Bailey Fork Stream Restoration

Burke County, North Carolina, Project #D04006-2

As-Built Report, Mitigation Plan, 0-Year Monitoring

Prepared for:
North Carolina Department of the Environment and Natural Resources
Ecosystem Enhancement Program (NCDENR-EEP)
1652 Mail Service Center
Raleigh, NC 27699-1652

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Prepared by:

NATURAL SYSTEMS
ENGINEERING

Natural Systems Engineering
3719 Benson Drive
Raleigh, NC 27609
(919) 878-5444 Office
(919) 872-8444 Fax

Project Manger: James M. Halley, P.E.
jhalley@nsepc.com

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Executive Summary

Please note: This project was contracted under as-built and monitoring guidelines published by EEP during the fall of 2004. In an effort to remain consistent with the current EEP guidelines every reasonable effort has been made to produce these documents as per the new standards while not exceeding the level of effort originally committed and agreed to by EEP and Wetlands Resource Center. In doing so, some components of the new guidelines will necessarily be omitted.

The project site is located approximately two (2) miles southwest of Morganton, in Burke County, North Carolina (**Figure 1**). This project entailed the restoration of over 5,700 linear feet of Bailey Fork and its unnamed tributaries. Bailey Fork and its unnamed tributaries have a combined drainage area of approximately 5.5 square miles. This section of Bailey Fork was selected due to its highly degraded state. Prior to the restoration project, the stream banks were actively eroding and the channel itself was severely incised.

The Restoration Plan for Bailey Fork outlined an approach of Priority 1 restoration for the unnamed tributaries and Priority 2 for Bailey Fork. **Table 1** below outlines the restoration activities.

Table 1 - Project Mitigation Structure and Objectives Table
Bailey Fork Stream Restoration Project / Number D04006-2

Reach	Mitigation Type	Approach	Linear Footage	Stationing
Upper	Restoration	Priority 2	1,543.0	0+00 – 15+43
Lower	Restoration	Priority 2	1,170.4	0+00 – 11+70
UT1	Restoration	Priority 1	1,758.1	0+00 – 17+58
UT2	Restoration	Priority 1	1,271.0	0+00 – 12+71
		Total	**5,742.5**	

1.0 Narrative

1.1 Project Background

Bailey Fork and two unnamed tributaries of Bailey Fork were selected for restoration by the North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program to fulfill a portion of the Request for Proposals: Full Delivery Project Catawba 01. The purpose of the RFP was to provide compensatory stream mitigation within the Catawba River Basin Cataloging Unit 03050101. The Request for Proposal was designated RFP 16-D04006. Closing date for the request was March 25, 2004. Wetlands Resource Center (WRC) entered into a contract with the State of North Carolina on July 22, 2004 to deliver 5,500 stream units within this project site (Contract No. D04006-2). As outlined in the request for proposals for this project the monitoring requirements were obtained from the US Army Corps of Engineers April 2003 Stream Mitigation Guidelines (USACE, 2003).

The site was selected because of the highly degraded state of Bailey Fork and the tributaries. Based on site observations the degraded condition of the streams within the project area was the result of floodplain accretion, historic channelization, periodic dredging, past and present vegetation maintenance practices, and to a lesser extent storm water runoff onto the site from the incremental increase in impervious surface associated with urbanization.

The stream banks were generally denuded, actively eroding, and had a nearly vertical profile. Vegetative cover was minimal along the embankment resulting in the banks eroding and promoting lateral channel migration and asymmetrical meander creation. The majority of the stream was classified as an F type channel with some sections classifying as E and G type channel under the Rosgen Stream Classification System (Rosgen and Silvey, 1998). Some sections of channel had limited access to the floodplain during peak flood flows. Flood waters reached the historic floodplain only during intense rain events. The channels did not have access to the floodplain during bankfull events that typically occur in stable stream channels during the 1.5 to 2 year return period storm (Leopold et al., 1992). The channels were in a highly incised state resulting in confined flood flows. Prior to the restoration project, the floodplain was functioning more as a terrace not accessible at the bankfull elevation. The streams were in a progressive state of channel evolution referred to as Stage III and Stage IV (Ward and Trimble, 2004). Meanders and a new, lower and functional, floodplain located at the bankfull elevation were beginning to take form within the existing confined channel as a result of active stream bank erosion, and bed degradation.

1.2 Restoration Summary

The project goal for this restoration plan was to modify the dimension, pattern and profile of the existing stream channels to be stable and self-maintaining by utilizing natural channel design techniques and procedures. The design was developed utilizing Rosgen-based natural channel design principles. Physical restoration and water quality improvements were accomplished by fulfilling the restoration objectives below.

1) Design a channel with the appropriate cross-sectional dimension, pattern, and longitudinal profile while utilizing the existing channel condition survey, and collected reference reach data as a guide.

2) Improve upon and create bed form and aquatic habitat diversity (riffles, runs, pools, and glides).

3) Integrate, in conjunction with the stream restoration, a nested floodplain (bankfull bench) that will be accessible at the proposed bankfull channel elevation (Priority II restoration) or raise the bed elevation of the current stream so the bankfull elevation matches the current floodplain elevation (Priority I).

4) Ensure channel and stream bank stabilization by integrating in-channel grade control structures, root wads, and native vegetation into the proposed restoration design while also creating a stable and functional aquatic and terrestrial habitat.

5) Establish a native forested riparian plant community within a minimum of 30 feet from the proposed top of the bankfull channel. Remove exotic vegetation during construction implementation and the elimination of current embankment maintenance practices.

6) Provide aesthetic and educational opportunities.

Table 2 - Mitigation Summary Table

Reach	Upper Bailey	Lower Bailey	Tributary 1	Tributary 2	Total
Design Stream Type	C/E	C/E	C/E	C/E	---
Existing Reach Length (ft)	1383.0	1125.3	1648.1	898.9	5055.3
Restored Reach Length (ft)	1543.0	1170.4	1758.1	1271.0	5742.5
Mitigation Type	Restoration	Restoration	Restoration	Restoration	N/A
Credit Ratio	1:1	1:1	1:1	1:1	N/A
Total Stream Mitigation Units	1543.0	1170.4	1758.1	1271.0	**5742.5**

2.0 Monitoring Plan

The methods, frequencies, and success criteria, for each monitoring element is listed below. Some parameters requested in the Ecosystem Enhancement Program (EEP) September 2005 guidance (EEP, 2005a; EEP, 2005b) may be necessarily omitted which reflects the difference between that document and the fall 2004 guidelines (EEP, 2004). Every effort has been made to present this data according to the new format while not exceeding the level of effort originally agreed upon between Wetland Resource Center (WRC) and EEP for this project.

A determination will be made regarding the success of the project following the collection and evaluation of ecological and physical monitoring data, photographs, site observations, and the performance of the restoration project during 2006 through to 2011, as per the contract between WRC and EEP. Monitoring components that will be evaluated include vegetation survival, channel bed and bank stability, and in-stream structure performance.

Channel stability will be evaluated using the surveyed permanent cross-sections, longitudinal profiles, evaluation of bank stability and cover, evaluation of in-stream structure performance and pebble counts compared to the as-built and any previously collected monitoring data.

The longitudinal profile will typically adjust depending on the frequency of bankfull or greater storm events. Normally the constructed channel profile will adjust (especially in a sand dominated bed) but it will need to function without significant degradation (bed scour), or aggradation (mid-channel bars).

Table 3 - Monitoring Summary

Parameter	Methodology	Frequency	Success Criteria	0 Year Data
Hydrology	Photo documentation, crest gauge readings	Annually and as needed	2 or more events within 5 years	1 bankfull event documented
Profile	Horizontal/vertical survey of 3,000 linear feet of the longitudinal profile	Annually, between August and October	No major aggradation of degradation or changes from as-built measurements	Longitudinal profile performed on entire project
Pattern	Data indirectly collected during longitudinal profile survey	Annually, but data will only be analyzed if significant bank erosion is present	No significant bank erosion resulting in channel migration	Survey data indicates the design pattern matches the as-built stream pattern
Dimension	Survey the twelve established cross-sections and compare to the previous year, photos	Annually, between August and October	No major aggradation of degradation or changes from as-built measurements	12 cross-sections measured as part of the as-built plan
Bed Material	Pebble counts at 6 cross-sections. 3 pool and 3 riffle sections	Annually, between August and October	Consistent trend in materials data through year 5	12 pebble counts measured as part of the as-built plan
Vegetation	Stem counts within the 10 established vegetation plots	Annually, between August and October	Stem survival greater than 320 stems/acre through year 3	400 stems/acre

2.1 Hydrology

2.1.1 Methodology - Hydrology

Bankfull events will be documented through on-site evidence such as wrack lines or through the measurement of river stage using crest gauges. Four (4) crest gauges (Rantz et al., 1982) have been installed on site in strategic locations on each unnamed tributary and on both Lower and Upper Bailey. These gauges have a dowel inside that holds granulated cork at approximately one-foot intervals. As stream levels rise, water enters the crest gauge which suspends the granulated cork within the cylinder. As flood waters recede, an adherence ring is left on the dowel. During manual inspection the distance between the top of the dowel and the adherence ring is subtracted from the known elevation of the top of the dowel to yield the maximum river stage. Historical rainfall data and stream gauge data can then be used to pinpoint the date of the corresponding rainfall event and evaluate the field results.

2.1.2 Frequency - Hydrology

On-site crest gauges shall be inspected during every site visit. Site visits should be conducted, when possible, subsequent to known major rain events to ensure accuracy in gauge readings. The results of the inspection shall be documented for each gauge. Once documentation is complete, the dowel will be cleaned and the granulated cork replaced in each cup to reset the gauge for the next event.

2.1.3 Success Criteria - Hydrology

A minimum of two events must be documented within the 5-year monitoring period (USACE, 2003).

2.1.4 0-Year Data - Hydrology

A bankfull event was documented at the site immediately after construction. The bankfull event occurred between October 7th and 8th 2005 and is documented by the photos, rainfall data, and stream gauge data contained in **Appendix 5**. The wrack lines, shown in the photos, document stream levels well above bankfull stage. The wrack was observed above the headwall structure at station 15+43 on Upper Bailey. The bankfull elevation along the stream at this location is 1033.66 feet mean sea level (MSL). The headwall at this location has an elevation of 1040.04 MSL; therefore, river stage elevations were more than six (6) feet above bankfull. Total rainfall recorded at the Morganton National Weather Service station MRGN7 was 2.4 and 3.5 inches on October 7th and 8th respectively (**Appendix 5**).

2.2 Profile

2.2.1 Methodology - Profile

The project stream is 5,700 feet long; therefore, a total profile length of 3,000 feet will be used during monitoring. The Bailey Fork stream restoration project has a main stem which is 2,713 liner feet and two unnamed tributaries, UT1 and UT2, which are 1,758 and 1,271 respectively. Longitudinal profile measurements will follow the procedures outlined in the "Stream Restoration: A Natural Channel Design Handbook" (Doll et al., 2003). Data will be collected on the riffle-run-pool-glide sequence and each data set will be graphically compared to the previous years' data.

Table 4 - Proposed Profile Monitoring Plan

Bailey Fork Stream Reach	As-Built Total Length (ft.)	Proposed Profile Monitoring Length (ft.)
Upper Bailey	1,543.0	800
Lower Bailey	1,170.4	800
UT1	1,760.1	800
UT2	1,271.0	600
Totals	**5,742.5**	**3,000**

2.2.2 Frequency - Profile

A longitudinal survey will be conducted annually at the project site during each monitoring year.

2.2.3 Success Criteria - Profile

The longitudinal profile will typically adjust depending on the frequency of bankfull or greater storm events. Normally the constructed channel profile will adjust (especially in a sand dominated bed) although it is expected to function without significant degradation (bed scour), aggradation (mid-

channel bars), or bank erosion. No significant changes, such as major aggradation or degradation, will indicate success for this monitoring parameter.

2.2.4 0-Year Data - Profile

Longitudinal profile plots are presented in **Appendix 2.** Total thalweg distance is shown in **Table 4** Section 2.2.1. **Table 5** summarizes the riffle facet slopes. Pool-to-pool spacing is presented in **Appendix 4**, along with the raw data and summary data for each longitudinal profile survey.

Table 5 - Profile Data Summary

Stream Reach	Reach Water Surface Slope (start to end)	Design Riffle Facet Slope[1]	As-Built Riffle Facet Slope[1]	
			Median	Average
Upper Bailey	0.2%	0.2% - 0.4%	0.5%	1.4%
Lower Bailey	0.3%	0.1% - 0.3%	0.6%	0.9%
UT1	0.7%	0.3% - 0.7%	0.2%	1.4%
UT2	0.5%	0.2% - 0.5%	1.0%	3.4%

[1] – Minimum and maximum slope analysis consistently produced slope values near zero and slope values that were sometimes an order of magnitude above average slope values, respectively. Raw data and data analysis is presented in **Appendix 4.**

2.3 Pattern

2.3.1 Methodology - Pattern

Pattern information was indirectly collected during the as-built survey. A comparison of design pattern data and as-built data indicates that the stream was constructed as designed with only minor deviations from the intended alignment. This comparison allows the design pattern to be equivalent to the as-built pattern data as shown in the as-built plans located in **Appendix 1.** It is proposed that in-depth analysis of pattern measurements occur only if significant bank erosion becomes evident along the restored stream. Significant bank erosion being defined as a section of any stream bank longer than 25 feet exhibiting Bank Erosion Hazard Index (Rosgen, 1996) characteristics of High, Very High, or Extreme.

If significant bank erosion occurs, pattern measurements will be analyzed to determine the causes, and a remedy will be recommended. If needed, annual pattern data can be derived from historical survey data collected during measurement of the longitudinal profile. If the area of concern does not lie within the survey area, the area of concern will be surveyed to aid in determining a solution to the problem. If significant bank erosion does not occur, no pattern measurements will be reported.

2.3.2 Frequency - Pattern

Annually, pattern data will be collected indirectly during longitudinal profile surveys. Analysis of pattern data will be conducted on an as needed basis only.

2.3.3 Success Criteria - Pattern

No significant bank erosion that results in lateral channel migration.

2.3.4 0-Year Data - Pattern

As-built survey data indicates that the design pattern closely matches the as-built stream pattern (**Appendix 1**). If site conditions warrant further data analysis of pattern, additional information will be presented.

2.4 Dimension

2.4.1 Methodology - Dimension

The dimension shall be measured annually by surveying the twelve (12) established cross-sections on the site. Twelve cross-sections were established based on the total restoration length of 5,742 feet. The cross-sections were selected to show six (6) pool sections and six (6) riffle sections. Permanent monuments have been set at either end of each cross-section to aid in location each subsequent year. These monuments are half-inch rebar with survey cap set in concrete within a plastic (PVC) cover. The elevation data shall be collected along the established cross-section lines from left bank to right bank. This data will then be compared with the data collected at the respective cross-sections previously surveyed.

2.4.2 Frequency - Dimension

Cross-sectional surveys shall be performed at least once each monitoring year.

2.4.3 Success Criteria - Dimension

No significant vertical or lateral changes in dimension will indicate success for this monitoring parameter.

2.4.4 0-Year Data - Dimension

Twelve (12) permanent cross-sections have been established across the restored streams at the site. Survey measurements of these cross-sections were recorded and will be compared to data collected during subsequent monitoring years. Cross-section data is presented in **Appendix 3**.

2.5 Bed Material

2.5.1 Methodology - Bed Material

The bed material shall be measured annually using six (6) pebble counts performed at monumented cross-sections. The pebble counts will be performed at three (3) selected pools and three (3) selected riffle sections. Riffle and pool pebble counts will be conducted together at a selected cross-section location. Each monitoring year pebble counts will be conducted in the same location as the previous monitoring year.

2.5.2 Frequency - Bed Material

Pebble counts shall be performed at least once each monitoring year.

2.5.3 Success Criteria - Bed Material

A consistent trend in the materials data through year five will indicate success for this monitoring parameter.

2.5.4 0-Year Data - Bed Material

A pebble count was performed at each of the twelve (12) cross-sections. The data is presented in **Appendix 3**.

2.6 Vegetation

2.6.1 Methodology – Vegetation

Proposed vegetation monitoring will follow the criteria presented by EEP during the June 2006 workshop sponsored by North Carolina State University. The scope of the new 2006 vegetation monitoring requirements is greater than the scope outlined in the initial (EEP, 2004) vegetation monitoring requirements that apply to this project. To offset this difference in effort, fewer vegetation plots will be established than would normally be required under the new guidelines. Based on discussions with EEP it will be beneficial to collect the data during the next five (5) years using the new protocol, even if it means a slight reduction in the number of vegetation plots.

Based on discussions with EEP the project would normally require fourteen (14) vegetation plots. To remain within the level of effort originally contracted for this project, NSE proposes to establish ten (10) vegetation plots using the new criteria and Protocol Level 1, instead of the 2004 criteria (EEP, 2004). This reduction will allow monitoring to proceed under the new guidelines while not exceeding the original level of effort planned for this phase of the project. Monitoring will follow Protocol Level 1, which stipulates measuring only planted stems. The taxonomic protocol used for identification must be documented so subsequent investigators will know how the identification was derived. All plots will have dimensions of either 5 x 20 meters or 10 x 10 meters depending on the terrain. Each vegetation plot will be monumented at all corners with recoverable markers.

2.6.2 Frequency - Vegetation

The vegetation plots shall be inventoried and documented annually between August and October. This timeframe will ensure that the maximum number of characteristics will be present to properly identify each species within the plots.

2.6.3 Success Criteria - Vegetation

The vegetative success shall be based on the Army Corps of Engineers 2003 guidelines. The survival rate for the planted woody species on the mitigation site should be greater than three hundred-twenty

(320) stems per acre through year three (3). A ten percent mortality rate will be acceptable in year four (4) (288 stems per acre) and an additional ten percent in year five (5) resulting in a required survival rate of 260 woody stems per acre through year five (5).

2.6.4 0-Year Data - Vegetation

Vegetation was established at the site during and after construction activities. Four-thousand (4,000) bare root seedlings were planted on the 10.0 acres in Zone 2 during March 2006. This resulted in a 400 stems per acre baseline woody vegetation density. Plant species were selected based on geographic location, soil quality, existing local vegetation, and target plant communities. Local woody species were transplanted from the existing stream bank to the restored stream bank in Zone 1. Perennial and annual seed mixes were broadcast in both of the established planting zones to aid in bank stabilization during construction and vegetation re-establishment.

Two vegetation zones were created along all reaches of the restoration. Zone 1 is located between the top of bank and edge of water. Zone 2 extends from the top of bank to the easement line. Zone 1 and Zone 2 were both planted with annual and perennial seed mixtures as indicated in the tables below. Zone 1 seed mixes were supplemented with direct transplants of deciduous species taken from the original stream bank.

Table 6 - Zone 1 Vegetation

Common Name	Scientific Name	Description
German Millet	Echinochloa crusgalli	Annual Seed Mix
Rye Grain	Secale cereale	Annual Seed Mix
Crimson Clover	Trifolium incarnatum	Annual Seed Mix
Silky Dogwood	Cornus amomum	Perennial Seed Mix
Black Eyed Susan	Rudbeckia hirta	Perennial Seed Mix
Deer Tongue	Panicum clandestinum	Perennial Seed Mix
Switch Grass	Panicum virgatum var.	Perennial Seed Mix
Riverbank Wild Rye	Elymus riparius	Perennial Seed Mix
Tag Alder	Alnus serulatta	Transplant From Existing Bank
Silky Dogwood	Cornus amomum	Transplant From Existing Bank
Black Willow	Salix nigra	Transplant From Existing Bank
Elderberry	Sambucus canadensis	Transplant From Existing Bank
(Raeford et al., 1968)		

Zone 2 received additional plantings of bare root seedlings of bottomland hardwood species. The project planting goal for Zone 2 was four hundred (400) hardwood stems per acre with an approximate on center spacing of eight (8) to ten (10) feet. Four thousand (4000) seedlings were planted on ten (10.0) acres resulting in a density of four hundred (400) stems per acre. The seedlings were planted during March 2006.

Table 7 - Zone 2 Vegetation

Common Name	Scientific Name	Description	Stems Planted
Japanese Millet	Echinochloa frumentacea	Annual Seed Mix	N/A
Rye Grain	Secale cereale	Annual Seed Mix	N/A
American Sycamore	Plantanus occidentalis	Bare Root Seedling	800
Yellow Poplar	Liriodendron tulipfera	Bare Root Seedling	800
Cherry Bark Oak	Quercus pagoda	Bare Root Seedling	800
Willow Oak	Quercus phellos	Bare Root Seedling	800
Silky Dogwood	Cornus amomum	Bare Root Seedling	800
(Raeford et al., 1968)			

2.7 Benthos

Benthic monitoring was not required for this project.

2.8 Bank Erosion Hazard Index (BEHI)

BEHI monitoring was not required for this project.

3.0 Maintenance and Contingency Plans

At least annually during monitoring any problem areas will be noted by site personnel and the information will be provided to the Wetlands Resource Center (WRC). WRC will evaluate the problem at that time and determine the best course of action. Site visits will also be conducted by the monitoring contractor and WRC on an occasional basis throughout the year to identify potential problem areas. This approach of frequent site visits will ensure that any developing problem can be addressed before it poses a major risk to the success of the project.

4.0 References

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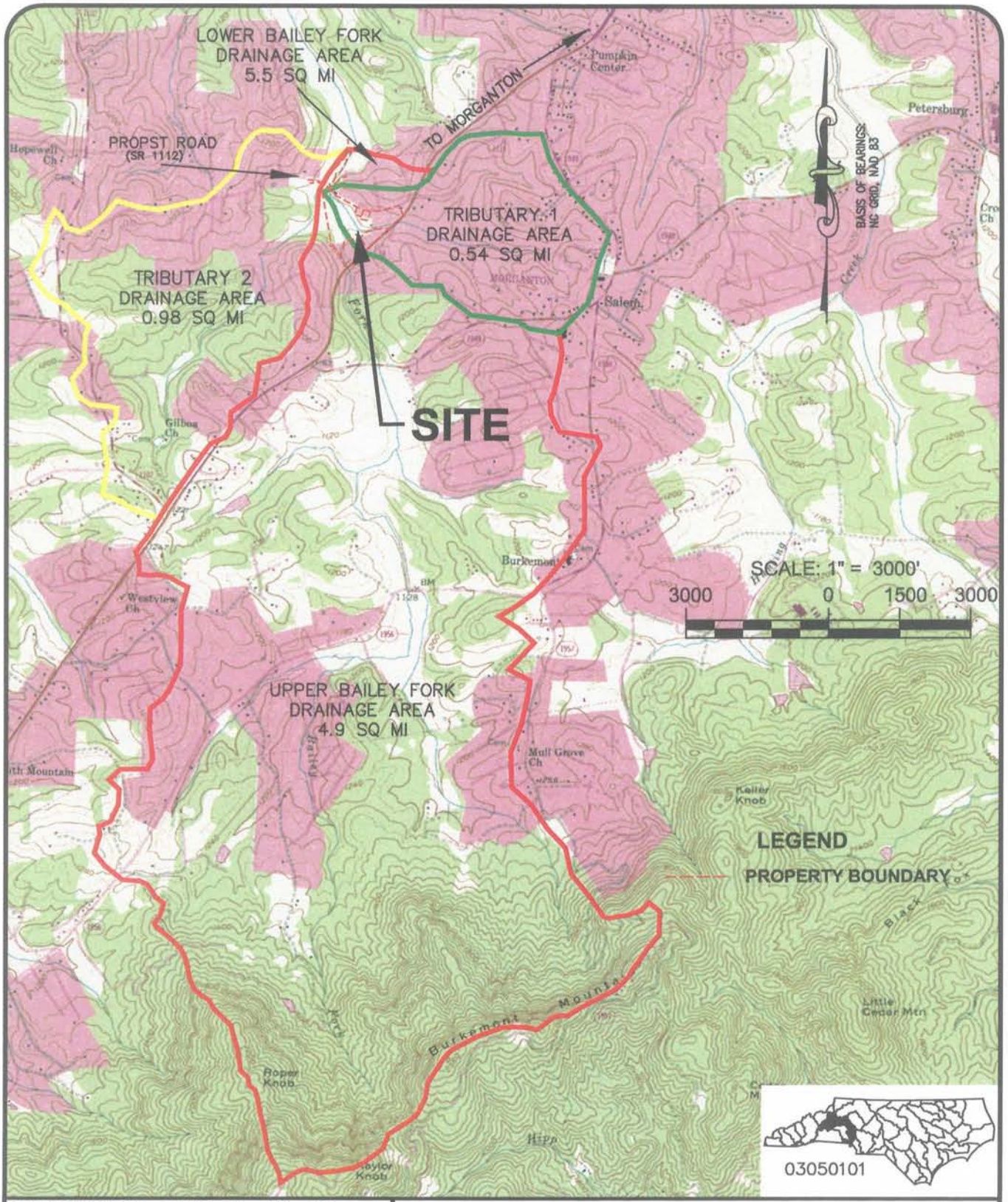
Section 5.0 Figures

Project Site Vicinity Map

Figure 1.0



PRODUCTION DATE: 7–17–06
NC COUNTY: BURKE
EEP PROJECT No: D04006–2

TITLE: VICINITY MAP, USGS MORGANTON SOUTH QUAD
PROJECT: BAILEY FORK STREAM RESTORATION

NATURAL SYSTEMS
ENGINEERING
Raleigh, North Carolina (919) 878-5444 www.nsepc.com

Ecosystem Enhancement Program

FIGURE
1

Section 6.0 Appendices

As-Built Plans – Bailey Fork Stream Restoration Project

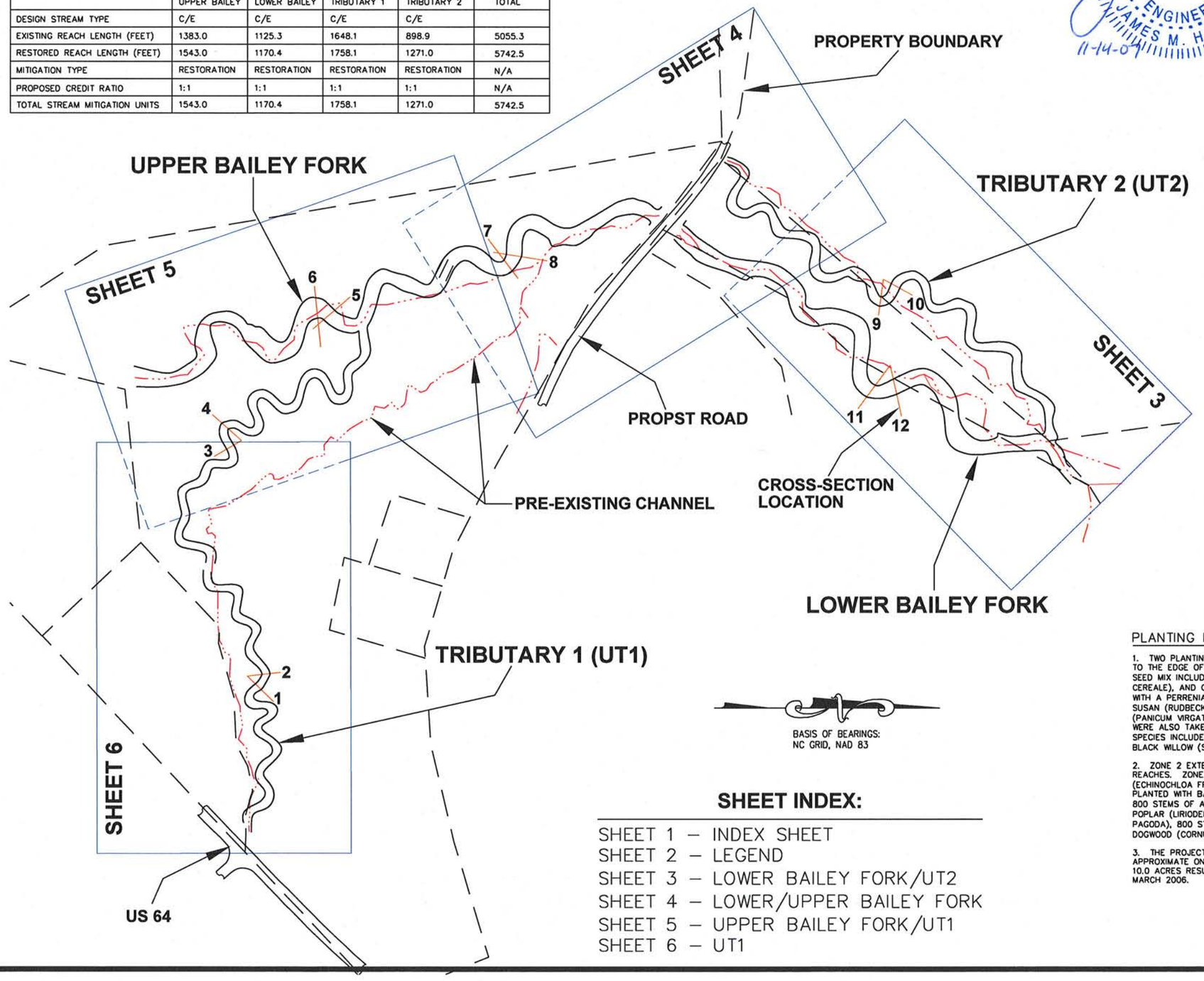
Appendix 1.0

NATURAL SYSTEMS
ENGINEERING

BAILEY FORK STREAM RESTORATION AS-BUILT

PROJECT SUMMARY:

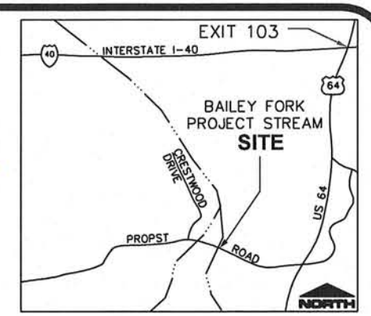
	UPPER BAILEY	LOWER BAILEY	TRIBUTARY 1	TRIBUTARY 2	TOTAL
DESIGN STREAM TYPE	C/E	C/E	C/E	C/E	
EXISTING REACH LENGTH (FEET)	1383.0	1125.3	1648.1	898.9	5055.3
RESTORED REACH LENGTH (FEET)	1543.0	1170.4	1758.1	1271.0	5742.5
MITIGATION TYPE	RESTORATION	RESTORATION	RESTORATION	RESTORATION	N/A
PROPOSED CREDIT RATIO	1:1	1:1	1:1	1:1	N/A
TOTAL STREAM MITIGATION UNITS	1543.0	1170.4	1758.1	1271.0	5742.5



BASIS OF BEARINGS:
NC GRID, NAD 83

SHEET INDEX:

NORTH CAROLINA PROFESSIONAL SEAL 29216 ENGINEER JAMES M. HALLEY
11-14-07



VICINITY MAP MORGANTON, NC
NOT TO SCALE

GENERAL NOTES:

1. PREPARED FOR NC ECOSYSTEM ENHANCEMENT PROGRAM, 1652 MAIL SERVICE CENTER, RALEIGH, NC 27699-1652. ON BEHALF OF WETLANDS RESOURCE CENTER, 3970 BOWEN ROAD, CANAL WINCHESTER, OH 43110.

2. SURFACE TOPOGRAPHY GENERATED FROM DATA COLLECTED BY NATURAL SYSTEMS ENGINEERING., 3719 BENSON DRIVE, RALEIGH, N.C. 27609, DURING MAY 2006.

3. THE BASE CLASS "C" TOPOGRAPHIC SURVEY WAS DRAWN FROM AN ACTUAL SURVEY PERFORMED UNDER SUPERVISION OF DAVID S. TURNER, PLS; LICENSE NUMBER L-4551; OF NATURAL SYSTEMS ENGINEERING; AND MEETS OR EXCEEDS THE NORTH CAROLINA ADMINISTRATIVE CODE 21.56.1605 AND 21.56.1606 STANDARDS.

4. EXACT RECORDS FOR THIS DIGITAL FILE CAN BE FOUND ON FILE WITH NATURAL SYSTEMS ENGINEERING UNDER JOB NUMBER WRC0402.

5. BOUNDARY LINES NOT SURVEYED ARE SHOWN AS BROKEN LINES FROM INFORMATION FOUND ON THE FACE OF THIS PLAT. THE BOUNDARY INFORMATION WAS COLLECTED FROM RECORD EVIDENCE LOCATED AT THE BURKE COUNTY COURTHOUSE DURING THE COURSE OF THE TOPOGRAPHIC SURVEY. THIS MAP DOES NOT CONFORM TO G.S. 47-30 AND IS NOT INTENDED TO DEPICT A BOUNDARY SURVEY FOR RECORDATION, TRANSFER, OR CONVEYANCE.

6. THIS PROJECT WAS CONTRACTED UNDER AS-BUILT AND MONITORING GUIDELINES PUBLISHED BY EEP DURING THE FALL OF 2004. IN AN EFFORT TO REMAIN CONSISTENT WITH THE CURRENT EEP GUIDELINES EVERY REASONABLE EFFORT HAS BEEN MADE TO PRODUCE THESE DOCUMENTS AS PER THE NEW STANDARDS WHILE NOT EXCEEDING THE LEVEL OF EFFORT ORIGINALLY COMMITTED AND AGREED TO BY EEP AND WETLANDS RESOURCE CENTER. IN DOING SO, SOME COMPONENTS OF THE NEW GUIDELINES WILL NECESSARILY BE OMITTED.

* THIS AS-BUILT WAS CONDUCTED BY NATURAL SYSTEMS ENGINEERING IN MAY 2006, AND WAS RESUBMITTED BY THE JOHN R. MCADAMS COMPANY IN NOVEMBER 2007. EXISTING STREAM STRUCTURES AT STATION 9+50 ON UPPER BAILEY AND UT 1 STATION 8+00 WERE NOT DEPICTED ON THE ORIGINAL AS-BUILT AND ARE SHOWN IN THIS REVISED SET OF DRAWINGS.

PLANTING NOTES:

1. TWO PLANTING ZONES EXIST ON THIS PROJECT. ZONE 1 EXTENDS FROM TOP OF BANK TO THE EDGE OF WATER ON ALL REACHES. ZONE 1 WAS PLANTED WITH AN ANNUAL SEED MIX INCLUDING GERMAN MILLET (ECHINOCHLOA CRUSGALLI), RYE GRAIN (SECALE CEREALE), AND CRIMSON CLOVER (TRIFOLIUM INCARNATUM). ZONE 1 WAS ALSO PLANTED WITH A PERRENIAL SEED MIX INCLUDING SILKY DOGWOOD (CORNUS AMOMUM), BLACK EYED SUSAN (RUDBECKIA HIRTA), DEER TONGUE (PANICUM CLANDESTINUM), SWITCH GRASS (PANICUM VIRGATUM VAR.) AND RIVERBANK WILDRYE (ELYMUS RIPARIUS). TRANSPLANTS WERE ALSO TAKEN FROM THE EXISTING CHANNEL AND PLACED IN ZONE 1. THESE SPECIES INCLUDED TAG ALDER (ALNUS SERULATTA), SILKY DOGWOOD (CORNUS AMOMUM), BLACK WILLOW (SALIX NIGRA), AND ELDERBERRY (SAMBUCUS CANADENSIS).

2. ZONE 2 EXTENDS FROM THE TOP OF BANK OUTWARD TO THE EASEMENT LINE ON ALL REACHES. ZONE 2 WAS PLANTED WITH AN ANNUAL SEED MIX OF JAPANESE MILLET (ECHINOCHLOA FRUMENTACEA) AND RYE GRAIN (SECALE CEREALE). ZONE 2 WAS ALSO PLANTED WITH BARE ROOT SEEDLINGS OF BOTTOMLAND HARDWOOD SPECIES INCLUDING 800 STEMS OF AMERICAN SYCAMORE (PLATANUS OCCIDENTALIS), 800 STEMS OF YELLOW POPLAR (LIRIODENDRON TULIPFERA), 800 STEMS OF CHERRYBARK OAK (QUERCUS PAGODA), 800 STEMS OF WILLOW OAK (QUERCUS PHELLOS), AND 800 STEMS OF SILKY DOGWOOD (CORNUS AMOMUM).

3. THE PROJECT PLANTING GOAL WAS 400 TO 600 STEMS PER ACRE WITH AN APPROXIMATE ON CENTER SPACING OF 8 TO 10 FEET. 4000 STEMS WERE PLANTED ON 10.0 ACRES RESULTING IN A DENSITY OF 400 STEMS PER ACRE. PLANTING DATE WAS MARCH 2006.

THE JOHN R. McADAMS COMPANY, INC.
ENGINEERS/PLANNERS/SURVEYORS
RESEARCH TRIANGLE PARK, NC
P.O. BOX 14005 ZIP 27709-4005
(919) 361-5000

BAILEY FORK STREAM RESTORATION AS-BUILT
TITLE AND INDEX SHEET
BURKE COUNTY, NORTH CAROLINA

PROJECT NO. WRC-07040
FILENAME: WRC07040ASBLT.DWG
SCALE: NTS
DATE: 07-18-06*

McADAMS

BAILEY FORK STREAM RESTORATION AS-BUILT

LEGEND

- PROPERTY LINE
- NEW FENCE LINE
- EASEMENT LINE
- MAJOR CONTOUR
- MINOR CONTOUR
- TOP OF BANK
- EDGE OF WATER
- AS-BUILT THALWEG
- OE — OVERHEAD ELECTRIC
- POWER POLE
- PRE-EXISTING THALWEG
- DESIGN BANKFULL
- ROOT WAD
- STEP CROSS-VANE
- "J" HOOK CROSS-VANE
- ROCK CHANNEL SILL
- LOG CHANNEL SILL
- STREAM FORD
- TREE LINE
- SINGLE TREE
- RIP RAP
- XSEC 1 — CROSS SECTION
- 15" CMP — STORM PIPE
- HEADWALL
- CG1 — CREST GAUGE
- PHOTO POINT
- CROSS-SECTION CONTROL POINT
- VEGETATION PLOT

NORTH CAROLINA PROFESSIONAL SEAL 29216 ENGINEER JAMES M. HALLEY 11-14-07

COORDINATES FOR SITE MONUMENTS:

DESCRIPTION	NORTHING	EASTING	ELEVATION
SITE BENCH MARK	721441.6310	1193642.0620	1045.53
X-SEC 1 RIGHT BANK	721079.0294	1194191.1914	1048.95
X-SEC 1 LEFT BANK	721025.7815	1194139.1639	1048.83
X-SEC 2 RIGHT BANK	721441.6310	1193642.0620	1049.33
X-SEC 2 LEFT BANK	721025.7815	1194139.1639	1048.83
X-SEC 3 RIGHT BANK	721014.7654	1193662.2643	1043.03
X-SEC 3 LEFT BANK	720959.7706	1193662.2643	1043.55
X-SEC 4 RIGHT BANK	721014.7654	1193662.2643	1043.03
X-SEC 4 LEFT BANK	720956.3953	1193609.8882	1043.05
X-SEC 5 RIGHT BANK	721157.9448	1193436.4844	1038.84
X-SEC 5 LEFT BANK	721233.7073	1193371.4565	1038.56
X-SEC 6 RIGHT BANK	721173.9271	1193472.6298	1041.97
X-SEC 6 LEFT BANK	721161.1621	1193349.2386	1038.91
X-SEC 7 RIGHT BANK	721572.5458	1193333.9063	1038.31
X-SEC 7 LEFT BANK	721512.4652	1193253.9009	1038.37
X-SEC 8 RIGHT BANK	721631.3051	1193298.1789	1036.81
X-SEC 8 LEFT BANK	721523.4577	1193281.0191	1037.32
X-SEC 9 RIGHT BANK	722301.2510	1193409.1486	1037.75
X-SEC 9 LEFT BANK	722311.3265	1193335.8527	1037.25
X-SEC 10 RIGHT BANK	722370.2418	1193367.8822	1036.79
X-SEC 10 LEFT BANK	722311.3265	1193335.8527	1037.25
X-SEC 11 RIGHT BANK	722259.6636	1193597.6218	1037.12
X-SEC 11 LEFT BANK	722324.9678	1193509.7189	1033.99
X-SEC 12 RIGHT BANK	722347.9970	1193613.2409	1037.47
X-SEC 12 LEFT BANK	722324.9678	1193509.7189	1033.99

* THIS AS-BUILT WAS CONDUCTED BY NATURAL SYSTEMS ENGINEERING IN MAY 2006, AND WAS RESUBMITTED BY THE JOHN R. MCADAMS COMPANY IN NOVEMBER 2007. EXISTING STREAM STRUCTURES AT STATION 9+50 ON UPPER BAILEY AND UT 1 STATION 8+00 WERE NOT DEPICTED ON THE ORIGINAL AS-BUILT AND ARE SHOWN IN THIS REVISED SET OF DRAWINGS.

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ENGINEERS/PLANNERS/SURVEYORS
RESEARCH TRIANGLE PARK, NC
P.O. BOX 14005 ZIP 27709-4005
(919) 361-5000

BAILEY FORK STREAM RESTORATION AS-BUILT
LEGEND
BURKE COUNTY, NORTH CAROLINA

PROJECT NO. WRC-07040
FILENAME: WRC07040ASBLT.DWG
SCALE: NTS
DATE: 07-18-06*

McADAMS

BAILEY FORK STREAM RESTORATION AS-BUILT

**NOTE: THE LOCATION OF THE VEGETATION PLOTS SHOWN IS APPROXIMATE. DUE TO THE TRANSITIONAL NATURE OF THIS PROJECT THE VEGETATION PLOTS WILL BE MONUMENTED DURING THE FIRST MONITORING EVENT AS ACKNOWLEDGED BY EP.

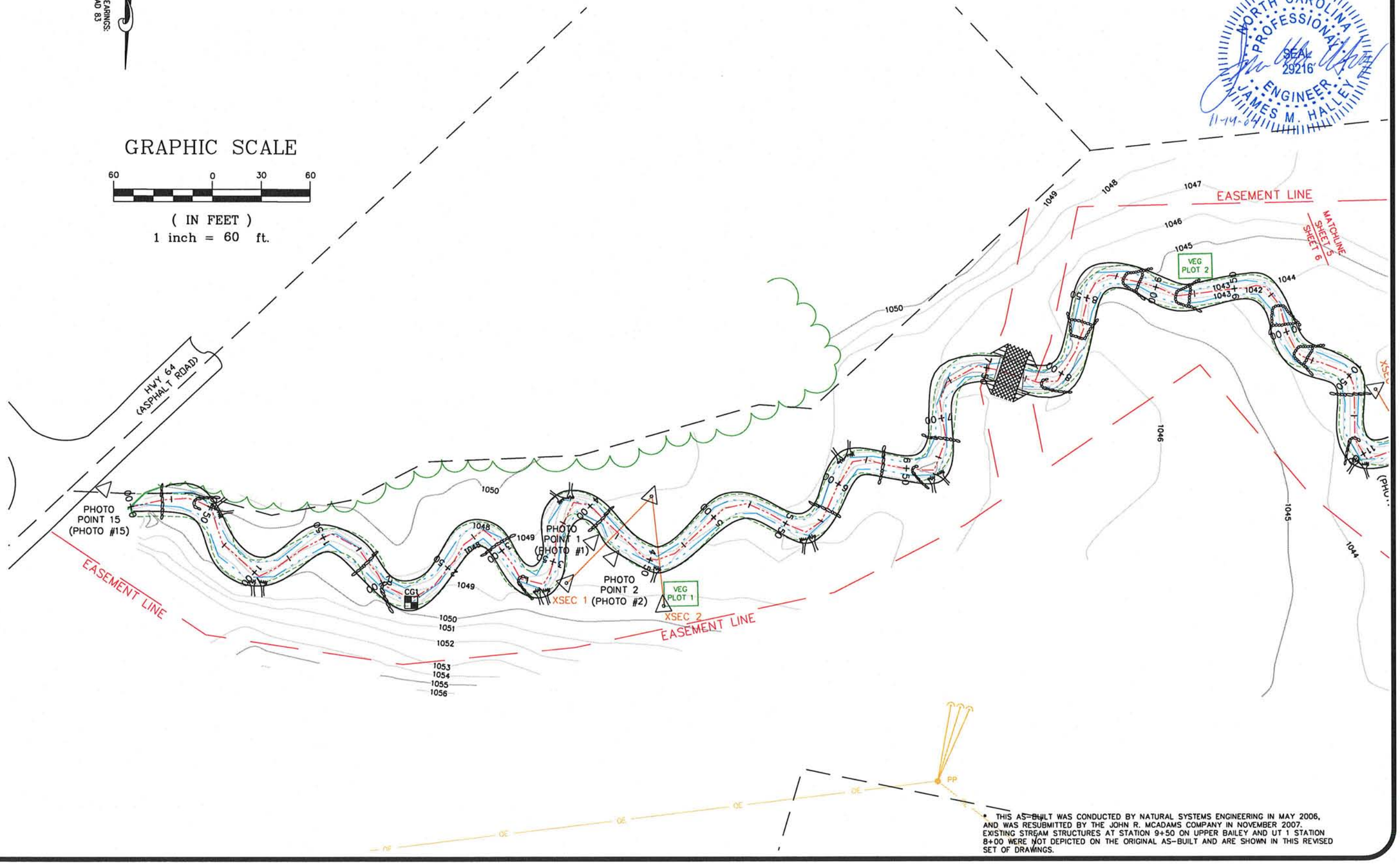
BASIS OF BEARINGS: NC GRID, NAD 83

GRAPHIC SCALE

60 0 30 60

(IN FEET)
1 inch = 60 ft.

NORTH CAROLINA PROFESSIONAL SEAL 29216 ENGINEER JAMES M. HALLEY
11-14-06



* THIS AS-BUILT WAS CONDUCTED BY NATURAL SYSTEMS ENGINEERING IN MAY 2006, AND WAS RESUBMITTED BY THE JOHN R. MCADAMS COMPANY IN NOVEMBER 2007. EXISTING STREAM STRUCTURES AT STATION 9+50 ON UPPER BAILEY AND UT 1 STATION 8+00 WERE NOT DEPICTED ON THE ORIGINAL AS-BUILT AND ARE SHOWN IN THIS REVISED SET OF DRAWINGS.

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ENGINEERS/PLANNERS/SURVEYORS
RESEARCH TRIANGLE PARK, NC
P.O. BOX 14005 ZIP 27709-4005
(919) 361-5000

BAILEY FORK STREAM RESTORATION AS-BUILT
UT1
BURKE COUNTY, NORTH CAROLINA

PROJECT NO. WRC-07040
FILENAME: WRC07040ASBLT.DWG
SCALE: 1" = 60'
DATE: 07-18-06*

McADAMS

BAILEY FORK STREAM RESTORATION AS-BUILT

BASIS OF BEARINGS: NC GRID, NAD 83

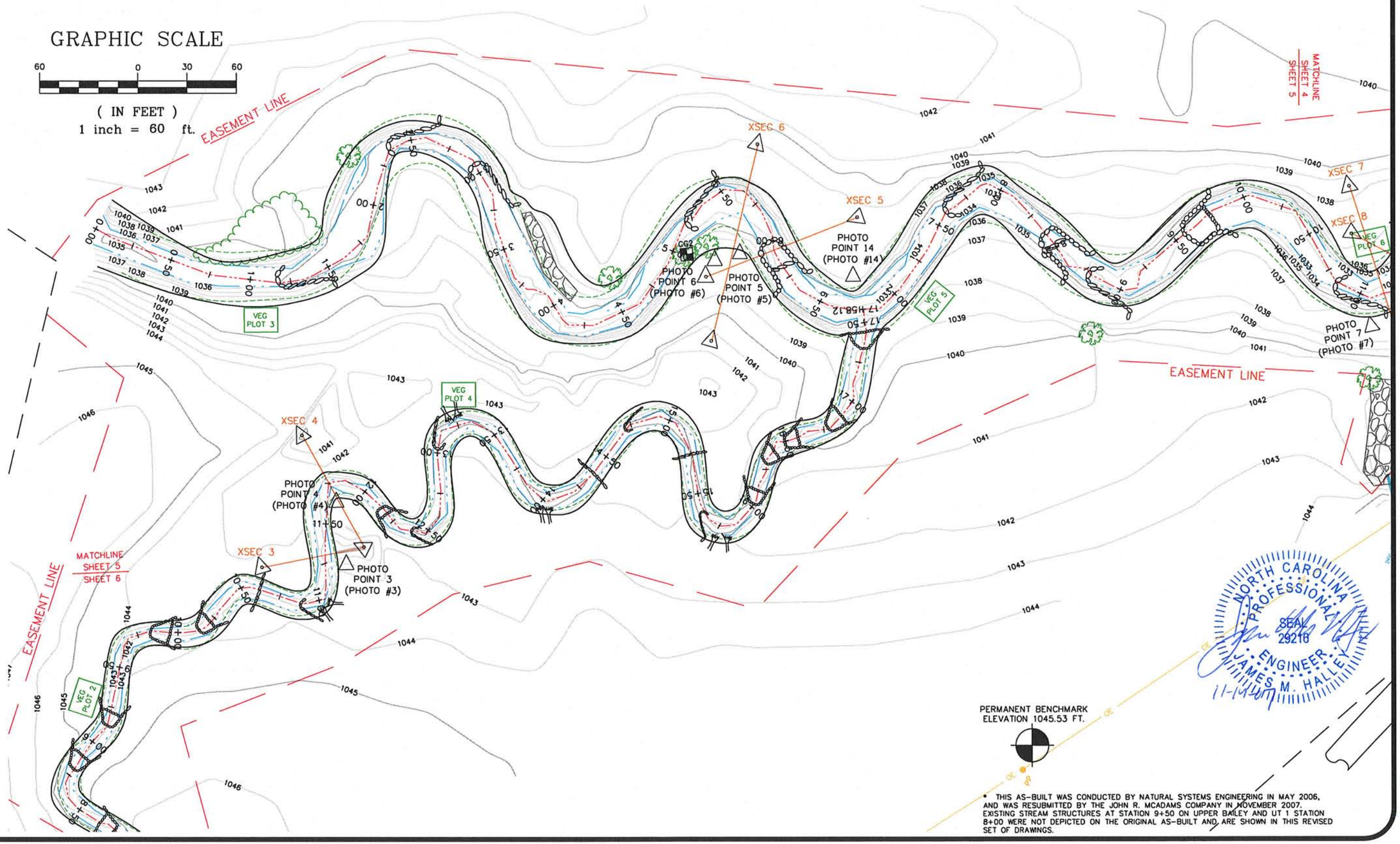
**NOTE: THE LOCATION OF THE VEGETATION PLOTS SHOWN IS APPROXIMATE. DUE TO THE TRANSITIONAL NATURE OF THIS PROJECT THE VEGETATION PLOTS WILL BE MONUMENTED DURING THE FIRST MONITORING EVENT AS ACKNOWLEDGED BY EEP.

GRAPHIC SCALE

60 0 30 60

(IN FEET)

1 inch = 60 ft.



PERMANENT BENCHMARK
ELEVATION 1045.53 FT.

* THIS AS-BUILT WAS CONDUCTED BY NATURAL SYSTEMS ENGINEERING IN MAY 2006, AND WAS RESUBMITTED BY THE JOHN R. MCADAMS COMPANY IN NOVEMBER 2007. EXISTING STREAM STRUCTURES AT STATION 9+50 ON UPPER BAILEY AND UT 1 STATION 8+00 WERE NOT DEPICTED ON THE ORIGINAL AS-BUILT AND, ARE SHOWN IN THIS REVISED SET OF DRAWINGS.

NORTH CAROLINA PROFESSIONAL SEAL 29210 ENGINEER JAMES M. HALLEY 11-14-07

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ENGINEERS/PLANNERS/SURVEYORS
RESEARCH TRIANGLE PARK, NC
P.O. BOX 14005 ZIP 27709-4005
(919) 361-5000

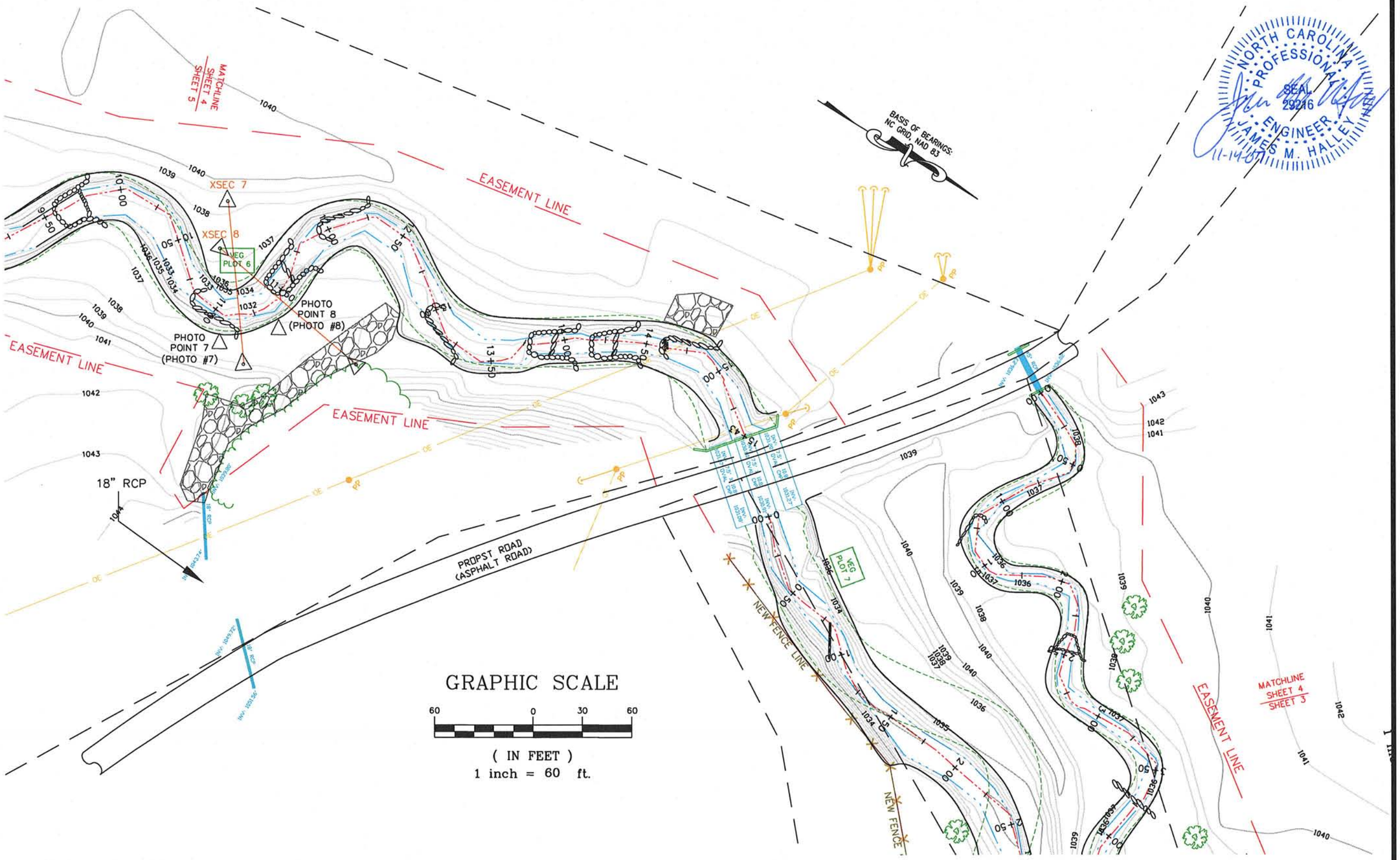
BAILEY FORK STREAM RESTORATION AS-BUILT
UPPER BAILEY FORK / UT1
BURKE COUNTY, NORTH CAROLINA

PROJECT NO.	WRC-07040
FILENAME:	WRC07040ASBLT.DWG
SCALE:	1" = 60'
DATE:	07-18-06*

McADAMS

BAILEY FORK STREAM RESTORATION AS-BUILT

**NOTE: THE LOCATION OF THE VEGETATION PLOTS SHOWN IS APPROXIMATE. DUE TO THE TRANSITIONAL NATURE OF THIS PROJECT THE VEGETATION PLOTS WILL BE MONUMENTED DURING THE FIRST MONITORING EVENT AS ACKNOWLEDGED BY EEP.



* THIS AS-BUILT WAS CONDUCTED BY NATURAL SYSTEMS ENGINEERING IN MAY 2006, AND WAS RESUBMITTED BY THE JOHN R. MCADAMS COMPANY IN NOVEMBER 2007. EXISTING STREAM STRUCTURES AT STATION 9+50 ON UPPER BAILEY AND UT 1 STATION 8+00 WERE NOT DEPICTED ON THE ORIGINAL AS-BUILT AND ARE SHOWN IN THIS REVISED SET OF DRAWINGS.

NORTH CAROLINA PROFESSIONAL SEAL 29216 ENGINEER JAMES M. HALLEY 11-14-07

THE JOHN R. McADAMS COMPANY, INC.
ENGINEERS/PLANNERS/SURVEYORS
RESEARCH TRIANGLE PARK, NC
P.O. BOX 14005 ZIP 27709-4005
(919) 361-5000

BAILEY FORK STREAM RESTORATION AS-BUILT
UPPER/LOWER BAILEY FORK
BURKE COUNTY, NORTH CAROLINA

PROJECT NO.	WRC-07040
FILENAME:	WRC07040ASBLT.DWG
SCALE:	1" = 60'
DATE:	07-18-06*

McADAMS

BAILEY FORK STREAM RESTORATION AS-BUILT

**NOTE: THE LOCATION OF THE VEGETATION PLOTS SHOWN IS APPROXIMATE. DUE TO THE TRANSITIONAL NATURE OF THIS PROJECT THE VEGETATION PLOTS WILL BE MONUMENTED DURING THE FIRST MONITORING EVENT AS ACKNOWLEDGED BY EEP.

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 29216 JAMES M. HALLEY 11-1-07

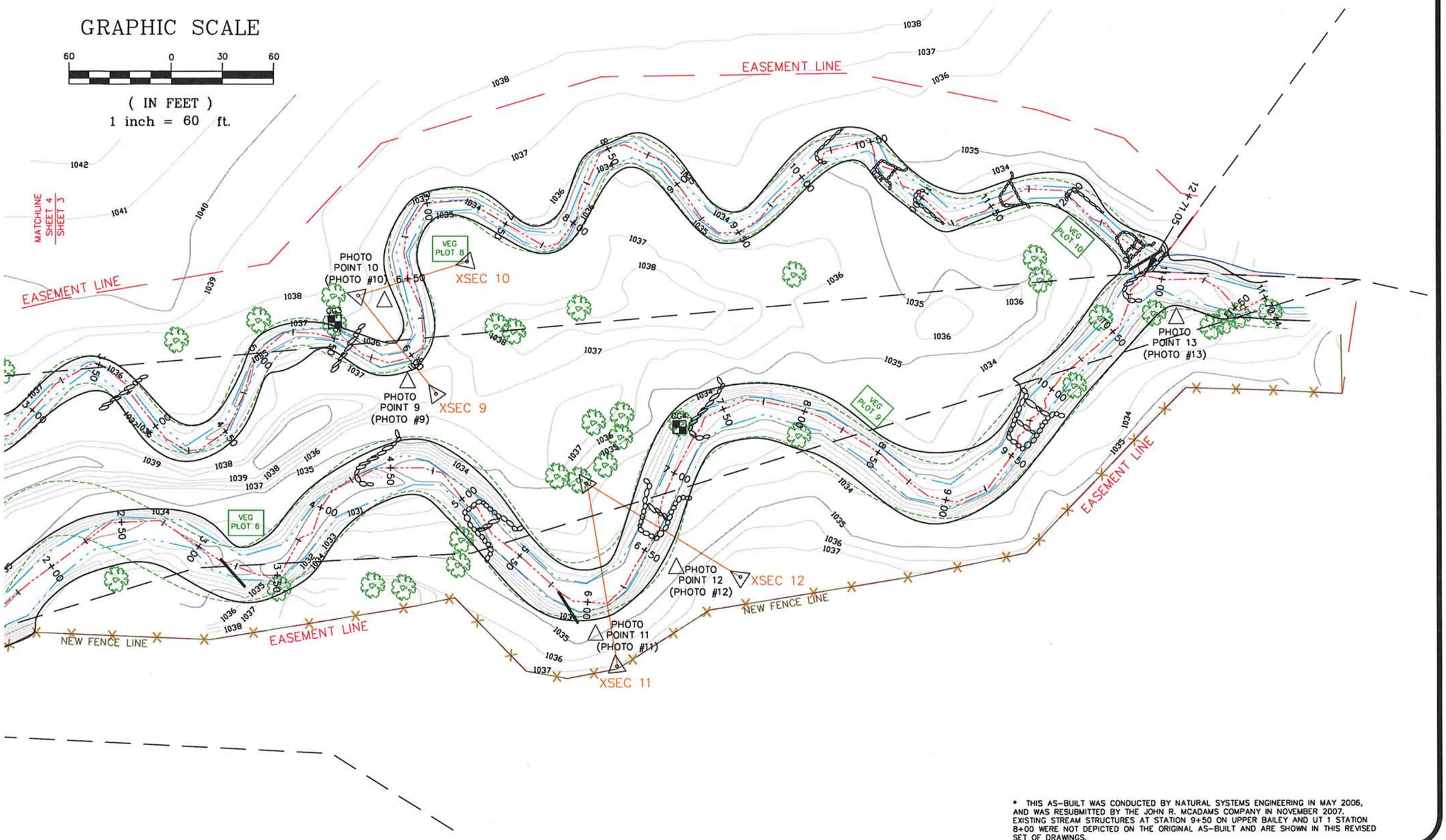
BASIS OF BEARINGS: NC GRID, NAD 83

GRAPHIC SCALE

60 0 30 60

(IN FEET)

1 inch = 60 ft.



* THIS AS-BUILT WAS CONDUCTED BY NATURAL SYSTEMS ENGINEERING IN MAY 2006, AND WAS RESUBMITTED BY THE JOHN R. MCADAMS COMPANY IN NOVEMBER 2007. EXISTING STREAM STRUCTURES AT STATION 9+50 ON UPPER BAILEY AND UT 1 STATION 8+00 WERE NOT DEPICTED ON THE ORIGINAL AS-BUILT AND ARE SHOWN IN THIS REVISED SET OF DRAWINGS.

THE JOHN R. McADAMS COMPANY, INC.
ENGINEERS/PLANNERS/SURVEYORS
RESEARCH TRIANGLE PARK, NC
P.O. BOX 14005 ZIP 27709-4005
(919) 361-5000

BAILEY FORK STREAM RESTORATION AS-BUILT
LOWER BAILEY FORK / UT2
BURKE COUNTY, NORTH CAROLINA

PROJECT NO.	WRC-07040
FILENAME:	WRC07040ASBLT.DWG
SCALE:	1" = 60'
DATE:	07-18-06*

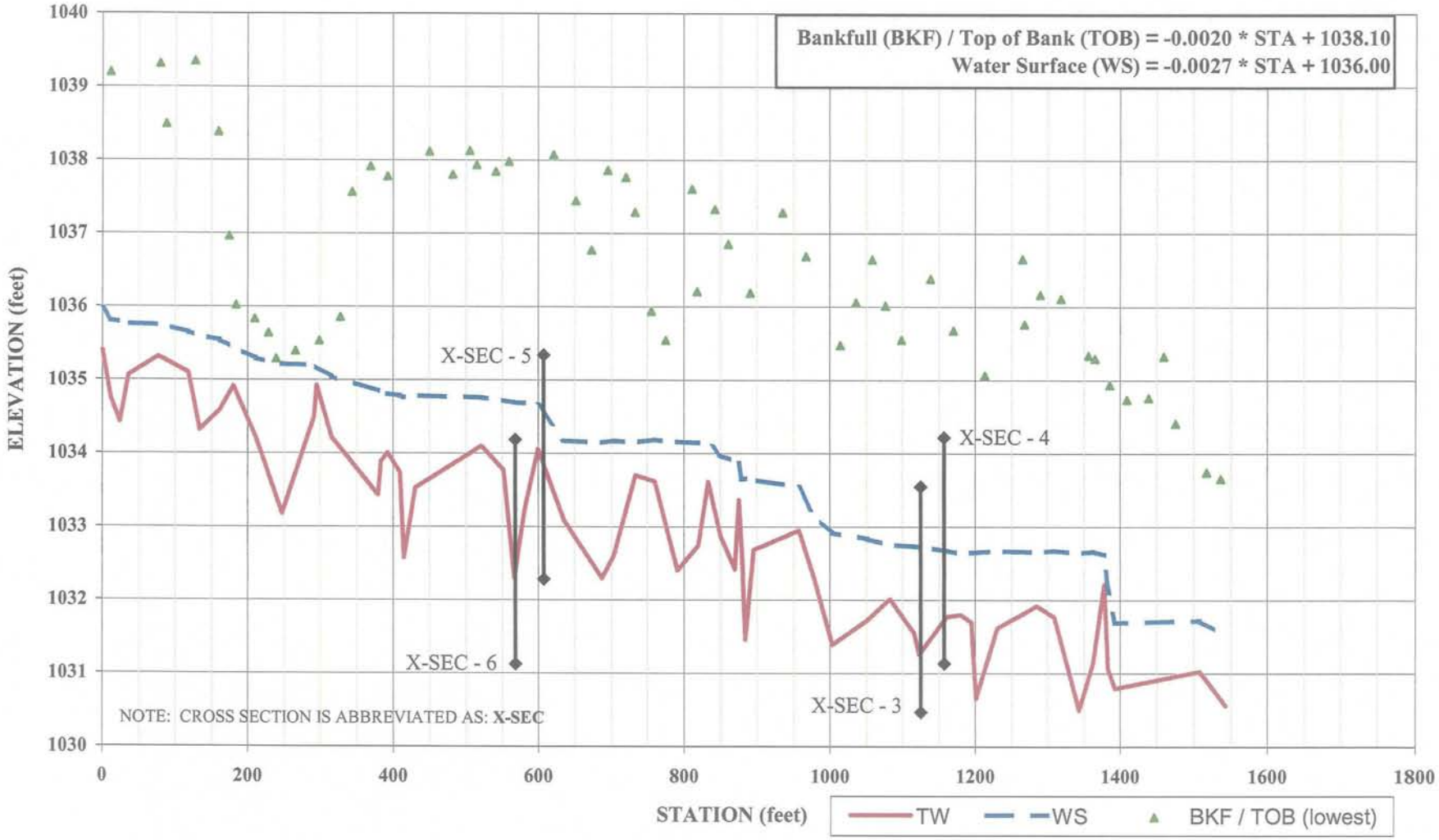
McADAMS

Longitudinal Profiles

Appendix 2.0

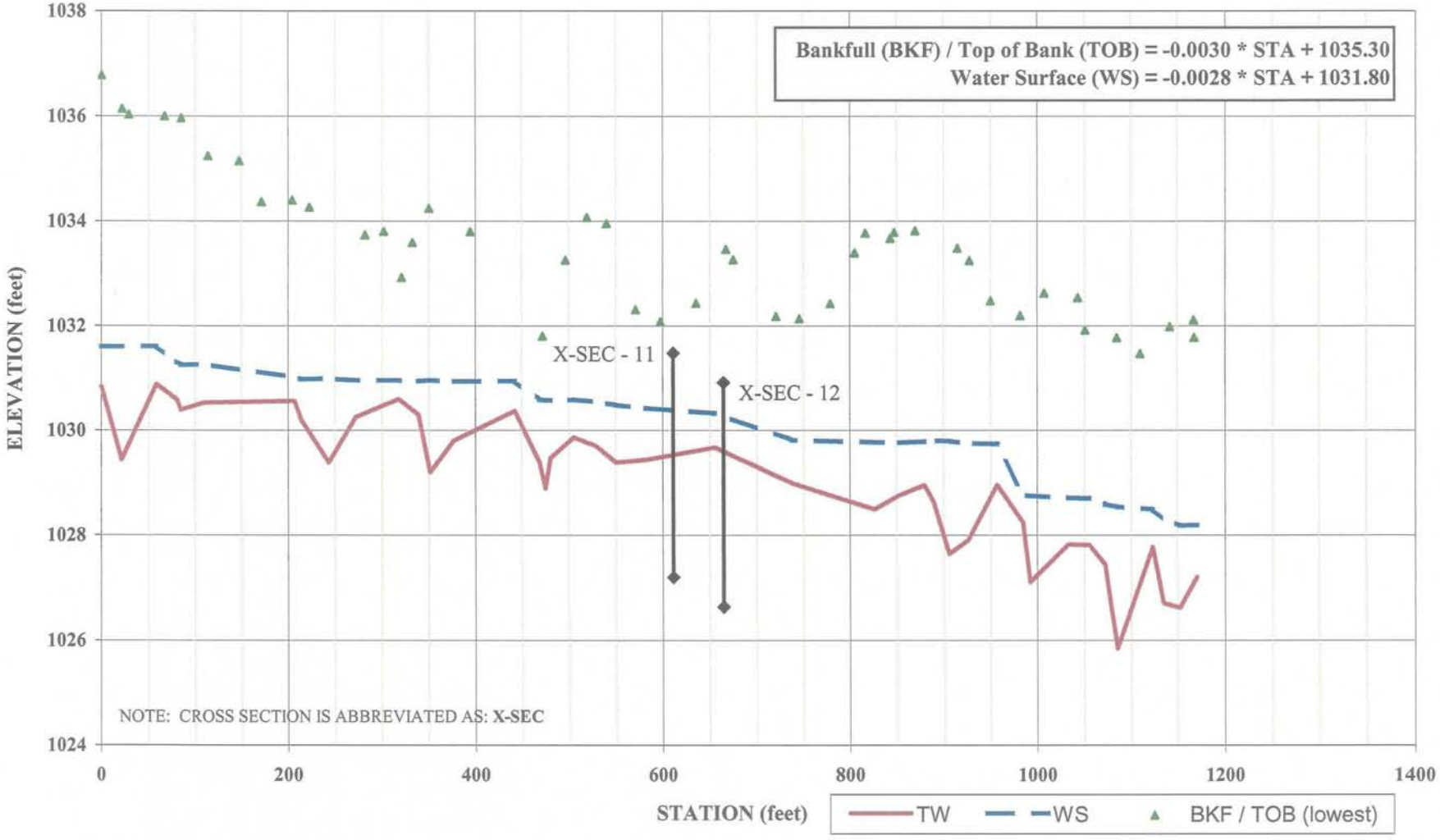
NATURAL SYSTEMS
ENGINEERING

Bailey Fork
Upper - Longitudinal Profile
2005 (0-Year) Monitoring (As-Built)



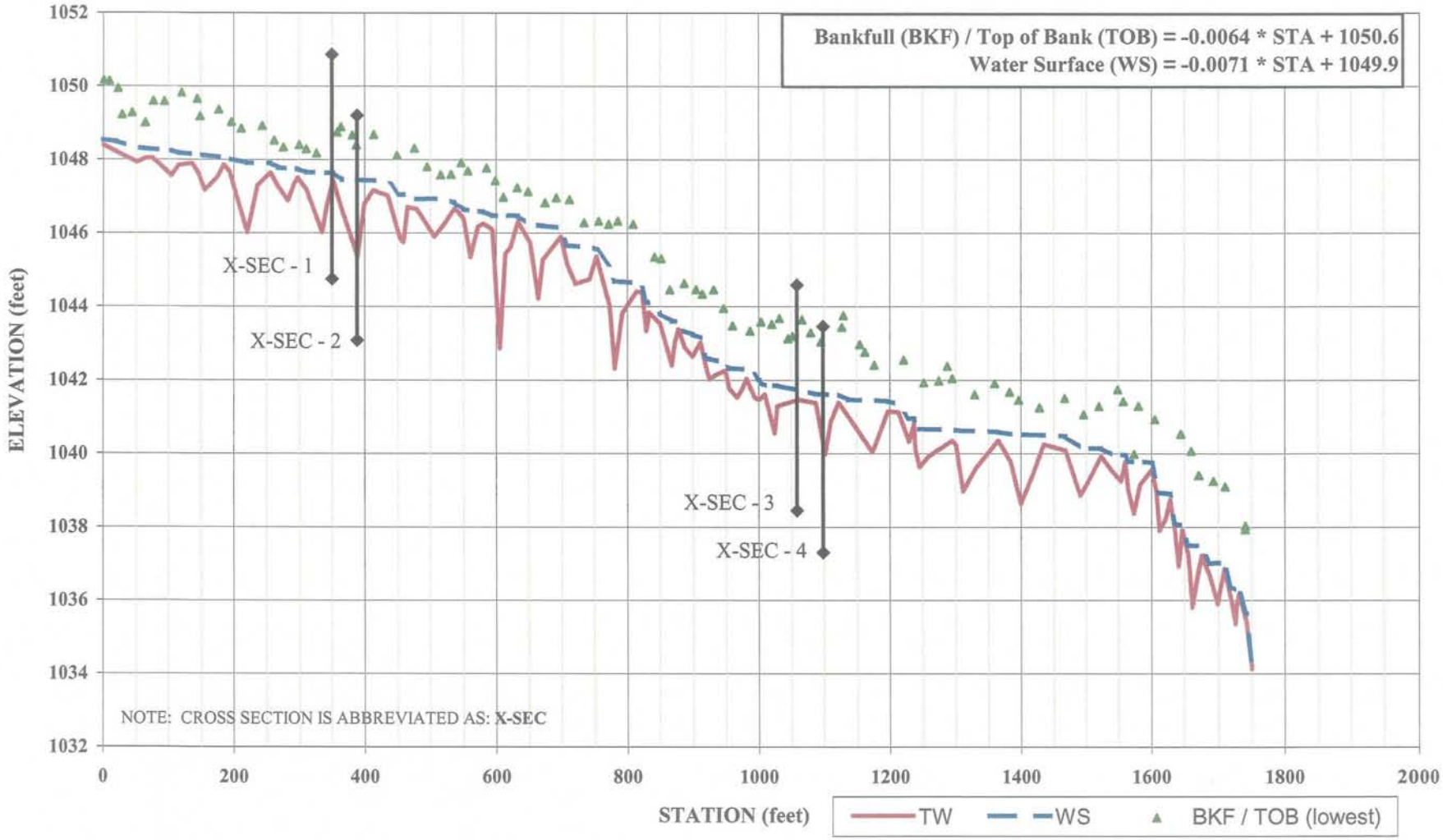
NATURAL SYSTEMS
ENGINEERING

Bailey Fork
Lower - Longitudinal Profile
2005 (0-Year) Monitoring (As-Built)



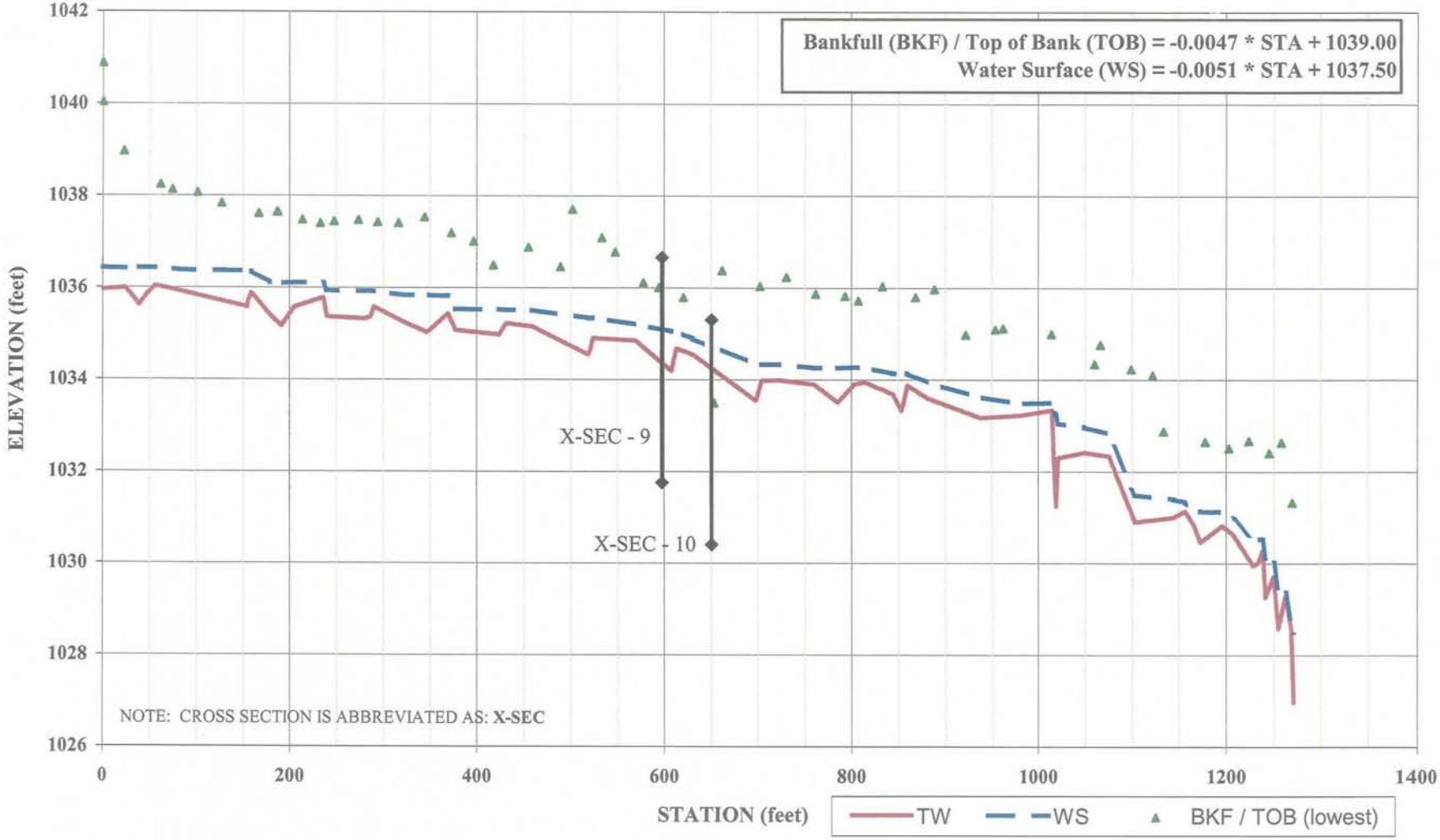
NATURAL SYSTEMS
ENGINEERING

Bailey Fork
UT1 - Longitudinal Profile
2005 (0-Year) Monitoring (As-Built)



NATURAL SYSTEMS
ENGINEERING

Bailey Fork
UT2 - Longitudinal Profile
2005 (0-Year) Monitoring (As-Built)



NATURAL SYSTEMS
ENGINEERING

Cross-Sections and Pebble Counts

Appendix 3.0

NATURAL SYSTEMS
ENGINEERING

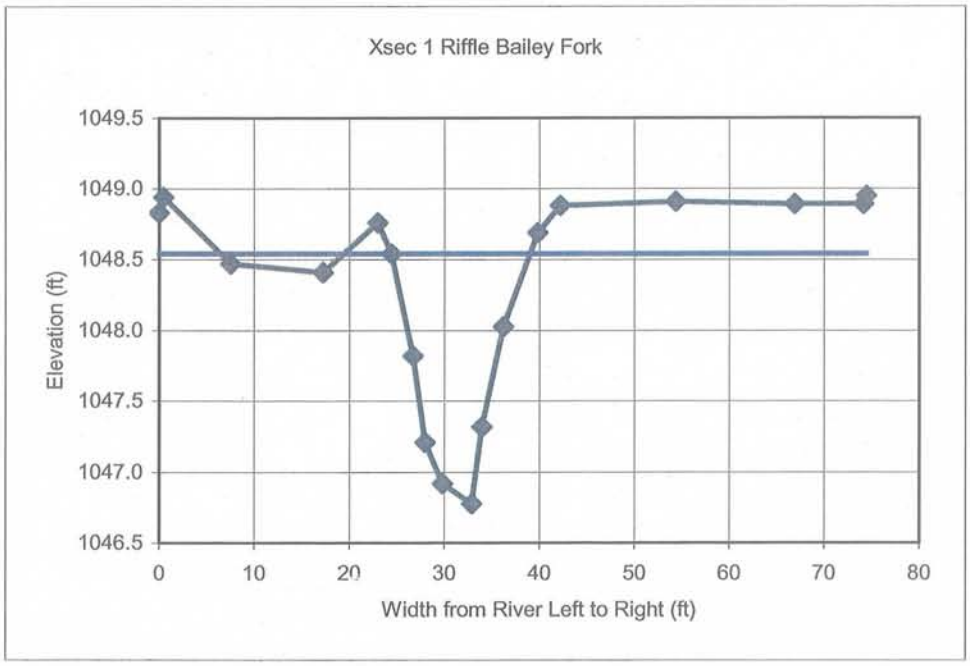
PROJECT: D04006-2 **0-YEAR, 2005 SURVEY DATA**

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

CROSS-SECTION: 1
FEATURE: RIFFLE

Station	Elevation	Remark
0	1048.83	ctl pt 1
0	1048.94	gn
8	1048.47	gn
17	1048.41	gn
23	1048.76	gn
24	1048.54	tb
27	1047.82	gn
28	1047.21	ew
30	1046.92	ck
33	1046.78	tw
34	1047.32	ew
36	1048.03	gn
40	1048.69	gn
42	1048.88	tb
54	1048.91	gn
67	1048.89	gn
74	1048.89	gn
74	1048.95	ctl pt 1

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

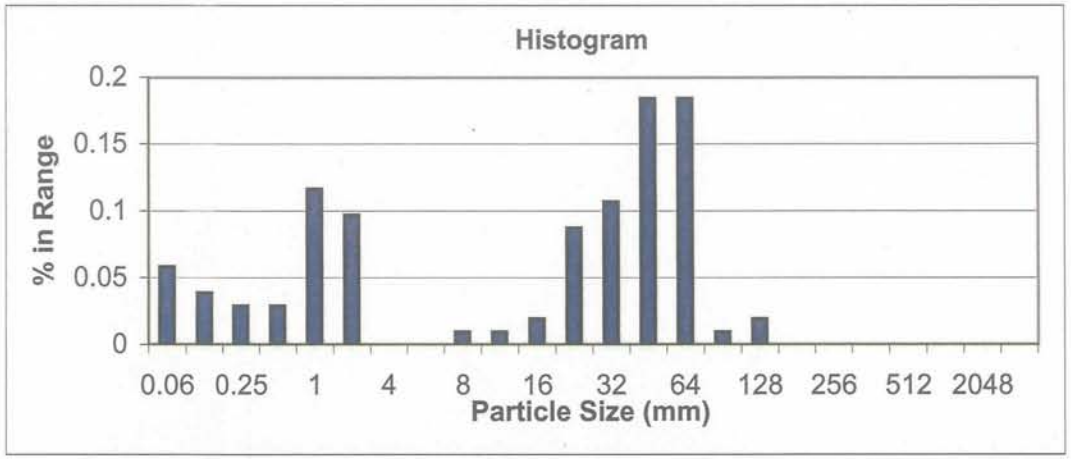
Summary Data
All dimensions in feet.

Bankfull X-sec area	15.4
Bankfull Width	27.4
Bankfull Mean Depth	0.56
Bankfull Max Depth	1.8
Width/Depth Ratio	>12
Entrenchment Ratio	>2.2
Classification	C

Remarks:

Ecosystem Enhancement Program

Figure 3.1



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

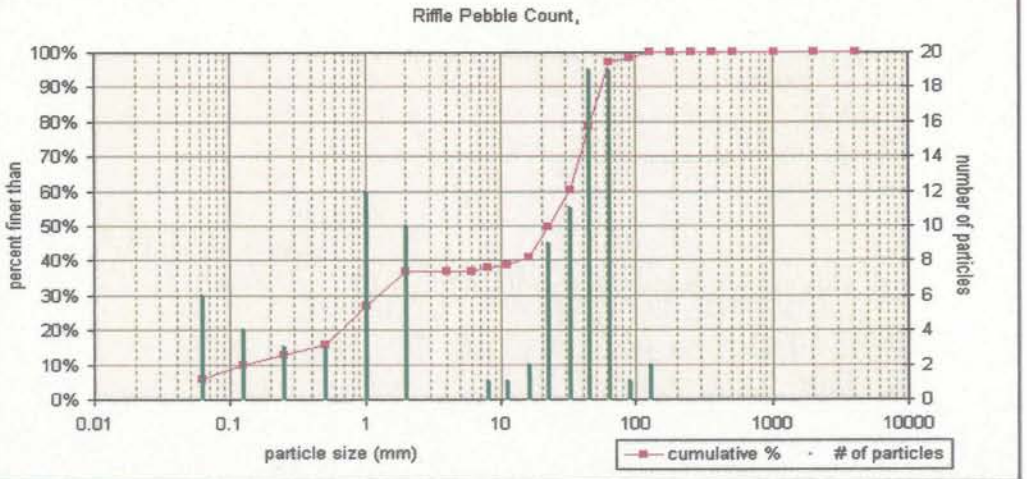
CROSS-SECTION: 1
FEATURE: RIFFLE

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	6	6%	6%
very fine sand	0.062	0.13	4	4%	10%
fine sand	0.13	0.25	3	3%	13%
medium sand	0.25	0.5	3	3%	16%
coarse sand	0.5	1	12	12%	27%
very coarse sand	1	2	10	10%	37%
very fine gravel	2	4			37%
fine gravel	4	6			37%
fine gravel	6	8	1	1%	38%
medium gravel	8	11	1	1%	39%
medium gravel	11	16	2	2%	41%
coarse gravel	16	22	9	9%	50%
coarse gravel	22	32	11	11%	60%
very coarse gravel	32	45	19	18%	79%
very coarse gravel	45	64	19	18%	97%
small cobble	64	90	1	1%	98%
medium cobble	90	128	2	2%	100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			103		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		103

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.514	1.75	22.4	35	50	61	22.9	5.1	9.8
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	6%	31%	60%	3%	0%	0%	0%	0%	0%

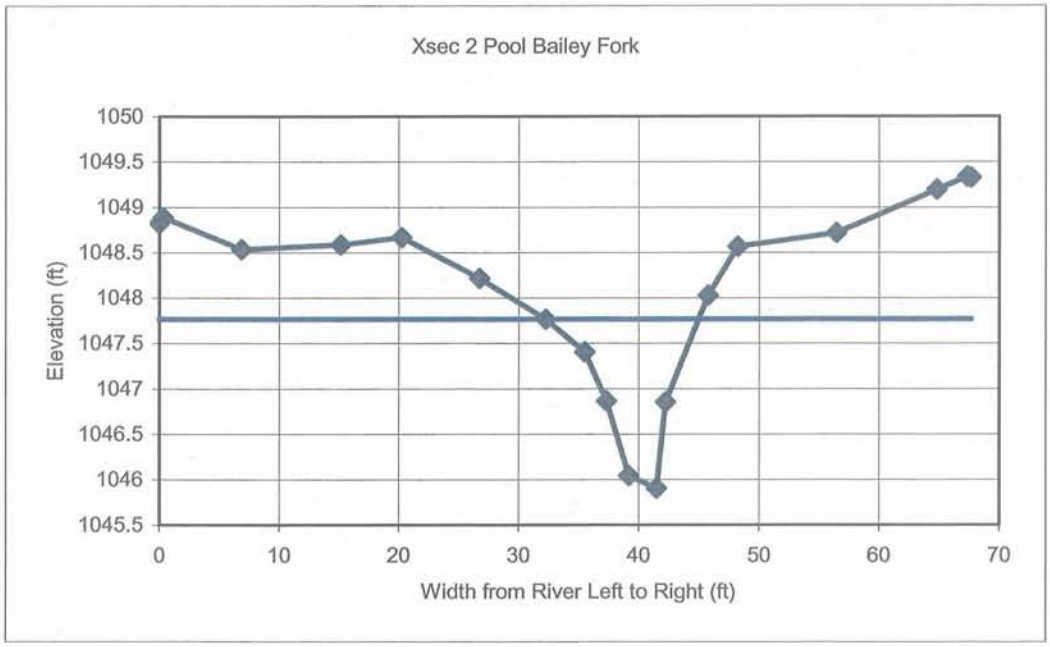
PROJECT: D04006-2 **0-YEAR, 2005 SURVEY DATA**

PROJECT	BAILEY FORK
TASK	LONGITUDINAL PROFILE
REACH	UT 1
DATE	5/9/2006 to 5/12/2006
CREW	TURNER/HALLEY/KUSAN

CROSS-SECTION: 2
FEATURE: POOL

Station	Elevation	Remark
0	1048.83	ctl pt 1&2
0	1048.89	gn
7	1048.54	gn
15	1048.59	gn
20	1048.67	gn
27	1048.22	gn
32	1047.77	tb
35	1047.41	gn
37	1046.87	ew
39	1046.05	ck
41	1045.91	tw
42	1046.86	ew
46	1048.03	gn
48	1048.57	tb
56	1048.72	gn
65	1049.2	gn
67	1049.34	gn
68	1049.33	ctl pt 2

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

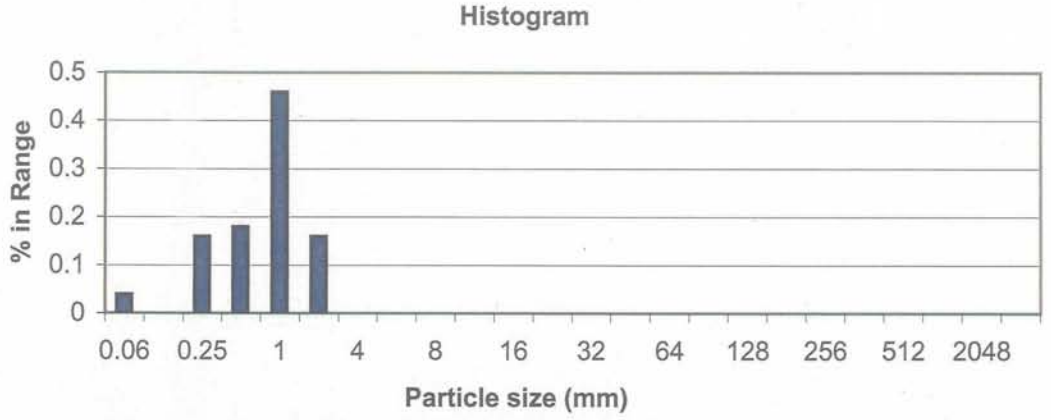
Summary Data
All dimensions in feet.

Bankfull X-sec area	n/a
Bankfull Width	n/a
Bankfull Mean Depth	n/a
Bankfull Max Depth	n/a
Width/Depth Ratio	n/a
Entrenchment Ratio	n/a
Classification	n/a

Remarks:

Ecosystem Enhancement Program

Figure 3.2



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

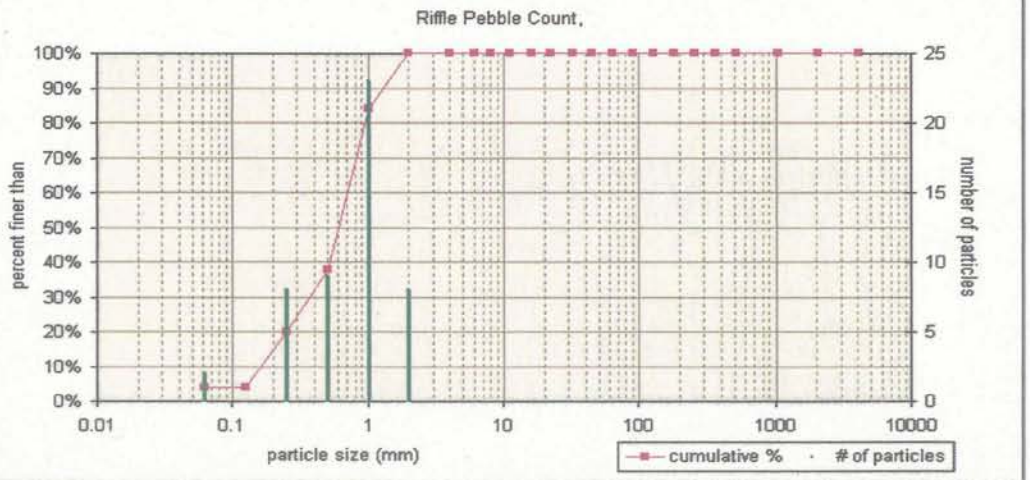
CROSS-SECTION: 2
FEATURE: POOL

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	2	4%	4%
very fine sand	0.062	0.13			4%
fine sand	0.13	0.25	8	16%	20%
medium sand	0.25	0.5	9	18%	38%
coarse sand	0.5	1	23	46%	84%
very coarse sand	1	2	8	16%	100%
very fine gravel	2	4			100%
fine gravel	4	6			100%
fine gravel	6	8			100%
medium gravel	8	11			100%
medium gravel	11	16			100%
coarse gravel	16	22			100%
coarse gravel	22	32			100%
very coarse gravel	32	45			100%
very coarse gravel	45	64			100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			50		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		50

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.210	0.45	0.6	1	1	2	2.3	0.5	2.2
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	4%	96%	0%	0%	0%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

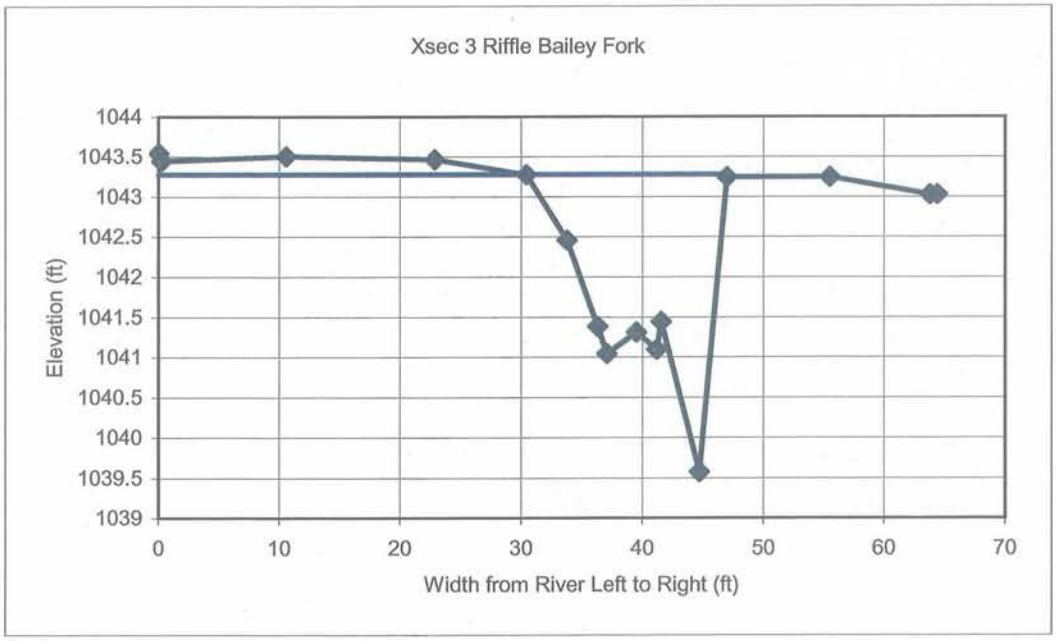
PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

CROSS-SECTION: 3
FEATURE: RIFFLE

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1043.55	ctl pt 3
0.24	1043.45	gn
10.53	1043.51	gn
22.83	1043.47	gn
30.4	1043.28	tb
33.75	1042.46	gn
36.31	1041.39	ew
37.06	1041.05	tw
39.5	1041.32	ck
41.16	1041.1	ck
41.53	1041.45	ew
44.72	1039.58	gn
46.99	1043.25	tb
55.49	1043.25	gn
63.77	1043.03	gn
64.4	1043.03	ctl pt 3&4

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



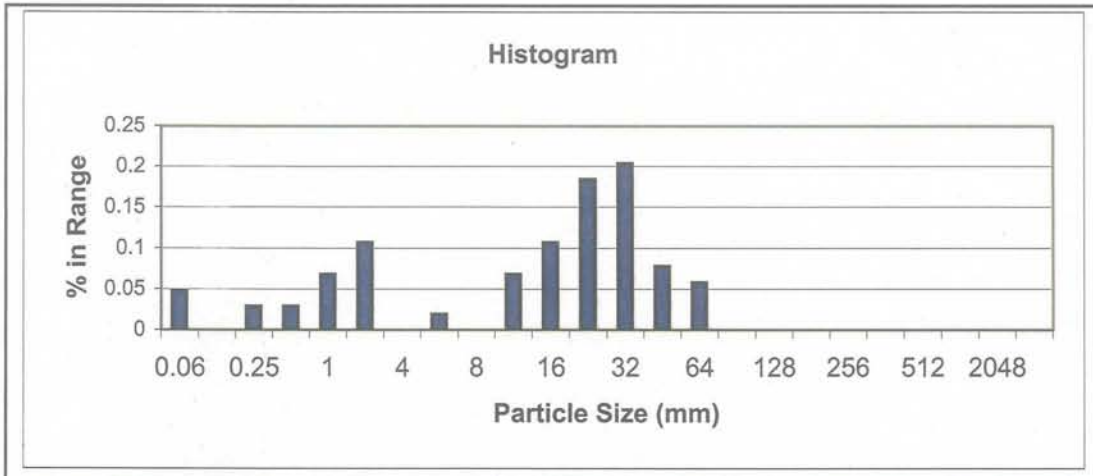
CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

Bankfull X-sec area	28.7
Bankfull Width	16.6
Bankfull Mean Depth	1.73
Bankfull Max Depth	0.3
Width/Depth Ratio	<12
Entrenchment Ratio	>2.2
Classification	E

Remarks:

Figure 3.3



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

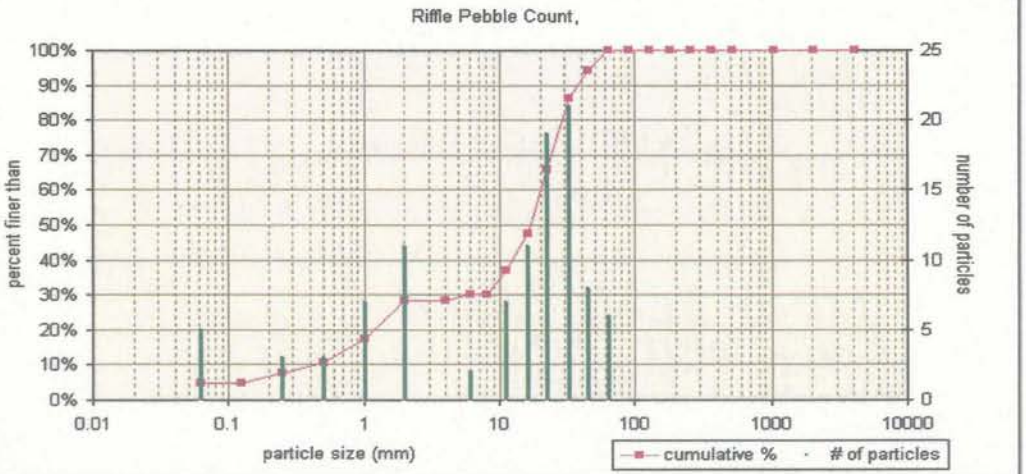
CROSS-SECTION: 3
FEATURE: RIFFLE

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	5	5%	5%
very fine sand	0.062	0.13			5%
fine sand	0.13	0.25	3	3%	8%
medium sand	0.25	0.5	3	3%	11%
coarse sand	0.5	1	7	7%	17%
very coarse sand	1	2	11	11%	28%
very fine gravel	2	4			28%
fine gravel	4	6	2	2%	30%
fine gravel	6	8			30%
medium gravel	8	11	7	7%	37%
medium gravel	11	16	11	11%	48%
coarse gravel	16	22	19	18%	66%
coarse gravel	22	32	21	20%	86%
very coarse gravel	32	45	8	8%	94%
very coarse gravel	45	64	6	6%	100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			103		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		103

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.860	10.07	16.7	22	31	47	10.6	5.1	6.0
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	5%	23%	72%	0%	0%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

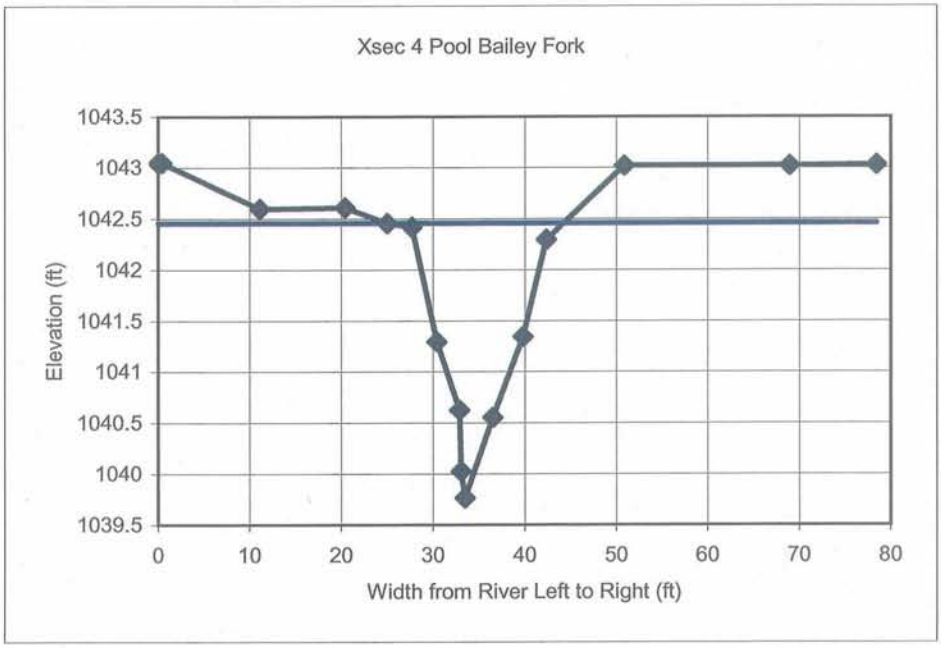
PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

CROSS-SECTION: 4
FEATURE: POOL

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1043.05	ctl pt 4
0	1043.05	gn
11	1042.6	gn
20	1042.61	gn
25	1042.46	tb
28	1042.42	gn
30	1041.3	ew
33	1040.63	ck
33	1040.03	mp
33	1039.77	tw
37	1040.56	ck
40	1041.35	gn
42	1042.3	tb
51	1043.02	gn
69	1043.02	gn
78	1043.03	ctl pt 3&4

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

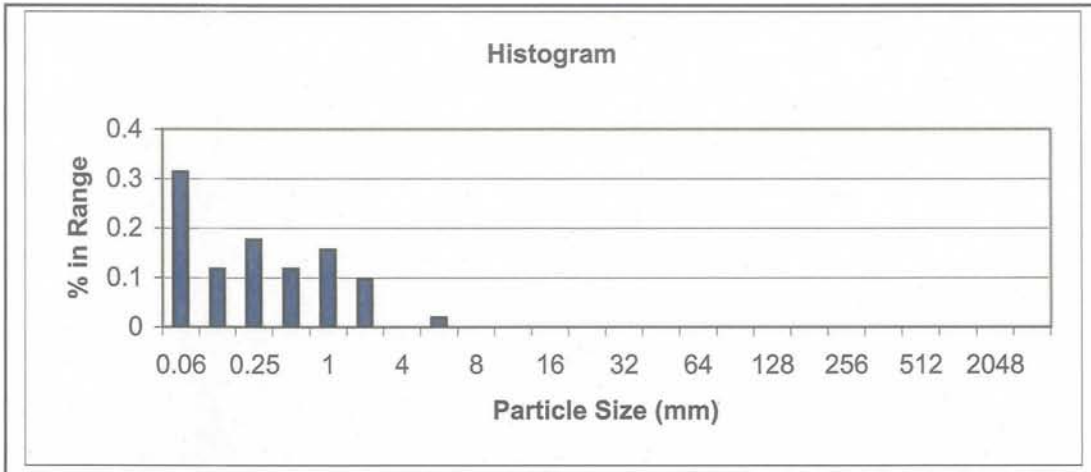
Bankfull X-sec area	n/a
Bankfull Width	n/a
Bankfull Mean Depth	n/a
Bankfull Max Depth	n/a
Width/Depth Ratio	n/a
Entrenchment Ratio	n/a
Classification	n/a

Remarks:

Ecosystem Enhancement Program

Figure 3.4

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

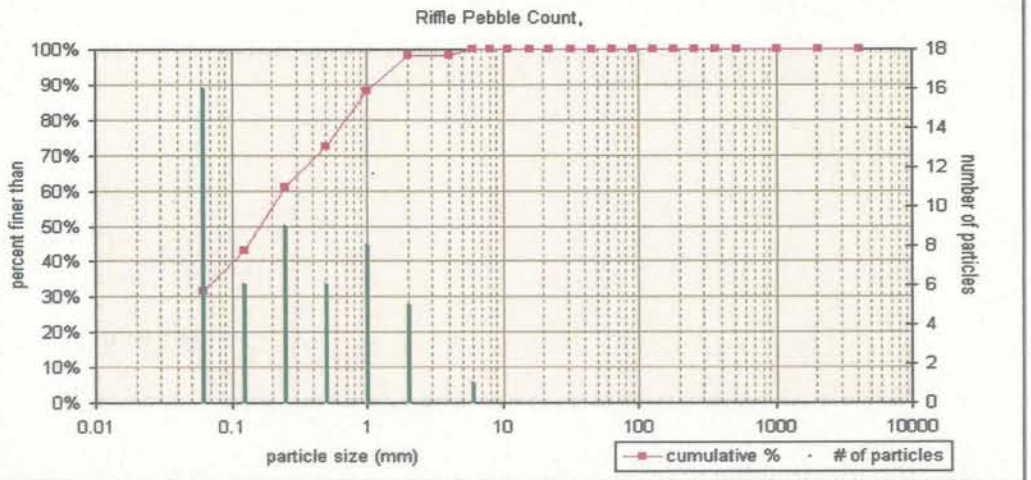
CROSS-SECTION: 4
FEATURE: POOL

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	16	31%	31%
very fine sand	0.062	0.13	6	12%	43%
fine sand	0.13	0.25	9	18%	61%
medium sand	0.25	0.5	6	12%	73%
coarse sand	0.5	1	8	16%	88%
very coarse sand	1	2	5	10%	98%
very fine gravel	2	4			98%
fine gravel	4	6	1	2%	100%
fine gravel	6	8			100%
medium gravel	8	11			100%
medium gravel	11	16			100%
coarse gravel	16	22			100%
coarse gravel	22	32			100%
very coarse gravel	32	45			100%
very coarse gravel	45	64			100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			51		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		51

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.08	0.2	0	1	2	3.9	0.2	3.7
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	31%	67%	2%	0%	0%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

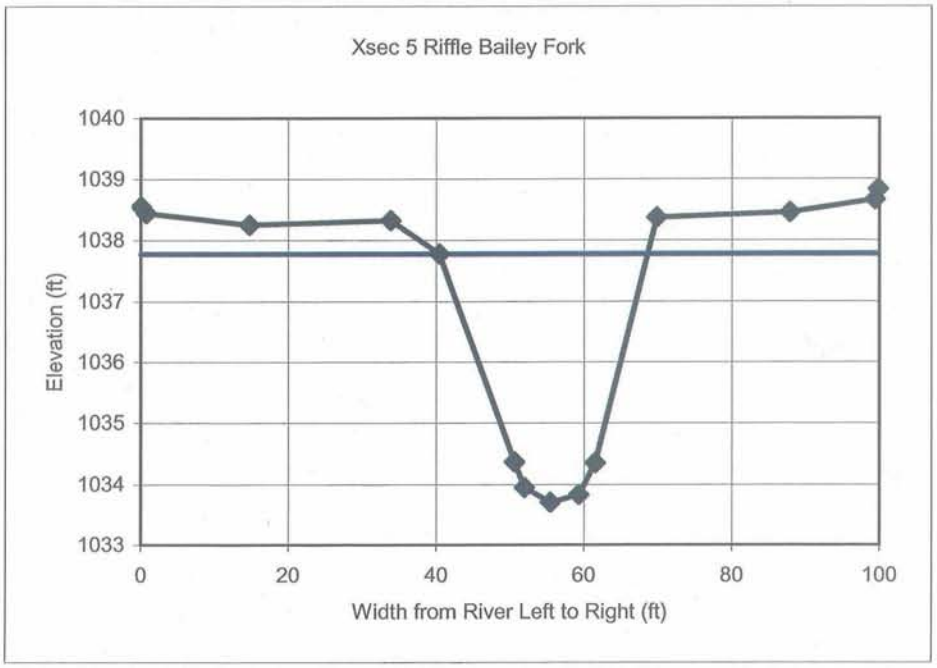
PROJECT: D04006-2 **0-YEAR, 2005 SURVEY DATA**

PROJECT	BAILEY FORK
TASK	LONGITUDINAL PROFILE
REACH	UPPER
DATE	5/9/2006 to 5/12/2006
CREW	TURNER/HALLEY/KUSAN

CROSS-SECTION: 5
FEATURE: RIFFLE

Station	Elevation	Remark
0	1038.56	ctl pt 5
1	1038.45	gn
15	1038.26	gn
34	1038.33	gn
40	1037.78	tb
51	1034.38	ew
52	1033.96	ck
55	1033.72	tw
59	1033.84	ck
62	1034.36	ew
70	1038.38	tb
88	1038.46	gn
99	1038.67	gn
100	1038.84	ctl pt 5

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

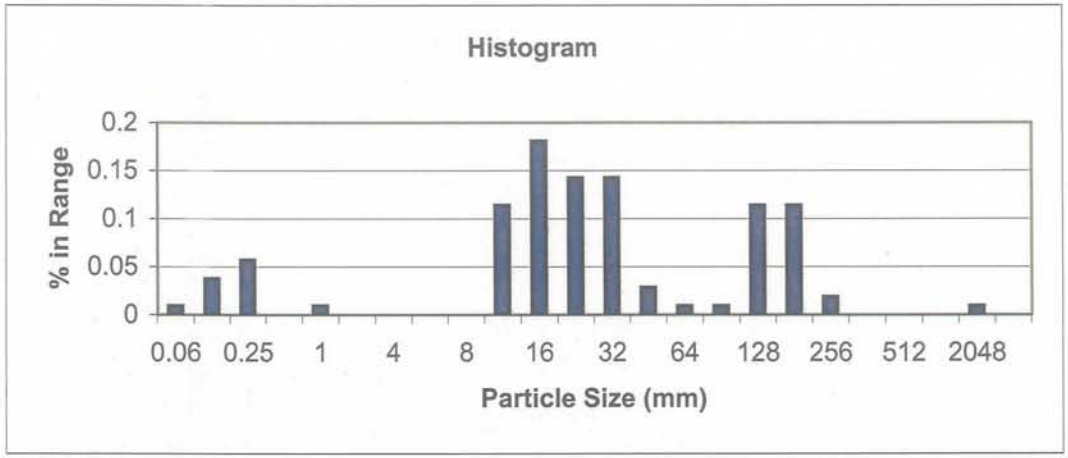
Bankfull X-sec area	71.7
Bankfull Width	28.2
Bankfull Mean Depth	2.54
Bankfull Max Depth	4.1
Width/Depth Ratio	>12
Entrenchment Ratio	>2.2
Classification	C

Remarks: Entrenchment Ratio can vary +/- 0.2; while width/depth ratios can vary +/- 2.0.

Ecosystem Enhancement Program

Figure 3.5

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UPPER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

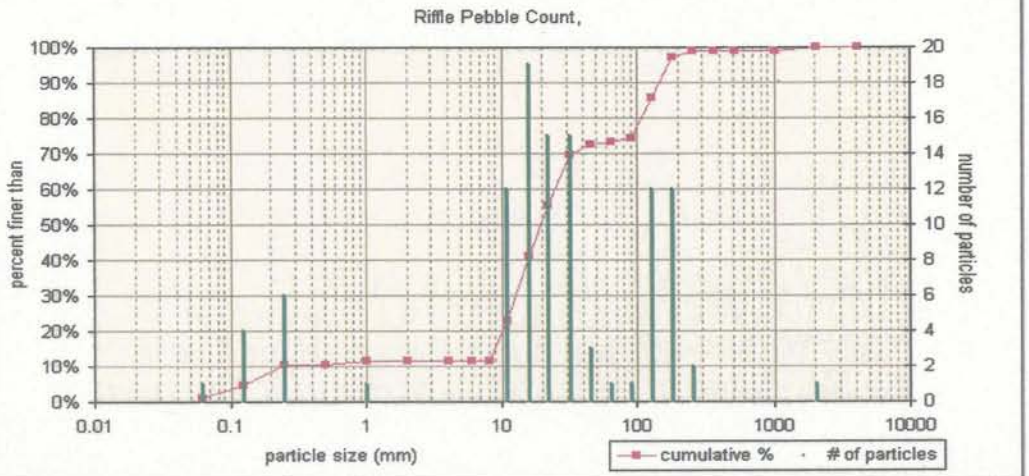
CROSS-SECTION: 5
FEATURE: RIFFLE

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	1	1%	1%
very fine sand	0.062	0.13	4	4%	5%
fine sand	0.13	0.25	6	6%	10%
medium sand	0.25	0.5			10%
coarse sand	0.5	1	1	1%	11%
very coarse sand	1	2			11%
very fine gravel	2	4			11%
fine gravel	4	6			11%
fine gravel	6	8			11%
medium gravel	8	11	12	11%	23%
medium gravel	11	16	19	18%	41%
coarse gravel	16	22	15	14%	55%
coarse gravel	22	32	15	14%	70%
very coarse gravel	32	45	3	3%	72%
very coarse gravel	45	64	1	1%	73%
small cobble	64	90	1	1%	74%
medium cobble	90	128	12	11%	86%
large cobble	128	180	12	11%	97%
very large cobble	180	256	2	2%	99%
small boulder	256	362			99%
small boulder	362	512			99%
medium boulder	512	1024			99%
large boulder	1024	2048	1	1%	100%
very large boulder	2048	4096			100%
total particle count:			105		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		105

Note:



	size percent less than (mm)						particle size distribution		
based on sediment particles only	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	9.087	14.14	19.6	28	121	169	4.2	33.2	3.7

	percent by substrate type								
based on total count	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	10%	62%	26%	1%	0%	0%	0%	0%

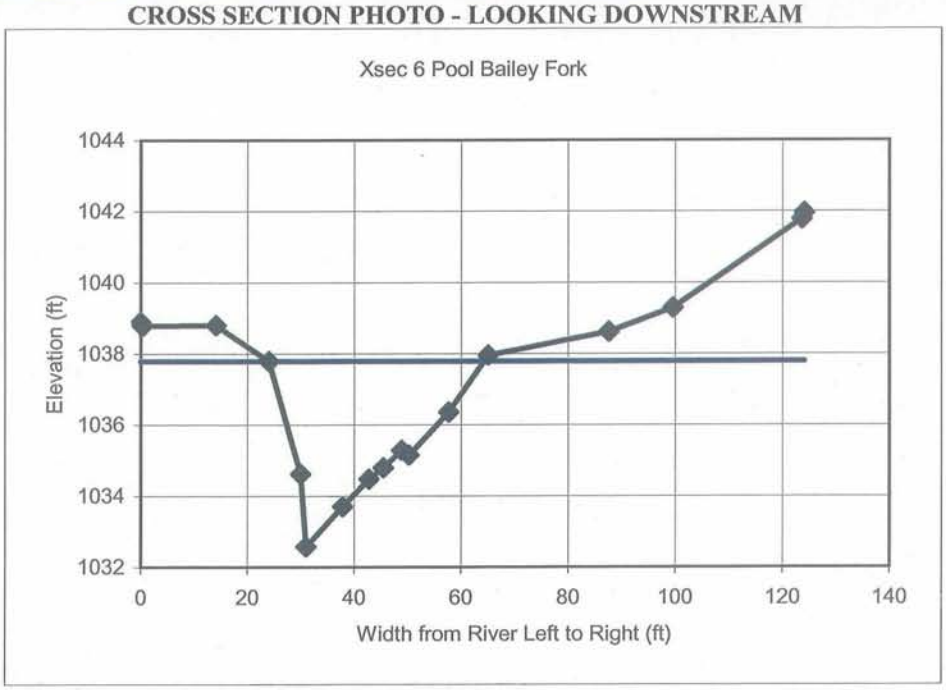
NATURAL SYSTEMS ENGINEERING

PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
CROSS-SECTION: 6 **REACH** UPPER
FEATURE: POOL **DATE** 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1038.91	ctl pt 6
0	1038.80	gn
14	1038.82	gn
24	1037.80	tb
30	1034.64	ew
31	1032.60	mp
38	1033.72	ck
43	1034.50	ew
45	1034.82	gn
49	1035.31	gn
50	1035.17	bb
58	1036.38	gn
65	1037.97	tb
88	1038.63	gn
100	1039.30	gn
124	1041.79	gn
124	1041.97	ctl pt 6

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

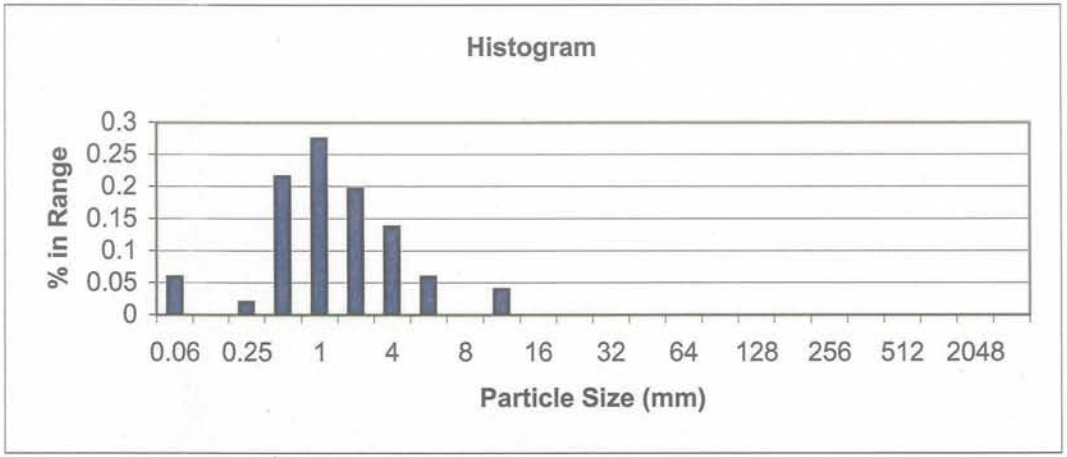
Summary Data
All dimensions in feet.

Bankfull X-sec area	n/a
Bankfull Width	n/a
Bankfull Mean Depth	n/a
Bankfull Max Depth	n/a
Width/Depth Ratio	n/a
Entrenchment Ratio	n/a
Classification	n/a

Remarks:

Figure 3.6

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UPPER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

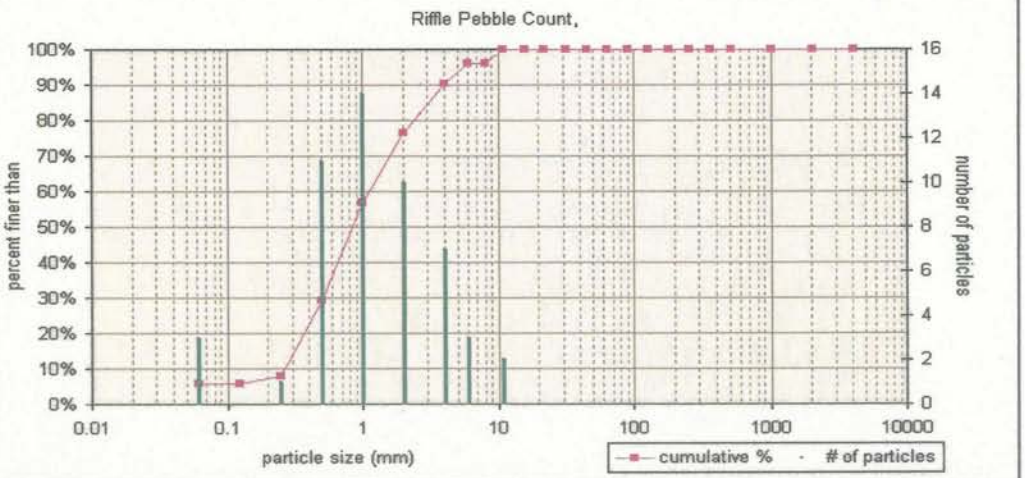
CROSS-SECTION: 6
FEATURE: POOL

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	3	6%	6%
very fine sand	0.062	0.13			6%
fine sand	0.13	0.25	1	2%	8%
medium sand	0.25	0.5	11	22%	29%
coarse sand	0.5	1	14	27%	57%
very coarse sand	1	2	10	20%	76%
very fine gravel	2	4	7	14%	90%
fine gravel	4	6	3	6%	96%
fine gravel	6	8			96%
medium gravel	8	11	2	4%	100%
medium gravel	11	16			100%
coarse gravel	16	22			100%
coarse gravel	22	32			100%
very coarse gravel	32	45			100%
very coarse gravel	45	64			100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			51		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		51

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.325	0.58	0.8	1	3	6	3.0	1.0	3.0
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	6%	71%	24%	0%	0%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

CROSS-SECTION: 7
FEATURE: POOL

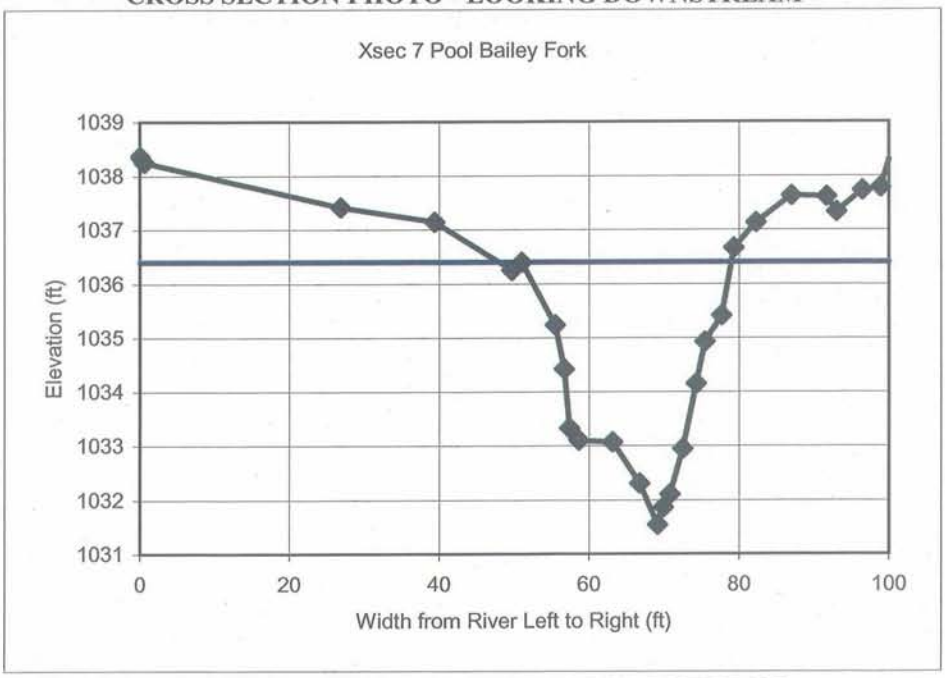
PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
REACH UPPER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1038.37	ctl pt 7
1	1038.26	gn
27	1037.42	gn
39	1037.15	gn
50	1036.26	gn
51	1036.41	tb
55	1035.25	gn
57	1034.43	gn
57	1033.34	bb
59	1033.12	gn
63	1033.08	ew
67	1032.32	ck
69	1031.56	mp
70	1031.88	tw
71	1032.12	ck
73	1032.96	ew
74	1034.16	gn
75	1034.94	gn
78	1035.43	bf
79	1036.67	gn
82	1037.14	tb
87	1037.64	gn
92	1037.62	gn
93	1037.34	gn
96	1037.74	gn
99	1037.79	gn
100	1038.31	ctl pt 7

Summary Data
All dimensions in feet.

Bankfull X-sec area	n/a
Bankfull Width	n/a
Bankfull Mean Depth	n/a
Bankfull Max Depth	n/a
Width/Depth Ratio	n/a
Entrenchment Ratio	n/a
Classification	n/a

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



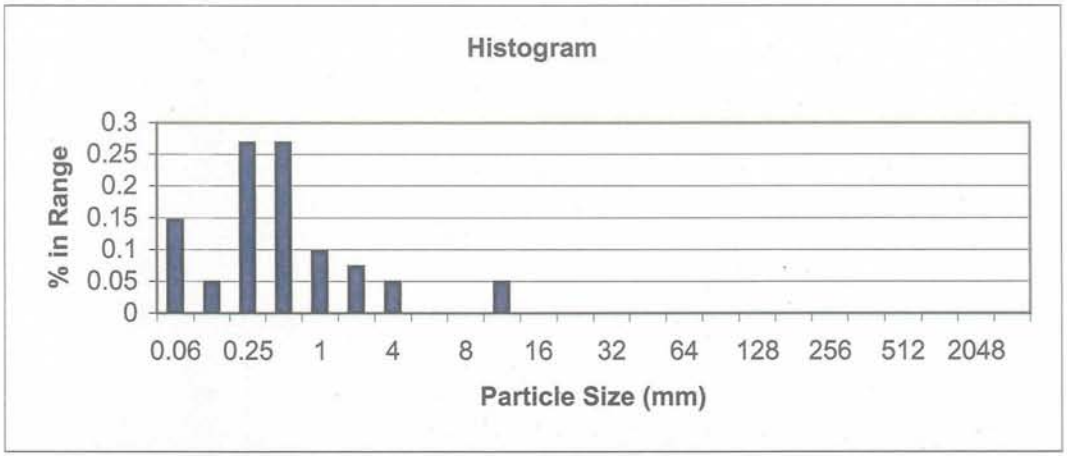
CROSS SECTION PLOT - LOOKING DOWNSTREAM

Remarks:

Ecosystem Enhancement Program

Figure 3.7

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UPPER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

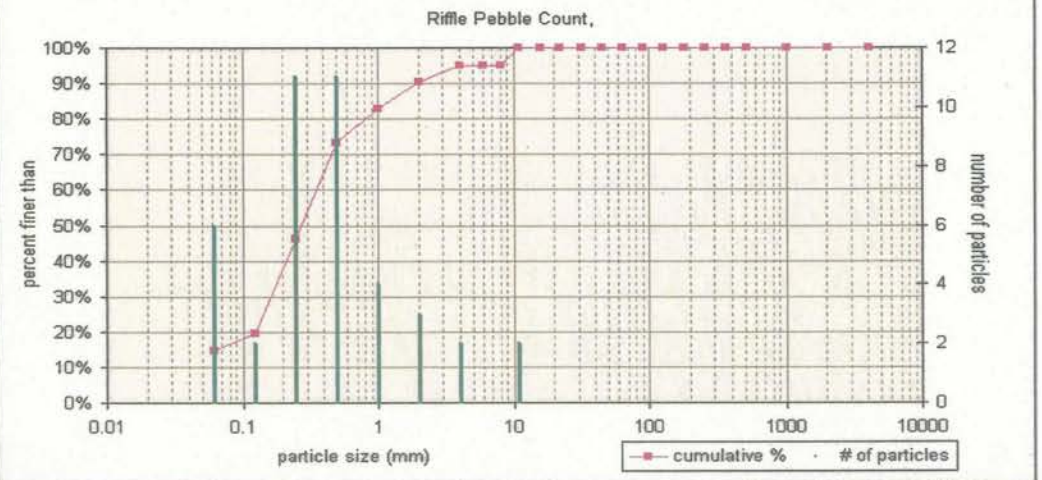
CROSS-SECTION: 7
FEATURE: POOL

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	6	15%	15%
very fine sand	0.062	0.13	2	5%	20%
fine sand	0.13	0.25	11	27%	46%
medium sand	0.25	0.5	11	27%	73%
coarse sand	0.5	1	4	10%	83%
very coarse sand	1	2	3	7%	90%
very fine gravel	2	4	2	5%	95%
fine gravel	4	6			95%
fine gravel	6	8			95%
medium gravel	8	11	2	5%	100%
medium gravel	11	16			100%
coarse gravel	16	22			100%
coarse gravel	22	32			100%
very coarse gravel	32	45			100%
very coarse gravel	45	64			100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
	total particle count:		41		

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	41

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.075	0.19	0.3	0	1	4	3.8	0.3	3.8
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	15%	76%	10%	0%	0%	0%	0%	0%	0%

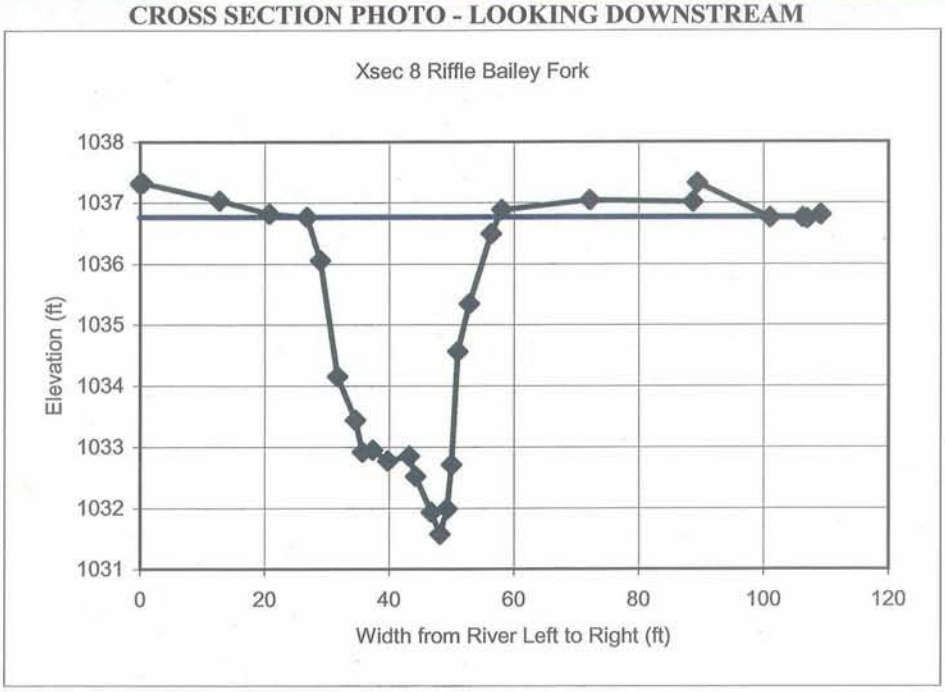
NATURAL SYSTEMS ENGINEERING

PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
CROSS-SECTION: 8 **REACH** UPPER
FEATURE: RIFFLE **DATE** 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1037.32	ctl pt 8
0	1037.33	gn
13	1037.04	gn
21	1036.82	gn
27	1036.77	tb
29	1036.06	gn
32	1034.16	gn
35	1033.45	gn
36	1032.93	gn
37	1032.96	ew
40	1032.78	ck
43	1032.86	ck
44	1032.53	ck
47	1031.94	ck
48	1031.58	tw
49	1032.00	ck
50	1032.72	ew
51	1034.57	gn
53	1035.35	gn
56	1036.50	gn
58	1036.89	tb
72	1037.05	gn
89	1037.02	tb
89	1037.33	gn/rr
101	1036.76	gn/rr
106	1036.76	gn
107	1036.74	gn
109	1036.81	gn
109	1036.81	ctl pt 8

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

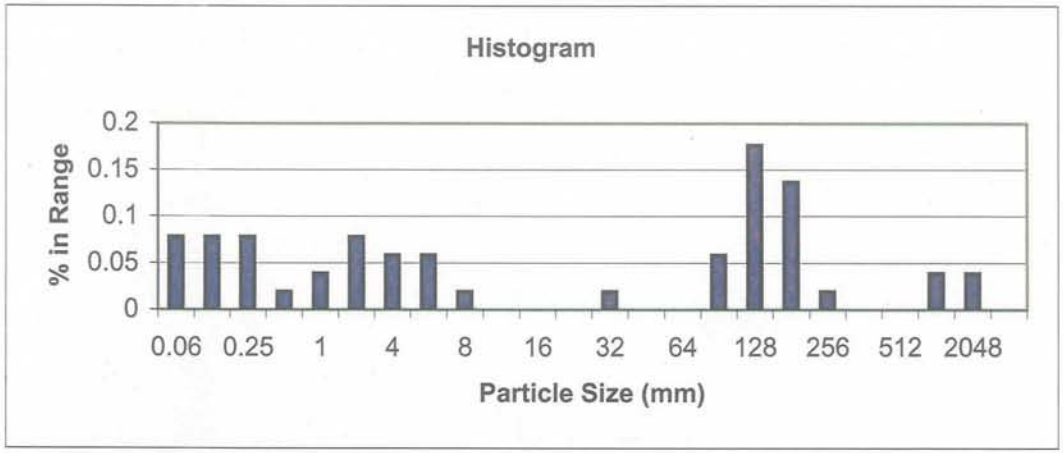
Bankfull X-sec area	88.1
Bankfull Width	37.7
Bankfull Mean Depth	2.3
Bankfull Max Depth	5.2
Width/Depth Ratio	>12
Entrenchment Ratio	>2.2
Classification	C

Remarks:

Ecosystem Enhancement Program

Figure 3.8

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UPPER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

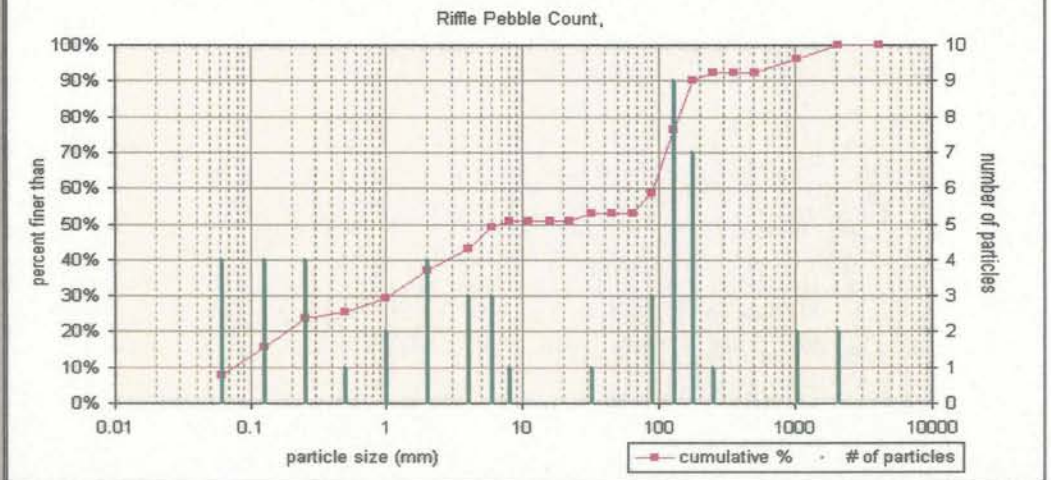
CROSS-SECTION: 8
FEATURE: RIFFLE

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	4	8%	8%
very fine sand	0.062	0.13	4	8%	16%
fine sand	0.13	0.25	4	8%	24%
medium sand	0.25	0.5	1	2%	25%
coarse sand	0.5	1	2	4%	29%
very coarse sand	1	2	4	8%	37%
very fine gravel	2	4	3	6%	43%
fine gravel	4	6	3	6%	49%
fine gravel	6	8	1	2%	51%
medium gravel	8	11			51%
medium gravel	11	16			51%
coarse gravel	16	22			51%
coarse gravel	22	32	1	2%	53%
very coarse gravel	32	45			53%
very coarse gravel	45	64			53%
small cobble	64	90	3	6%	59%
medium cobble	90	128	9	18%	76%
large cobble	128	180	7	14%	90%
very large cobble	180	256	1	2%	92%
small boulder	256	362			92%
small boulder	362	512			92%
medium boulder	512	1024	2	4%	96%
large boulder	1024	2048	2	4%	100%
very large boulder	2048	4096			100%
total particle count:			51		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		51

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.129	1.64	6.9	102	154	846	38.1	4.5	34.7
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	8%	29%	16%	39%	8%	0%	0%	0%	0%

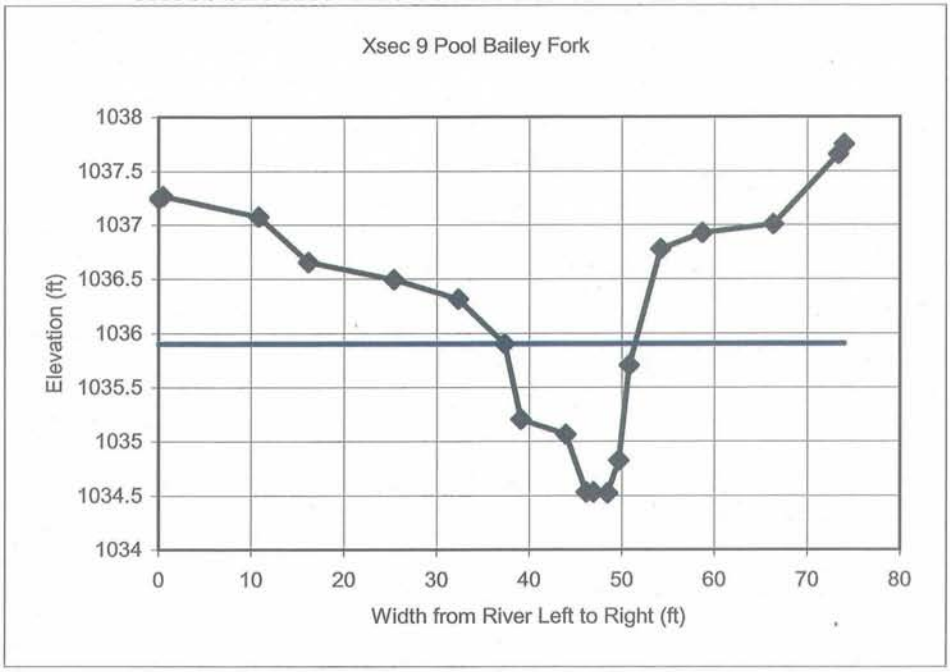
NATURAL SYSTEMS ENGINEERING

PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
CROSS-SECTION: 9 **REACH** UT 2
FEATURE: POOL **DATE** 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1037.25	ctl pt 9&10
0	1037.27	gn
11	1037.08	gn
16	1036.66	gn
25	1036.50	gn
32	1036.32	bf
37	1035.91	tb
39	1035.21	gn
44	1035.07	ew/ws
46	1034.54	ck
47	1034.54	tw
48	1034.53	ck
50	1034.83	ck
51	1035.71	gn
54	1036.78	tb
59	1036.93	gn
66	1037.01	gn
73	1037.66	gn
74	1037.75	ctl pt 9

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

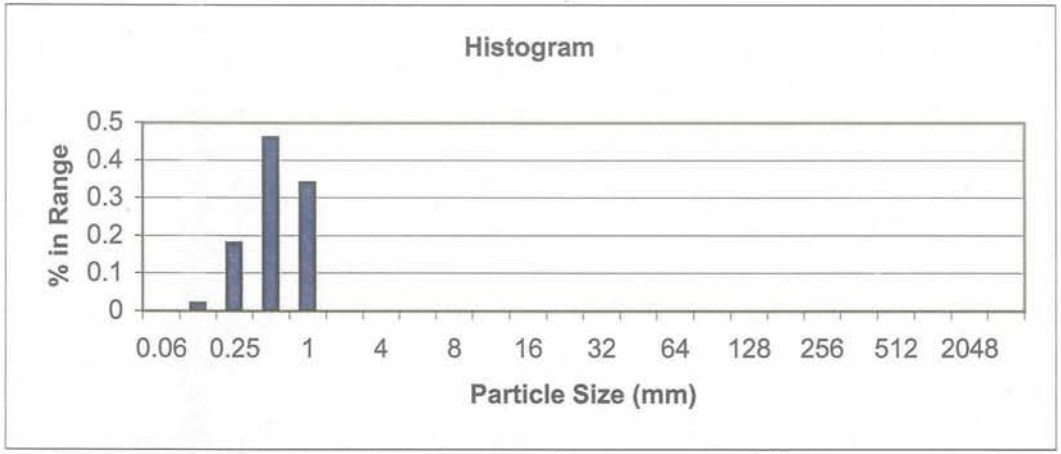
Bankfull X-sec area	n/a
Bankfull Width	n/a
Bankfull Mean Depth	n/a
Bankfull Max Depth	n/a
Width/Depth Ratio	n/a
Entrenchment Ratio	n/a
Classification	n/a

Remarks:

Ecosystem Enhancement Program

Figure 3.9

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UT 2
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

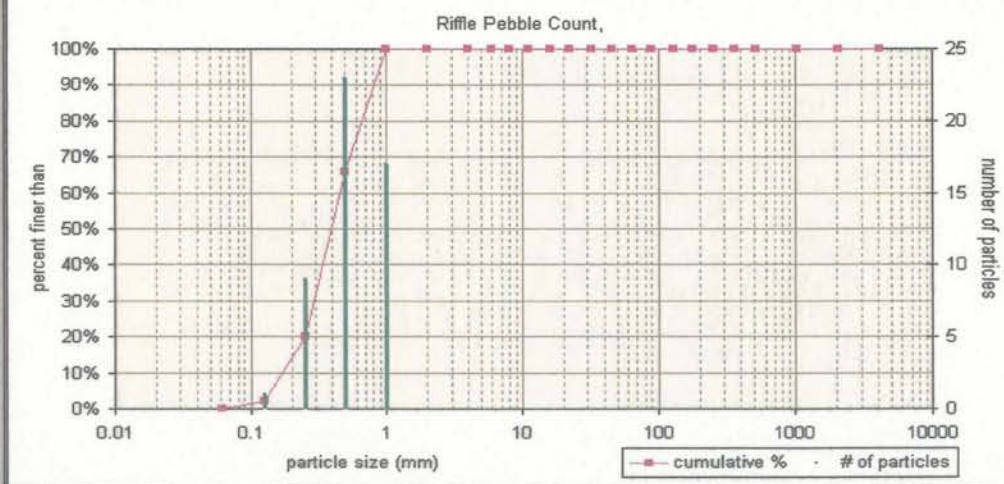
CROSS-SECTION: 9
FEATURE: POOL

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062		0%	0%
very fine sand	0.062	0.13	1	2%	2%
fine sand	0.13	0.25	9	18%	20%
medium sand	0.25	0.5	23	46%	66%
coarse sand	0.5	1	17	34%	100%
very coarse sand	1	2			100%
very fine gravel	2	4			100%
fine gravel	4	6			100%
fine gravel	6	8			100%
medium gravel	8	11			100%
medium gravel	11	16			100%
coarse gravel	16	22			100%
coarse gravel	22	32			100%
very coarse gravel	32	45			100%
very coarse gravel	45	64			100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			50		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		50

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.214	0.31	0.4	0	1	1	1.8	0.4	1.8
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	100%	0%	0%	0%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

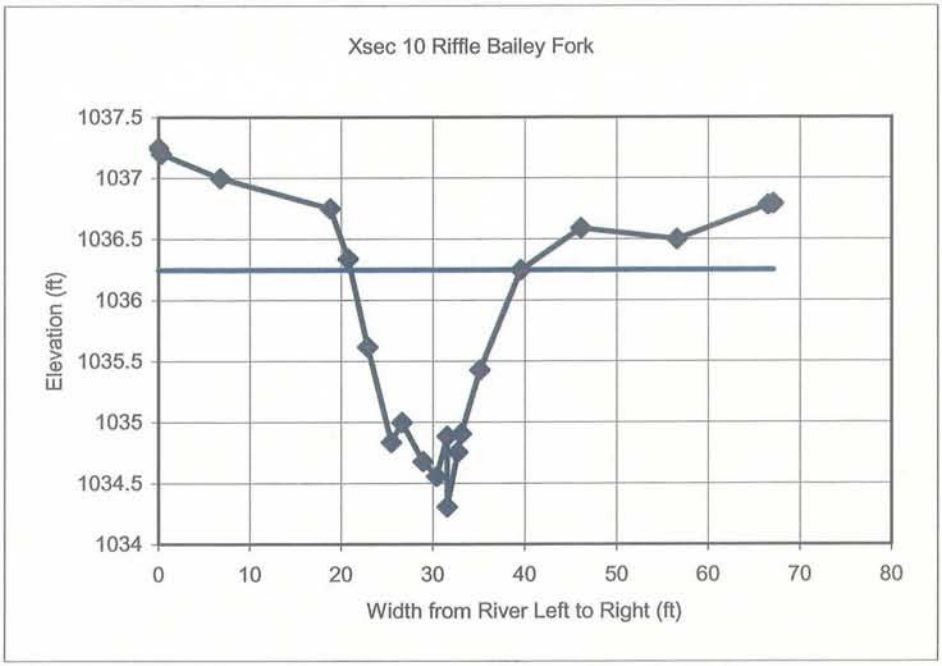
PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
REACH UT 2
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

CROSS-SECTION: 10
FEATURE: RIFFLE

Station	Elevation	Remark
0	1037.25	ctl 9&10
0	1037.2	gn
7	1037	gn
19	1036.75	tb
21	1036.34	gn
23	1035.62	gn
25	1034.84	gn
27	1035	ew
29	1034.68	ck
30	1034.56	tw
31	1034.89	ws
31	1034.31	ck
33	1034.76	ew
33	1034.91	gn
35	1035.43	gn
40	1036.25	tb
46	1036.59	gn
57	1036.5	gn
66	1036.78	gn
67	1036.79	ctl pt 10

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

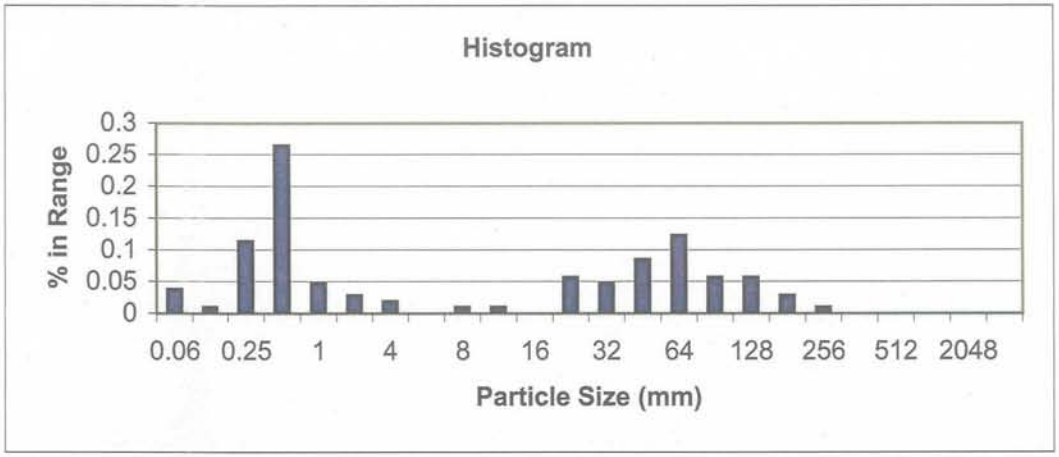
Bankfull X-sec area	18.7
Bankfull Width	18.6
Bankfull Mean Depth	1.0
Bankfull Max Depth	1.9
Width/Depth Ratio	>12
Entrenchment Ratio	>2.2
Classification	C

Remarks:

Ecosystem Enhancement Program

Figure 3.10

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH UT 2
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

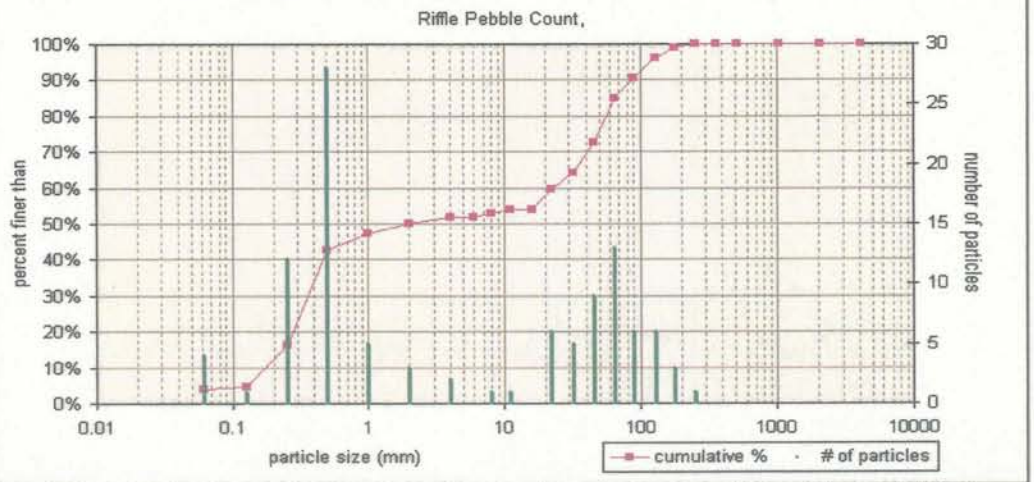
CROSS-SECTION: 10
FEATURE: RIFFLE

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	4	4%	4%
very fine sand	0.062	0.13	1	1%	5%
fine sand	0.13	0.25	12	11%	16%
medium sand	0.25	0.5	28	26%	42%
coarse sand	0.5	1	5	5%	47%
very coarse sand	1	2	3	3%	50%
very fine gravel	2	4	2	2%	52%
fine gravel	4	6			52%
fine gravel	6	8	1	1%	53%
medium gravel	8	11	1	1%	54%
medium gravel	11	16			54%
coarse gravel	16	22	6	6%	59%
coarse gravel	22	32	5	5%	64%
very coarse gravel	32	45	9	8%	73%
very coarse gravel	45	64	13	12%	85%
small cobble	64	90	6	6%	91%
medium cobble	90	128	6	6%	96%
large cobble	128	180	3	3%	99%
very large cobble	180	256	1	1%	100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			106		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		106

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.249	0.41	2.0	33	62	119	19.6	3.9	15.8
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	4%	46%	35%	15%	0%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

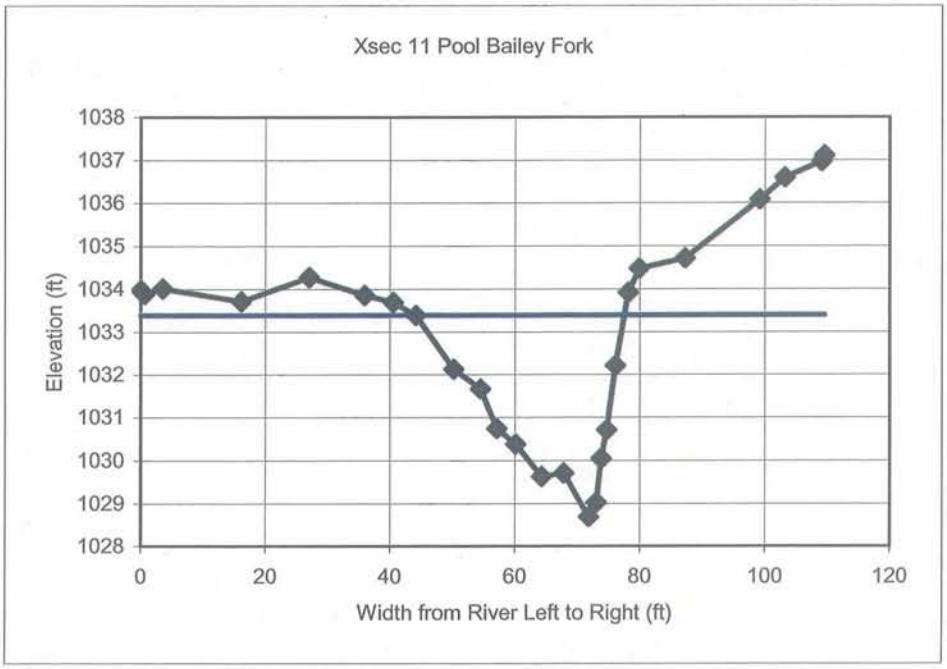
PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

CROSS-SECTION: 11
FEATURE: POOL

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
REACH LOWER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1033.99	ctl pt 11&12
1	1033.90	gn
4	1034.03	gn
16	1033.73	gn
27	1034.29	gn
36	1033.87	gn
40	1033.71	gn
44	1033.41	bf
50	1032.15	tb
54	1031.68	gn
57	1030.76	gn
60	1030.40	ew/ws
64	1029.65	ck
68	1029.72	ck
72	1028.71	mp
73	1029.05	ck
74	1030.06	ew
75	1030.73	gn
76	1032.23	gn
78	1033.93	gn
80	1034.49	tb
87	1034.72	gn
99	1036.09	gn
103	1036.60	gn
109	1036.98	gn
110	1037.12	ctl pt 11

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

Summary Data
All dimensions in feet.

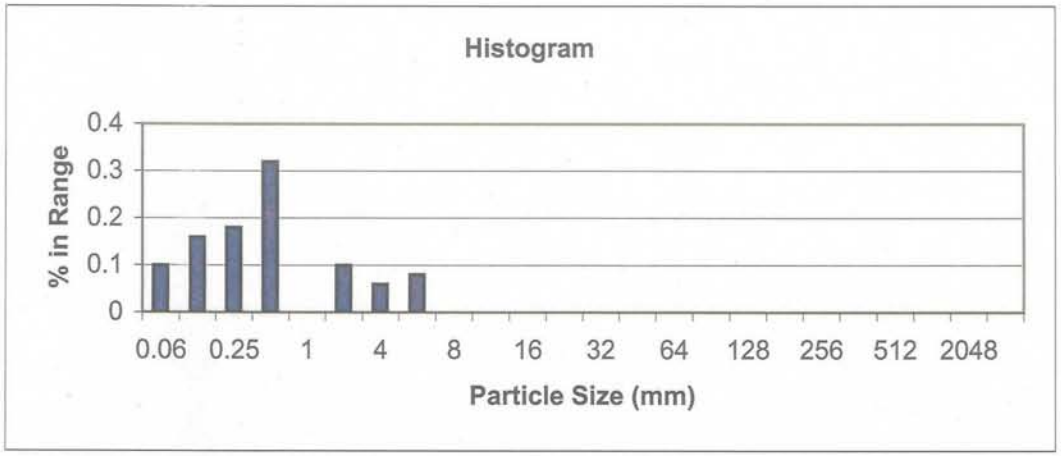
Bankfull X-sec area	n/a
Bankfull Width	n/a
Bankfull Mean Depth	n/a
Bankfull Max Depth	n/a
Width/Depth Ratio	n/a
Entrenchment Ratio	n/a
Classification	n/a

Remarks:

Ecosystem Enhancement Program

Figure 3.11

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH LOWER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

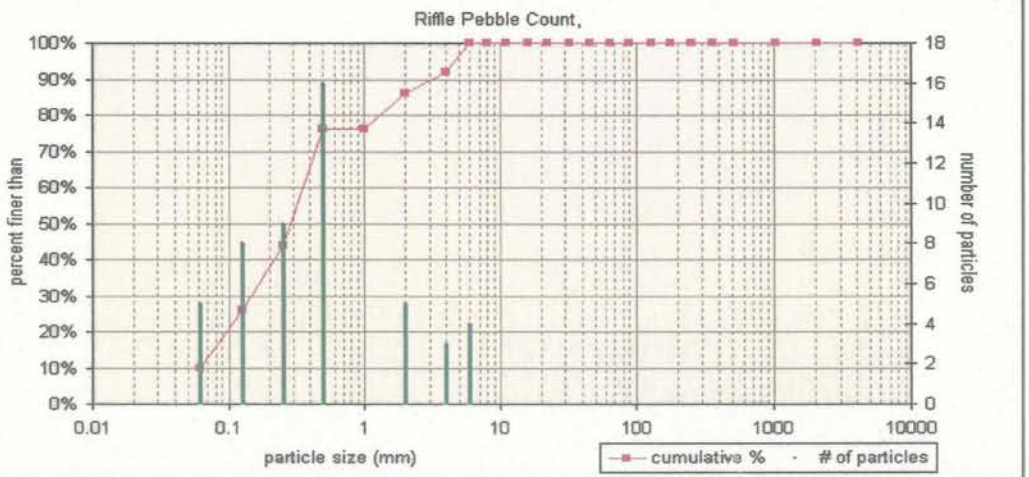
CROSS-SECTION: 11
FEATURE: POOL

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	5	10%	10%
very fine sand	0.062	0.13	8	16%	26%
fine sand	0.13	0.25	9	18%	44%
medium sand	0.25	0.5	16	32%	76%
coarse sand	0.5	1			76%
very coarse sand	1	2	5	10%	86%
very fine gravel	2	4	3	6%	92%
fine gravel	4	6	4	8%	100%
fine gravel	6	8			100%
medium gravel	8	11			100%
medium gravel	11	16			100%
coarse gravel	16	22			100%
coarse gravel	22	32			100%
very coarse gravel	32	45			100%
very coarse gravel	45	64			100%
small cobble	64	90			100%
medium cobble	90	128			100%
large cobble	128	180			100%
very large cobble	180	256			100%
small boulder	256	362			100%
small boulder	362	512			100%
medium boulder	512	1024			100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			50		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		50

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.081	0.18	0.3	0	2	5	4.8	0.4	4.6
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	10%	76%	14%	0%	0%	0%	0%	0%	0%

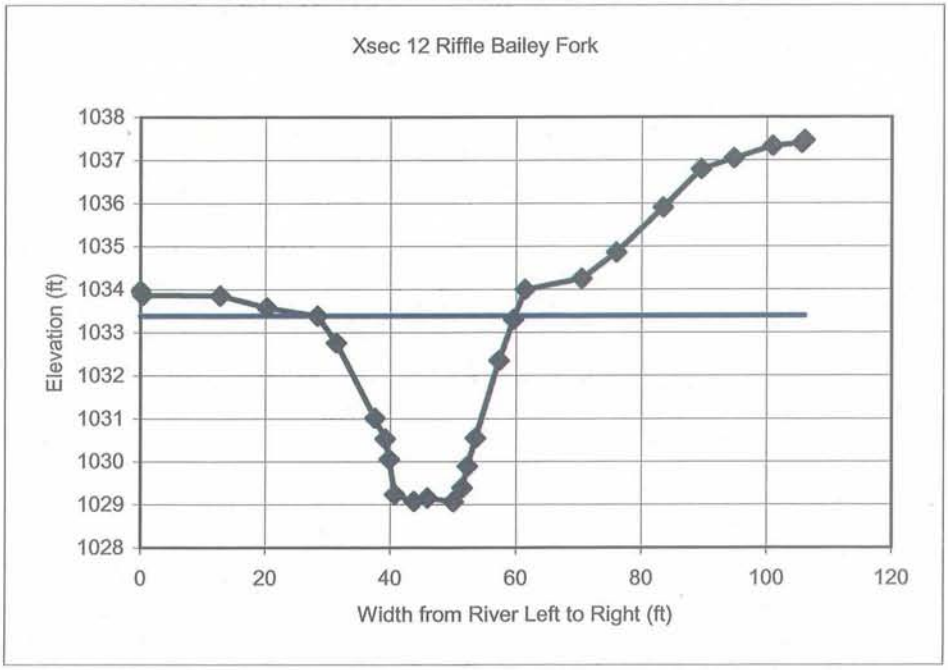
NATURAL SYSTEMS ENGINEERING

PROJECT: D04006-2 | **0-YEAR, 2005 SURVEY DATA**

PROJECT BAILEY FORK
TASK LONGITUDINAL PROFILE
CROSS-SECTION: 12 **REACH** LOWER
FEATURE: RIFFLE **DATE** 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Station	Elevation	Remark
0	1033.99	ctl pt 11&12
0	1033.88	gn
13	1033.87	gn
20	1033.59	gn
28	1033.40	bf
31	1032.77	gn
37	1031.03	gn
39	1030.55	gn
40	1030.07	ew/ws
41	1029.25	ck
44	1029.09	ck
46	1029.17	ck
50	1029.08	tw
51	1029.41	ck
52	1029.91	ew
54	1030.56	gn
57	1032.36	gn
60	1033.32	gn
61	1034.01	tb
70	1034.27	gn
76	1034.87	gn
83	1035.91	gn
90	1036.80	gn
95	1037.05	gn
101	1037.34	gn
106	1037.40	gn
106	1037.47	ctl pt 12

CROSS SECTION PHOTO - LOOKING DOWNSTREAM



CROSS SECTION PLOT - LOOKING DOWNSTREAM

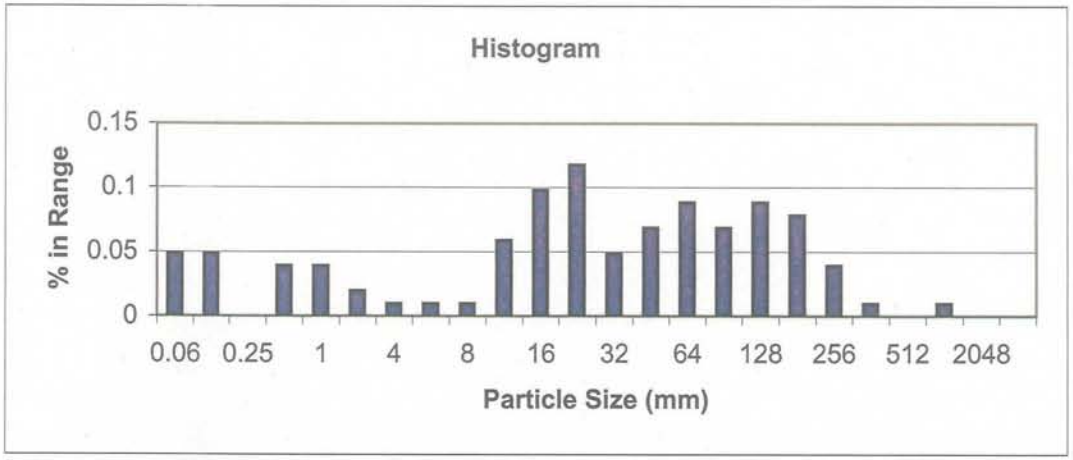
Summary Data
All dimensions in feet.

Bankfull X-sec area	81.4
Bankfull Width	31.5
Bankfull Mean Depth	2.6
Bankfull Max Depth	4.3
Width/Depth Ratio	>12
Entrenchment Ratio	>2.2
Classification	C

Remarks:

Figure 3.12

NATURAL SYSTEMS ENGINEERING



PROJECT BAILEY FORK
D04006-2
0-YEAR

TASK PEBBLE COUNT
REACH LOWER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

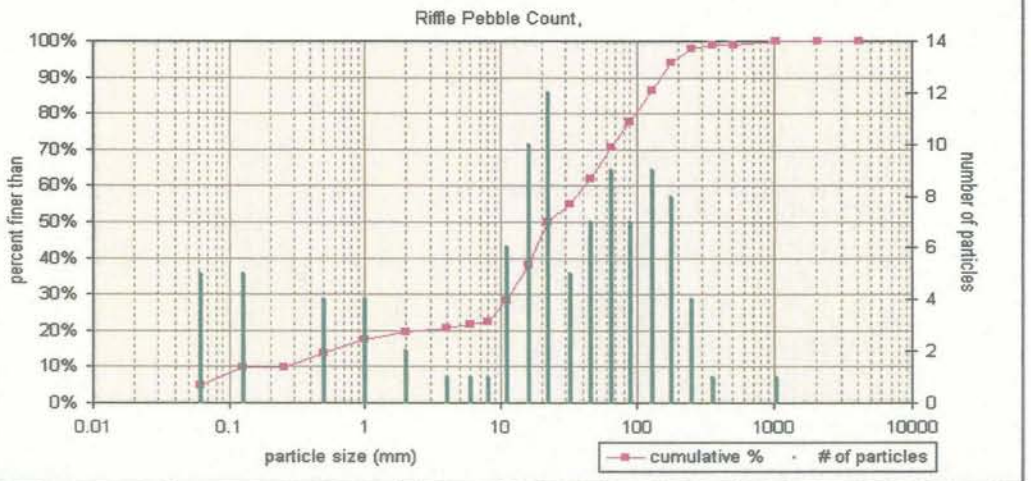
CROSS-SECTION: 12
FEATURE: RIFFLE

Riffle Pebble Count

Material	Size Range (mm)		Count	% in Range	% Cumulative
silt/clay	0	0.062	5	5%	5%
very fine sand	0.062	0.13	5	5%	10%
fine sand	0.13	0.25			10%
medium sand	0.25	0.5	4	4%	14%
coarse sand	0.5	1	4	4%	18%
very coarse sand	1	2	2	2%	20%
very fine gravel	2	4	1	1%	21%
fine gravel	4	6	1	1%	22%
fine gravel	6	8	1	1%	23%
medium gravel	8	11	6	6%	28%
medium gravel	11	16	10	10%	38%
coarse gravel	16	22	12	12%	50%
coarse gravel	22	32	5	5%	55%
very coarse gravel	32	45	7	7%	62%
very coarse gravel	45	64	9	9%	71%
small cobble	64	90	7	7%	77%
medium cobble	90	128	9	9%	86%
large cobble	128	180	8	8%	94%
very large cobble	180	256	4	4%	98%
small boulder	256	362	1	1%	99%
small boulder	362	512			99%
medium boulder	512	1024	1	1%	100%
large boulder	1024	2048			100%
very large boulder	2048	4096			100%
total particle count:			102		

bedrock		
clay hardpan		
detritus/wood		
artificial		
total count:		102

Note:



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.747	14.14	22.0	51	117	195	17.4	9.3	12.5
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	5%	15%	51%	27%	2%	0%	0%	0%	0%

NATURAL SYSTEMS ENGINEERING

0 – Year As-Built Survey Data

Appendix 4.0

NATURAL SYSTEMS
ENGINEERING

0-YEAR, 2005 SURVEY DATA

FEATURE/FACET SLOPE LENGTH, AND SPACING AND LONGITUDINAL PROFILE DATA

PROJECT NAME BAILEY FORK

TASK LONGITUDINAL PROFILE
REACH UPPER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Overall water surface slope =	0.2%
WS sta. start =	0.00 ft
WS sta. end =	1382.55 ft
ELEV. Start =	1035.97 ft msl
ELEV. End =	1032.63 ft msl

	DESIGN	MIN.	MAX.
	Riffle	0.2%	0.4%
	Run	---	---
	p-p spacing	95	224

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	15	-0.1%	0.5%	1.4%	9.5%
Run slopes measured =	15	-0.3%	0.2%	0.5%	4.9%
Pools measured =	15	20	112	98	151

All data reported in units of **feet** unless otherwise specified. Elevation data is presented in feet mean sea level.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Riffle	0	12	12	1035.97	1035.81	0.16	1.4%
Riffle	76	118	42	1035.75	1035.65	0.10	0.2%
Riffle	180	211	31	1035.43	1035.29	0.14	0.5%
Riffle	294	315	21	1035.17	1035.04	0.13	0.6%
Riffle	392	410	17	1034.81	1034.79	0.02	0.1%
Riffle	521	552	31	1034.76	1034.72	0.04	0.1%
Riffle	599	635	36	1034.66	1034.17	0.49	1.3%
Riffle	733	760	27	1034.15	1034.18	-0.03	-0.1%
Riffle	833	850	17	1034.17	1033.97	0.20	1.2%
Riffle	875	879	4	1033.87	1033.65	0.22	5.1%
Riffle	957	979	21	1033.55	1033.15	0.40	1.9%
Riffle	1082	1115	33	1032.76	1032.74	0.02	0.1%
Riffle	1180	1194	14	1032.64	1032.65	-0.01	-0.1%
Riffle	1285	1309	24	1032.66	1032.68	-0.02	-0.1%
Riffle	1378	1383	5	1032.63	1032.17	0.46	9.5%

n =	15	
MIN =	-0.1%	Water surface flat, difference in shot was 0.03 feet.
MEDIAN =	0.5%	
AVG. =	1.4%	
MAX =	9.5%	Structure

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Run	12	24	12	1035.81	1035.79	0.02	0.2%
Run	118	133	16	1035.65	1035.60	0.05	0.3%
Run	211	247	36	1035.29	1035.21	0.08	0.2%
Run	315	379	64	1035.04	1034.85	0.19	0.3%
Run	410	415	5	1034.79	1034.76	0.03	0.5%
Run	552	566	14	1034.72	1034.69	0.03	0.2%
Run	635	687	52	1034.17	1034.15	0.02	0.0%
Run	760	791	31	1034.18	1034.16	0.02	0.1%
Run	850	863	14	1033.97	1033.92	0.05	0.4%
Run	879	884	5	1033.65	1033.66	-0.01	-0.3%

0-YEAR, 2005 SURVEY DATA **PROJECT NAME** BAILEY FORK

Run	979	1003	25	1033.15	1032.92	0.23	0.9%
Run	1115	1122	7	1032.74	1032.73	0.01	0.1%
Run	1194	1201	7	1032.65	1032.66	-0.01	-0.1%
Run	1309	1343	34	1032.68	1032.65	0.03	0.1%
Run	1383	1392	10	1032.17	1031.70	0.47	4.9%

n =	15	
MIN =	-0.3%	Water surface flat, difference in shot was 0.01 feet.
MEDIAN =	0.2%	
AVG. =	0.5%	
MAX =	4.9%	Structure

Feature	Start sta.	End sta.	Length	p-p spacing
Pool	24	36	12	
Pool	133	161	28	109
Pool	247	291	44	114
Pool	379	383	4	132
Pool	415	431	16	36
Pool	566	581	14	151
Pool	687	703	16	121
Pool	791	819	29	104
Pool	863	869	6	73
Pool	884	895	11	20
Pool	1003	1051	48	120
Pool	1122	1160	38	119
Pool	1201	1230	29	79
Pool	1343	1362	19	142
Pool	1392	1508	115	49

n =	15	
MIN =	20	(p-p spacing)
MEDIAN =	112	
AVG. =	98	
MAX =	151	

Longitudinal Profile
Upper - Bailey Fork

TW - Thalweg
WS - Water Surface

Feature	Station	TW	WS	Station	Bankfull
Riffle	0	1035.40	1035.97	11	1039.20
Run	12	1034.75	1035.81	79	1039.31
Pool	24	1034.43	1035.79	87	1038.49
Glide	36	1035.06	1035.76	128	1039.35
Riffle	76	1035.31	1035.75	160	1038.38
Run	118	1035.10	1035.65	174	1036.96
Pool	133	1034.32	1035.60	184	1036.02
Glide	161	1034.59	1035.54	210	1035.84
Riffle	180	1034.91	1035.43	229	1035.64
Run	211	1034.21	1035.29	240	1035.29
Pool	247	1033.18	1035.21	266	1035.40
Glide	291	1034.49	1035.20	299	1035.54
Riffle	294	1034.92	1035.17	328	1035.86
Run	315	1034.21	1035.04	344	1037.57
Pool	379	1033.43	1034.85	369	1037.92
Glide	383	1033.89	1034.81	393	1037.78
Riffle	392	1034.01	1034.81	450	1038.12
Run	410	1033.74	1034.79	482	1037.80
Pool	415	1032.58	1034.76	505	1038.13
Glide	431	1033.53	1034.78	515	1037.94
Riffle	521	1034.10	1034.76	541	1037.85
Run	552	1033.77	1034.72	559	1037.98
Pool	566	1032.31	1034.69	621	1038.07
Glide	581	1033.22	1034.68	652	1037.45
Riffle	599	1034.06	1034.66	673	1036.78
Run	635	1033.09	1034.17	695	1037.86
Pool	687	1032.30	1034.15	720	1037.77
Glide	703	1032.61	1034.17	733	1037.29
Riffle	733	1033.70	1034.15	755	1035.94
Run	760	1033.62	1034.18	775	1035.54
Pool	791	1032.41	1034.16	811	1037.61
Glide	819	1032.75	1034.15	818	1036.21
Riffle	833	1033.61	1034.17	843	1037.33
Run	850	1032.87	1033.97	861	1036.86
Pool	863	1032.57	1033.92	891	1036.19
Glide	869	1032.42	1033.90	935	1037.29
Riffle	875	1033.37	1033.87	967	1036.69
Run	879	1032.67	1033.65	1015	1035.48
Pool	884	1031.46	1033.66	1036	1036.06
Glide	895	1032.69	1033.64	1058	1036.65
Riffle	957	1032.95	1033.55	1077	1036.02
Run	979	1032.29	1033.15	1099	1035.55
Pool	1003	1031.39	1032.92	1138	1036.38
Glide	1051	1031.73	1032.84	1170	1035.68
Riffle	1082	1032.02	1032.76	1213	1035.07
Run	1115	1031.56	1032.74	1265	1036.66
Pool	1122	1031.26	1032.73	1268	1035.77

0-YEAR, 2005 SURVEY DATA **PROJECT NAME** BAILEY FORK

Glide	1160	1031.78	1032.68	1290	1036.17
Riffle	1180	1031.81	1032.64	1318	1036.12
Run	1194	1031.70	1032.65	1356	1035.34
Pool	1201	1030.66	1032.66	1365	1035.30
Glide	1230	1031.63	1032.68	1386	1034.94
Riffle	1285	1031.93	1032.66	1409	1034.74
Run	1309	1031.78	1032.68	1439	1034.76
Pool	1343	1030.50	1032.65	1460	1035.33
Glide	1362	1031.15	1032.67	1476	1034.42
Riffle	1378	1032.22	1032.63	1517	1033.75
Run	1383	1031.07	1032.17	1537	1033.66
Pool	1392	1030.80	1031.70		
Glide	1508	1031.03	1031.73		
Thalweg	1543	1030.56	1031.53		

0-YEAR, 2005 SURVEY DATA

FEATURE/FACET SLOPE LENGTH, AND SPACING AND LONGITUDINAL PROFILE DATA

PROJECT NAME BAILEY FORK

TASK LONGITUDINAL PROFILE
REACH LOWER
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Overall water surface slope =	0.3%
WS sta. start =	58.10 ft
WS sta. end =	1055.06 ft
ELEV. Start =	1031.60 ft msl
ELEV. End =	1028.72 ft msl

	DESIGN	MIN.	MAX.
	Riffle	0.1%	0.3%
	Run	---	---
	p-p spacing	110	140

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	9	-0.1%	0.6%	0.9%	3.5%
Run slopes measured =	9	-0.1%	0.2%	0.3%	1.4%
Pools measured =	10	63	94	118	276

All data reported in units of **feet** unless otherwise specified. Elevation data is presented in feet mean sea level.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Riffle	58	80	22	1031.60	1031.31	0.29	1.3%
Riffle	206	214	7	1031.01	1030.98	0.03	0.5%
Riffle	318	339	21	1030.96	1030.94	0.02	0.1%
Riffle	442	468	26	1030.94	1030.59	0.35	1.3%
Riffle	505	529	24	1030.59	1030.55	0.04	0.2%
Riffle	655	738	82	1030.33	1029.82	0.51	0.6%
Riffle	879	889	10	1029.80	1029.81	-0.01	-0.1%
Riffle	957	984	28	1029.75	1028.77	0.98	3.5%
Riffle	1055	1072	17	1028.72	1028.60	0.12	0.7%

n =	9	
MIN =	-0.1%	Water surface flat, difference in shot was 0.01 feet.
MEDIAN =	0.6%	
AVG. =	0.9%	
MAX =	3.5%	Structure

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Run	80	85	4	1031.31	1031.25	0.06	1.4%
Run	214	243	29	1030.98	1030.99	-0.01	0.0%
Run	339	351	12	1030.94	1030.96	-0.02	-0.1%
Run	468	475	6	1030.59	1030.58	0.01	0.2%
Run	529	550	21	1030.55	1030.49	0.06	0.3%
Run	738	826	88	1029.82	1029.78	0.04	0.0%
Run	889	906	17	1029.81	1029.81	0.00	0.0%
Run	984	992	7	1028.77	1028.76	0.01	0.2%
Run	1072	1086	13	1028.60	1028.55	0.05	0.4%

n =	9	
MIN =	-0.1%	Water surface flat, difference in shot was 0.02 feet.
MEDIAN =	0.2%	
AVG. =	0.3%	
MAX =	1.4%	

0-YEAR, 2005 SURVEY DATA **PROJECT NAME** BAILEY FORK

Feature	Start sta.	End sta.	Length	p-p spacing
Pool	21	58	37	
Pool	85	110	25	63
Pool	243	272	29	158
Pool	351	377	25	108
Pool	475	480	5	124
Pool	550	582	32	75
Pool	826	852	26	276
Pool	906	926	20	80
Pool	992	1033	41	86
Pool	1086	1123	38	94

n =	10	
MIN =	63	(p-p spacing)
MEDIAN =	94	
AVG. =	118	
MAX =	276	

Longitudinal Profile
Lower - Bailey Fork

TW - Thalweg
WS - Water Surface

Feature	Station	TW	WS	Station	Bankfull
Thalweg	0	1030.83	1031.60	0	1036.77
Pool	21	1029.44	1031.60	22	1036.14
Riffle	58	1030.88	1031.60	29	1036.03
Run	80	1030.59	1031.31	67	1036.00
Pool	85	1030.39	1031.25	85	1035.96
Glide	110	1030.53	1031.26	114	1035.24
Riffle	206	1030.56	1031.01	148	1035.14
Run	214	1030.20	1030.98	171	1034.36
Pool	243	1029.39	1030.99	204	1034.39
Glide	272	1030.26	1030.96	222	1034.26
Riffle	318	1030.60	1030.96	282	1033.73
Run	339	1030.30	1030.94	302	1033.80
Pool	351	1029.20	1030.96	321	1032.92
Glide	377	1029.81	1030.94	333	1033.59
Riffle	442	1030.37	1030.94	351	1034.24
Run	468	1029.39	1030.59	395	1033.79
Pool	475	1028.89	1030.58	472	1031.80
Glide	480	1029.47	1030.58	496	1033.25
Riffle	505	1029.87	1030.59	519	1034.06
Run	529	1029.70	1030.55	540	1033.95
Pool	550	1029.39	1030.49	571	1032.30
Glide	582	1029.44	1030.43	598	1032.08
Riffle	655	1029.68	1030.33	636	1032.42
Run	738	1028.99	1029.82	667	1033.46
Pool	826	1028.50	1029.78	675	1033.26
Glide	852	1028.76	1029.78	721	1032.18
Riffle	879	1028.96	1029.80	746	1032.13
Run	889	1028.64	1029.81	779	1032.42
Pool	906	1027.65	1029.81	805	1033.39
Glide	926	1027.91	1029.76	816	1033.77
Riffle	957	1028.96	1029.75	843	1033.67
Run	984	1028.24	1028.77	847	1033.78
Pool	992	1027.11	1028.76	870	1033.81
Glide	1033	1027.83	1028.72	915	1033.48
Riffle	1055	1027.82	1028.72	928	1033.24
Run	1072	1027.45	1028.60	950	1032.47
Pool	1086	1025.84	1028.55	982	1032.20
Glide	1123	1027.77	1028.50	1007	1032.62
Thalweg	1135	1026.71	1028.30	1043	1032.54
Thalweg	1153	1026.62	1028.20	1051	1031.92
Thalweg	1170	1027.20	1028.20	1085	1031.78
Thalweg	1170	1027.20	1028.20	1110	1031.47
				1142	1031.98
				1167	1032.11
				1168	1031.78

0-YEAR, 2005 SURVEY DATA

FEATURE/FACET SLOPE LENGTH, AND SPACING AND LONGITUDINAL PROFILE DATA

PROJECT NAME BAILEY FORK

TASK LONGITUDINAL PROFILE
REACH UT 1
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Overall water surface slope =	0.7%
WS sta. start =	19.46 ft
WS sta. end =	1728.02 ft
ELEV. Start =	1048.49 ft msl
ELEV. End =	1036.29 ft msl

DESIGN	MIN.	MAX.
Riffle	0.3%	0.7%
Run	---	---
p-p spacing	50	85

Results

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	36	-0.1%	0.2%	1.4%	18.3%
Run slopes measured =	36	0.0%	0.1%	0.2%	2.1%
Pools measured =	35	22	50	49	88

All data reported in units of **feet** unless otherwise specified. Elevation data is presented in feet mean sea level.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Riffle	19	50	31	1048.49	1048.32	0.17	0.6%
Riffle	89	103	15	1048.26	1048.24	0.02	0.1%
Riffle	145	155	10	1048.13	1048.11	0.02	0.2%
Riffle	193	220	27	1048.02	1047.91	0.11	0.4%
Riffle	267	282	15	1047.78	1047.75	0.03	0.2%
Riffle	311	335	24	1047.65	1047.65	0.00	0.0%
Riffle	365	389	24	1047.46	1047.45	0.00	0.0%
Riffle	435	453	18	1047.41	1047.05	0.36	2.0%
Riffle	479	506	27	1046.93	1046.93	0.00	0.0%
Riffle	550	561	11	1046.65	1046.62	0.03	0.3%
Riffle	594	614	20	1046.48	1046.48	0.00	0.0%
Riffle	652	664	13	1046.23	1046.22	0.02	0.1%
Riffle	708	721	12	1045.67	1045.65	0.01	0.1%
Riffle	773	781	8	1045.15	1044.69	0.46	6.0%
Riffle	823	829	6	1044.51	1044.14	0.38	6.5%
Riffle	850	868	18	1043.81	1043.61	0.21	1.1%
Riffle	888	900	12	1043.34	1043.25	0.10	0.8%
Riffle	920	925	5	1042.60	1042.58	0.02	0.3%
Riffle	955	967	12	1042.33	1042.32	0.01	0.1%
Riffle	994	1001	7	1042.15	1042.01	0.14	2.0%
Riffle	1015	1025	9	1041.86	1041.86	0.00	0.1%
Riffle	1087	1102	14	1041.62	1041.62	0.00	0.0%
Riffle	1136	1173	37	1041.47	1041.46	0.01	0.0%
Riffle	1213	1229	16	1041.35	1040.96	0.39	2.4%
Riffle	1239	1245	6	1040.67	1040.67	0.00	0.0%
Riffle	1301	1312	11	1040.65	1040.63	0.02	0.2%
Riffle	1384	1400	16	1040.53	1040.52	0.01	0.1%
Riffle	1468	1490	22	1040.48	1040.17	0.30	1.3%
Riffle	1540	1553	14	1039.98	1039.97	0.01	0.1%
Riffle	1565	1573	8	1039.79	1039.79	0.00	0.0%
Riffle	1608	1612	4	1039.20	1038.93	0.26	6.5%
Riffle	1636	1641	6	1038.09	1038.07	0.02	0.3%
Riffle	1656	1662	7	1037.51	1037.50	0.01	0.2%

Riffle	1687	1699	12	1037.02	1037.03	-0.02	-0.1%
Riffle	1719	1726	7	1036.38	1036.29	0.09	1.2%
Riffle	1742	1751	8	1035.65	1034.14	1.51	18.3%

n =	36	
MIN =	-0.1%	One instance, water surface flat, difference in shot was 0.02 feet.
MEDIAN =	0.2%	
AVG. =	1.4%	
MAX =	18.3%	Drop structure at end of project, atypical of reach.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Run	50	63	12	1048.32	1048.30	0.02	0.1%
Run	103	115	12	1048.24	1048.18	0.06	0.5%
Run	155	174	18	1048.11	1048.08	0.04	0.2%
Run	220	236	16	1047.91	1047.91	0.00	0.0%
Run	282	291	9	1047.75	1047.75	0.00	0.0%
Run	335	342	7	1047.65	1047.64	0.01	0.1%
Run	389	399	10	1047.45	1047.44	0.01	0.1%
Run	453	459	6	1047.05	1047.05	0.00	0.0%
Run	506	521	15	1046.93	1046.93	0.01	0.1%
Run	561	572	12	1046.62	1046.61	0.01	0.1%
Run	614	622	8	1046.48	1046.48	0.00	0.0%
Run	664	671	7	1046.22	1046.21	0.01	0.2%
Run	721	742	22	1045.65	1045.64	0.01	0.1%
Run	781	793	12	1044.69	1044.68	0.01	0.1%
Run	829	831	3	1044.14	1044.12	0.02	0.6%
Run	868	873	5	1043.61	1043.61	0.00	0.0%
Run	900	905	5	1043.25	1043.20	0.04	0.8%
Run	925	936	11	1042.58	1042.53	0.05	0.4%
Run	967	975	8	1042.32	1042.31	0.01	0.1%
Run	1001	1004	4	1042.01	1041.93	0.08	2.1%
Run	1025	1028	4	1041.86	1041.85	0.01	0.2%
Run	1102	1110	8	1041.62	1041.61	0.01	0.1%
Run	1173	1183	10	1041.46	1041.45	0.01	0.1%
Run	1229	1232	4	1040.96	1040.96	0.00	0.0%
Run	1245	1259	14	1040.67	1040.66	0.01	0.0%
Run	1312	1331	19	1040.63	1040.62	0.00	0.0%
Run	1400	1418	19	1040.52	1040.52	0.00	0.0%
Run	1490	1501	11	1040.17	1040.15	0.02	0.2%
Run	1553	1557	3	1039.97	1039.97	0.00	0.0%
Run	1573	1582	10	1039.79	1039.79	0.00	0.0%
Run	1612	1621	10	1038.93	1038.92	0.01	0.2%
Run	1641	1643	2	1038.07	1038.07	0.00	0.0%
Run	1662	1668	6	1037.50	1037.50	0.00	0.0%
Run	1699	1702	3	1037.03	1037.03	0.00	0.1%
Run	1726	1728	2	1036.29	1036.29	0.00	0.0%

n =	36
MIN =	0.0%
MEDIAN =	0.1%
AVG. =	0.2%
MAX =	2.1%

0-YEAR, 2005 SURVEY DATA **PROJECT NAME** BAILEY FORK

Feature	Start sta.	End sta.	Length	p-p spacing
Pool	63	73	11	
Pool	115	136	21	52
Pool	174	185	11	59
Pool	236	256	20	62
Pool	291	297	6	55
Pool	342	352	10	50
Pool	399	413	14	57
Pool	459	465	6	60
Pool	521	537	16	62
Pool	572	581	8	52
Pool	622	633	11	50
Pool	671	699	28	49
Pool	742	753	11	71
Pool	793	815	22	51
Pool	831	833	2	38
Pool	873	878	5	42
Pool	905	911	6	32
Pool	936	949	13	31
Pool	975	982	6	39
Pool	1004	1009	5	29
Pool	1028	1060	32	24
Pool	1110	1122	12	81
Pool	1183	1196	13	74
Pool	1232	1237	4	49
Pool	1259	1295	37	26
Pool	1331	1365	34	72
Pool	1418	1435	16	88
Pool	1501	1523	22	83
Pool	1557	1560	3	55
Pool	1582	1600	18	26
Pool	1621	1628	7	39
Pool	1643	1647	4	22
Pool	1668	1675	7	25
Pool	1702	1709	7	34
Pool	1728	1731	3	26

n =	35	
MIN =	22	(p-p spacing)
MEDIAN =	50	
AVG. =	49	
MAX =	88	

Longitudinal Profile
UT1 - Bailey Fork

TW - Thalweg
WS - Water Surface

Feature	Station	TW	WS	Station	Bankfull
Riffle	0	1048.38	1048.53	1	1050.16
Run	19	1048.20	1048.49	9	1050.14
Pool	50	1047.91	1048.32	22	1049.94
Glide	63	1048.03	1048.30	29	1049.22
Riffle	73	1048.04	1048.28	44	1049.28
Run	89	1047.80	1048.26	64	1049.01
Pool	103	1047.56	1048.24	76	1049.59
Glide	115	1047.84	1048.18	93	1049.59
Riffle	136	1047.90	1048.16	120	1049.83
Run	145	1047.63	1048.13	144	1049.66
Pool	155	1047.17	1048.11	148	1049.18
Glide	174	1047.50	1048.08	177	1049.37
Riffle	185	1047.86	1048.05	197	1049.03
Run	193	1047.67	1048.02	212	1048.85
Pool	220	1046.01	1047.91	243	1048.92
Glide	236	1047.30	1047.91	262	1048.53
Riffle	256	1047.64	1047.91	276	1048.34
Run	267	1047.25	1047.78	300	1048.40
Pool	282	1046.88	1047.75	310	1048.29
Glide	291	1047.33	1047.75	327	1048.17
Riffle	297	1047.50	1047.74	358	1048.75
Run	311	1047.18	1047.65	364	1048.90
Pool	335	1046.02	1047.65	381	1048.68
Glide	342	1046.74	1047.64	387	1048.40
Riffle	352	1047.43	1047.64	414	1048.69
Run	365	1046.61	1047.46	449	1048.12
Pool	389	1045.36	1047.45	476	1048.31
Glide	399	1046.78	1047.44	495	1047.81
Riffle	413	1047.16	1047.44	515	1047.59
Run	435	1047.01	1047.41	531	1047.60
Pool	453	1045.86	1047.05	547	1047.92
Glide	459	1045.75	1047.05	557	1047.69
Riffle	465	1046.70	1047.04	585	1047.77
Run	479	1046.65	1046.93	599	1047.43
Pool	506	1045.90	1046.93	611	1046.98
Glide	521	1046.24	1046.93	632	1047.24
Riffle	537	1046.66	1046.83	649	1047.13
Run	550	1046.40	1046.65	675	1046.83
Pool	561	1045.35	1046.62	692	1046.97
Glide	572	1046.18	1046.61	712	1046.91
Riffle	581	1046.25	1046.59	734	1046.29
Run	594	1046.09	1046.48	756	1046.33
Pool	614	1045.44	1046.48	772	1046.25
Glide	622	1045.61	1046.48	786	1046.33
Riffle	633	1046.30	1046.48	809	1046.25
Run	652	1045.75	1046.23	842	1045.36
Pool	664	1044.21	1046.22	852	1045.31

Glide	671	1045.27	1046.21	865	1044.46
Riffle	699	1045.90	1046.15	887	1044.63
Run	708	1045.15	1045.67	905	1044.47
Pool	721	1044.62	1045.65	915	1044.35
Glide	742	1044.74	1045.64	932	1044.46
Riffle	753	1045.36	1045.56	947	1043.96
Run	773	1044.02	1045.15	960	1043.48
Pool	781	1042.31	1044.69	987	1043.34
Glide	793	1043.82	1044.68	1004	1043.59
Riffle	815	1044.41	1044.65	1021	1043.53
Run	823	1044.38	1044.51	1032	1043.69
Pool	829	1043.34	1044.14	1045	1043.13
Glide	831	1043.53	1044.12	1052	1043.20
Riffle	833	1043.84	1044.09	1067	1043.65
Run	850	1043.54	1043.81	1080	1043.29
Pool	868	1042.39	1043.61	1095	1043.05
Glide	873	1043.05	1043.61	1127	1043.45
Riffle	878	1043.38	1043.61	1129	1043.77
Run	888	1042.89	1043.34	1154	1042.97
Pool	900	1042.64	1043.25	1162	1042.77
Glide	905	1042.85	1043.20	1176	1042.42
Riffle	911	1043.02	1043.15	1221	1042.56
Run	920	1042.34	1042.60	1252	1041.93
Pool	925	1042.02	1042.58	1275	1041.99
Glide	936	1042.15	1042.53	1288	1042.39
Riffle	949	1042.26	1042.51	1295	1042.05
Run	955	1041.76	1042.33	1329	1041.62
Pool	967	1041.52	1042.32	1360	1041.91
Glide	975	1041.76	1042.31	1383	1041.68
Riffle	982	1042.03	1042.29	1396	1041.46
Run	994	1041.53	1042.15	1428	1041.25
Pool	1001	1041.46	1042.01	1467	1041.51
Glide	1004	1041.52	1041.93	1496	1041.07
Riffle	1009	1041.61	1041.87	1519	1041.29
Run	1015	1041.20	1041.86	1548	1041.75
Pool	1025	1040.55	1041.86	1557	1041.43
Glide	1028	1041.29	1041.85	1573	1039.99
Riffle	1060	1041.47	1041.73	1580	1041.30
Run	1087	1041.38	1041.62	1605	1040.94
Pool	1102	1039.98	1041.62	1645	1040.54
Glide	1110	1040.86	1041.61	1661	1040.07
Riffle	1122	1041.38	1041.61	1672	1039.41
Run	1136	1041.01	1041.47	1693	1039.25
Pool	1173	1040.03	1041.46	1711	1039.10
Glide	1183	1040.51	1041.45	1741	1037.94
Riffle	1196	1041.15	1041.44	1741	1038.04
Run	1213	1041.12	1041.35		
Pool	1229	1040.32	1040.96		
Glide	1232	1040.55	1040.96		
Riffle	1237	1040.81	1040.96		
Run	1239	1040.10	1040.67		
Pool	1245	1039.63	1040.67		
Glide	1259	1039.93	1040.66		

Riffle	1295	1040.35	1040.66
Run	1301	1040.23	1040.65
Pool	1312	1038.97	1040.63
Glide	1331	1039.60	1040.62
Riffle	1365	1040.36	1040.60
Run	1384	1039.78	1040.53
Pool	1400	1038.63	1040.52
Glide	1418	1039.47	1040.52
Riffle	1435	1040.25	1040.51
Run	1468	1040.08	1040.48
Pool	1490	1038.86	1040.17
Glide	1501	1039.16	1040.15
Riffle	1523	1039.93	1040.15
Run	1540	1039.53	1039.98
Pool	1553	1039.25	1039.97
Glide	1557	1039.51	1039.97
Riffle	1560	1039.78	1039.96
Run	1565	1038.99	1039.79
Pool	1573	1038.37	1039.79
Glide	1582	1039.15	1039.79
Riffle	1600	1039.57	1039.76
Run	1608	1038.94	1039.20
Pool	1612	1037.90	1038.93
Glide	1621	1038.24	1038.92
Riffle	1628	1038.74	1038.91
Run	1636	1037.88	1038.09
Pool	1641	1036.94	1038.07
Glide	1643	1037.25	1038.07
Riffle	1647	1037.92	1038.05
Run	1656	1037.26	1037.51
Pool	1662	1035.81	1037.50
Glide	1668	1036.56	1037.50
Riffle	1675	1037.23	1037.49
Run	1687	1036.65	1037.02
Pool	1699	1035.91	1037.03
Glide	1702	1036.26	1037.03
Riffle	1709	1036.87	1037.03
Run	1719	1036.07	1036.38
Pool	1726	1035.37	1036.29
Glide	1728	1035.92	1036.29
Riffle	1731	1036.19	1036.29
Run	1742	1035.43	1035.65
Pool	1751	1034.14	1034.14

0-YEAR, 2005 SURVEY DATA

FEATURE/FACET SLOPE LENGTH, AND SPACING AND LONGITUDINAL PROFILE DATA

PROJECT NAME BAILEY FORK

TASK LONGITUDINAL PROFILE
REACH UT2
DATE 5/9/2006 to 5/12/2006
CREW TURNER/HALLEY/KUSAN

Overall water surface slope =	0.5%
WS sta. start =	0.00 ft
WS sta. end =	1262.39 ft
ELEV. Start =	1035.97 ft msl
ELEV. End =	1029.41 ft msl

DESIGN	MIN.	MAX.
Riffle	0.2%	0.5%
Run	---	---
p-p spacing	55	85

	n =	MIN.	MEDIAN.	AVG.	MAX.
Riffle slopes measured =	20	0.0%	1.0%	3.4%	14.5%
Run slopes measured =	17	-0.3%	0.2%	0.8%	4.8%
Pools measured =	18	13	81	72	156

All data reported in units of **feet** unless otherwise specified. Elevation data is presented in feet mean sea level.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Riffle	0	12	12	1035.97	1035.81	0.16	1.4%
Riffle	24	35	11	1036.41	1036.41	0.00	0.0%
Riffle	55	82	27	1036.42	1036.37	0.05	0.2%
Riffle	159	179	20	1036.34	1036.10	0.24	1.2%
Riffle	236	239	4	1036.10	1035.93	0.17	4.7%
Riffle	290	321	31	1035.91	1035.83	0.08	0.3%
Riffle	369	377	8	1035.81	1035.52	0.29	3.6%
Riffle	431	459	27	1035.51	1035.50	0.01	0.0%
Riffle	524	569	45	1035.34	1035.20	0.14	0.3%
Riffle	613	631	18	1035.04	1034.89	0.15	0.9%
Riffle	723	760	37	1034.33	1034.26	0.07	0.2%
Riffle	814	844	31	1034.27	1034.14	0.13	0.4%
Riffle	860	882	22	1034.14	1033.94	0.20	0.9%
Riffle	1015	1016	2	1033.50	1033.35	0.15	9.5%
Riffle	1049	1075	26	1032.97	1032.83	0.15	0.6%
Riffle	1156	1166	9	1031.34	1031.20	0.15	1.6%
Riffle	1195	1207	12	1031.13	1030.99	0.15	1.3%
Riffle	1238	1241	3	1030.54	1030.12	0.42	14.5%
Riffle	1249	1254	5	1030.12	1029.41	0.71	14.2%
Riffle	1262	1268	6	1029.41	1028.70	0.71	12.3%

n =	20	
MIN =	0.0%	Water surface flat, difference in shot was 0.03 feet.
MEDIAN =	1.0%	
AVG. =	3.4%	
MAX =	14.5%	Structures at end which transitions from Priorty 1 to Priority 2.

Feature	Start sta.	End sta.	Length	WS El. Start	WS El. End	Change	Slope
Run	12	24	12	1035.81	1035.79	0.02	0.2%
Run	35	38	4	1036.41	1036.42	-0.01	-0.3%
Run	82	154	72	1036.37	1036.36	0.01	0.0%
Run	179	191	12	1036.10	1036.09	0.01	0.1%
Run	239	280	41	1035.93	1035.92	0.01	0.0%

Run	321	346	25	1035.83	1035.83	0.00	0.0%
Run	377	424	47	1035.52	1035.52	0.00	0.0%
Run	459	519	60	1035.50	1035.34	0.16	0.3%
Run	569	608	38	1035.20	1035.05	0.15	0.4%
Run	631	698	67	1034.89	1034.34	0.55	0.8%
Run	760	785	25	1034.26	1034.26	0.00	0.0%
Run	844	853	9	1034.14	1034.14	0.00	0.0%
Run	882	938	56	1033.94	1033.62	0.32	0.6%
Run	1016	1019	2	1033.35	1033.25	0.10	4.1%
Run	1075	1103	28	1032.83	1031.50	1.33	4.8%
Run	1166	1173	7	1031.20	1031.14	0.06	0.8%
Run	1207	1228	21	1030.99	1030.54	0.45	2.2%

n =	17	
MIN =	-0.3%	Water surface flat, difference in shot was 0.01 feet.
MEDIAN =	0.2%	
AVG. =	0.8%	
MAX =	4.8%	Structure

Feature	Start sta.	End sta.	Length	p-p spacing
Pool	38	48	9	
Pool	154	155	1	115
Pool	191	205	14	37
Pool	346	352	6	156
Pool	424	427	4	77
Pool	519	521	2	95
Pool	608	610	2	89
Pool	698	704	6	90
Pool	785	803	18	87
Pool	853	856	3	68
Pool	938	980	43	84
Pool	1019	1021	2	81
Pool	1103	1145	42	84
Pool	1173	1182	10	70
Pool	1228	1233	5	55
Pool	1241	1249	9	13
Pool	1254	1262	8	14
Pool	1268	1271	3	14

n =	18	
MIN =	13	(p-p spacing)
MEDIAN =	81	
AVG. =	72	
MAX =	156	

Longitudinal Profile
UT2 - Bailey Fork

TW - Thalweg
WS - Water Surface

Feature	Station	TW	WS	Station	Bankfull
Glide	0	1035.95	1036.42	0	1040.89
Riffle	24	1035.98	1036.41	0	1040.04
Run	35	1035.72	1036.41	23	1038.97
Pool	38	1035.62	1036.42	61	1038.24
Glide	48	1035.87	1036.42	74	1038.13
Riffle	55	1036.03	1036.42	102	1038.07
Run	82	1035.92	1036.37	127	1037.84
Pool	154	1035.58	1036.36	167	1037.62
Glide	155	1035.72	1036.35	186	1037.64
Riffle	159	1035.88	1036.34	187	1037.65
Run	179	1035.40	1036.10	214	1037.48
Pool	191	1035.16	1036.09	233	1037.40
Glide	205	1035.57	1036.10	247	1037.44
Riffle	236	1035.78	1036.10	273	1037.47
Run	239	1035.37	1035.93	294	1037.42
Pool	280	1035.32	1035.92	316	1037.41
Glide	286	1035.37	1035.92	344	1037.54
Riffle	290	1035.58	1035.91	373	1037.19
Run	321	1035.25	1035.83	397	1037.01
Pool	346	1035.02	1035.83	418	1036.49
Glide	352	1035.13	1035.82	455	1036.88
Riffle	369	1035.43	1035.81	489	1036.46
Run	377	1035.07	1035.52	502	1037.71
Pool	424	1034.97	1035.52	534	1037.08
Glide	427	1035.10	1035.52	548	1036.78
Riffle	431	1035.22	1035.51	578	1036.10
Run	459	1035.15	1035.50	594	1036.00
Pool	519	1034.55	1035.34	621	1035.78
Glide	521	1034.65	1035.33	653	1033.49
Riffle	524	1034.90	1035.34	662	1036.38
Run	569	1034.85	1035.20	702	1036.03
Pool	608	1034.19	1035.05	730	1036.23
Glide	610	1034.40	1035.05	762	1035.87
Riffle	613	1034.68	1035.04	793	1035.82
Run	631	1034.55	1034.89	807	1035.72
Pool	698	1033.54	1034.34	833	1036.03
Glide	704	1033.98	1034.33	869	1035.80
Riffle	723	1033.99	1034.33	889	1035.97
Run	760	1033.90	1034.26	922	1034.98
Pool	785	1033.50	1034.26	954	1035.10
Glide	803	1033.90	1034.27	962	1035.12
Riffle	814	1033.95	1034.27	1014	1035.00
Run	844	1033.69	1034.14	1060	1034.35
Pool	853	1033.33	1034.14	1066	1034.76
Glide	856	1033.55	1034.15	1099	1034.24
Riffle	860	1033.88	1034.14	1122	1034.10
Run	882	1033.59	1033.94	1134	1032.88

0-YEAR, 2005 SURVEY DATA **PROJECT NAME** BAILEY FORK

Pool	938	1033.17	1033.62	1178	1032.65
Glide	980	1033.23	1033.49	1203	1032.51
Riffle	1015	1033.34	1033.50	1223	1032.68
Run	1016	1032.29	1033.35	1245	1032.41
Pool	1019	1031.25	1033.25	1258	1032.64
Glide	1021	1032.30	1033.05	1270	1031.33
Riffle	1049	1032.41	1032.97		
Run	1075	1032.34	1032.83		
Pool	1103	1030.91	1031.50		
Glide	1145	1031.01	1031.41		
Riffle	1156	1031.14	1031.34		
Run	1166	1030.84	1031.20		
Pool	1173	1030.47	1031.14		
Glide	1182	1030.62	1031.13		
Riffle	1195	1030.82	1031.13		
Run	1207	1030.64	1030.99		
Pool	1228	1029.96	1030.54		
Glide	1233	1030.02	1030.54		
Riffle	1238	1030.29	1030.54		
Pool	1241	1029.26	1030.12		
Riffle	1249	1029.72	1030.12		
Pool	1254	1028.59	1029.41		
Riffle	1262	1029.31	1029.41		
Pool	1268	1028.55	1028.70		
Pool	1271	1026.97	1028.52		

Bankfull Event Documentation

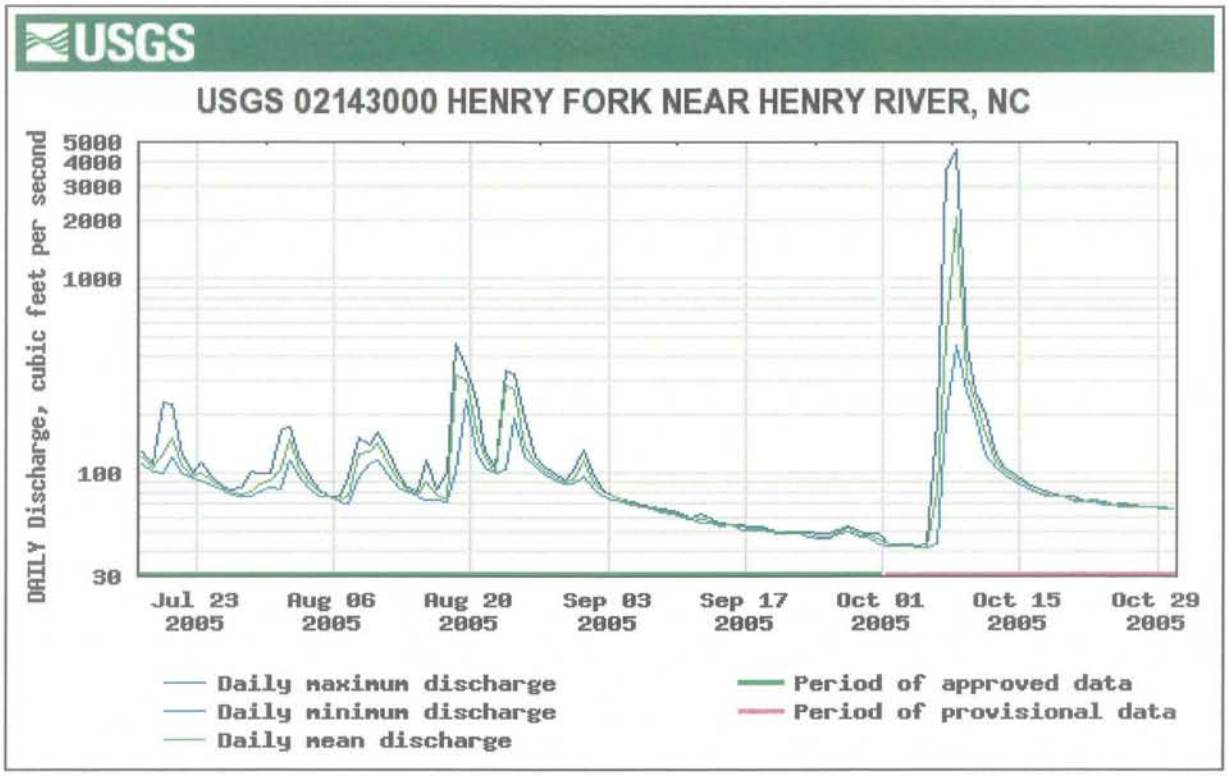
Appendix 5.0

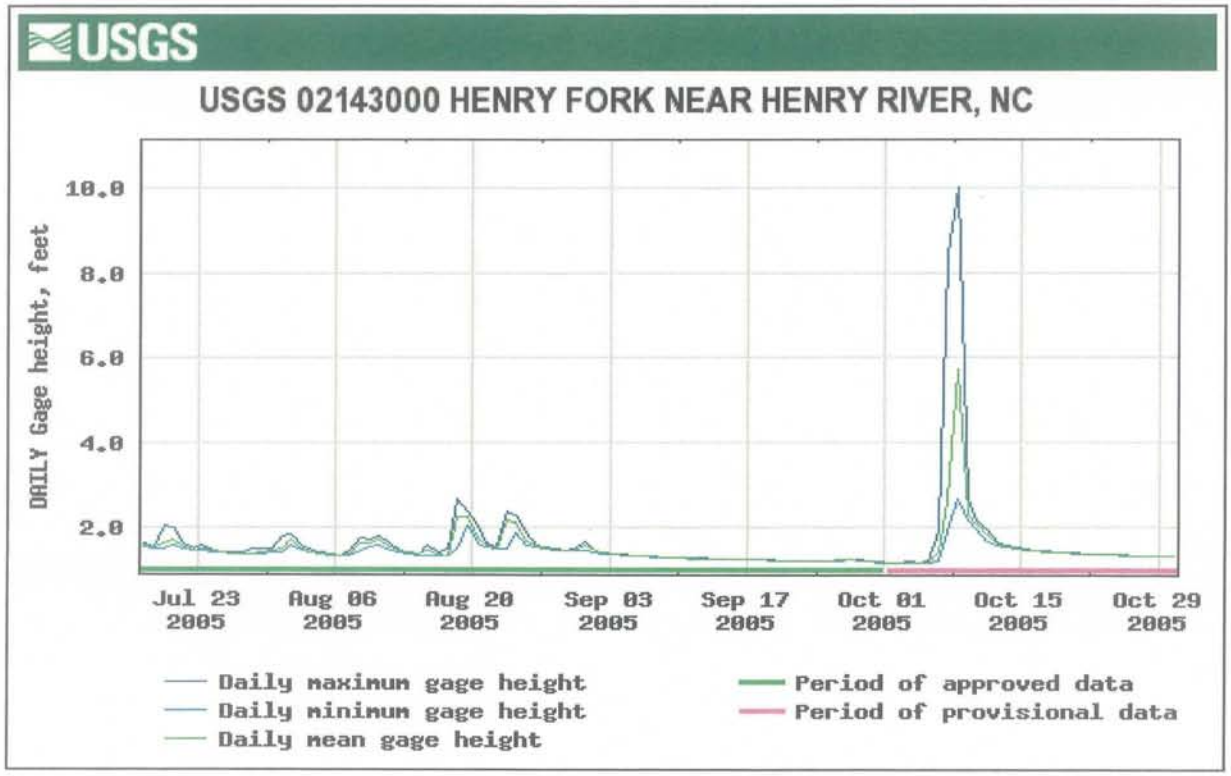
NATURAL SYSTEMS
ENGINEERING

Photo 1 - Wrack line, Upper Bailey culvert headwall, photo date Oct. 31, 2005.

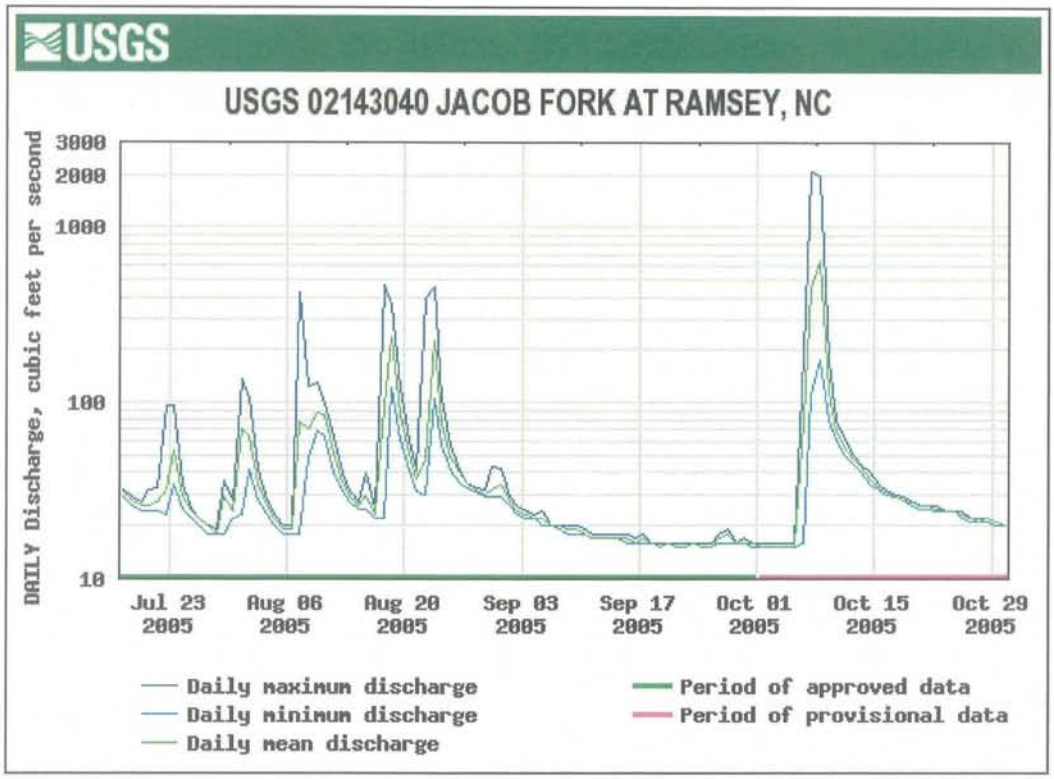
Photo 2 - Wrack line, Upper Bailey culvert headwall, photo date Oct. 31, 2005.

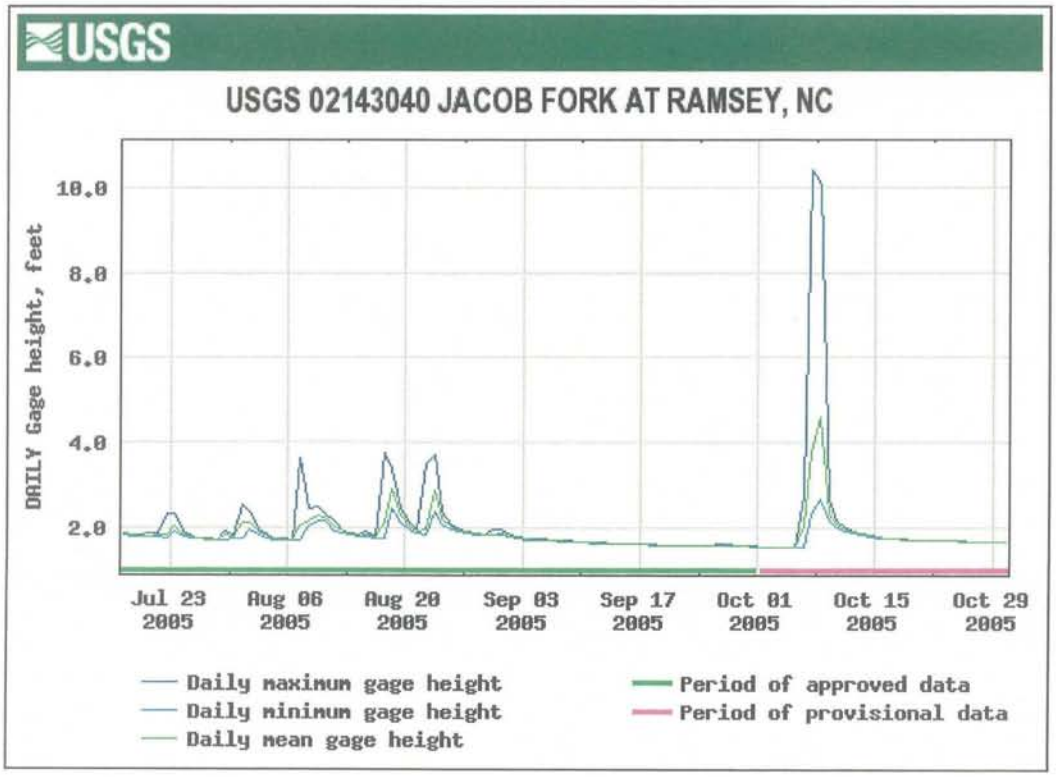
USGS Stream Gauge near Henry River
16.95 miles East of Restoration Site





USGS Stream Gauge near Ramsey, NC
15.01 miles South of Restoration Site





Select AM or PM Version

Please note this information is preliminary and subject to revision. Official and certified climatic data can be accessed at the National Climatic Data Center (NCDC) (http://www.ncdc.noaa.gov/oa/ncdc.html).

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ASUS62 KGSP 081352
RTPGSP

MOUNTAIN AND FOOTHILLS REPORTS FOR NORTH CAROLINA
NATIONAL WEATHER SERVICE GREENVILLE-SPARTANBURG SC
952 AM EDT SAT OCT 08 2005

THIS IS THE NORTH CAROLINA MOUNTAIN AND FOOTHILLS REPORT...
WHICH INCLUDES THE HIGH AND LOW TEMPERATURES AND PRECIPITATION
FOR THE 24 HOUR PERIOD ENDING AROUND 7 AM THIS MORNING.
```

STATION	ELEV	HIGH	LOW	PCPN
BCHN7:BEECH MOUNTAIN	5069:	62/	54/	1.48
BOON7:BOONE	3800:	68/	62/	1.30
BRCN7:BRYSON CITY	2020:	72/	57/	0.53
LNNN7:GRANDFATHER MTN	5300:	63/	55/	1.23
HTSN7:HOT SPRINGS	1400:	74/	59/	0.52
JFFN7:JEFFERSON	2770:	69/	62/	1.41
LENN7:LENOIR	1300:	72/	65/	3.00
MRHN7:MARSHALL	1800:	71/	58/	0.28
MRGN7:MORGANTON	1160:	70/	66/	3.47
MMTN7:MOUNT MITCHELL	6240:	59/	54/	1.15
MURN7:MURPHY	1800:	77/	57/	0.72
RBNN7:ROBBINSVILLE	2225:	71/	55/	0.47
SPPN7:SPRUCE PINE	2500:	69/	60/	0.93
ROBN7:STECOAH	1996:	71/	55/	0.41

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HIGH AND LOW TEMPERATURES AND PRECIPITATION TOTALS ARE
FOR THE PAST 24 HOURS ENDING AROUND 7 AM THIS MORNING.
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Select AM or PM Version

Please note this information is preliminary and subject to revision. Official and certified climatic data can be accessed at the National Climatic Data Center (NCDC) (http://www.ncdc.noaa.gov/oa/ncdc.html).

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ASUS62 KGSP 071348
RTPGSP

MOUNTAIN AND FOOTHILLS REPORTS FOR NORTH CAROLINA
NATIONAL WEATHER SERVICE GREENVILLE-SPARTANBURG SC
947 AM EDT FRI OCT 07 2005

THIS IS THE NORTH CAROLINA MOUNTAIN AND FOOTHILLS REPORT...
WHICH INCLUDES THE HIGH AND LOW TEMPERATURES AND PRECIPITATION
FOR THE 24 HOUR PERIOD ENDING AROUND 7 AM THIS MORNING.

STATION	ELEV	HIGH	LOW	PCPN
BCHN7:BEECH MOUNTAIN	5069:	59/	54/	2.20
BOON7:BOONE	3800:	64/	59/	3.65
BRCN7:BRYSON CITY	2020:	69/	61/	0.34
FLAN7:FLAT TOP	4330:	63/	58/	2.01
LNNN7:GRANDFATHER MTN	5300:	61/	55/	4.37
HTSN7:HOT SPRINGS	1400:	73/	63/	0.20
JFFN7:JEFFERSON	2770:	66/	59/	1.58
LENN7:LENOIR	1300:	78/	65/	1.95
MRHN7:MARSHALL	1800:	69/	60/	0.44
MRGN7:MORGANTON	1160:	70/	64/	2.40
MMTN7:MOUNT MITCHELL	6240:	58/	53/	5.76
MURN7:MURPHY	1800:	70/	64/	0.07
RBNN7:ROBBINSVILLE	2225:	72/	61/	0.49
SPPN7:SPRUCE PINE	2500:	70/	62/	2.15

HIGH AND LOW TEMPERATURES AND PRECIPITATION TOTALS ARE
FOR THE PAST 24 HOURS ENDING AROUND 7 AM THIS MORNING.

Baseline Morphology and Hydraulic Summary

Appendix 6.0

NATURAL SYSTEMS ENGINEERING

Baseline Morphology and Hydraulic Summary
Bailey Fork Stream Restoration Project
May 2006 As-Built Survey

Stream Name	Sal's Branch			Whites Creek			S. Muddy Birchfield			S. Muddy Trib 4		
Data Category	Reference			Reference			Reference			Reference		
Parameter	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Bankfull Width (Wbkf)	---	---	10.2	---	---	17	---	---	10.8	---	---	7.35
Flood Prone Width (Wfpa)	---	---	100	---	---	150	---	---	100	---	---	43
Bankfull Cross-Section Area (Abkf)	---	---	13.8	---	---	35.7	---	---	20.7	---	---	9.1
Bankfull Mean Depth (Dbkf)	---	---	1.3	---	---	2.1	---	---	1.9	---	---	1.3
Bankfull Max Depth (Dmax)	---	---	1.9	---	---	2.8	---	---	2.5	---	---	1.8
Width/Depth Ratio	---	---	7.6	---	---	8.1	---	---	5.6	---	---	6
Entrenchment Ratio (Wfpa/Wbkf)	---	---	9.8	---	---	8.8	---	---	9.3	---	---	5.8
Wetted Perimeter (ft)	---	---	---	---	---	---	---	---	---	---	---	---
Hydraulic radius (ft)	---	---	---	---	---	---	---	---	---	---	---	---
Pattern												
Belt Width (Wblt)	20	62	---	60	80	---	---	---	---	50	80	---
Radius of Curvature (Rc)	11	21	---	11	16	---	---	---	---	10	11	---
Meander Length (Lm)	35	43	---	49	54	---	---	---	---	50	160	---
Min Meander Width Ratio (Wblt/Wbkf)	2	6.1	---	3.5	4.7	---	---	---	---	6.8	10.9	---
Profile												
Min Riffle Length (Lrif)	3	28	---	3.1	16.1	---	6	26	---	3.4	26.4	---
Min Riffle Slope (Srif)	0.016	0.036	---	0.0068	0.0607	---	0.035	0.0042	---	0.0138	0.07	---
Pool Length (Lpool)	---	---	21-35	---	---	32-60.1	---	---	6-12	---	---	5.5-41.3
Pool-Pool Spacing (p-p)	---	---	51-66	---	---	26-73	---	---	16-43	---	---	17-70
Substrate												
d50 (mm)	---	---	---	---	---	---	---	---	---	---	---	---
d84 (mm)	---	---	---	---	---	---	---	---	---	---	---	---
Additional Reach Parameters												
Valley Length (ft)	---	---	---	---	---	209	---	---	---	---	---	295
Channel Length (ft)	---	---	---	---	---	406	---	---	---	---	---	475
Sinuosity	---	---	2	---	---	1.9	---	---	---	---	---	1.6
Water Surface Slope (Save)	---	---	0.005	---	---	0.0044	---	---	0.006	---	---	0.0219
Bankfull Slope (Sval)	---	---	0.006	---	---	0.006	---	---	NA	---	---	0.025
Rosgen Classification	---	---	E	---	---	E4	---	---	E4	---	---	E4
Bankfull mean velocity (Vbkf)	---	---	3.8	---	---	4.8	---	---	4.7	---	---	7.1
Bankfull Discharge (Qbkf)	---	---	51.6	---	---	194	---	---	98	---	---	64
Drainage Area (mi2)	---	---	0.35	---	---	1.7	---	---	1.3	---	---	0.14

Baseline Morphology and Hydraulic Summary
Bailey Fork Stream Restoration Project
May 2006 As-Built Survey

Stream Name	Upper Bailey Fork			Upper Bailey Fork			Upper Bailey Fork		
Data Category	Existing			Design			As-Built		
Parameter	Min	Max	Med	Min	Max	Med	Min	Max	Med
Bankfull Width (Wbkf)	---	---	23.2	---	---	28	28.2	37.7	---
Flood Prone Width (Wfpa)	---	---	180	---	---	280	180	200	---
Bankfull Cross-Section Area (Abkf)	---	---	69.5	---	---	65	71.7	88.1	---
Bankfull Mean Depth (Dbkf)	---	---	3.1	---	---	2.3	2.3	2.5	---
Bankfull Max Depth (Dmax)	---	---	4.8	---	---	4.2	4.1	5.2	---
Width/Depth Ratio	---	---	7.8	---	---	12	11.4	16.2	---
Entrenchment Ratio (Wfpa/Wbkf)	---	---	7.9	---	---	10	5.3	6.4	---
Wetted Perimeter (ft)	---	---	---	---	---	---	29.7	40.7	---
Hydraulic radius (ft)	---	---	---	---	---	---	2.2	2.4	---
Pattern									
Belt Width (Wblt)	75	105	---	70	153	---	100	120	---
Radius of Curvature (Rc)	18	30	---	42	84	---	42	84	---
Meander Length (Lm)	60	96	---	70	154	---	70	154	---
Min Meander Width Ratio (Wblt/Wbkf)	3.2	3.6	---	2.5	5.5	---	3.2	3.5	---
Profile									
Min Riffle Length (Lrif)	15	67.8	---	23.8	68	---	4	42	21
Min Riffle Slope (Srif)	0.0086	0.086	---	0.002	0.0035*	---	0	0.051	0.005
Pool Length (Lpool)	---	---	90	---	---	45-96	4	115	19
Pool-Pool Spacing (p-p)	---	---	81-211	---	---	95-224	20	151	111
Substrate									
d50 (mm)	---	---	6	---	---	---	7	20	---
d84 (mm)	---	---	15	---	---	55	121	154	---
Additional Reach Parameters									
Valley Length (ft)	---	---	---	---	---	---	---	---	1110
Channel Length (ft)	---	---	---	---	---	---	---	---	1543
Sinuosity	---	---	1.1	---	---	1.3	---	---	1.4
Water Surface Slope (Save)	---	---	0.0024	---	---	0.0025*	---	---	0.002
Bankfull Slope (Sval)	---	---	0.0035	---	---	0.0033	---	---	0.0026
Rosgen Classification	---	---	G4/F4	---	---	E4/C4	---	---	C4
Bankfull mean velocity (Vbkf)	---	---	3.9	---	---	3.5	3.2	3.4	---
Bankfull Discharge (Qbkf)	---	---	268.5	---	---	227.5	245	280	---
Drainage Area (mi2)	---	---	5	---	---	5	---	---	5

Baseline Morphology and Hydraulic Summary
Bailey Fork Stream Restoration Project
May 2006 As-Built Survey

Stream Name	Lower Bailey Fork			Lower Bailey Fork			Lower Bailey Fork		
Data Category	Existing			Design			As-Built		
Parameter	Min	Max	Med	Min	Max	Med	Min	Max	Med
Bankfull Width (Wbkf)	---	---	37.4	---	---	30	---	---	31.5
Flood Prone Width (Wfpa)	---	---	70	---	---	250	---	---	106
Bankfull Cross-Section Area (Abkf)	---	---	95	---	---	75	---	---	81.4
Bankfull Mean Depth (Dbkf)	---	---	2.6	---	---	2.5	---	---	2.6
Bankfull Max Depth (Dmax)	---	---	3.33	---	---	4.5	---	---	4.3
Width/Depth Ratio	---	---	14.7	---	---	12	---	---	12.2
Entrenchment Ratio (Wfpa/Wbkf)	---	---	1.9	---	---	8.3	---	---	3.4
Wetted Perimeter (ft)	---	---	---	---	---	---	---	---	33.3
Hydraulic radius (ft)	---	---	---	---	---	---	---	---	2.4
Pattern									
Belt Width (Wblt)	54	66	---	98	120	---	60	120	---
Radius of Curvature (Rc)	24	30	---	45	90	---	45	90	---
Meander Length (Lm)	90	144	---	200	220	---	200	220	---
Min Meander Width Ratio (Wblt/Wbkf)	1.44	1.76	---	3.2	4	---	1.9	3.8	---
Profile									
Min Riffle Length (Lrif)	15	102	---	30	55	---	7	82	22
Min Riffle Slope (Srif)	0.0042	0.027	---	0.0013	0.0029*	---	0	0.035	0.006
Pool Length (Lpool)	---	---	30-87	---	---	50-100	5	41	28
Pool-Pool Spacing (p-p)	---	---	68-292	---	---	110-140	63	276	94
Substrate									
d50 (mm)	---	---	20	---	---	---	---	---	22
d84 (mm)	---	---	34	---	---	80	---	---	117
Additional Reach Parameters									
Valley Length (ft)	---	---	---	---	---	---	---	---	920
Channel Length (ft)	---	---	---	---	---	---	---	---	1170
Sinuosity	---	---	1.1	---	---	1.3	---	---	1.3
Water Surface Slope (Save)	---	---	0.003	---	---	0.0029*	---	---	0.003
Bankfull Slope (Sval)	---	---	0.004	---	---	0.0037	---	---	0.0035
Rosgen Classification	---	---	F4	---	---	C4/E4	---	---	C4
Bankfull mean velocity (Vbkf)	---	---	4.2	---	---	4	---	---	4.2
Bankfull Discharge (Qbkf)	---	---	395	---	---	302	---	---	342
Drainage Area (mi2)	---	---	5.5	---	---	5.5	---	---	5.5

Baseline Morphology and Hydraulic Summary
Bailey Fork Stream Restoration Project
May 2006 As-Built Survey

Stream Name	UT1 of Bailey Fork			UT1 of Bailey Fork			UT1 of Bailey Fork		
Data Category	Existing			Design			As-Built		
Parameter	Min	Max	Med	Min	Max	Med	Min	Max	Med
Bankfull Width (Wbkf)	---	---	10.8	---	---	14	16.6	27.4	---
Flood Prone Width (Wfpa)	---	---	23.8	---	---	65-120	120	200+	---
Bankfull Cross-Section Area (Abkf)	---	---	16.3	---	---	17.5	15.4	28.7	---
Bankfull Mean Depth (Dbkf)	---	---	1.5	---	---	1.3	0.56	1.7	---
Bankfull Max Depth (Dmax)	---	---	2.1	---	---	1.8	1.8	3.7	---
Width/Depth Ratio	---	---	7.2	---	---	11.2	9.6	21	---
Entrenchment Ratio (Wfpa/Wbkf)	---	---	2.3	---	---	4.6-8.5	4.3	12	---
Wetted Perimeter (ft)	---	---	---	---	---	---	19.7	28	---
Hydraulic radius (ft)	---	---	---	---	---	---	0.6	1.5	---
Pattern									
Belt Width (Wblt)	30	40	---	30	80	---	30	80	---
Radius of Curvature (Rc)	9	18	---	15	35	---	15	35	---
Meander Length (Lm)	48	60	---	55	100	---	55	100	---
Min Meander Width Ratio (Wblt/Wbkf)	2.8	3.7	---	2.1	5.7	---	1.8	2.9	---
Profile									
Min Riffle Length (Lrif)	34.8	69.5	---	14	40	---	4	37	12
Min Riffle Slope (Srif)	0.007	0.0235	---	0.0025	0.007	---	0.001	0.18	0.002
Pool Length (Lpool)	---	---	27.2-60.0	---	---	20-45	2	37	11
Pool-Pool Spacing (p-p)	---	---	110	---	---	50-85	21	80	50
Substrate									
d50 (mm)	---	---	28	---	---	---	16.7	22.4	---
d84 (mm)	---	---	40	---	---	65	31	50	---
Additional Reach Parameters									
Valley Length (ft)	---	---	---	---	---	---	---	---	1311
Channel Length (ft)	---	---	---	---	---	---	---	---	1755
Sinuosity	---	---	1.2	---	---	1.4	---	---	1.3
Water Surface Slope (Save)	---	---	0.009	---	---	0.0049*	---	---	0.007
Bankfull Slope (Sval)	---	---	0.0086	---	---	0.0075	---	---	0.0062
Rosgen Classification	---	---	G4/F4	---	---	E4/C4	---	---	E4
Bankfull mean velocity (Vbkf)	---	---	3.5	---	---	3.2	2.4	4.6	---
Bankfull Discharge (Qbkf)	---	---	56.5	---	---	56.4	37	131	---
Drainage Area (mi2)	---	---	0.54	---	---	0.55	---	---	0.55

Baseline Morphology and Hydraulic Summary
Bailey Fork Stream Restoration Project
May 2006 As-Built Survey

Stream Name	UT2 of Bailey Fork			UT2 of Bailey Fork			UT2 of Bailey Fork		
Data Category	Existing			Design			As-Built		
Parameter	Min	Max	Med	Min	Max	Med	Min	Max	Med
Bankfull Width (Wbkf)	---	---	8.2	---	---	16	---	---	18.6
Flood Prone Width (Wfpa)	---	---	12-150	---	---	60-180	---	---	100
Bankfull Cross-Section Area (Abkf)	---	---	20.1	---	---	23	---	---	18.7
Bankfull Mean Depth (Dbkf)	---	---	2.4	---	---	1.4	---	---	1
Bankfull Max Depth (Dmax)	---	---	3.5	---	---	2	---	---	1.9
Width/Depth Ratio	---	---	2.7	---	---	10.6	---	---	18.4
Entrenchment Ratio (Wfpa/Wbkf)	---	---	1.5-18.3	---	---	3.8-11.3	---	---	5.4
Wetted Perimeter (ft)	---	---	---	---	---	---	---	---	19.7
Hydraulic radius (ft)	---	---	---	---	---	---	---	---	1
Pattern									
Belt Width (Wblt)	30	33	---	34	91.2	---	34	91	---
Radius of Curvature (Rc)	15	18	---	24	40	---	24	40	---
Meander Length (Lm)	66	78	---	56	104	---	56	104	---
Min Meander Width Ratio (Wblt/Wbkf)	3.7	4	---	2.1	5.7	---	---	---	2.5
Profile									
Min Riffle Length (Lrif)	16	42	---	16	44.8	---	1.6	45	18
Min Riffle Slope (Srif)	0.0072	0.065	---	0.002	0.0045	---	0	0.047	1
Pool Length (Lpool)	---	---	---	---	---	22.4-48	1.4	42	6
Pool-Pool Spacing (p-p)	---	---	---	---	---	55-85	13	115	79
Substrate									
d50 (mm)	---	---	10.2	---	---	---	---	---	2
d84 (mm)	---	---	28	---	---	48	---	---	62
Additional Reach Parameters									
Valley Length (ft)	---	---	---	---	---	---	---	---	860
Channel Length (ft)	---	---	---	---	---	---	---	---	1271
Sinuosity	---	---	1.1	---	---	1.4	---	---	1.5
Water Surface Slope (Save)	---	---	0.0098	---	---	0.0030*	---	---	0.005
Bankfull Slope (Sval)	---	---	0.0048	---	---	0.0041	---	---	0.007
Rosgen Classification	---	---	G4/F4	---	---	E4/C4	---	---	C4
Bankfull mean velocity (Vbkf)	---	---	6.4	---	---	2.78	---	---	2.9
Bankfull Discharge (Qbkf)	---	---	129	---	---	64	---	---	54
Drainage Area (mi2)	---	---	0.98	---	---	0.96	---	---	0.96

Sediment Transport Analysis

Appendix 7.0

NATURAL SYSTEMS
ENGINEERING

Sediment Transport Analysis
Bailey Fork Stream Restoration Project
May 2006 As-Built Survey

Summary	Design Shear Stress (lbs/ft^2)	As-Built Shear Stress (lbs/ft^2)
Upper Bailey	0.31	0.37
Lower Bailey	0.39	0.52
UT1	0.32	0.41
UT2	0.21	0.44

	Design	As-Built
	Max Particle Size Moved (D84, mm), Revised Shields Curve	
Upper Bailey	55	75
Lower Bailey	80	100
UT1	65	90
UT2	48	95

Calculations

	SG water (lb/ft^3)	Hyd. Radius R (ft)	Bkf slope S (ft/ft)	Shear Stress (lbs/ft^2)
Upper Bailey	62.4	2.3	0.0026	0.37
Lower Bailey	62.4	2.4	0.0035	0.52
UT1	62.4	1.05	0.0062	0.41
UT2	62.4	1	0.007	0.44