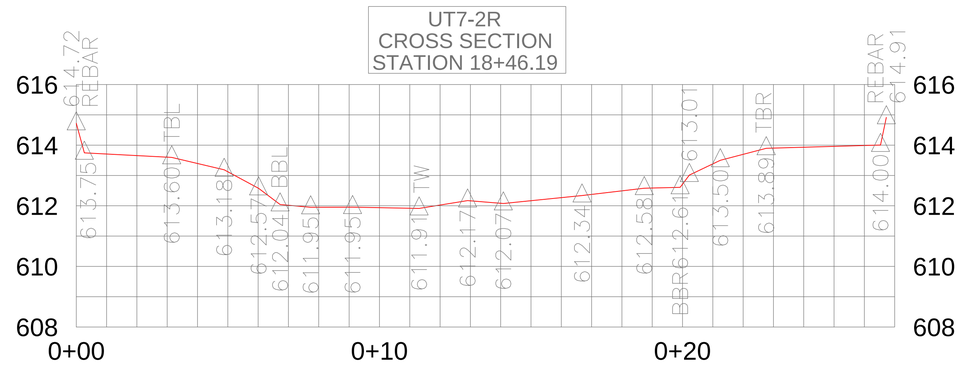
DATE JULY 2015
PROJECT NO. 94147
SHEET 10 OF 13

Filename: $FILEL$ Date: $DATE$ Time: $TIME$

MATCHLINE SEE SHEET 10 OF 12



UT7-2R
CROSS SECTION
STATION 18+46.19



CROSS SECTION SCALE

HORIZONTAL: 1"=2.5' (22x34)

VERTICAL: 1"=2.5' (22x34)

TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG

50' 0' 50' 100'

SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

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50' 0' 50' 100'

HORIZONTAL SCALE: 1"= 50' @ 22x34
1"= 100' @ 11x17

5' 0' 5' 10'

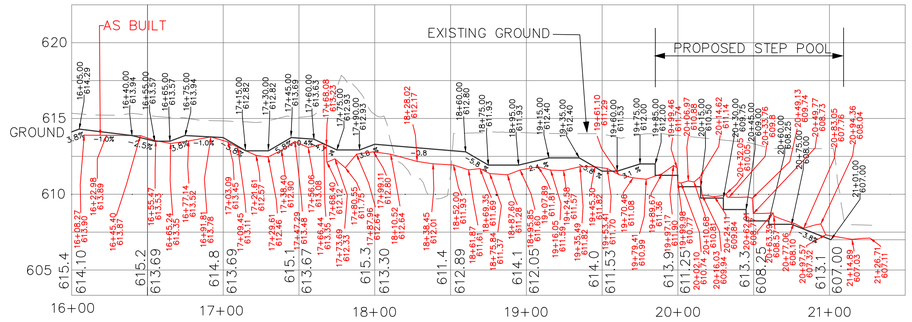
VERTICAL SCALE: 1"= 5' @ 22x34
1"= 10' @ 11x17

DESIGN

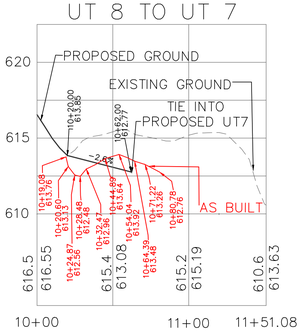
AS–BUILT

EXISTING

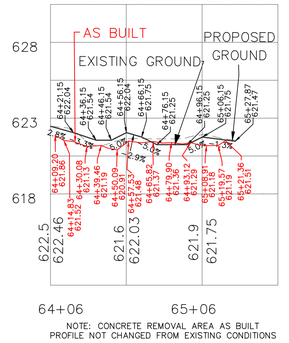
"UT 7"



UT 8 TO UT 7

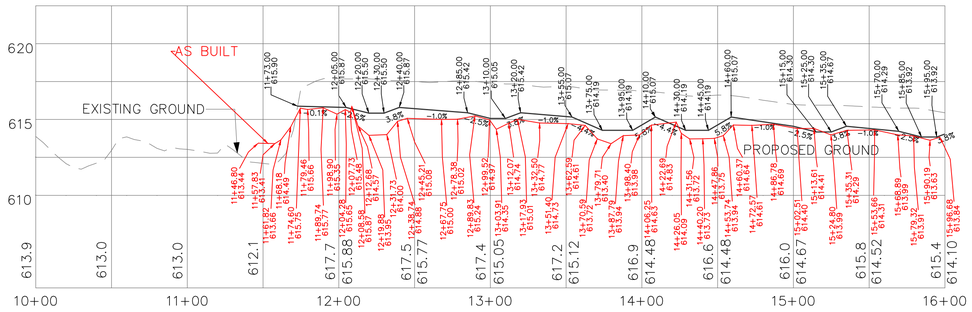


MAINSTEM – REACH 4

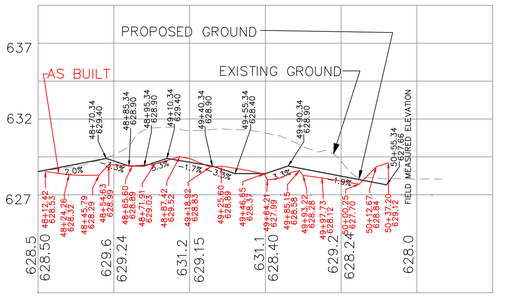


NOTE: CONCRETE REMOVAL AREA AS BUILT
PROFILE NOT CHANGED FROM EXISTING CONDITIONS

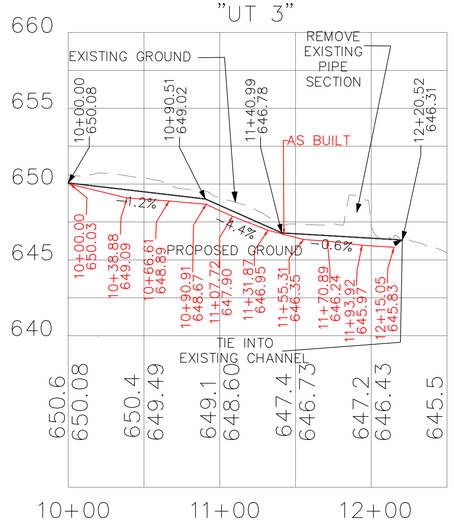
"UT 7"



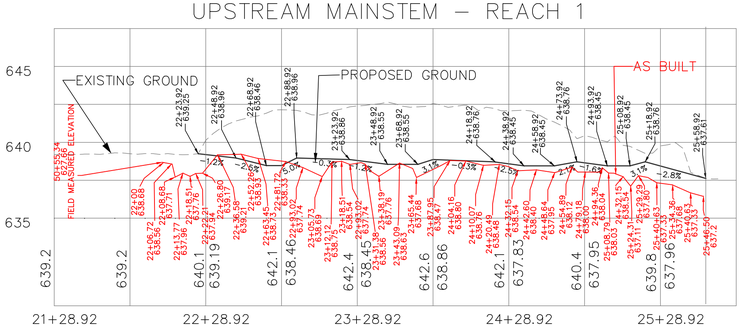
DOWNSTREAM MAINSTEM – REACH 3



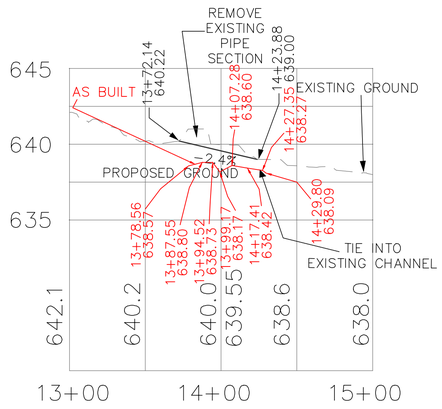
"UT 3"



UPSTREAM MAINSTEM – REACH 1



"UT 2"



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AS BUILT PROFILES

NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

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Filename: $FILE$ Date: $DATE$ Time: $TIME$

25' 0' 25' 50'

HORIZONTAL SCALE: 1"= 25' @ 22x34
1"= 50' @ 11x17

2.5' 0' 2.5' 5'

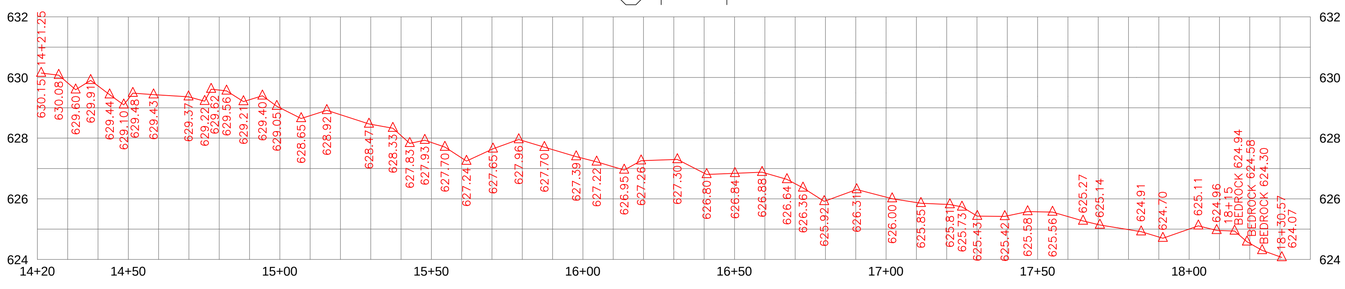
VERTICAL SCALE: 1"= 2.5' @ 22x34
1"= 5' @ 11x17

DESIGN

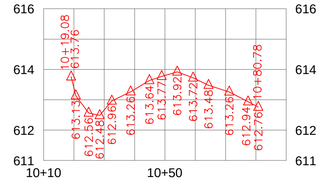
AS-BUILT

EXISTING

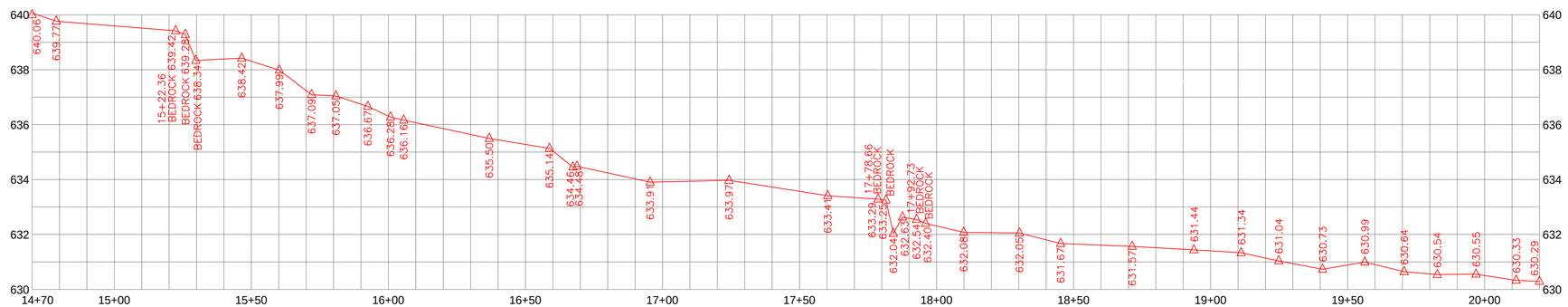
"UT-4"



"UT-8"



"UT-3"



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NORTH CAROLINA PROFESSIONAL SEAL 16003 ENGINEER DEAN D. HATFIELD

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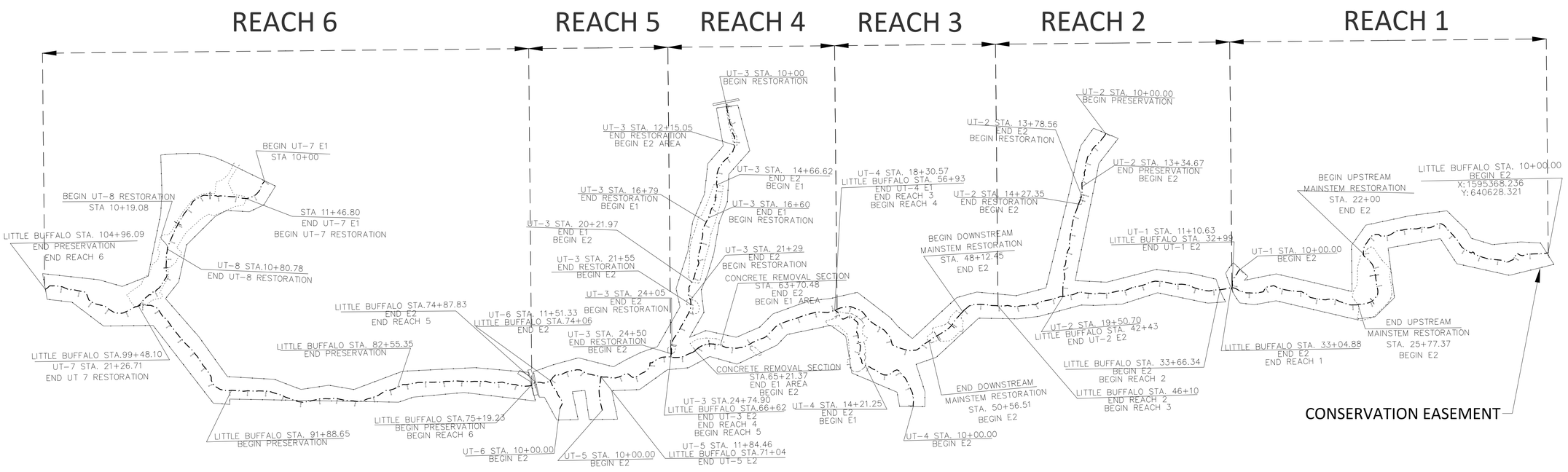
Filename: $FILE1$ Date: $DATE$ Time: $TIME$



MAINSTEM RESTORATION PLAN INDEX

ALIGNMENT	MITIGATION ACTIVITY	START STATION	END STATION
MAINSTEM	ENHANCEMENT LEVEL 2	10+00	22+00.00
	RESTORATION	22+00.00	25+77.37
	ENHANCEMENT LEVEL 2	25+77.37	33+04.88
	ENHANCEMENT LEVEL 2	33+66.34	48+12.45
	RESTORATION	48+12.45	50+56.51
	ENHANCEMENT LEVEL 2	50+56.51	63+70.48
	ENHANCEMENT LEVEL 1	63+70.48	65+21.37
	ENHANCEMENT LEVEL 2	65+21.37	74+87.83
	PRESERVATION	75+19.23	82+55.35
	PRESERVATION	91+88.65	104+96.09

MITIGATION ACTIVITY	GENERAL DESCRIPTION
RESTORATION	CHANNEL RE-ALIGNMENT AND CREATION. DITCH PLUG INSTALLATION. IN-STREAM STRUCTURE INSTALLATION, INCLUDING LOG VANES, ROCK CROSS VANES, STEP POOLS AND ROOT WADS. STREAM BANK RE-GRADING. PLANTING AND INVASIVE PLANT REMOVAL.
ENHANCEMENT LEVEL I (E1)	*STREAM BANK GRADING.* *MINOR CHANNEL REGRADING.* *CONCRETE REMOVAL FROM CHANNEL.* *PLANTING AND INVASIVE PLANT REMOVAL.*
ENHANCEMENT LEVEL 2 (E2)	*PLANTING AND INVASIVE PLANT REMOVAL.*

TRIBUTARY RESTORATION PLAN INDEX

ALIGNMENT	MITIGATION ACTIVITY	START STATION	END STATION
UT-1	ENHANCEMENT LEVEL 2	10+00	11+10.63
UT-2	PRESERVATION	10+00	13+34.67
UT-2	ENHANCEMENT LEVEL 2	13+34.67	13+78.56
UT-2	RESTORATION	13+78.56	14+27.35
UT-2	ENHANCEMENT LEVEL 2	14+27.35	19+50.70
UT-3	RESTORATION	10+00	12+15.05
UT-3	ENHANCEMENT LEVEL 2	12+15.05	14+66.62
UT-3	ENHANCEMENT LEVEL 1	14+66.62	16+60
UT-3	RESTORATION	16+60	16+79
UT-3	ENHANCEMENT LEVEL 1	16+79	20+21.97
UT-3	ENHANCEMENT LEVEL 2	20+21.97	21+29
UT-3	RESTORATION	21+29	21+55
UT-3	ENHANCEMENT LEVEL 2	21+55	24+05
UT-3	RESTORATION	24+05	24+50
UT-3	ENHANCEMENT LEVEL 2	24+50	24+74.90
UT-4	ENHANCEMENT LEVEL 2	10+00	14+21.25
UT-4	ENHANCEMENT LEVEL 1	14+21.25	18+30.57
UT-5	ENHANCEMENT LEVEL 2	10+00	11+84.46
UT-6	ENHANCEMENT LEVEL 2	10+00	11+51.33
UT-7	ENHANCEMENT LEVEL 1	10+00	11+46.80
UT-7	RESTORATION	11+46.80	21+26.71
UT-8	RESTORATION	10+19.08	10+80.78

NOTE: REFER TO PROPOSED CONDITIONS AND PLANTING PLANS FOR SPECIFIC ACTIVITIES AS PART OF THIS PROJECT. ADDITIONAL PROJECT COMPONENTS INCLUDE REMOVAL OF EXISTING FENCING, FENCE INSTALLATION, INSTALLATION OF TWO CATTLE CROSSINGS AND FLOOD GATES AS SHOWN ON THE PLANS.

NO.	REVISIONS	DRN	CHK	DATE

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TABLE 1 STREAM MITIGATION BY REACH

DATE JULY 2015
PROJECT NO. 94147
FIGURE A1