

East Pong of the Roaring River 2004 Annual Monitoring Report



Delivered to: NCDENR/Ecosystem Enhancement Program
1619 Mail Service Center
Raleigh, NC 27699-1619

Prepared by: Biological & Agricultural Engineering
Water Resources Research Institute
North Carolina State University
Campus Box 7625
Raleigh, NC 27695

April, 2005



NC STATE UNIVERSITY

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2004 The East Prong of the Roaring River Monitoring Abstract

Reaches on the East Prong of the Roaring River were restored through the North Carolina Wetlands Restoration Program (NCWRP). The objectives of the project are to:

1. Improve water quality degraded by sedimentation by returning the East Prong Roaring River to a stable dimension, pattern and profile.
2. Restore the aquatic and terrestrial habitat of the stream corridor.
3. Restore floodplain and wetland functionality.
4. Improve the natural aesthetics of the river corridor.

This is the 4th year of the 5-year monitoring plan for the East Prong of the Roaring River

Table 1A. Background Information

Project Name	The East Prong of the Roaring River (Stone Mtn.)
Designer's Name	NCSU-BAE Stream Restoration Institute Campus Box 7637 Raleigh, NC 27695 919-515-8182
Contractor's Name	SEI Environmental 1-800-474-7044
Project County	Wilkes County, North Carolina
Directions to Project Site	From Interstate 77 North merge onto US-21 bypass north via exit 83 on the left toward Sparta continue 2.8 miles. Turn slight right onto US-21. continue 7.9 miles. Turn left onto Traphill Road. Continue 5.1 miles. Turn right onto long Bottom Road/ NC-1737 continue 2.9 miles. Turn right on Stone Mountain Road into Stone Mountain State Park. The first parking area on the right is located at the upstream portion of Reach-4.
Drainage Area	22.0 sq. mi (17.5 sq. mi)
USGS Hydro Unit	03040101
NCDWQ Subbasin	03-07-01 Upper Yadkin
Project Length	5,100 Linear feet
Restoration Approach	5,100 ft of priority 1 Natural Channel Design (dimension, pattern, and profile)
Date of Completion	October 2000
Monitoring Dates	2001, 2002, 2003, October 2004

Results and Discussion

Overall, while the majority of the stream is functioning well and holding grade, the stream has areas of concern and areas of immediate need. Table 2 shows a summary of monitoring measurement results. The majority of the restored stream classifies as a C4 with and rock cross vanes that control and hold the grade. There are cross vanes located on both Reaches that have water piping around the structure and are in risk of ultimate failure. Channel pattern is similar to as-built conditions. There are areas of bank erosion and migration that occur on the outside of most meander bends that are not heavily armored. Most of the bank erosion on this project is localized and a result of high Near Bank Stress on the outside of meander bends after construction. The channel dimension for much of the restored section has not changed significantly. The changes in channel dimension for some of the cross-sections represent a forming bench which is lower than the designed Bankfull. For the majority of the project the channel profile has well defined bed features and is in proper sequence. Most structures are holding grade and functioning well. Vegetation is not succeeding to levels required for mitigation credit, replanting trees to obtain mitigation requirements and live stakes only in areas where erosion is problematic. Invasive vegetation is an issue on this project site. The Kudzu and fescue should be monitored however, and may need control so more diverse herbaceous vegetation can develop.

Table 2a. Summary of Channel Conditions East Prong of the Roaring River Reach-2

DIMENSION	East Prong Roaring River Reach 2 Cross-section #1 Riffle					East Prong Roaring River Reach 2 Cross-section #2 Pool				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	307.0	296.5	306.0	319.8		155.6	170.3	158.7	158.4	
Bankfull Width	61.2	62.0	62.0	61.9		53.3	53.4	53.0	53.9	
Bankfull Mean Depth	5.0	4.8	4.9	5.2		2.9	3.2	3.0	2.9	
Bankfull Max Depth	5.9	5.7	6.1	6.4		5.6	5.7	4.6	5.6	

DIMENSION	East Prong Roaring River Reach 2 Cross-section #3 Riffle					East Prong Roaring River Reach 2 Cross-section #4 Riffle				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	194.5	169.6	169.5	166.2	165.5	130.6	156.5	124.8	136.3	
Bankfull Width	60.1	58.3	59.7	60.2	60.0	48.4	56.5	53.0	54.0	
Bankfull Mean Depth	3.2	2.9	2.8	2.8	2.8	2.7	2.8	2.4	2.5	
Bankfull Max Depth	5.8	4.5	4.5	4.7	4.6	3.8	4.3	3.4	3.5	

PATTERN	East Prong Roaring River Reach 2 AS-BUILT			East Prong Roaring River Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			507	614	559
Radius of Curvature	Not Reported			145	196	166
Beltwidth	Not Reported			162	328	177

PROFILE	East Prong Roaring River Reach 2 DESIGN			East Prong Roaring River Reach 2 AS-BUILT			East Prong Roaring River Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			35	104	61
Riffle Slope	Not Reported			Not Reported			0.4%	2.4%	1.3%
Pool Length	Not Reported			Not Reported			45	77	66
Pool to Pool Spacing	Not Reported			Not Reported			83	391	163
Bankfull Slope	Not Reported			Not Reported			0.66%		

SUBSTRATE	STN MTN Reach 2 Cross-section #1		STN MTN Reach 2 Cross-section #2		STN MTN Reach 2 Cross-section #3		STN MTN Reach 2 Cross-section #4	
	Riffle		Pool		Riffle		Riffle	
Monitoring Year	2000	2004	2000	2004	2000	2004	2000	2004
d50	N/A	42.50	N/A	0.97	3.93	20.10	0.31	36.17
d84	N/A	147.52	N/A	45.41	27.30	82.76	38.50	81.53

VEGETATION 2004 Monitoring Reach 2				Bare Root # 1	Live Stake # 1	Live Stake # 2	Live Stake # 3
Live Trees* / Total Tree Stems				0/2	3/6	12/20	0/1
% Survivability				0%	50%	60%	0%
Natural Regeneration (Tree Stems)				17	23	54	10
Herbaceous Cover (%cover)				90	n/a	n/a	n/a

* Planted value represents number of stems observed alive that were planted.

Table 2b. Summary of Channel Conditions East Prong of the Roaring River Reach-4

DIMENSION	East Prong Roaring River Reach 4 Cross-section #1 Riffle					East Prong Roaring River Reach 4 Cross-section #2 Pool					East Prong Roaring River Reach 4 Cross-section #3 Pool				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	196.1	215.8	202.5	206.6	206.3	224.4	210.6	182.8	179.6	189.6	162.2	173.0	181.3	170.0	183.9
Bankfull Width	57.7	59.3	58.2	57.0	57.0	42.5	41.5	42.1	43.0	43.7	58.0	61.3	65.0	66.0	70.0
Bankfull Mean Depth	3.4	3.6	3.5	3.6	3.6	5.3	5.1	4.3	4.2	4.3	2.8	2.8	2.8	2.6	2.6
Bankfull Max Depth	4.9	5.6	4.9	4.7	5.0	8.1	7.8	6.9	6.8	6.6	5.5	5.6	5.4	5.7	5.0

DIMENSION	East Prong Roaring River Reach 4 Cross-section #4 Riffle					East Prong Roaring River Reach 4 Cross-section #5 Pool					East Prong Roaring River Reach 4 Cross-section #6 Riffle				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	140.4	139.1	140.7	139.7		182.6	175.1		183.6		215.6	223.1	207.3	210.1	
Bankfull Width	46.5	45.5	45.9	46.0		56.9	56.0		60.0		45.6	45.2	43.7	46.3	
Bankfull Mean Depth	3.0	3.1	3.1	3.0		3.2	3.1		3.1		4.7	4.9	4.7	4.5	
Bankfull Max Depth	5.0	4.5	4.0	3.9		5.8	5.8		4.8		7.4	7.3	7.4	6.0	

PATTERN	East Prong Roaring River Reach 4 AS-BUILT			East Prong Roaring River Reach 4 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			534	767	596
Radius of Curvature	Not Reported			78	296	122
Beltwidth	Not Reported			222	503	301

East Prong Roaring River Reach 4 Cross-section #7 Pool				
2004	2003	2002	2001	2000
200.2		217.8	186.1	
71.5		71.4	71.4	
2.8		3.1	2.6	
7.4		8.2	7.5	

PROFILE	East Prong Roaring River Reach 2 DESIGN			East Prong Roaring River Reach 2 AS-BUILT			East Prong Roaring River Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			35	170	80
Riffle Slope	Not Reported			Not Reported			0.4%	0.7%	0.5%
Pool Length	Not Reported			Not Reported			60	130	85
Pool to Pool Spacing	Not Reported			Not Reported			175	335	255
Bankfull Slope	Not Reported			Not Reported			0.50%		

SUBSTRATE	STN MTN Reach 4 Cross-section #1		STN MTN Reach 4 Cross-section #4		STN MTN Reach 4 Cross-section #6	
	Riffle		Riffle		Riffle	
Monitoring Year	2000	2004	2000	2004	2000	2004
d50	N/A	42.50	N/A	0.97	3.93	20.10
d84	N/A	147.52	N/A	45.41	27.30	82.76

VEGETATION 2004 Monitoring Reach 2	Bare Root # 2	Bare Root # 3	Bare Root # 4	Live Stake # 1	Live Stake # 2	Live Stake # 3	Live Stake # 4	Live Stake # 5
Live Trees* / Total Tree Stems	4/4	1/5	0/0	3/6	0/0	0/0	0/0	0/0
% Survivability	100%	20%	0%	50%	0%	0%	0%	0%
Natural Regeneration (Tree Stems)	>300	102	>300	26	0	>100	0	0
Herbaceous Cover (%cover)	90	90	90	n/a	n/a	n/a	n/a	n/a

* Planted value represents number of stems observed alive that were planted.

Areas of Concern

The following areas of concern should be monitored closely and considered for repair as suggested:

The East Prong of the Roaring River

- Rock Cross Vanes
 - There are two rock cross vanes that have piping around the vane arm located on Reach-2 at stations 13+00 and 14+50. If these two structures fail there will be a massive head-cut through the system.
 - At station 13+00 there is bank erosion on the left bank and water is piping past the rock cross vane. At this point the structure is still holding grade a lower elevation but ultimate will occur if this vane is not repaired or redesigned.
 - At station 14+50 there is bank erosion on the left bank and water is piping past the rock cross vane. At this point the structure is still holding grade at a lower elevation but ultimate failure will occur if this vane is not repaired or redesigned.
 - There is one rock cross vanes that have piping around the vane arm located on Reach-4 at stations 25+20. If these two structures fails there will be a localized head-cut.
 - At station 25+20 there is massive bank erosion on the right bank and water is piping past the rock cross vane. At this point the structure is not holding grade ultimate failure will occur if repairs or redesign are not pursued
- Bank Erosion and Meander Migration
 - The total bank material that has been transported, since construction in October 2000, from the outside meander banks in both reaches is nearly 4000 Tons
 - Bank erosion on the outside of meander bends has been noted at one location on the reaches of Reach 2 at stations 6+00
 - At Station 6+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~4 ft.
 - Bank erosion on the outside of meander bends has been noted at four locations on the reaches of Reach 4 at stations 21+00, 24+00, 30+00 and 34+00.
 - At Station 21+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~4 ft.
 - At Station 24+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~6 ft.
 - At Station 30+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~5 ft.
 - At Station 34+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~10 ft.

Example Issue Photos

The following are photographs of typical sections and areas of concern throughout the project.



Typical Riffle



Typical Pool



**Issue Photo 1. Bank Erosion STA ~28+75
Reach 2**

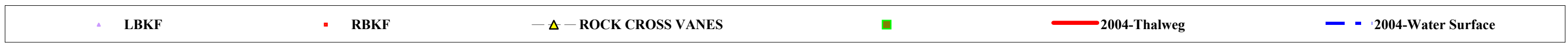
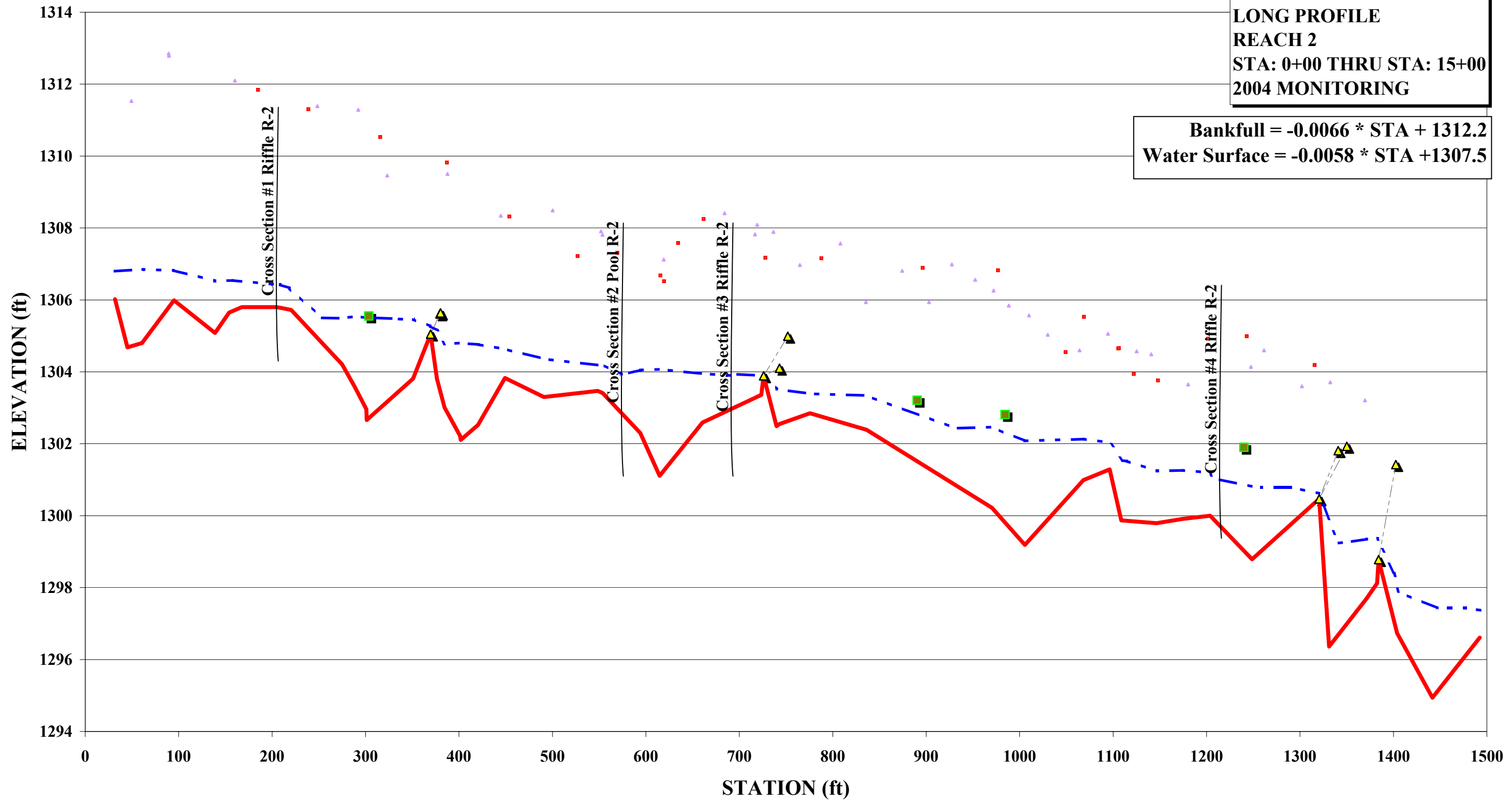


**Issue Photo 2. Erosion Cross Vane STA ~12+90
Reach 4**

*There are more issue photos in the photo log of this report

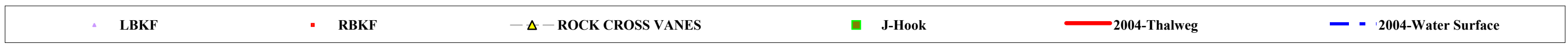
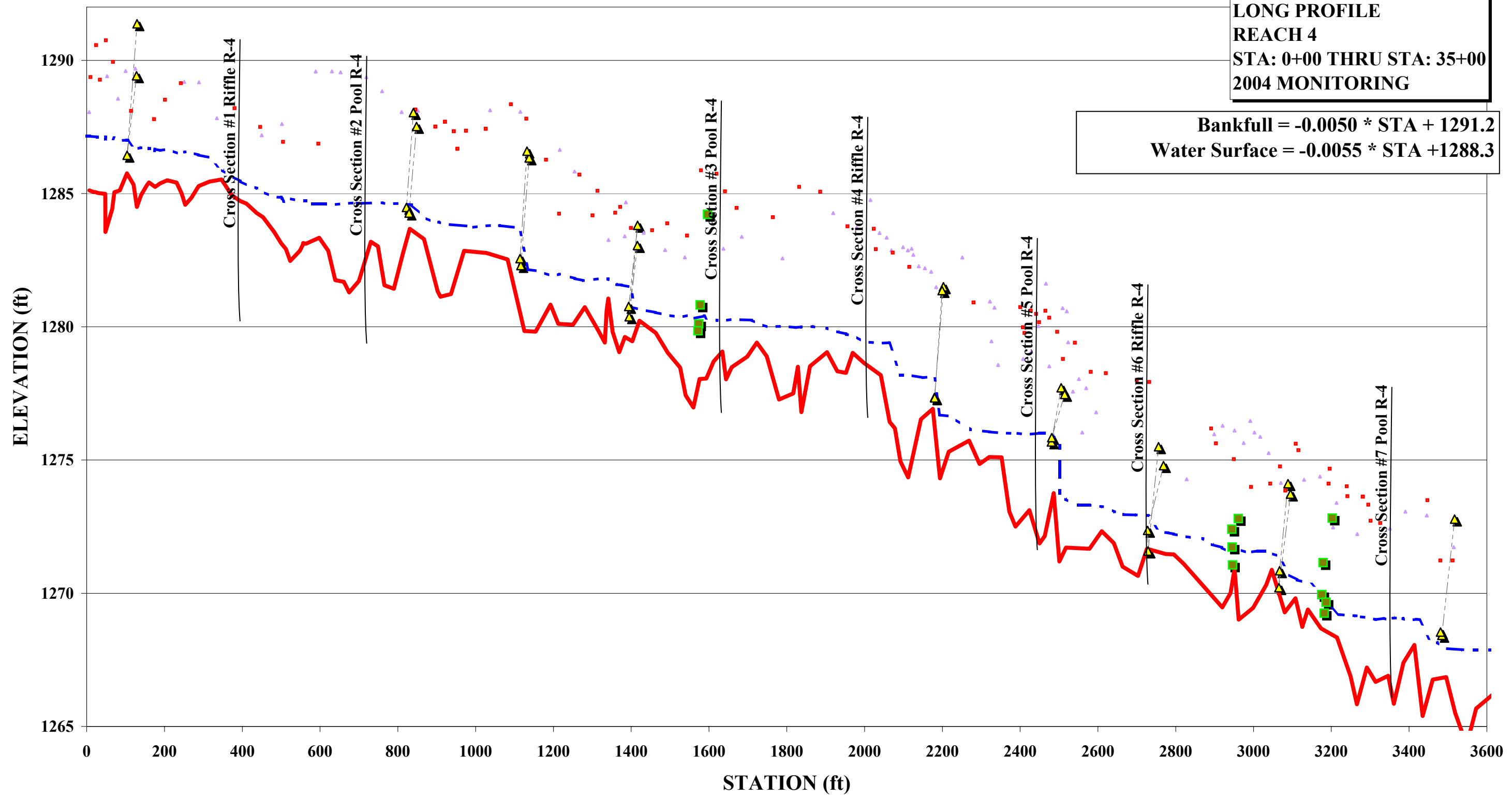
**STONE MOUNTAIN
LONG PROFILE
REACH 2
STA: 0+00 THRU STA: 15+00
2004 MONITORING**

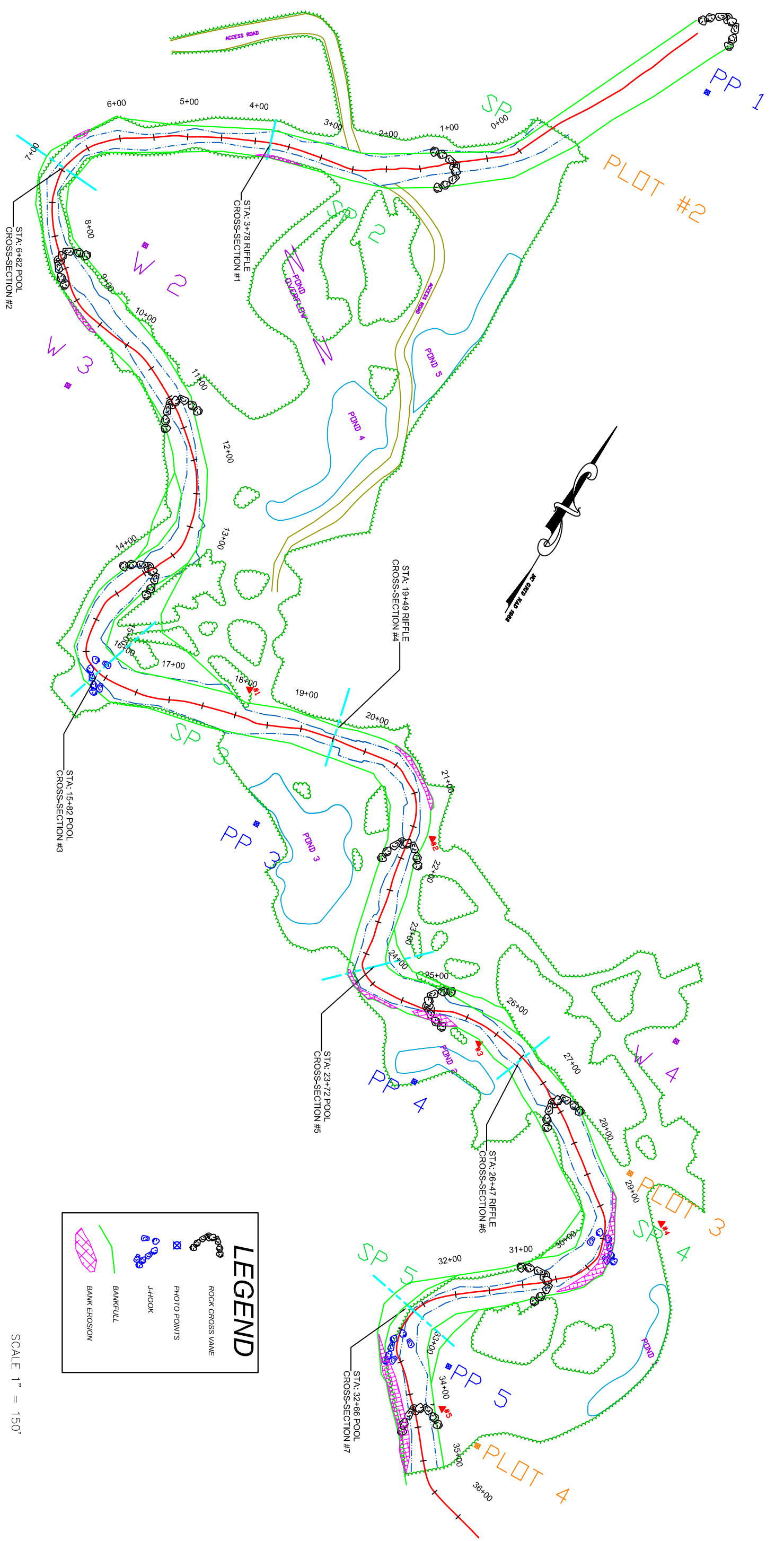
**Bankfull = $-0.0066 * STA + 1312.2$
Water Surface = $-0.0058 * STA + 1307.5$**



**STONE MOUNTAIN
LONG PROFILE
REACH 4
STA: 0+00 THRU STA: 35+00
2004 MONITORING**

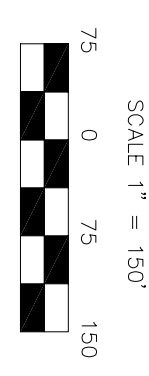
**Bankfull = $-0.0050 * STA + 1291.2$
Water Surface = $-0.0055 * STA + 1288.3$**





LEGEND

- ROCK CROSS VANE
- PHOTO POINTS
- J-HOOK
- BANKFULL
- BANK EROSION



STONE MOUNTAIN STATE PARK
 EAST PRONG OF THE ROARING RIVER
 WILKES COUNTY, N.C.

2004 MONITORING-ABSTRACT
 PLAN SHEET REACH-4

NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
 Weaver Labs Campus Box 7625
 North Carolina State University
 Raleigh, NC 27695

1	INITIAL DESIGN	DAB	DRC	04/30/05
NO	REVISIONS	DRN	CHK	DATE

DATE: 04/30/2005
 PROJECT NO.:
 FILENAME: STONE.MTN.DWG
 SHEET NO.: Pg - x
 DRAWING NO.:

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1.0 BACKGROUND INFORMATION

Project planning was initiated for the East Prong of the Roaring River Restoration in 1999 for the implementation of a developing watershed stream restoration project at Stone Mountain State Park in North Carolina (Figure 2). Natural Channel Design techniques and procedures were employed in the restoration of the East Prong Roaring River in Wilkes County, NC. In this article I will describe the project and how the restoration will benefit this river and its surrounding riparian corridor.

The East Prong Roaring River stream restoration project has been a collaborative effort between the North Carolina Ecosystem Enhancement Program, North Carolina Division of Parks and Recreation, the North Carolina Stream Restoration Institute at NCSU, and Buck Engineering. The project includes nearly two miles of stream restoration within the boundaries of Stone Mountain State Park in Wilkes and Alleghany Counties. The drainage area for the section of river being restored is approximately 22 square miles. The construction aspect of the stream restoration project was from July 2000 to the October 2000. Floodplain and stream bank planting continued through the winter until February 2001. This project offers a rare opportunity for a “true restoration”. The design was approached with the stability of the river in mind and little to no constraints were present as the land in the watershed is nearly all enclosed within the park boundaries, and utilities, roads, and residences were not a major issue.

Stone Mountain State Park was purchased by the State of North Carolina in the early 1960s. Prior to this purchase, all of the streams in the alluvial valley portion of the park were modified to improve agricultural production. Field observations suggest that tributary streams in the alluvial valley were straightened. A large portion of the downstream portion of the restoration site was used for gravel mining. As part of this operation, the East Prong was channelized, impounded, and moved several times, resulting in destabilization of the channel. Spoil piles that were created during the mining operation created overly high bank heights and as a result were being eroded away during high flows. Aerial photos and the USGS Glade Valley Quadrangle indicate locations of the historic channels.

The project consisted of the analysis of the 22.0 square mile portion of the East Prong Roaring River watershed (located within USGS Hydrologic Unit Code 03040101, NCDWQ Sub-basin 03-07-01 of the Upper Yadkin River Basin) that contribute drainage to the project site. The restoration of these portions of the East Prong of the Roaring River Restoration, located in Stone Mountain State Park, was conducted to correct identified system deficiencies including severe bank erosion, channel widening, and the loss of aquatic habitat resulting from stream channelization, the loss of riparian vegetation, and watershed development. The goal of the project was to develop a stable stream channel with reduced bank erosion, efficient sediment transport, enhanced warm water fisheries, and improved overall stream habitat and site aesthetics. Implementation of the project was completed by October 2000.

1.1 Goals and Objective

The East Prong Roaring River was restored through the North Carolina Wetlands Restoration Program (NCWRP). The goals of the stream restoration project on the East Prong Roaring River were as follows:

5. Improve water quality degraded by sedimentation by returning the East Prong Roaring River to a stable dimension, pattern and profile.
6. Restore the aquatic and terrestrial habitat of the stream corridor.
7. Restore floodplain and wetland functionality.
8. Improve the natural aesthetics of the river corridor.

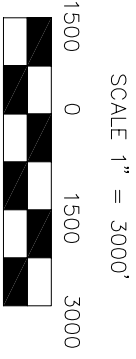
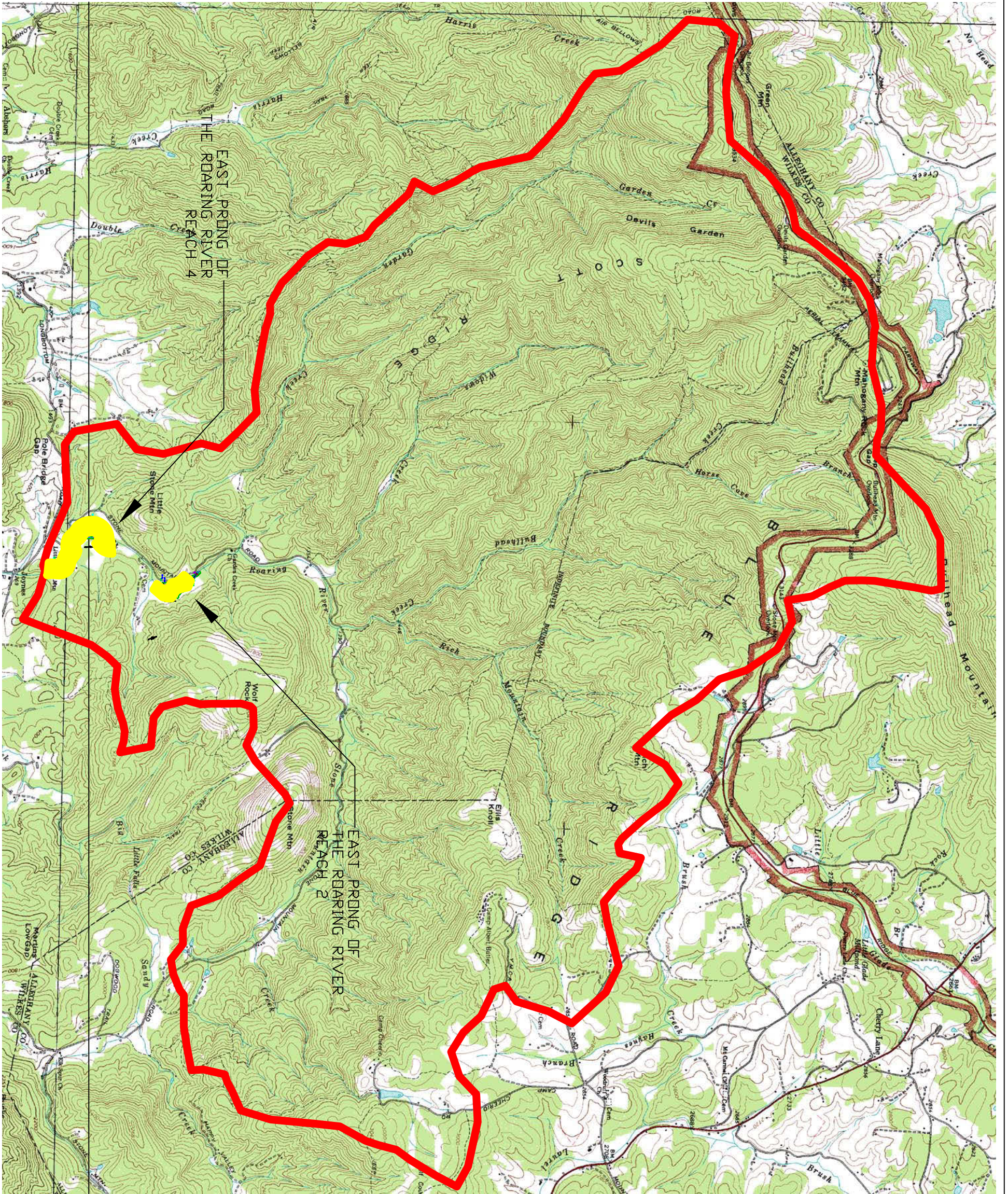
1.2 Project Location

The East Prong Roaring River stream restoration project is Located in Stone Mountain State Park in Wilkes County (figure 2). From Interstate 77 North merge onto US-21 bypass north via exit 83 on the left toward Sparta continue 2.8 miles. Turn slight right onto US-21. continue 7.9 miles. Turn left onto Traphill Road. Continue 5.1 miles. Turn right onto long Bottom Road/ NC-1737 continue 2.9 miles. Turn right on Stone Mountain Road into Stone Mountain State Park. The first parking area on the right is located at the upstream portion of Reach-4.

1.3 Project Description

A previously straight and incised East Prong Roaring River was restored using channel dimension, pattern, and profile modifications and the establishment of riparian zone adjacent to the creek. Channel profile is maintained through the use of rock cross vanes. Channel pattern is maintained through the use of single vanes and vegetation along the channel banks.

The East Prong Roaring River stream restoration project has been a collaborative effort between the North Carolina Ecosystem Enhancement Program, North Carolina Division of Parks and Recreation, the North Carolina Stream Restoration Institute at NCSU, and Buck Engineering. The project includes nearly two miles of stream restoration within the boundaries of Stone Mountain State Park in Wilkes and Alleghany Counties. The drainage area for the section of river being restored is approximately 22 square miles. The construction aspect of the stream restoration project was from July 2000 to the October 2000. Floodplain and stream bank planting continued through the winter until February 2001. This project offers a rare opportunity for a “true restoration”. The design was approached with the stability of the river in mind and little to no constraints were present as the land in the watershed is nearly all enclosed within the park boundaries, and utilities, roads, and residences were not a major issue.



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 DRAWING NO.

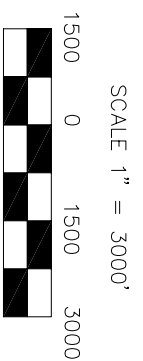
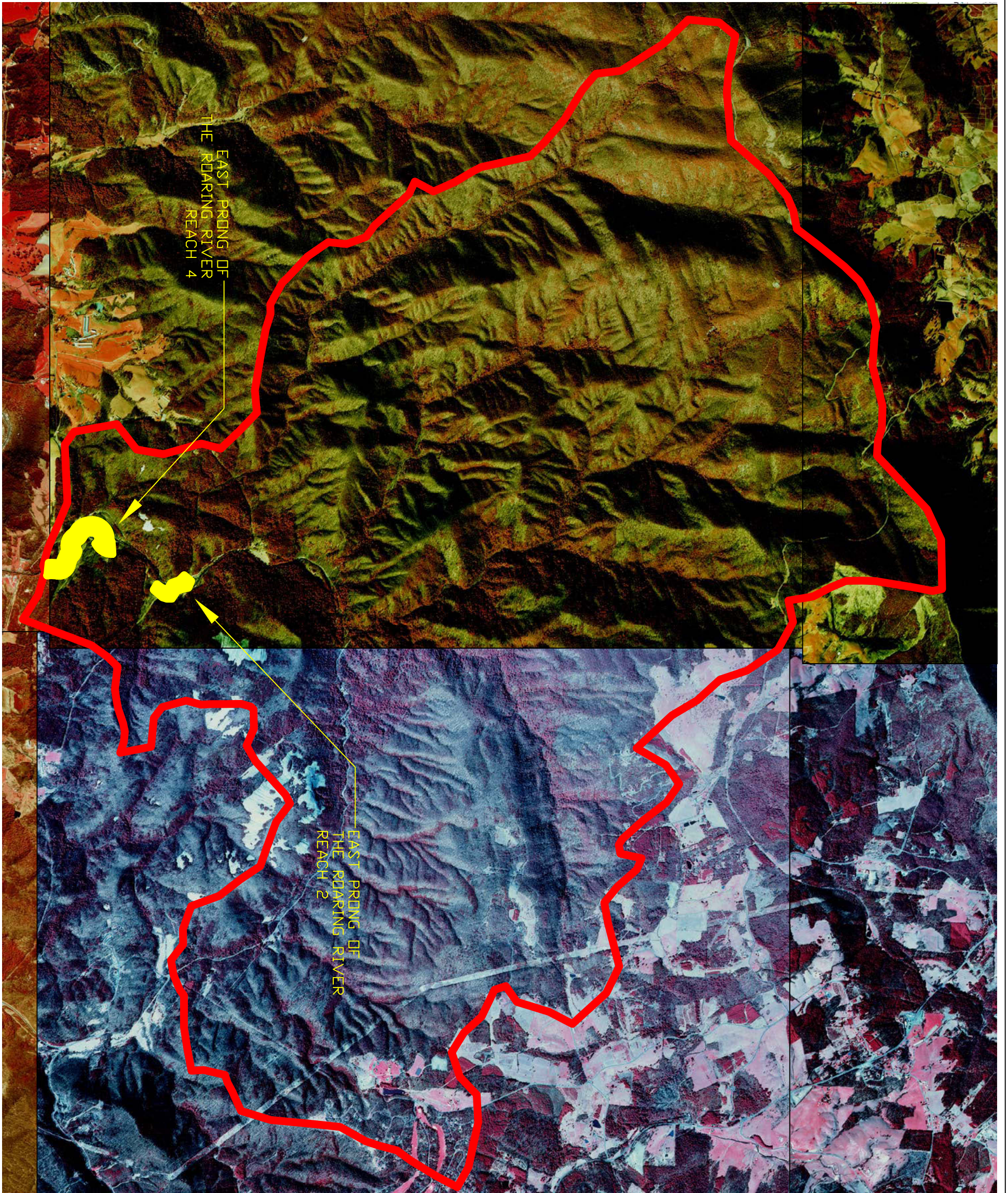
STONE MOUNTAIN STATE PARK
 EAST PRONG OF THE ROARING RIVER
 WILKES COUNTY, N.C.

22 SQUARE MILES (17.5 SQMI)
 WATERSHED WITH USGS QUAD

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 Raleigh, NC 27695

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DATE	04/30/2005
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FILENAME	STONE MTLNDWG
SHEET NO.	Pg - 6
DRAWING NO.	

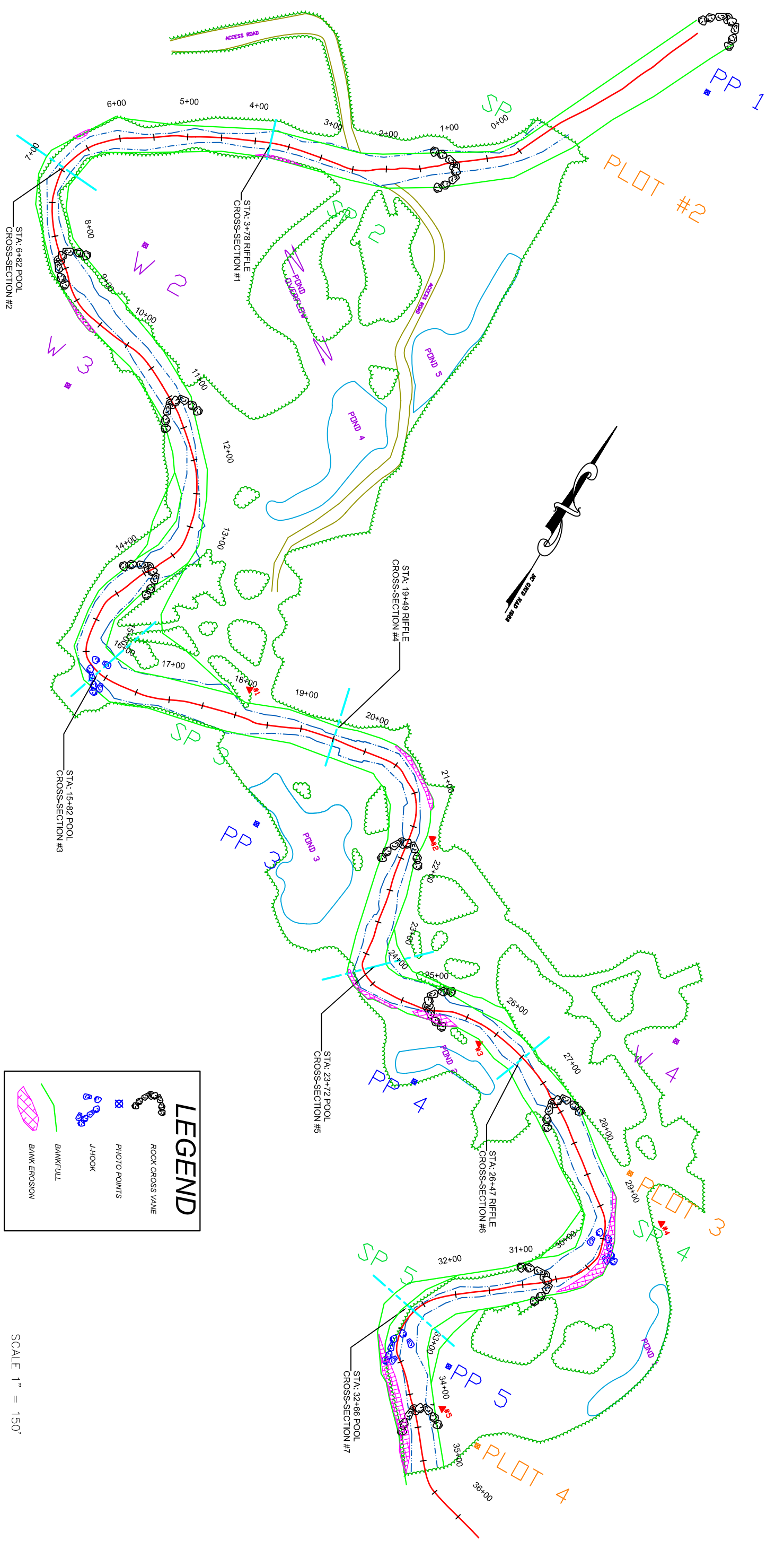
STONE MOUNTAIN STATE PARK
 EAST PRONG OF THE ROARING RIVER
 WILKES COUNTY, N.C.

22 SQUARE MILES (17.5 SQMI)
 WATERSHED WITH ORTHO-PHOTO

NC STATE UNIVERSITY

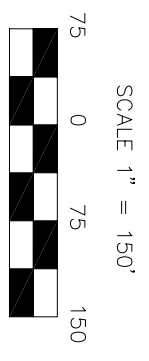
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LEGEND

- ROCK CROSS VANE
- PHOTO POINTS
- J-HOOK
- BANKFULL
- BANK EROSION



STONE MOUNTAIN STATE PARK
 EAST PRONG OF THE ROARING RIVER
 WILKES COUNTY, N.C.

2004 MONITORING
 PLAN SHEET REACH-4






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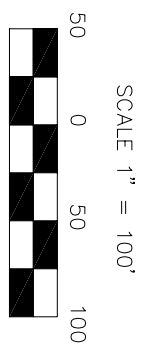
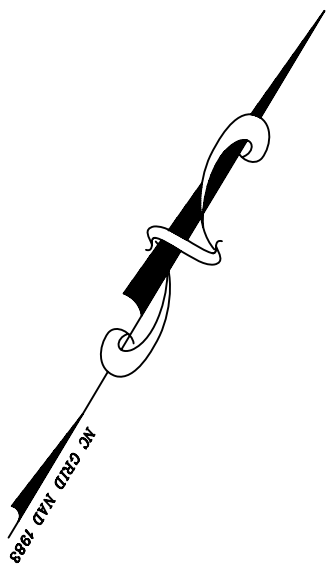
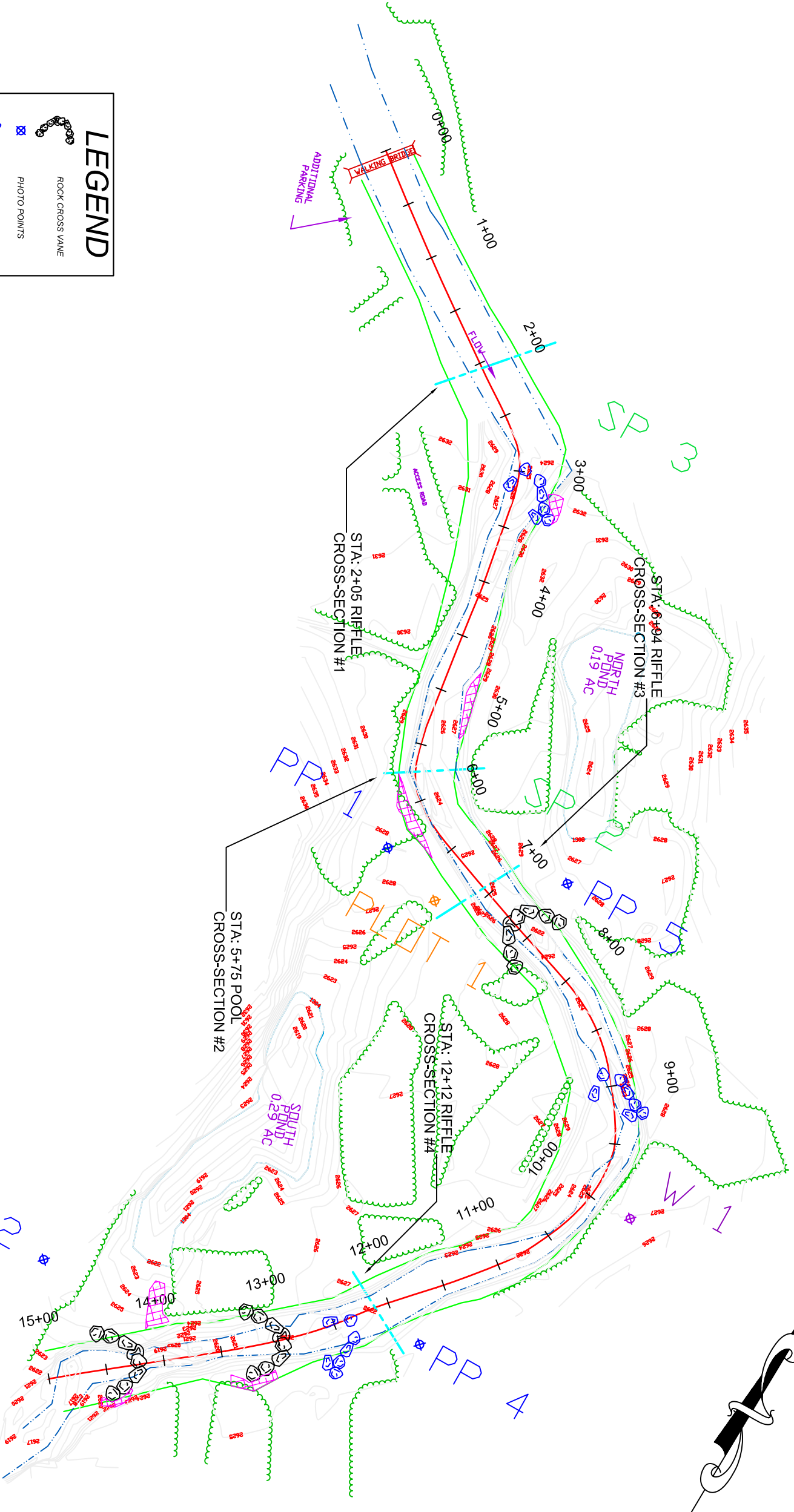
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NO	REVISIONS	DRN	CHK	DATE

DATE: 04/30/2005
 PROJECT NO.:
 FILENAME: STONE.MTN.DWG
 SHEET NO.: Pg - 8
 DRAWING NO.:

LEGEND

-  ROCK CROSS VANE
-  PHOTO POINTS
-  J-HOOK
-  BANKFULL
-  BANK EROSION



DATE: 04/30/2005
 PROJECT NO.:
 FILENAME: STONE.MTDWG
 SHEET NO.: Pg - 9
 DRAWING NO.:

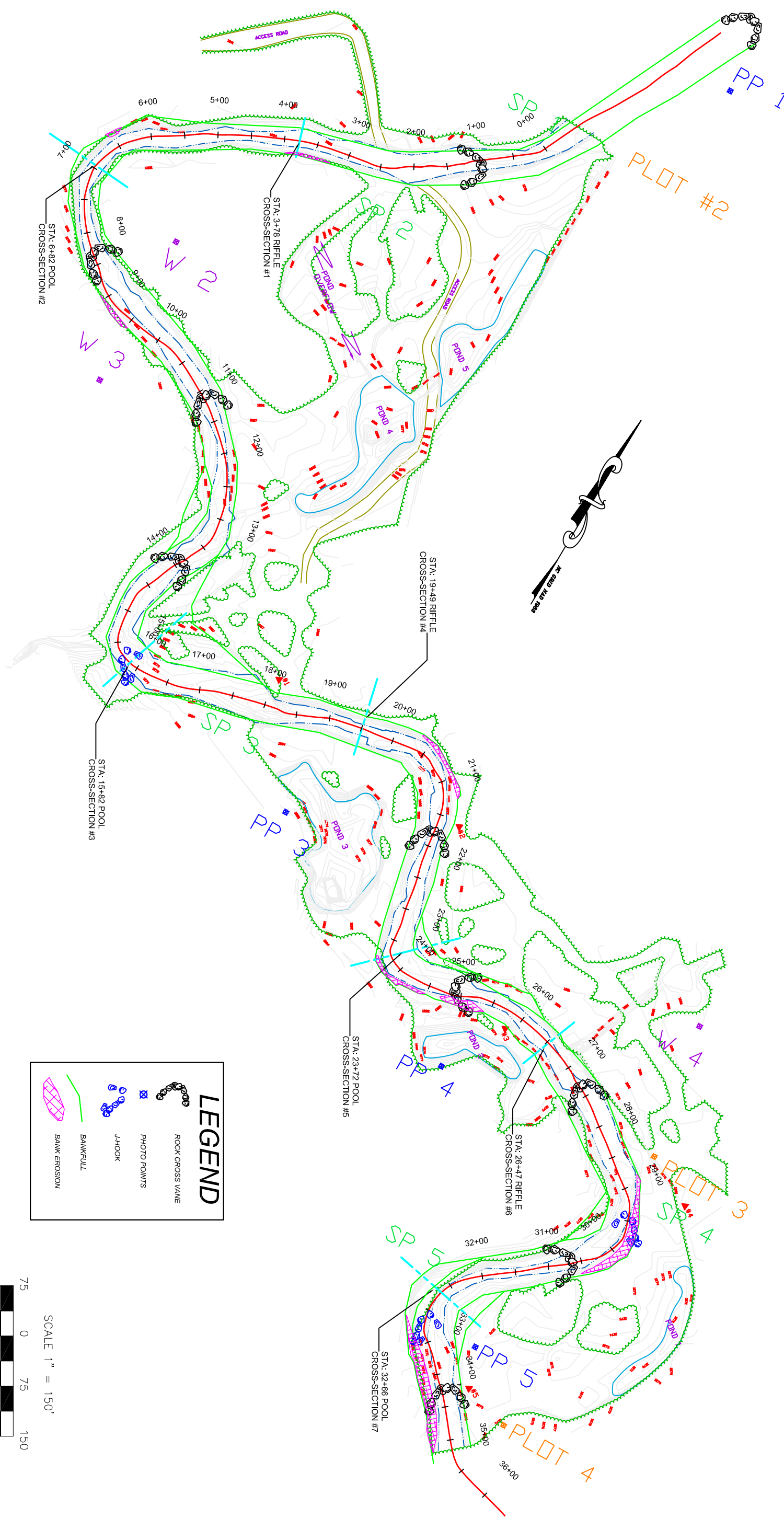
STONE MOUNTAIN STATE PARK
 EAST PRONG OF THE ROARING RIVER
 WILKES COUNTY, N.C.

ASBUILT & 2004 MONITORING
 PLAN SHEET REACH-2

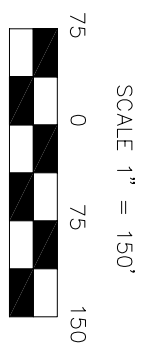
NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
 Weaver Labs Campus Box 7625
 North Carolina State University
 Raleigh, NC 27695

NO.	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DAB	DRC	04/30/05



LEGEND	
	ROCK CROSS VANE
	PHOTO POINTS
	J-HOOK
	BANKFULL
	BANK EROSION



DATE	04/30/2005
PROJECT NO.	
FILENAME	STONE MTLNDWG
SHEET NO.	Pg - 10
DRAWING NO.	

STONE MOUNTAIN STATE PARK
 EAST PRONG OF THE ROARING RIVER
 WILKES COUNTY, N.C.

ASBUILT & 2004 MONITORING
 PLAN SHEET REACH-4

NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
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 Raleigh, NC 27695

NO	REVISIONS	DRN	CHK	DATE
1	INITIAL DESIGN	DAB	DRC	04/30/05

2.0 YEAR 2004 RESULTS AND DISCUSSION

Year 2004 monitoring results are shown for Reach 2 and Reach 4 of the East Prong of the Roaring River restoration project.

2.1 Vegetation

Using the Draft Vegetation Monitoring Plan for NCWRP Riparian Buffer and Wetland Restoration Projects, 1 bare root monitoring plot was located within the riparian buffer of Reach 2 and 3 bare root plots were placed within the buffer of Reach 4. There were 3 live stake monitoring plots located within the riparian buffer of Reach 2 and 5 live stake plots were placed within the buffer of Reach 4. No reference area was studied; therefore no comparisons could be made to reference conditions.

2.1.1 Results and Discussion

No additional plants were installed in 2004. There was a marked reduction in surviving bare root plants in Reach 2 and Reach 4. Deer browse continues to be a problem at this site. A very few bare root plants and live stakes have survived deer browse, but have been limited in vertical growth as a result. Browse has occurred from the top down. Only the taller planted trees performed well against the deer browse. As in last years survey results, black walnut (*Juglans nigra*) and sycamore (*Platanus occidentalis*) seem to be the least browsed species. No indication of beaver activity or deer scraping was seen on any of the surveyed trees.

Natural regeneration was surveyed with the regular plots again this growing season. Seedlings range from 1 to 4 years old are abundant throughout the project area. The majority species is sycamore, tulip poplar (*Liriodendron tulipifera*), river birch (*Betula nigra*), Virginia pine (*Pinus virginiana*), sweet gum (*Liquidambar styraciflua*), black cherry (*Prunus serotina*), tag alder (*Alnus serrulata*), and spice bush (*Lindera benzoin*). Deer browse does not seem to be a problem with these plants.

Bare root survival was poor in all plots. Extrapolated averages across 4 bare root plots gave an overall project average of 5 planted trees per acre that are surviving. Live plants included sycamore, black cherry, river birch, black walnut, tag alder, spice bush, and silky dogwood (*Cornus amomum*). Only taller black walnut and sycamore bare roots planted this season were less affected by deer browse. Other survivors were browsed lower to the ground.

Live stake survival was again extremely low. This may be attributed to droughty conditions during growing season and in some cases, washout from flooding. Deer browse was also a major contributing factor. It was noted that foot traffic up and down the staked banks was often heavy in select places and that many stakes were dislodged or removed completely. Several stake plots had sloughed off during high water events.

Herbaceous cover was determined in bare root plots and was greater than 90% in all plots. Switchgrass, rushes, and sedges were exceptionally robust. Seeding is presently not required.

Invasive vegetation control was not employed this growing season. Maintenance is highly recommended for next season. Kudzu (*Pueraria lobata*) was observed in small patches throughout the area.

2.2 Geo-Morphology

Restored channel dimension, pattern, profile and substrate were examined during the 2004 monitoring. Both Reach 2 and Reach 4 of the East Prong of the Roaring River received a full three dimensional fluvial geo-morphological survey in the fall of 2004. Limited data was used from the prior years based on the compatibility of the data sources.

2.2.1 Results and Discussion

Reach 2

The East Prong of the Roaring River is a gravel bed channel with well defined bed features. The restoration construction created a C4 channel from an existing C4 with a very low sinuosity. This reach is approximately 1500 feet in length the channel was restored by changing the dimension, pattern and profile of the river. The river slope for this reach is 0.66%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately < 1.2. There are rock cross vanes that hold grade on this reach. The channel profile along Reach 2 has not shown signs of down-cutting or deposition between the as-build profile and this year's monitoring. In general for this reach of stream features are still located in the correct plan form locations.

Rock cross vanes are holding the grade of the stream but the two at the end of the reach are at risk of massive failure. The river has cut around the left vane arm on both of the cross vanes at the end of the reach. The vanes are located at approximately Sta: 13+00 and 14+50. If these vanes are not repaired the river will continue to erode around the vane arms and there will be an ultimate failure of both vanes. An ultimate failure of these vanes will result in a head-cut that would continue upstream in the reach until it reached a stable grade control. There is a potential of a 4.5ft head-cut if these structures are allowed to fail this would related to a head cut approximately 500 ft or more upstream from the rock cross vane at Sta: 13+00.

Cross section results were calculated using NCSU techniques for consistency purposes, there were 3-5 years of cross section data available for analysis. Cross-sectional trends were analyzed by looking at the cross-sections, change in planform, BEHI, and the longitudinal profile. Cross-Section 1 is located on a riffle and has no significant change in cross sectional area from 320 square feet to 307 square feet in 2004. Cross-section 2 is located on a pool and has no significant change in cross sectional area from 158 square feet to 156 square feet in 2004. Cross-Section 2 does show about a four foot bank migration at the toe of the bank and high NBS with approximately a 4 foot bank height. Cross-section 3 is located on a riffle and has a significant change in cross sectional area from 165 square feet to 195 square feet in 2004. Cross-Section 3 shows about a four foot bank migration at the toe of the bank and high NBS on the right bank with approximately a 4 foot bank height. This cross section is located on the downstream end of an area of massive bank erosion and migration of the outside of a meander bend. There is a depositional bench that is forming on cross-section 3 that produces a section area of 144 square foot. There is major bank erosion and migration on the outside of the meander bends that have a tight radius of curvature and a short arc length. Cross-Section 4 is located on a riffle and has no significant change in cross sectional area from 136 square feet to 131 square feet in 2004. Bank erosion mostly due to meander migration has transported approximately 1000 tons of sediment from of this reach since construction.

Reach 4

The restoration construction created a C4 channel from an existing C4 / D4 with a very low sinuosity. This reach is approximately 3600 feet in length the channel was restored by changing the dimension, pattern and profile of the river. The river slope for this reach is 0.50%, this reach has entrenchment ratio greater than 3.0 and the ratio of the top of bank height to the bankfull height is approximately < 1.2 . There are rock cross vanes that hold grade on this reach. The channel profile along Reach 4 has not shown signs of down-cutting or deposition between the as-build profile and this year's monitoring. In general for this reach of stream features are still located in the correct plan form locations.

Rock cross vanes are holding the grade of the stream but the one is at risk of massive failure. The river has cut around the right vane arm on the cross vanes at Sta: 24+80. If this vanes is not repaired the river will continue to erode around the vane arms and there will be an ultimate failure of this vane. There is a potential of a 3.0ft head-cut if this structure is allowed to fail this would related to a head cut approximately 300 ft or more upstream from the rock cross vane at Sta: 22+00.

There was 3-5 years of cross section data available for analysis of this reach's cross-sections. Cross-sectional trends were analyzed by looking at the cross-sections, change in planform, BEHI, and the longitudinal profile. Cross-Section 1 is located on a riffle and has no significant change in cross sectional area from 206 square feet to 196 square feet in 2004. This cross-section shows bank erosion on the left bank due to the river re-adjusting a straight efficient riffle and a forming bench on the right bank. There is a depositional bench that is forming on cross-section 1 that produces a section area of 132 square foot. Cross-section 2 is located on a pool and has a significant change in cross sectional area from 190 square feet to 224 square feet in 2004. Cross-section 2 does show about a six foot bank migration at the toe of the outside meander bank and high NBS with approximately a 10 foot bank height. The top of the right bank of cross-section 2 is reinforced with mature tree tap roots. Cross-sections 3 is located on a pool and has no significant change in cross sectional area from 184 square feet to 164 square feet in 2004. This pool has a very tight radius of curvature but the bank is armored and there is a j-hook placed to relieve to NBS on the outside of the meander bend. The point bar of Cross-Section 3 is slightly building since construction and the channel seems to be narrowing. Cross-Section 4 is located on a riffle and has no significant change in cross sectional area from 140square feet to 140 square feet in 2004. Section 5 is located on a pool and has no significant change in cross sectional area from 183 square feet to 183 square feet in 2004. Section 6 is located on a riffle and has no significant change in cross sectional area from 210 square feet to 215 square feet in 2004. Section 6 is located on the apex of a slight bend and has a small lateral pool located on the left side of the cross-section. Cross-section 7 is located on a pool and has a significant change in cross sectional area from 186 square feet to 209 square feet in 2004. Cross-section 2 does show about a six foot bank migration at the toe of the outside meander bank and high NBS with approximately an 8 foot bank height. Bank erosion mostly due to meander migration has transported approximately 3000 tons of sediment from of this reach since construction.

The channel substrate in the riffle sections of the East Prong of the Roaring River Reaches 2 and 4 are gravel and have a D50 of 19 mm with a D84 of 82 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

2.3 Biological and Ecological

2.3.1 Results and Discussion

Studies have indicated that stream bank erosion along downstream reaches of the East Prong of the Roaring River was severe due to past agricultural practices. Restoration of the East Prong, within Stone Mountain State Park, included stabilization of the eroding banks and the provision of instream habitat as well as reestablishment of pattern, dimension and profile. The total length of the project was 10,633 linear feet in two major reaches of the river. Biological samples were collected from three locations. Reference data (site 1) were collected from a site above both restoration reaches within a stable section of the East Prong. Two downstream stations were also sampled. Site 2 is within a stable reach of the East Prong but below a section of the East Prong that was restored; this reach was not manipulated during the construction. Site 3 is within the downstream restoration section and within a reach that was restored and is essentially a new channel. Data were collected during the months of September or October during all surveys.

Table. Summary statistics from the stream restoration project at Stone Mountain State Park.

Site Location	Site 1, upstream reference					Site 2					Site 3				
Metric/Survey year	1998	2001	2002	2003	2004	1998	2001	2002	2003	2004	1998	2001	2002	2003	2004
Total Taxa Richness	73	61	73	73	69	75	67	75	88	59	66	61	73	79	68
EPT Taxa Richness	39	37	37	41	42	38	36	35	41	32	36	28	32	40	38
EPT abundance	165	173	202	215	182	170	154	183	219	157	194	109	126	180	174
Dominants in Common Index (%)	-	-	-	-	-	67%	76%	78%	73%	62%	74%	34%	48%	64%	69%
Number of Keystone Species	31	23	26	28	24	20	14	15	21	17	19	8	11	18	17

Relatively stable conditions were noted at the reference reach during these investigations (SEPT ranged from 37-42); however, total taxa richness was lower during the survey conducted in 2001 and much lower EPT abundance values were noted in 1998, 2001 and 2004) presumably related to high flow conditions prior to collection. This site is dominated by intolerant taxa. Slightly lower taxa richness values were recorded from all of the locations during the first post-construction survey, although the differences in EPT taxa richness between the pre- and post- construction surveys was larger at the most downstream location (site 3 in bold). EPT abundance values increased progressively downstream during the pre-construction survey: however this trend was reversed during post-construction investigations in 2001-2003. Note however, that these differences are much smaller during the 2003 survey (in bold). The most recent investigation was conducted immediately after major rain events associated with hurricanes Francis and Ivan. During the 2004 survey, EPT abundance values were lowest at station 2 and relatively stable within the restored reach at station 3. These data suggest that this reach of the East Prong Roaring River has stabilized and that some instability was noted at site 2. Dominants in Common index values remain relatively similar at site 2 (range from 67 to 78% through 2003), but increase progressively at station 3 following construction. Interestingly, this trend was reversed during the 2004 investigation where a higher DIC value was found at site 3 and a lower number at site 2 (in bold). In addition the number of keystone species in common with the reference reach has increased during surveys conducted through 2003. Lower numbers of keystone taxa were collected during the 2004 survey at all sites following the extremely high flow events. These data suggest that improvement in the biological condition of the East Prong of the Roaring River is occurring, but that DIC numbers do not match the proposed success criteria.

Data in the below table illustrate that there was a significant difference in the numbers of EPT taxa between the reference reach and the two downstream restoration sites. Note that the number of stoneflies collected from the organic component of the samples was much higher at the reference reach and that the percentage of stoneflies decline in this organic fraction at the downstream locations. We noted during the 2003 survey that the number of large (mature) stoneflies was much lower at site number 3. In addition we also noted that many of the rocks at station 3 had not yet developed periphytic material, which would support a grazing community of insects (Elimia for example was not collected at the downstream location).

Table. Abundance values of Ephemeroptera, Plecoptera and Trichoptera collected from inorganic and organic components of samples during the 2003 investigation from East Prong Roaring River at Stone Mountain State Park.

	Reference		Site 2		Site 3	
	inorganic	organic	inorganic	organic	inorganic	organic
Ephemeroptera	149	46	179	101	145	60
Plecoptera	69	121	73	70	44	52
Trichoptera	91	52	74	26	91	32
SubTotal	309	219	326	197	280	144
Total Abundance	528		523		424	

Table 1a. Summary of Channel Conditions East Prong of the Roaring River Reach-2

DIMENSION	East Prong Roaring River Reach 2 Cross-section #1 Riffle					East Prong Roaring River Reach 2 Cross-section #2 Pool				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	307.0	296.5	306.0	319.8		155.6	170.3	158.7	158.4	
Bankfull Width	61.2	62.0	62.0	61.9		53.3	53.4	53.0	53.9	
Bankfull Mean Depth	5.0	4.8	4.9	5.2		2.9	3.2	3.0	2.9	
Bankfull Max Depth	5.9	5.7	6.1	6.4		5.6	5.7	4.6	5.6	

DIMENSION	East Prong Roaring River Reach 2 Cross-section #3 Riffle					East Prong Roaring River Reach 2 Cross-section #4 Riffle				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	194.5	169.6	169.5	166.2	165.5	130.6	156.5	124.8	136.3	
Bankfull Width	60.1	58.3	59.7	60.2	60.0	48.4	56.5	53.0	54.0	
Bankfull Mean Depth	3.2	2.9	2.8	2.8	2.8	2.7	2.8	2.4	2.5	
Bankfull Max Depth	5.8	4.5	4.5	4.7	4.6	3.8	4.3	3.4	3.5	

PATTERN	East Prong Roaring River Reach 2 AS-BUILT			East Prong Roaring River Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			507	614	559
Radius of Curvature	Not Reported			145	196	166
Beltwidth	Not Reported			162	328	177

PROFILE	East Prong Roaring River Reach 2 DESIGN			East Prong Roaring River Reach 2 AS-BUILT			East Prong Roaring River Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			35	104	61
Riffle Slope	Not Reported			Not Reported			0.4%	2.4%	1.3%
Pool Length	Not Reported			Not Reported			45	77	66
Pool to Pool Spacing	Not Reported			Not Reported			83	391	163
Bankfull Slope	Not Reported			Not Reported			0.66%		

SUBSTRATE	STN MTN Reach 2 Cross-section #1		STN MTN Reach 2 Cross-section #2		STN MTN Reach 2 Cross-section #3		STN MTN Reach 2 Cross-section #4	
	Riffle		Pool		Riffle		Riffle	
Monitoring Year	2000	2004	2000	2004	2000	2004	2000	2004
d50	N/A	42.50	N/A	0.97	3.93	20.10	0.31	36.17
d84	N/A	147.52	N/A	45.41	27.30	82.76	38.50	81.53

VEGETATION 2004 Monitoring Reach 2				Bare Root # 1	Live Stake # 1	Live Stake # 2	Live Stake # 3
Live Trees* / Total Tree Stems				0/2	3/6	12/20	0/1
% Survivability				0%	50%	60%	0%
Natural Regeneration (Tree Stems)				17	23	54	10
Herbaceous Cover (%cover)				90	n/a	n/a	n/a

* Planted value represents number of stems observed alive that were planted.

Table 1b. Summary of Channel Conditions East Prong of the Roaring River Reach-4

DIMENSION	East Prong Roaring River Reach 4 Cross-section #1 Riffle					East Prong Roaring River Reach 4 Cross-section #2 Pool					East Prong Roaring River Reach 4 Cross-section #3 Pool				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	196.1	215.8	202.5	206.6	206.3	224.4	210.6	182.8	179.6	189.6	162.2	173.0	181.3	170.0	183.9
Bankfull Width	57.7	59.3	58.2	57.0	57.0	42.5	41.5	42.1	43.0	43.7	58.0	61.3	65.0	66.0	70.0
Bankfull Mean Depth	3.4	3.6	3.5	3.6	3.6	5.3	5.1	4.3	4.2	4.3	2.8	2.8	2.8	2.6	2.6
Bankfull Max Depth	4.9	5.6	4.9	4.7	5.0	8.1	7.8	6.9	6.8	6.6	5.5	5.6	5.4	5.7	5.0

DIMENSION	East Prong Roaring River Reach 4 Cross-section #4 Riffle					East Prong Roaring River Reach 4 Cross-section #5 Pool					East Prong Roaring River Reach 4 Cross-section #6 Riffle				
	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Monitoring Year	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000	2004	2003	2002	2001	2000
Bankfull Cross-sectional Area	140.4	139.1	140.7	139.7		182.6	175.1		183.6		215.6	223.1	207.3	210.1	
Bankfull Width	46.5	45.5	45.9	46.0		56.9	56.0		60.0		45.6	45.2	43.7	46.3	
Bankfull Mean Depth	3.0	3.1	3.1	3.0		3.2	3.1		3.1		4.7	4.9	4.7	4.5	
Bankfull Max Depth	5.0	4.5	4.0	3.9		5.8	5.8		4.8		7.4	7.3	7.4	6.0	

PATTERN	East Prong Roaring River Reach 4 AS-BUILT			East Prong Roaring River Reach 4 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			534	767	596
Radius of Curvature	Not Reported			78	296	122
Beltwidth	Not Reported			222	503	301

East Prong Roaring River Reach 4 Cross-section #7 Pool				
2004	2003	2002	2001	2000
200.2		217.8	186.1	
71.5		71.4	71.4	
2.8		3.1	2.6	
7.4		8.2	7.5	

PROFILE	East Prong Roaring River Reach 2 DESIGN			East Prong Roaring River Reach 2 AS-BUILT			East Prong Roaring River Reach 2 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			35	170	80
Riffle Slope	Not Reported			Not Reported			0.4%	0.7%	0.5%
Pool Length	Not Reported			Not Reported			60	130	85
Pool to Pool Spacing	Not Reported			Not Reported			175	335	255
Bankfull Slope	Not Reported			Not Reported			0.50%		

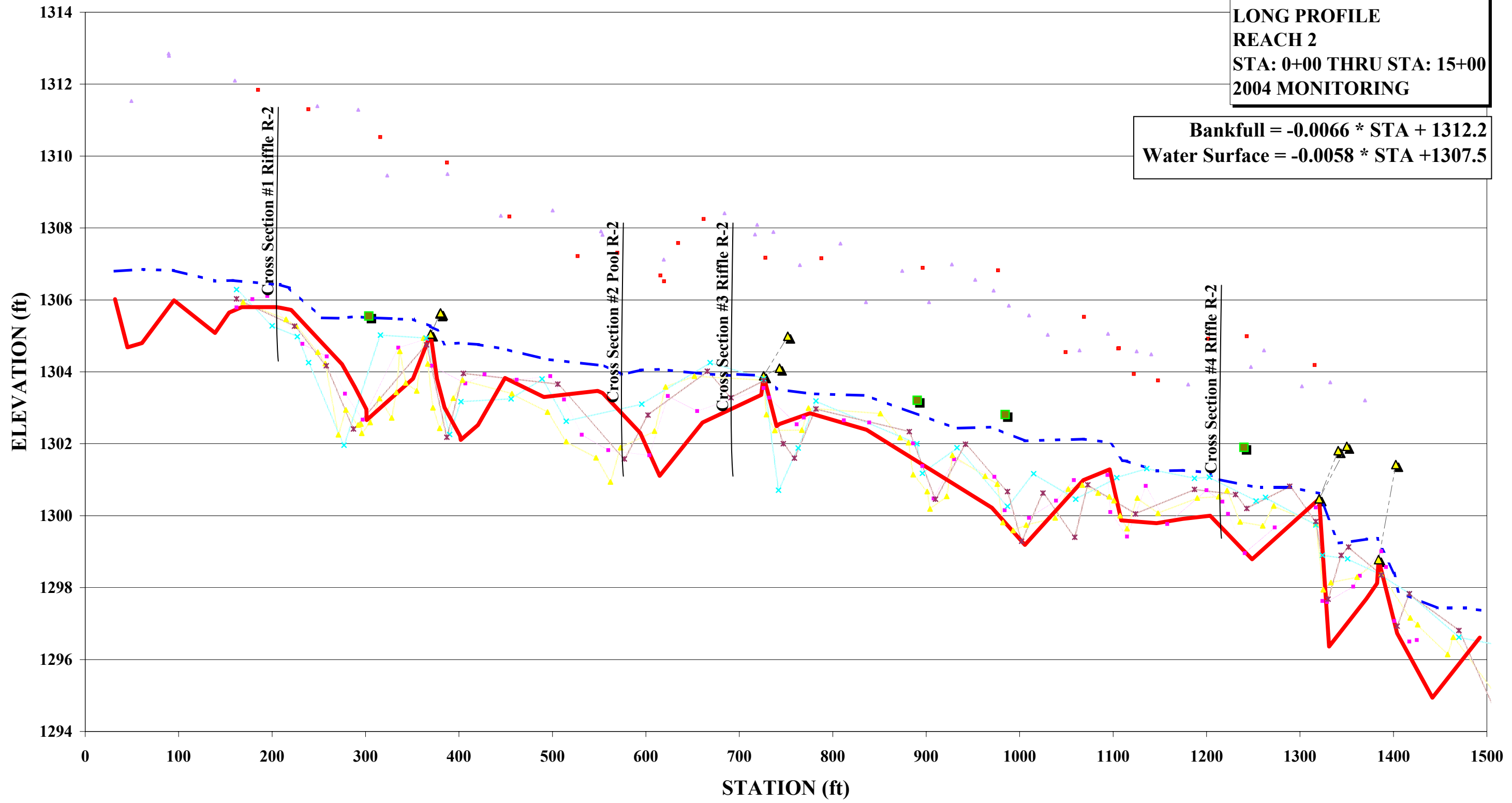
SUBSTRATE	STN MTN Reach 4 Cross-section #1		STN MTN Reach 4 Cross-section #4		STN MTN Reach 4 Cross-section #6	
	Riffle		Riffle		Riffle	
Monitoring Year	2000	2004	2000	2004	2000	2004
d50	N/A	42.50	N/A	0.97	3.93	20.10
d84	N/A	147.52	N/A	45.41	27.30	82.76

VEGETATION 2004 Monitoring Reach 2	Bare Root # 2	Bare Root # 3	Bare Root # 4	Live Stake # 1	Live Stake # 2	Live Stake # 3	Live Stake # 4	Live Stake # 5
Live Trees* / Total Tree Stems	4/4	1/5	0/0	3/6	0/0	0/0	0/0	0/0
% Survivability	100%	20%	0%	50%	0%	0%	0%	0%
Natural Regeneration (Tree Stems)	>300	102	>300	26	0	>100	0	0
Herbaceous Cover (%cover)	90	90	90	n/a	n/a	n/a	n/a	n/a

* Planted value represents number of stems observed alive that were planted.

**STONE MOUNTAIN
LONG PROFILE
REACH 2
STA: 0+00 THRU STA: 15+00
2004 MONITORING**

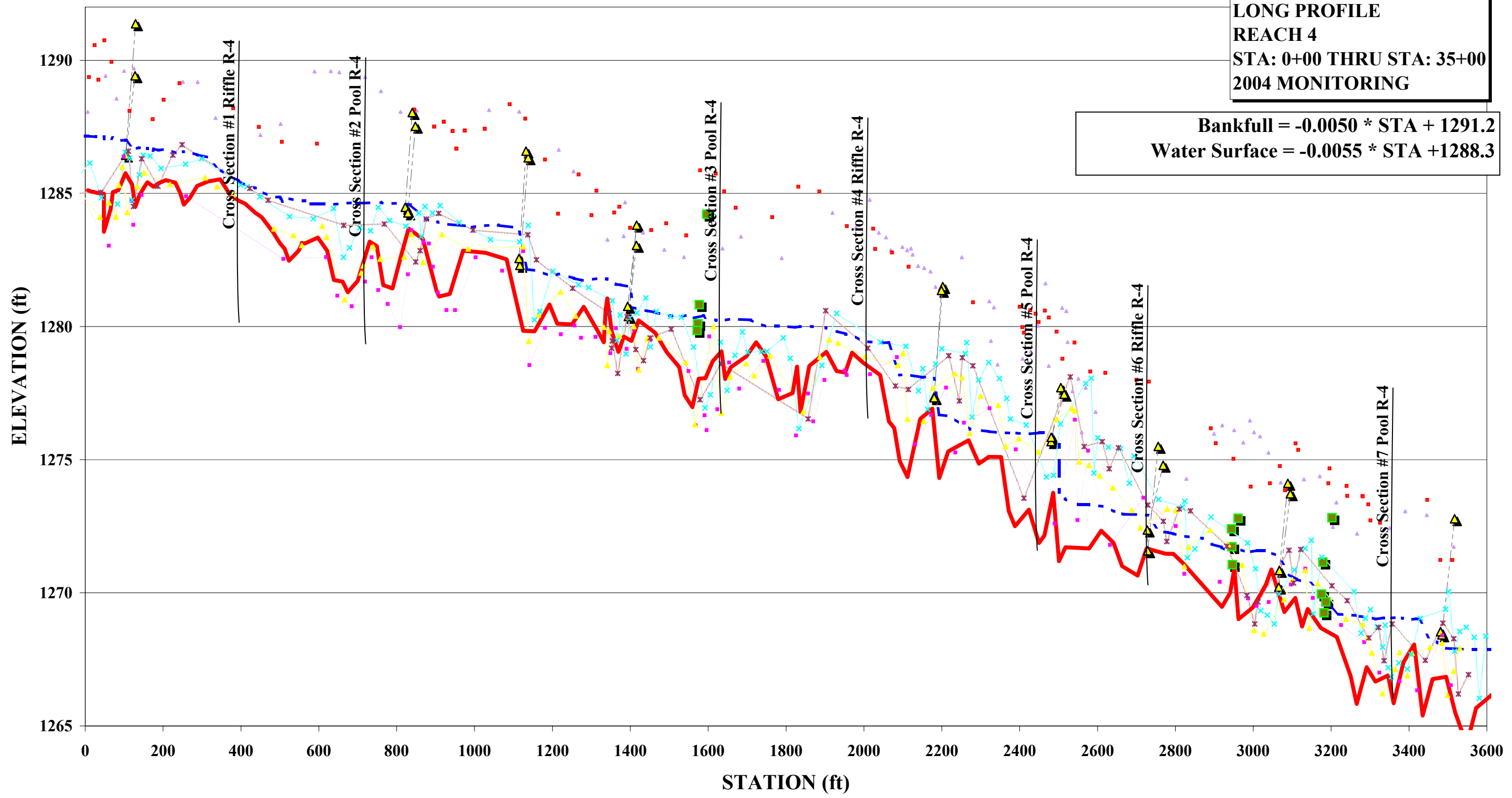
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Water Surface = -0.0058 * STA + 1307.5**



- ▲ LBKF
- RBKF
- ▲— ROCK CROSS VANES
-
- 2003-Thalweg
- ▲— 2002-Thalweg
- x— 2001-Thalweg
- x— 2000-Thalweg
- 2004-Thalweg
- 2004-Water Surface

**STONE MOUNTAIN
LONG PROFILE
REACH 4
STA: 0+00 THRU STA: 35+00
2004 MONITORING**

**Bankfull = $-0.0050 * STA + 1291.2$
Water Surface = $-0.0055 * STA + 1288.3$**



- ▲ LBKF
- RBKF
- ▲ ROCK CROSS VANES
- J-Hook
- ◆ 2003-Thalweg
- ▲ 2002-Thalweg
- × 2001-Thalweg
- × 2000-Thalweg
- 2004-Thalweg
- - - 2004-Water Surface

3.0 AREAS OF CONCERN

The following areas of concern should be monitored closely and considered for repair as suggested:

The East Prong of the Roaring River

- Rock Cross Vanes
 - There are two rock cross vanes that have piping around the vane arm located on Reach-2 at stations 13+00 and 14+50. If these two structures fail there will be a massive head-cut through the system.
 - At station 13+00 there is bank erosion on the left bank and water is piping past the rock cross vane. At this point the structure is still holding grade a lower elevation but ultimate will occur if this vane is not repaired or redesigned.
 - At station 14+50 there is bank erosion on the left bank and water is piping past the rock cross vane. At this point the structure is still holding grade at a lower elevation but ultimate failure will occur if this vane is not repaired or redesigned.
 - There is one rock cross vanes that have piping around the vane arm located on Reach-4 at stations 25+20. If these two structures fails there will be a localized head-cut.
 - At station 25+20 there is massive bank erosion on the right bank and water is piping past the rock cross vane. At this point the structure is not holding grade ultimate failure will occur if repairs or redesign are not pursued
- Bank Erosion and Meander Migration
 - The total bank material that has been transported, since construction in October 2000, from the outside meander banks in both reaches is nearly 4000 Tons
 - Bank erosion on the outside of meander bends has been noted at one location on the reaches of Reach 2 at stations 6+00
 - At Station 6+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~4 ft.
 - Bank erosion on the outside of meander bends has been noted at four locations on the reaches of Reach 4 at stations 21+00, 24+00, 30+00 and 34+00.
 - At Station 21+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~4 ft.
 - At Station 24+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~6 ft.
 - At Station 30+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~5 ft.
 - At Station 34+00 there is bank erosion on the outside of a meander bend the bank still has a High BEHI with a Moderate NBS. The bank height for this bank section is ~10 ft.



Reach 2: Photo Point 1 (2004)



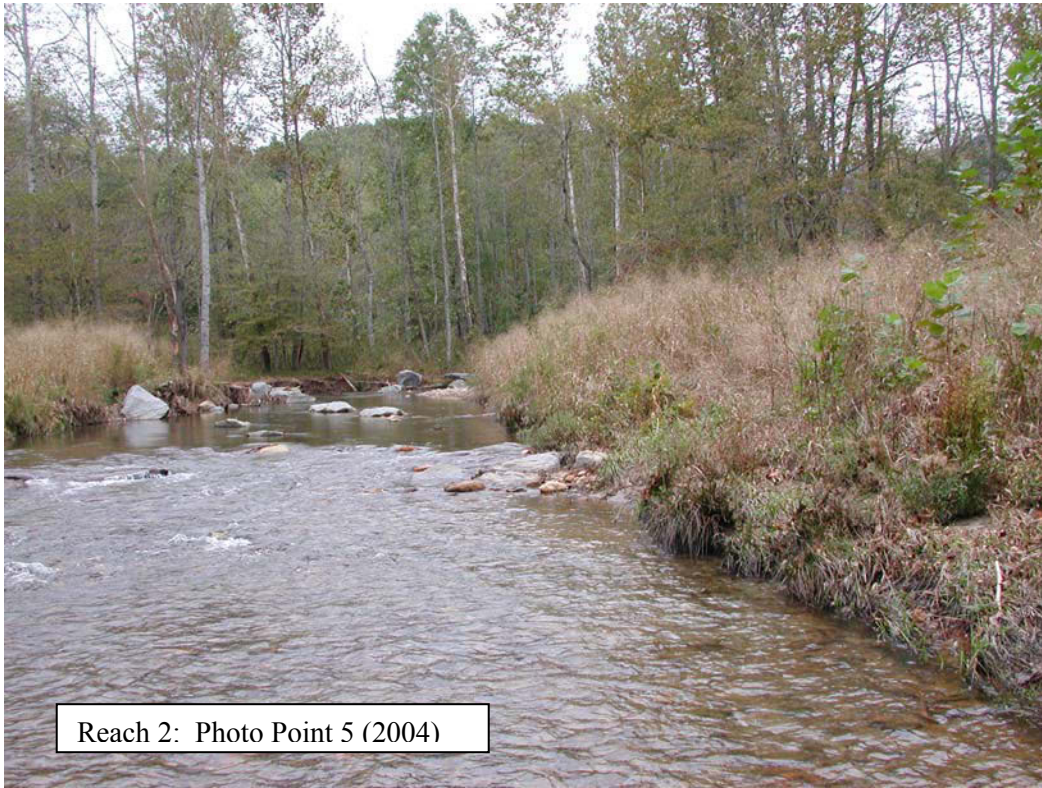
Reach 2: Photo Point 2 (2004)



Reach 2: Photo Point 3 (2004)



Reach 2: Photo Point 4 (2004)



Reach 2: Photo Point 5 (2004)



Looking Upstream STA~ 2+50



Looking Downstream at Left Bank Scour near J-Hook STA ~3+10



Looking Downstream at Left Bank Erosion STA ~ 5+00



Looking Downstream at Right Bank Erosion and Migration STA ~ 5+60



Exposed Root Wads and Boulder Toe Right Bank STA ~6+00



Right Bank Slump STA ~ 6+35



Looking Downstream at Left Bank Erosion and Migration STA ~ 8+50



Looking Downstream at Boulder Clusters STA ~ 11+50



Looking Downstream at Left Bank Erosion & Piping Water Around Rock Cross Vane STA ~ 12+90



Right Bank Erosion STA ~ 13+10



Looking Downstream at Left Bank Erosion & Piping Water Around Rock Cross Vane STA ~ 13+80



Reach 4: Photo Point 1 (2004)



Reach 4: Photo Point 2 (2004)



Reach 4: Photo Point 3 (2004)



Reach 4: Photo Point 4 (2004)



Reach 4: Photo Point 5 (2004)



Reach 4: Photo Point 6 (2004)



Looking Downstream at Left Bank Erosion STA ~ 3+00



Right Bank Erosion STA ~ 6+50



Looking Downstream at Right Bank Erosion and Migration STA ~ 8+10



Looking Downstream at Rock Cross Vane STA~ 11+00



Looking Downstream at Left Bank Erosion and Migration STA ~ 20+00



Looking Downstream at Right Bank Erosion and Migration STA ~ 23+50



Looking Downstream at Right Bank Erosion and Migration STA ~ 23+75



Looking Downstream at Right Bank Erosion & Piping Water around Rock Cross Vane STA ~ 24+40



Looking Downstream at Right Bank Erosion & Piping Water around Rock Cross Vane STA ~ 24+80



Looking Downstream at Left Bank Erosion and Migration STA ~ 28+75



Looking Downstream at Right Bank Erosion and Migration STA ~ 32+50

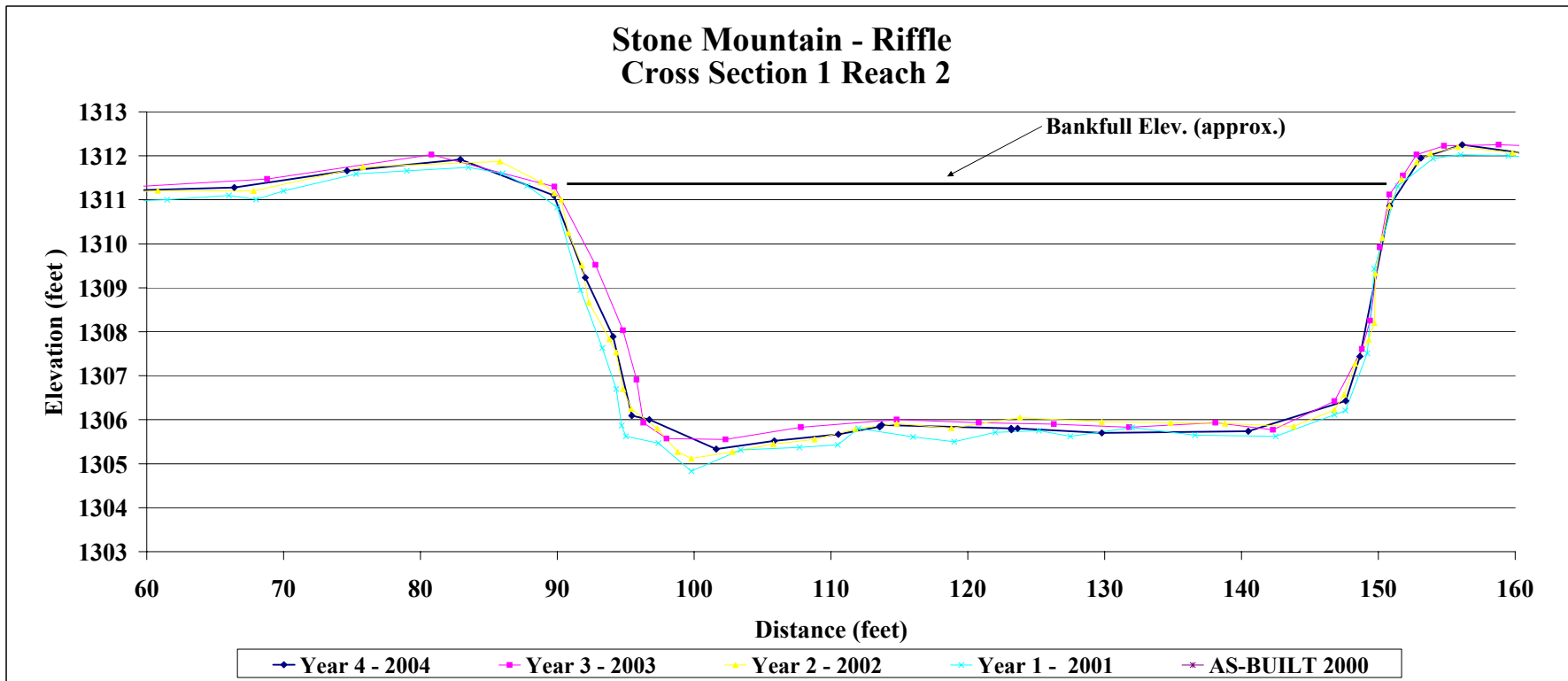
Project Name	Stone Mountain
Cross Section	Reach 2 Cross-Section 1
Feature	Riffle
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
53.8	1311.2	Lpin1	53.8	1311.2		53.8	1311.2	LPIN	53.8	1311.0				
54.0	1311.2		68.8	1311.5		53.8	1311.1	GRND	57.0	1311.0				
66.4	1311.3		80.8	1312.0		60.8	1311.2		61.5	1311.0				
74.6	1311.7		89.8	1311.3		67.8	1311.2		66.0	1311.1				
82.9	1311.9		92.8	1309.5		75.8	1311.8		68.0	1311.0				
89.8	1311.1		94.8	1308.0		85.8	1311.9		70.0	1311.2				
92.0	1309.2		95.8	1306.9		88.8	1311.4		75.3	1311.6				
94.1	1307.9		96.3	1305.9		89.8	1311.2		79.0	1311.7				
95.5	1306.1		98.0	1305.6		90.3	1311.0		83.5	1311.7				
96.7	1306.0		102.3	1305.6		90.8	1310.3		86.0	1311.6				
101.6	1305.3		107.8	1305.8		91.8	1309.5		87.8	1311.3				
105.9	1305.5		114.8	1306.0		92.3	1308.7		90.0	1310.8				
110.5	1305.7		120.8	1305.9		93.8	1307.8		91.7	1309.0				
113.5	1305.8		126.3	1305.9		94.3	1307.5		93.3	1307.6				
113.6	1305.8		131.8	1305.8		94.8	1306.7		94.3	1306.7				
113.7	1305.9		138.1	1305.9		95.4	1306.3		94.7	1305.9				
123.2	1305.8		142.3	1305.8		97.3	1305.8		95.0	1305.6				
123.2	1305.8		146.8	1306.4		98.8	1305.3		97.4	1305.5				
123.7	1305.8		148.8	1307.6		99.8	1305.1		99.8	1304.8				
129.8	1305.7		149.4	1308.3		102.8	1305.3		103.4	1305.3				
140.5	1305.7		150.1	1309.9		105.8	1305.5		107.7	1305.4				
147.6	1306.4		150.8	1311.1		108.8	1305.6		110.5	1305.4				
148.7	1307.4		151.8	1311.6		111.8	1305.8		112.0	1305.8				
150.8	1310.9		152.8	1312.0		114.8	1305.9		116.0	1305.6				
153.1	1312.0		154.8	1312.2		118.8	1305.8		119.0	1305.5				
156.1	1312.3		158.8	1312.3		123.8	1306.1		122.0	1305.7				
161.1	1312.0		162.9	1312.2		129.8	1306.0		125.2	1305.8				
163.0	1312.1	Rpin1	162.9	1312.1		134.8	1305.9		127.5	1305.6				
163.0	1312.1					138.8	1305.9		132.0	1305.8				



Photo of Cross-Section 1 - Reach 2 - Looking Downstream @ STA 2+00

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	307.0	296.5	306.0	319.8	
Width	61.2	62.0	62.0	61.9	
Mean Depth	5.0	4.8	4.9	5.2	
Max Depth	5.9	5.7	6.1	6.4	
W/D	12.2	13.0	12.6	12.0	



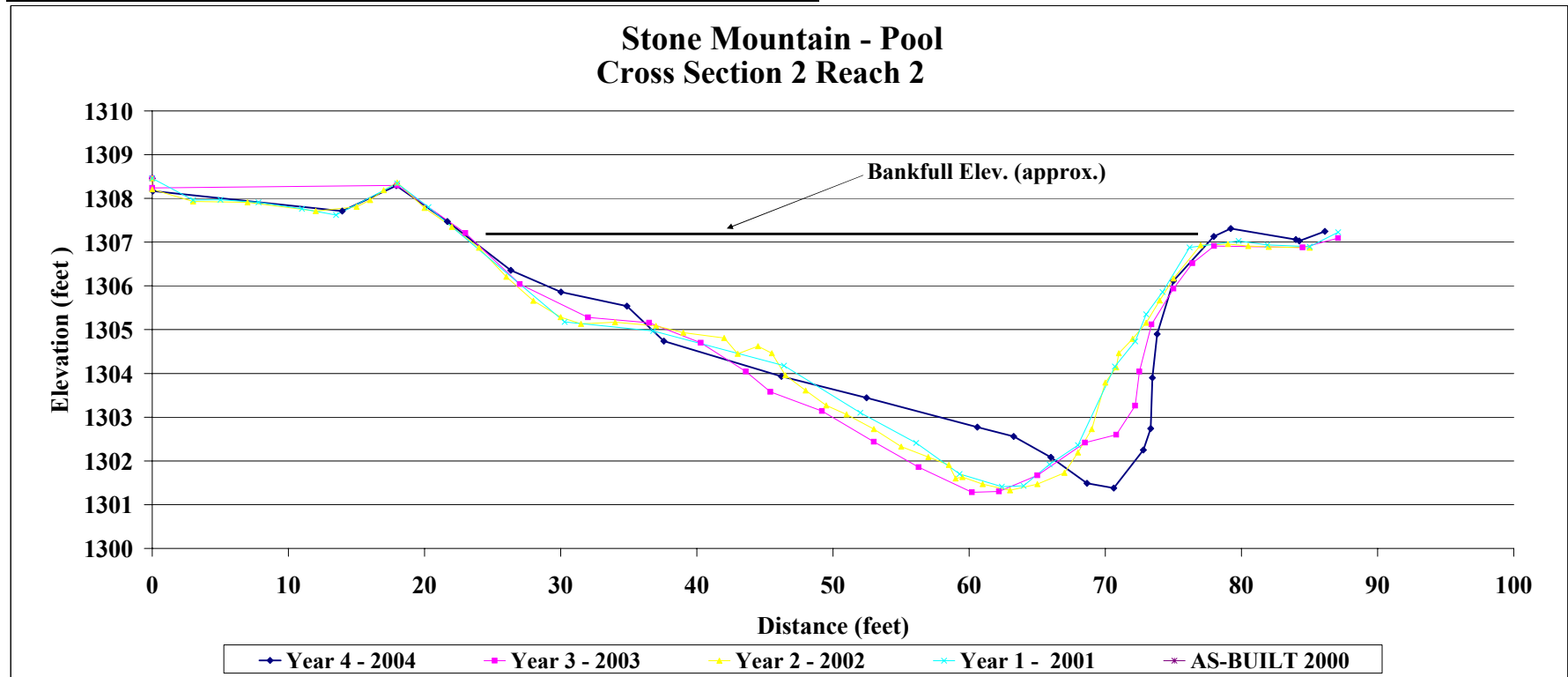
Project Name	Stone Mountain
Cross Section	Reach 2 Cross-Section 2
Feature	Pool
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.0	1308.5	LPIN	0.0	1308.5	LPIN	0.0	1308.5		0.0	1308.5	LPIN			
0.0	1308.2		0.0	1308.2	GRND	0.0	1308.2		3.0	1308.0				
14.0	1307.7		18.0	1308.3		3.0	1307.9		5.0	1308.0				
17.9	1308.3		23.0	1307.2		7.0	1307.9		7.8	1307.9				
21.7	1307.5		27.0	1306.0		12.0	1307.7		11.0	1307.8				
26.3	1306.4		32.0	1305.3		15.0	1307.8		13.5	1307.6				
30.0	1305.9		36.5	1305.2		16.0	1308.0		18.0	1308.3	LBKF			
34.9	1305.5		40.3	1304.7		17.0	1308.2		20.3	1307.8				
37.6	1304.7		43.6	1304.0	LEW	18.0	1308.4		30.3	1305.2				
46.2	1303.9		45.4	1303.6		20.0	1307.8		36.8	1305.0				
52.5	1303.4		49.2	1303.1		22.0	1307.4		46.4	1304.2				
60.6	1302.8		53.0	1302.4		24.0	1306.9		52.0	1303.1				
63.3	1302.6		56.3	1301.9		26.0	1306.2		56.1	1302.4				
66.0	1302.1		60.2	1301.3		28.0	1305.7		59.3	1301.7				
68.7	1301.5		62.2	1301.3		30.0	1305.3		62.4	1301.4				
70.6	1301.4		65.0	1301.7		31.5	1305.1		64.0	1301.4				
72.8	1302.3		68.5	1302.4		34.0	1305.2		65.9	1301.9				
73.3	1302.7		70.8	1302.6		37.0	1305.1		68.0	1302.4				
73.5	1303.9		72.2	1303.3	REW	39.0	1304.9		70.7	1304.2				
73.8	1304.9		72.5	1304.0		42.0	1304.8		72.2	1304.7				
75.0	1306.1		73.4	1305.1		43.0	1304.5		73.0	1305.4				
78.0	1307.1		75.0	1305.9		44.5	1304.6		74.2	1305.9				
79.2	1307.3		76.4	1306.5		45.5	1304.5		76.2	1306.9				
84.0	1307.1		78.0	1306.9		46.5	1304.0		79.8	1307.0				
84.3	1307.0		84.5	1306.9		48.0	1303.6		81.9	1306.9				
86.1	1307.3		87.1	1307.1	RPIN	49.5	1303.3		85.0	1306.9				
						51.0	1303.1		87.1	1307.2				
						53.0	1302.7							
						55.0	1302.3							



Photo of Cross-Section 2 - Reach 2 - Looking Downstream @ STA 5+75

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	155.6	170.3	158.7	158.4	
Width	53.3	53.4	53.0	53.9	
Mean Depth	2.9	3.2	3.0	2.9	
Max Depth	5.6	5.7	4.6	5.6	
W/D	18.3	16.7	17.7	18.3	



Project Name	Stone Mountain
Cross Section	Reach 2 Cross-Section 3
Feature	Riffle
Date	11/18/04
Crew	Bidelspach, Clinton

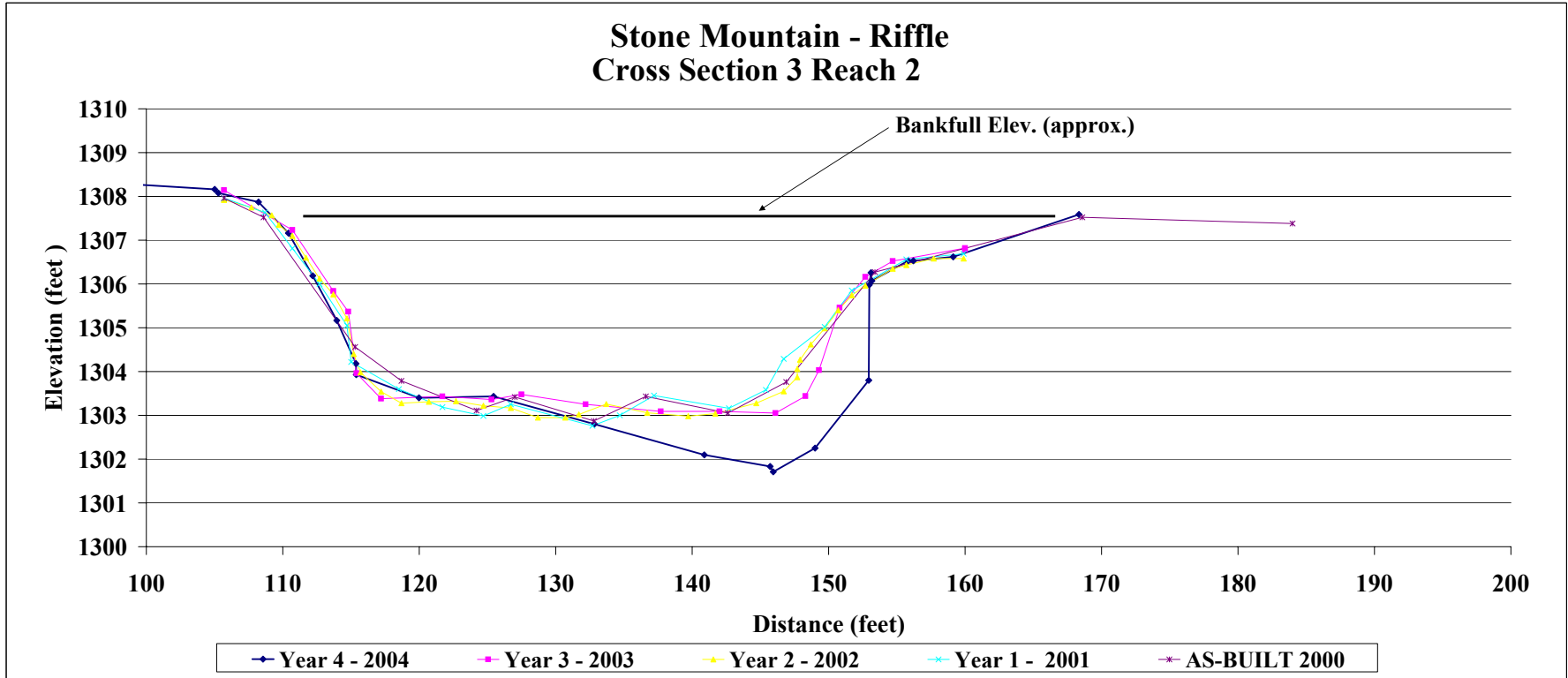
Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
97.2	1308.3		105.7	1308.1		105.7	1307.9		105.7	1308.0		105.7	1308.0	
105.0	1308.2	Lpin	110.7	1307.2		105.7	1307.9		108.7	1307.6		108.6	1307.5	LBKF
105.3	1308.1		113.7	1305.8		107.7	1307.8		110.7	1306.8		115.3	1304.6	
108.2	1307.9		114.8	1305.4		109.2	1307.6		112.7	1306.0		118.7	1303.8	
110.4	1307.2		115.4	1304.0		109.7	1307.4		114.7	1305.1		124.2	1303.1	
112.2	1306.2		117.2	1303.4		110.7	1307.1		115.0	1304.2		127.0	1303.4	
114.0	1305.2		121.7	1303.4		111.7	1306.6		118.5	1303.6		132.8	1302.9	
115.4	1304.2		125.3	1303.4		112.7	1306.1		121.7	1303.2		136.6	1303.4	
115.4	1303.9		127.5	1303.5		113.7	1305.8		124.7	1303.0		142.6	1303.1	
120.0	1303.4		132.2	1303.3		114.7	1305.2		126.7	1303.3		146.9	1303.8	
125.5	1303.4		137.7	1303.1		115.2	1304.4		132.7	1302.8		153.4	1306.3	
132.8	1302.8		142.0	1303.1		115.7	1304.0		134.7	1303.0		168.6	1307.5	
140.9	1302.1		146.1	1303.1		117.2	1303.5		137.2	1303.5		184.0	1307.4	RBKF
145.7	1301.8		148.3	1303.4		118.7	1303.3		142.7	1303.2				
146.0	1301.7		149.3	1304.0		120.7	1303.3		145.4	1303.6				
149.0	1302.3		150.8	1305.5		122.7	1303.3		146.7	1304.3				
152.9	1303.8		152.7	1306.2		124.7	1303.2		149.7	1305.0				
153.0	1306.0		154.7	1306.5		126.7	1303.2		151.7	1305.9				
153.1	1306.3		160.0	1306.8		128.7	1303.0		155.7	1306.6				
153.2	1306.1		160.0	1306.8		130.7	1303.0		159.9	1306.7				
155.8	1306.5					131.7	1303.0							
156.2	1306.5					133.7	1303.3							
159.1	1306.6	Rpin				136.7	1303.1							
168.4	1307.6					139.7	1303.0							
						141.7	1303.0							
						144.7	1303.3							
						146.7	1303.6							
						147.7	1303.9							
						147.7	1304.1							



Photo of Cross-Section 3 - Reach 2 - Looking Downstream @ STA 7+00

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	194.5	169.6	169.5	166.2	165.5
Width	60.1	58.3	59.7	60.2	60.0
Mean Depth	3.2	2.9	2.8	2.8	2.8
Max Depth	5.8	4.5	4.5	4.7	4.6
W/D	18.6	20.0	21.0	21.8	21.7

Bench 2004
144.3
44.0
3.3
4.8
13.4



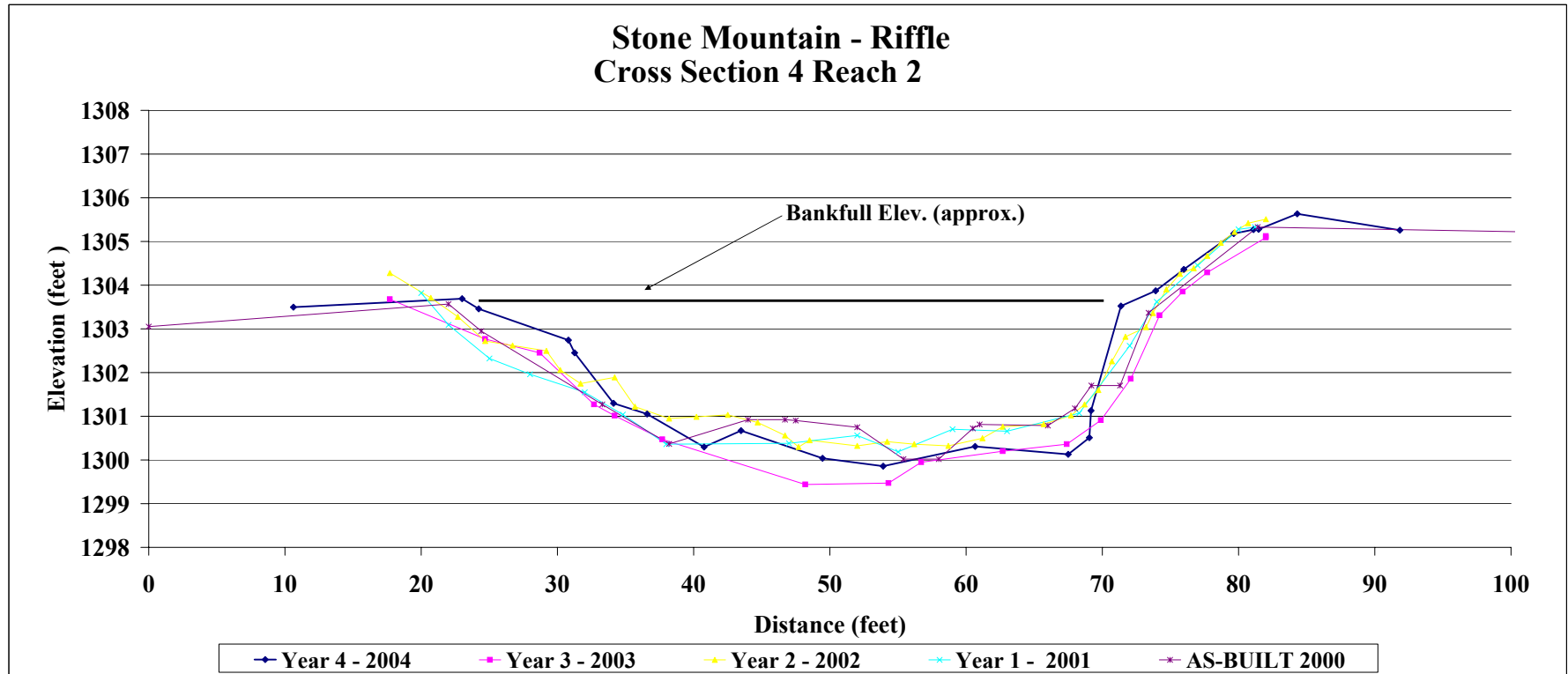
Project Name	Stone Mountain
Cross Section	Reach 2 Cross-Section 4
Feature	Riffle
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
10.6	1303.5		17.7	1303.7		17.7	1304.3		20.0	1303.8		0.0	1303.1	
23.0	1303.7	Lpin	24.7	1302.8		20.7	1303.7		22.0	1303.1		22.0	1303.6	LBKF
24.2	1303.5		28.7	1302.5		22.7	1303.3		25.0	1302.3	LPIN	24.4	1303.0	
30.8	1302.7		32.7	1301.3		24.7	1302.7		28.0	1302.0		33.3	1301.3	
31.3	1302.5		34.2	1301.0		26.7	1302.6		32.0	1301.6		38.2	1300.4	
34.1	1301.3		37.7	1300.5		29.2	1302.5		34.8	1301.0		44.0	1300.9	
36.6	1301.1		48.2	1299.4		30.2	1302.1		38.0	1300.4		46.7	1300.9	
40.8	1300.3		54.3	1299.5		31.7	1301.8		47.0	1300.4		47.5	1300.9	
43.5	1300.7		56.7	1300.0		34.2	1301.9		52.0	1300.6		52.0	1300.8	
49.5	1300.0		62.7	1300.2		35.7	1301.2		55.0	1300.2		55.4	1300.0	
53.9	1299.9		67.4	1300.4		38.2	1301.0		59.0	1300.7		58.0	1300.0	
60.7	1300.3		69.9	1300.9		40.2	1301.0		63.0	1300.7		60.5	1300.7	
67.5	1300.1		72.1	1301.9		42.5	1301.0		68.3	1301.1		61.0	1300.8	
69.1	1300.5		74.2	1303.3		44.7	1300.9		72.0	1302.6		66.0	1300.8	
69.2	1301.1		75.9	1303.9		46.7	1300.6		74.0	1303.6		68.0	1301.2	
71.4	1303.5		77.7	1304.3		47.7	1300.3		77.0	1304.5		69.2	1301.7	
73.9	1303.9		82.0	1305.1		48.5	1300.5		80.0	1305.3		71.3	1301.7	
76.0	1304.4		82.0	1305.1		52.0	1300.3		81.2	1305.3	RPIN	73.4	1303.4	RBKF
79.6	1305.2					54.2	1300.4					81.4	1305.3	RPIN
81.1	1305.3					56.2	1300.4					143.0	1305.0	
81.5	1305.3	Rpin				58.7	1300.3							
84.3	1305.6					61.2	1300.5							
91.9	1305.3					62.7	1300.8							
						65.7	1300.8							
						67.7	1301.0							
						68.7	1301.3							
						69.7	1301.6							
						70.7	1302.3							
						71.7	1302.8							



Photo of Cross-Section 4 - Reach 2 - Looking Downstream @ STA 12+25

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	130.6	156.5	124.8	136.3	
Width	48.4	56.5	53.0	54.0	
Mean Depth	2.7	2.8	2.4	2.5	
Max Depth	3.8	4.3	3.4	3.5	
W/D	17.9	20.4	22.5	21.4	



Project Name	Stone Mountain
Cross Section	Reach 4 Cross-Section 1
Feature	Riffle
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
27.0	1291.3	Left Pin	27.0	1291.3		27.0	1291.3	LPIN	27.0	1291.3		0.0	1290.2	
31.8	1290.7		30.0	1290.7		31.0	1291.0	LTOB	31.0	1291.0		27.0	1291.3	
33.8	1289.9		33.0	1289.7		34.1	1290.0		33.0	1290.4		32.0	1290.6	
35.2	1289.1		36.0	1288.5		35.0	1289.3		35.0	1289.2		33.0	1289.9	LBKF
35.9	1288.2		37.5	1287.3		36.1	1289.3		36.6	1289.0		35.0	1288.0	
36.1	1286.3		38.3	1284.9		39.7	1287.5		38.0	1288.3		38.5	1287.4	
37.0	1285.6	Water	39.0	1284.2		40.0	1285.3	LEW	39.0	1287.6		42.0	1286.0	
38.4	1285.0		40.0	1284.2		42.4	1284.9		42.4	1286.9		49.0	1285.4	
40.1	1285.0		44.0	1284.4		47.3	1285.1		41.0	1286.3		60.2	1284.8	
41.9	1284.9	XST	55.0	1284.6		55.8	1285.3		42.0	1285.7		63.2	1285.4	
46.7	1285.0		63.0	1284.8		63.4	1285.3		42.2	1285.2		65.4	1285.4	
50.2	1285.0		72.0	1285.1		68.0	1285.2		42.2	1285.4		65.7	1285.4	
54.4	1285.1		74.0	1286.4		70.6	1285.3		48.0	1285.1		68.5	1285.3	
58.2	1285.4		80.0	1287.8		71.7	1285.6	REW/WS	52.0	1285.1		69.0	1285.4	
63.1	1285.1		85.0	1289.4		73.4	1286.1	BAR	57.0	1285.1		78.3	1285.6	
65.1	1285.1		92.3	1289.0		74.4	1286.6		60.0	1285.2		83.4	1287.2	
66.9	1285.1					76.2	1286.7		64.0	1285.2		90.0	1289.7	RBKF
69.4	1285.3					78.8	1286.7		68.0	1285.2		105.0	1290.5	
71.4	1285.1					81.0	1286.4		71.0	1285.2		107.0	1288.6	
72.1	1285.4					87.3	1288.3		72.0	1285.4				
73.2	1286.6					89.2	1288.8		75.0	1285.9				
74.0	1287.3					90.0	1289.2	RTOB	79.0	1286.0				
75.5	1287.6					91.0	1289.5		82.0	1286.4				
77.0	1288.5					92.3	1289.6		86.0	1287.8				
79.4	1288.6								88.0	1288.9				
81.8	1288.3								89.0	1289.4				
85.8	1288.1								90.0	1289.6				
86.9	1288.7													
91.4	1289.5	Right Pin												

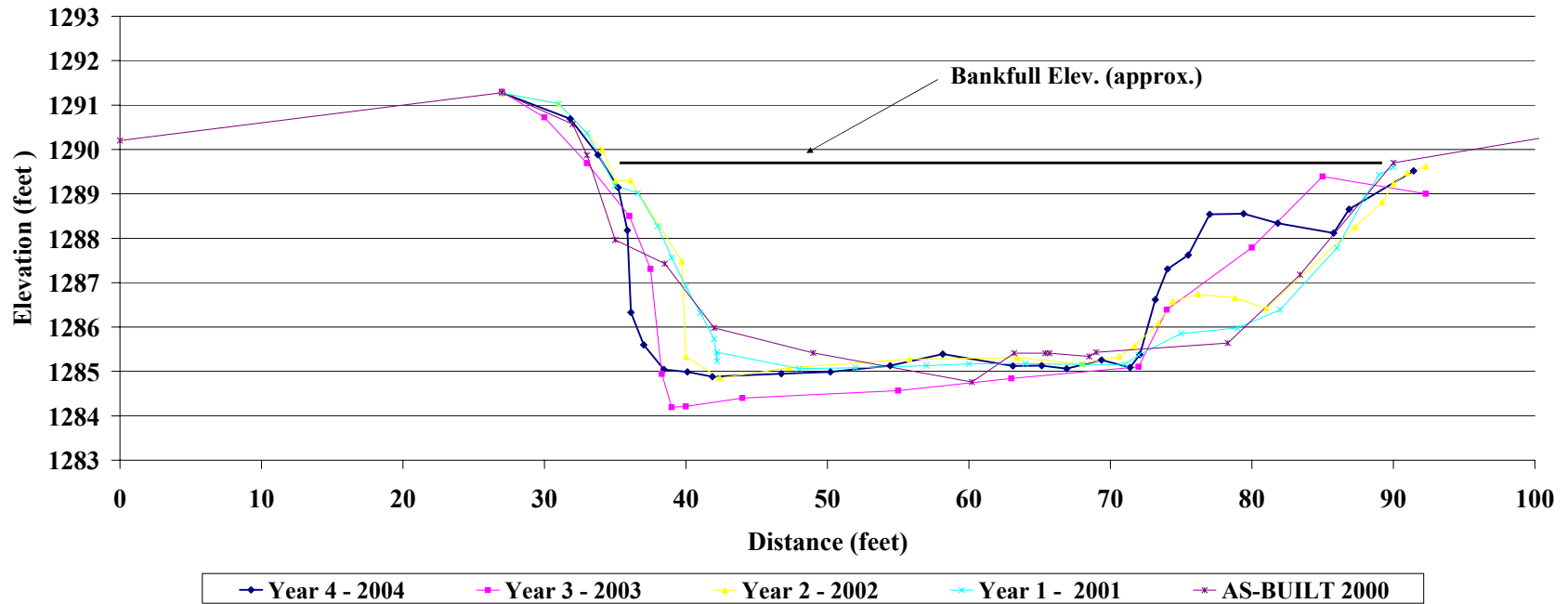


Photo of Cross-Section 1 - Reach 4 - Looking Downstream @ STA 4+50

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	196.1	215.8	202.5	206.6	206.3
Width	57.7	59.3	58.2	57.0	57.0
Mean Depth	3.4	3.6	3.5	3.6	3.6
Max Depth	4.9	5.6	4.9	4.7	5.0
W/D	16.9	16.3	16.7	15.7	15.7

Bench 2004
131.6
50.6
2.6
3.7
19.5

Stone Mountain - Riffle Cross Section 1 Reach 4



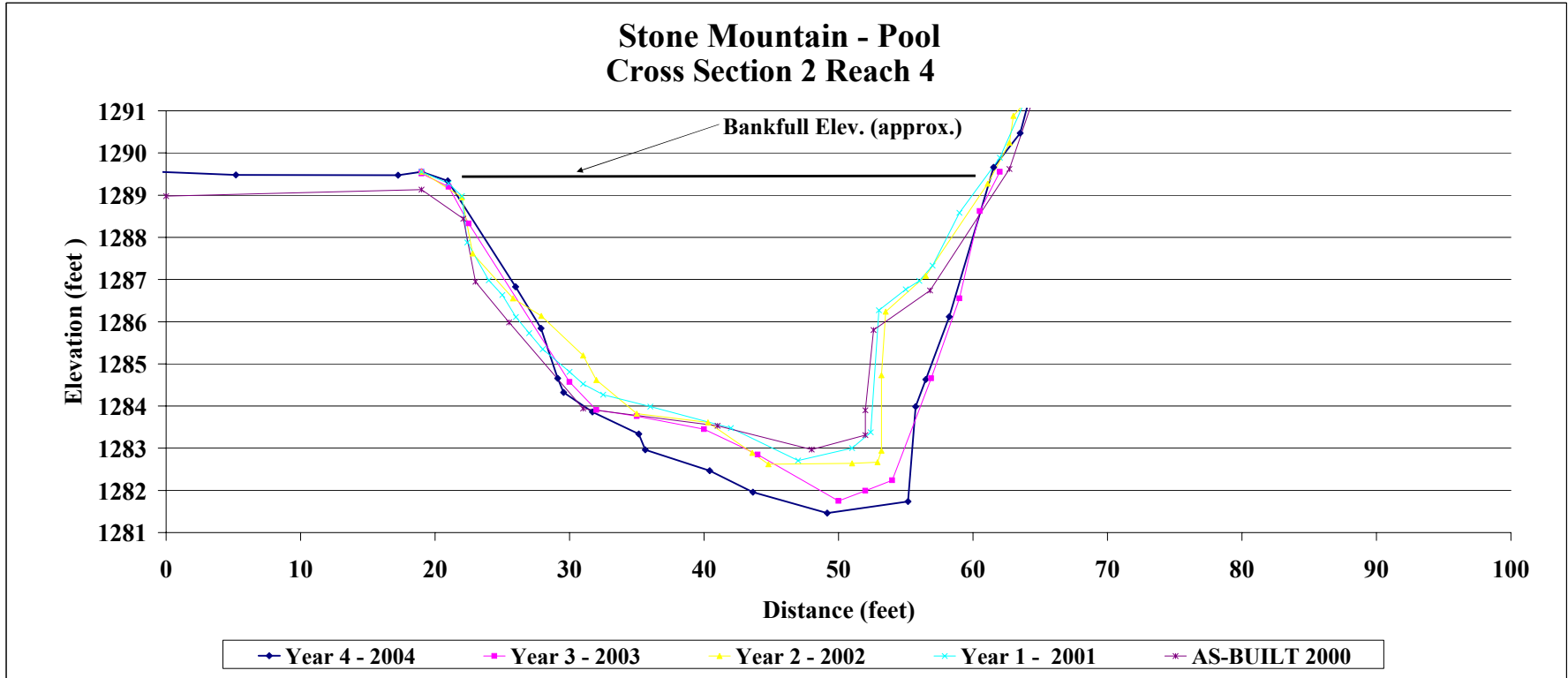
Project Name	Stone Mountain
Cross Section	Reach 4 Cross-Section 2
Feature	Pool
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-8.3	1289.5		19.0	1289.6	Left Pin	19.0	1289.6	Left Pin	19.0	1289.6		0.0	1289.0	
-8.9	1289.7		19.0	1289.5		22.0	1289.0		21.0	1289.3		19.0	1289.1	LBKF
5.2	1289.5		21.0	1289.2		22.8	1287.6		22.0	1289.0		22.1	1288.4	
17.3	1289.5		22.5	1288.3		25.8	1286.6		22.4	1287.9		23.0	1287.0	
19.0	1289.6	Left Pin	30.0	1284.6		27.9	1286.1		24.0	1287.0		25.5	1286.0	
21.0	1289.3		32.0	1283.9		31.0	1285.2		25.0	1286.6		31.0	1283.9	
26.0	1286.8		35.0	1283.8		32.0	1284.6		26.0	1286.1		41.0	1283.5	
27.9	1285.8		40.0	1283.5		35.0	1283.8		27.0	1285.7		48.0	1283.0	
29.1	1284.7	Water	44.0	1282.9		40.3	1283.6		28.0	1285.4		52.0	1283.3	
29.6	1284.3		50.0	1281.8		43.6	1282.9		30.0	1284.8		52.0	1283.9	
31.7	1283.9		52.0	1282.0		44.8	1282.6		31.0	1284.5		52.6	1285.8	
35.1	1283.3		54.0	1282.2		51.0	1282.6		32.5	1284.3		56.8	1286.7	
35.6	1283.0		56.9	1284.7		52.9	1282.7		36.0	1284.0		62.7	1289.6	RBKF
40.4	1282.5		59.0	1286.6		53.2	1282.9		42.0	1283.5		67.0	1293.7	
43.6	1282.0		60.5	1288.6		53.2	1284.7		47.0	1282.7		68.6	1293.9	
49.2	1281.5		62.0	1289.6	RBKFL	53.5	1286.2		51.0	1283.0		80.0	1293.9	
55.2	1281.7		64.5	1291.4		56.5	1287.1		52.4	1283.4		100.0	1293.9	
55.7	1284.0		68.0	1294.3	RTOB	61.1	1289.3	BKF	53.0	1286.3				
56.5	1284.6	Water				62.7	1290.2		55.0	1286.8				
58.2	1286.1					63.0	1290.9		56.0	1287.0				
61.5	1289.7					64.1	1291.3		57.0	1287.3				
63.5	1290.5					65.3	1292.7		59.0	1288.6				
65.5	1292.8					67.0	1294.0		62.0	1289.9				
67.5	1294.2					68.6	1294.4		64.0	1291.3				
79.4	1294.4								67.0	1294.1				
99.7	1294.5								68.4	1294.4				
117.4	1294.0								68.4	1294.4				
127.2	1294.1													
68.0	1294.4	Right Pin												



Photo of Cross-Section 2 - Reach 4 - Looking Downstream @ STA 7+65

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	224.4	210.6	182.8	179.6	189.6
Width	42.5	41.5	42.1	43.0	43.7
Mean Depth	5.3	5.1	4.3	4.2	4.3
Max Depth	8.1	7.8	6.9	6.8	6.6
W/D	8.1	8.2	9.7	10.3	10.1



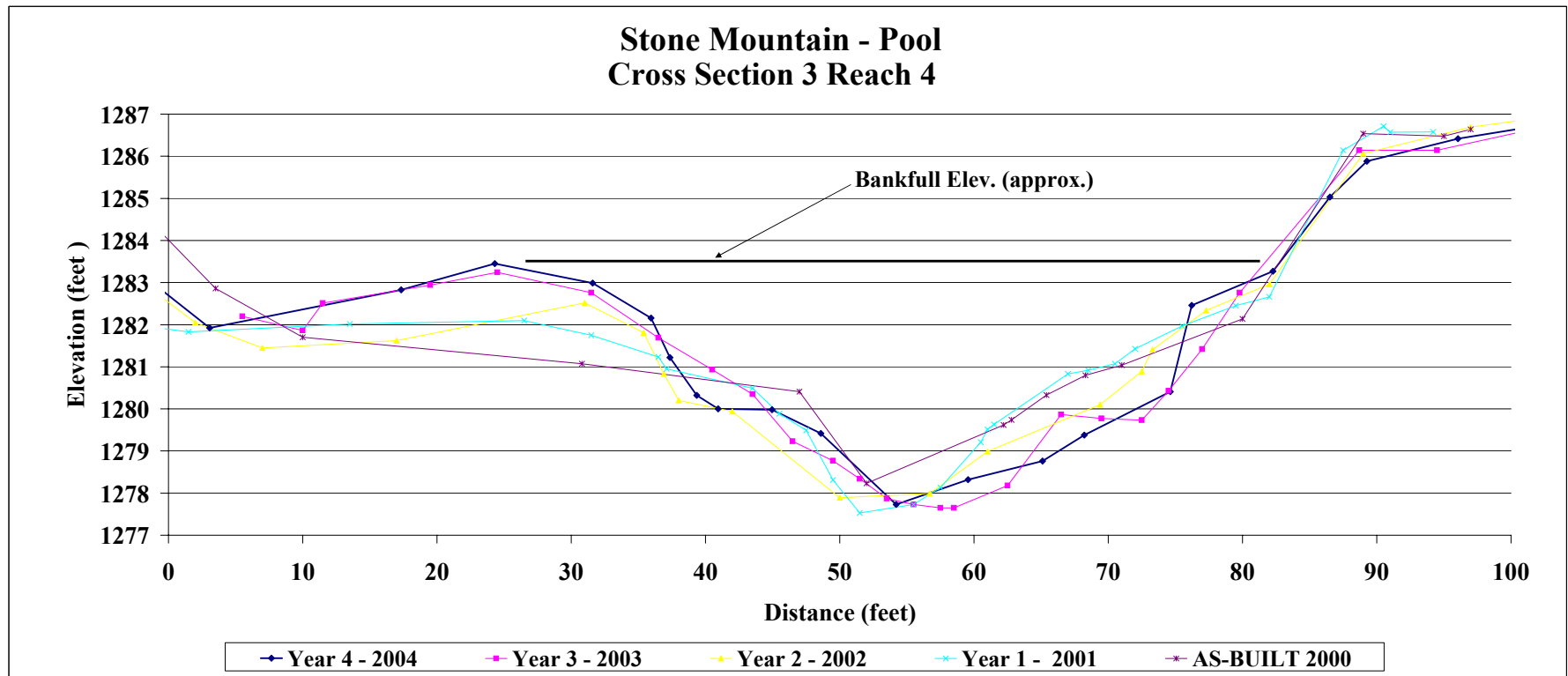
Project Name	Stone Mountain
Cross Section	Reach 4 Cross-Section 3
Feature	Pool
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-6.9	1284.4		5.5	1282.2		-8.0	1284.5	Left Pin	-12.5	1284.5		-3.0	1285.0	
3.1	1281.9		10.0	1281.9		2.0	1282.1		-8.5	1283.8		3.5	1282.9	LBKF
17.3	1282.8		11.5	1282.5		7.0	1281.5		-6.5	1283.0		10.0	1281.7	
24.3	1283.5		19.5	1282.9		17.0	1281.6		-2.5	1282.0		30.8	1281.1	
31.6	1283.0		24.5	1283.2	top bar	31.0	1282.5		1.5	1281.8		47.0	1280.4	
36.0	1282.2		31.5	1282.8		35.4	1281.8		13.5	1282.0		52.0	1278.2	
37.4	1281.2		36.5	1281.7		36.9	1280.8		26.5	1282.1		62.2	1279.6	
39.3	1280.3	Water	40.5	1280.9		38.0	1280.2		31.5	1281.8		62.8	1279.7	
41.0	1280.0		43.5	1280.4	lew	42.0	1279.9		36.5	1281.2		65.4	1280.3	
45.0	1280.0		46.5	1279.2		50.0	1277.9		37.1	1281.0		68.3	1280.8	
48.6	1279.4		49.5	1278.8		56.7	1278.0		43.5	1280.5		71.0	1281.0	
54.2	1277.7		51.5	1278.3		61.0	1279.0		45.5	1279.9		80.0	1282.1	
59.6	1278.3		53.5	1277.9		69.4	1280.1		47.5	1279.5		89.0	1286.5	RBKF
65.1	1278.8		55.5	1277.7		72.5	1280.9		49.5	1278.3		95.0	1286.5	
68.2	1279.4		57.5	1277.7		73.3	1281.4		51.5	1277.5		97.0	1286.6	
74.6	1280.4	Water	58.5	1277.7		77.3	1282.3		55.5	1277.7				
76.2	1282.5		62.5	1278.2		82.0	1283.0		57.5	1278.1				
82.3	1283.3		66.5	1279.9		89.0	1286.1		60.5	1279.2				
86.5	1285.0		69.5	1279.8		97.0	1286.7		61.0	1279.5				
89.3	1285.9		72.5	1279.7		104.0	1287.0	Right Pin	61.5	1279.6				
96.0	1286.4		74.5	1280.4	rew	113.2	1297.8		67.0	1280.8				
107.2	1287.0		77.0	1281.4					68.5	1280.9				
114.0	1287.8	Right Pin	79.8	1282.8					70.5	1281.1				
118.3	1288.2		88.7	1286.1					72.0	1281.4				
			94.5	1286.1					75.5	1282.0				
			103.5	1286.8					79.5	1282.5				
			114.0	1287.8	Right Pin				82.0	1282.7				
			114.0	1287.7					87.5	1286.1				
									90.5	1286.7				



Photo of Cross-Section 3 - Reach 4 - Looking Downstream @ STA 16+35

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	162.2	173.0	181.3	170.0	183.9
Width	58.0	61.3	65.0	66.0	70.0
Mean Depth	2.8	2.8	2.8	2.6	2.6
Max Depth	5.5	5.6	5.4	5.7	5.0
W/D	20.7	21.7	23.3	25.6	26.7



Project Name	Stone Mountain
Cross Section	Reach 4 Cross-Section 4
Feature	Riffle
Date	11/18/04
Crew	Bidelspach, Clinton

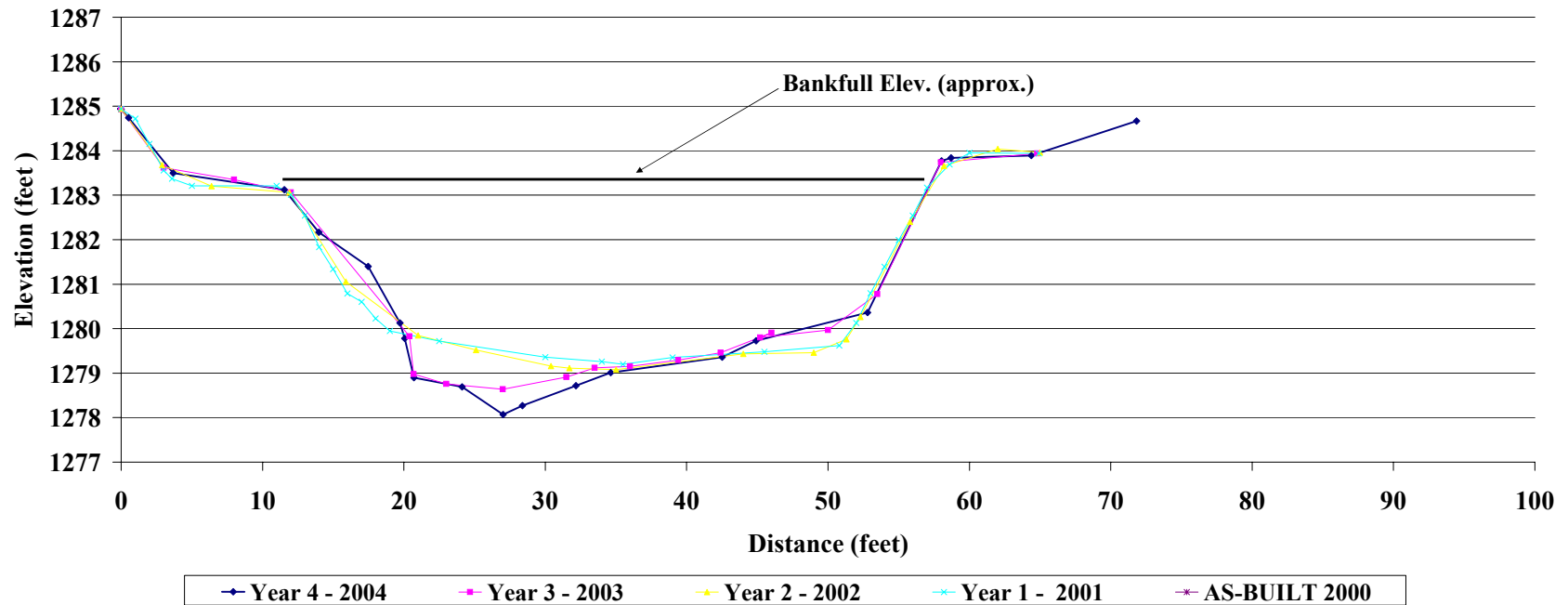
Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-47.0	1287.2		0.0	1284.9	Left Pin	0.0	1284.9	Left Pin	0.0	1284.9	Left Pin			
-28.9	1287.3		3.0	1283.6		2.9	1283.7		1.0	1284.7				
-17.6	1285.8		8.0	1283.4		6.4	1283.2		2.0	1284.2				
0.0	1284.9	Left Pin	12.0	1283.1		11.9	1283.1		3.0	1283.6				
0.5	1284.7		20.4	1279.8		15.9	1281.1		3.6	1283.4				
3.7	1283.5		20.7	1279.0		21.0	1279.9		5.0	1283.2				
11.5	1283.1		23.0	1278.8		25.1	1279.5		11.0	1283.2	LBKF			
14.0	1282.2		27.0	1278.6		30.4	1279.2		12.0	1283.0				
17.5	1281.4		31.5	1278.9		31.7	1279.1		13.0	1282.5				
19.7	1280.1		33.5	1279.1		35.0	1279.1		14.0	1281.8				
20.1	1279.8	Water	36.0	1279.2		44.0	1279.4		15.0	1281.3				
20.7	1278.9		39.4	1279.3		49.0	1279.5		16.0	1280.8				
24.1	1278.7		42.4	1279.5		51.3	1279.8		17.0	1280.6				
27.0	1278.1		46.0	1279.9		52.3	1280.3		18.0	1280.2				
28.4	1278.3	Thalweg	45.2	1279.8		55.8	1282.4		19.0	1280.0				
32.2	1278.7		50.0	1280.0		58.2	1283.7		22.5	1279.7				
34.6	1279.0		53.5	1280.8		62.0	1284.0		30.0	1279.4				
42.5	1279.4		58.0	1283.7		65.0	1284.0	Right Pin	34.0	1279.3				
44.9	1279.7	Water	64.8	1283.9	Right Pin				35.5	1279.2				
52.8	1280.4								39.0	1279.4				
58.0	1283.8	Bankfull							45.5	1279.5				
58.7	1283.8								50.8	1279.6				
64.4	1283.9	Right Pin							52.0	1280.1				
71.8	1284.7								53.0	1280.8				
									54.0	1281.4				
									55.0	1282.0				
									56.0	1282.5				
									57.0	1283.2	RBKF			
									58.6	1283.7				



Photo of Cross-Section 4 - Reach 4 - Looking Downstream @ STA 20+00

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	140.4	139.1	140.7	139.7	
Width	46.5	45.5	45.9	46.0	
Mean Depth	3.0	3.1	3.1	3.0	
Max Depth	5.0	4.5	4.0	3.9	
W/D	15.4	14.9	15.0	15.1	

Stone Mountain - Riffle Cross Section 4 Reach 4



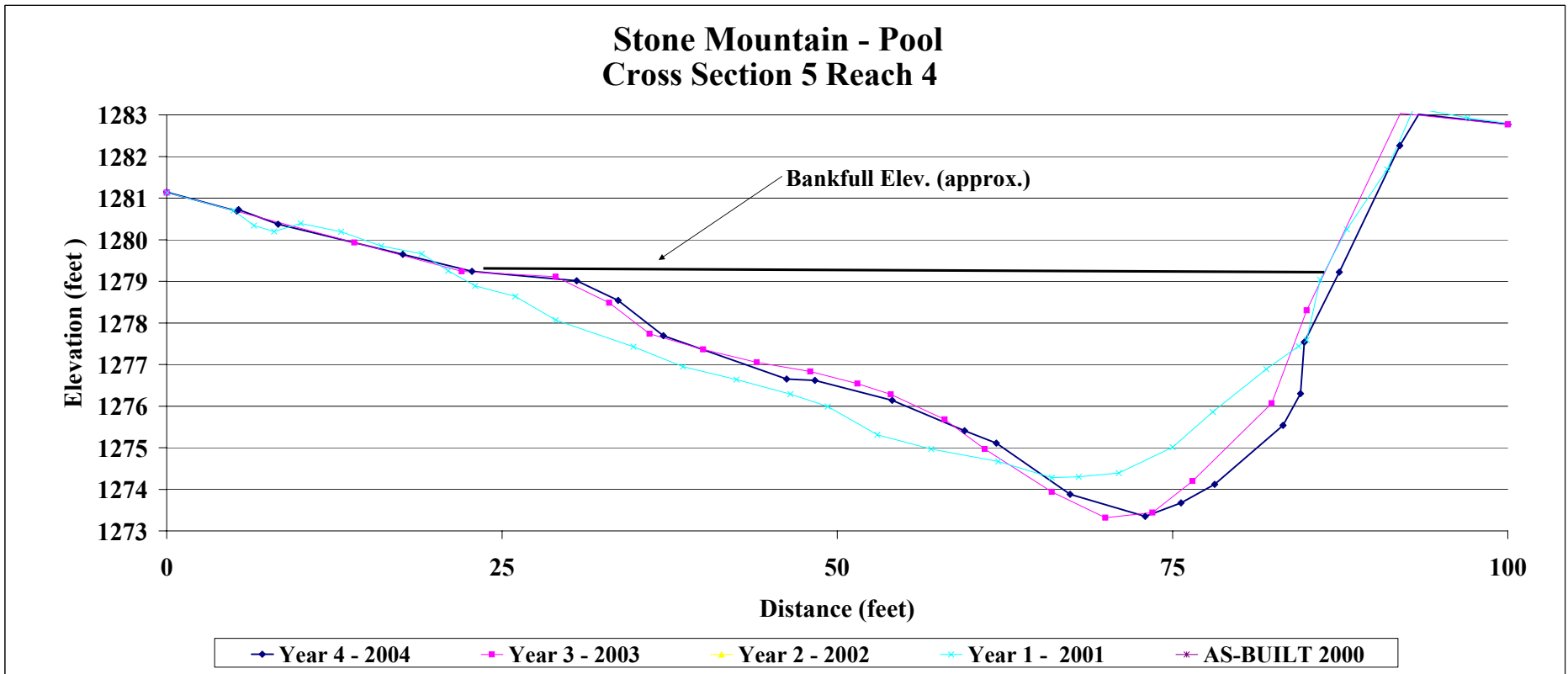
Project Name	Stone Mountain
Cross Section	Reach 4 Cross-Section 5
Feature	Pool
Date	11/18/04
Crew	Bidelspach, Clinton

Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-37.8	1280.7		0.0	1281.1			0.0	1281.1						
-18.3	1281.6		14.0	1279.9			5.0	1280.7						
-7.6	1281.6		22.0	1279.2			6.5	1280.3						
0.0	1281.1	Left Pin	29.0	1279.1			8.0	1280.2						
5.2	1280.7		33.0	1278.5			10.0	1280.4						
5.4	1280.7	Bankfull	36.0	1277.7			13.0	1280.2						
8.3	1280.4		40.0	1277.4			16.0	1279.9						
17.6	1279.7		44.0	1277.1			19.0	1279.7						
22.8	1279.2		48.0	1276.8			21.0	1279.3	LBKF					
30.6	1279.0		51.5	1276.5			23.0	1278.9						
33.7	1278.5		54.0	1276.3			26.0	1278.6						
37.0	1277.7		58.0	1275.7			29.0	1278.1						
46.2	1276.7		61.0	1275.0			34.8	1277.4						
48.3	1276.6		66.0	1273.9			38.5	1277.0						
54.1	1276.1		70.0	1273.3			42.5	1276.6						
59.5	1275.4		73.5	1273.4			46.5	1276.3						
61.9	1275.1		76.5	1274.2			49.3	1276.0						
67.4	1273.9		82.4	1276.1	rew		53.0	1275.3						
73.0	1273.4		85.0	1278.3			57.0	1275.0						
75.6	1273.7		92.0	1283.0	rtob		62.0	1274.7						
78.2	1274.1		100.0	1282.8	tpin		66.0	1274.3						
83.2	1275.5						68.0	1274.3						
84.6	1276.3						71.0	1274.4						
84.8	1277.5						75.0	1275.0						
87.4	1279.2						78.0	1275.9						
92.0	1282.3						82.0	1276.9						
93.4	1283.0						84.4	1277.4						
100.9	1282.8						85.0	1277.6						
101.2	1282.8	Right Pin					86.0	1279.0	RBKF					



Photo of Cross-Section 5 - Reach 4 - Looking Downstream @ STA 24+10

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	182.6	175.1		183.6	
Width	56.9	56.0		60.0	
Mean Depth	3.2	3.1		3.1	
Max Depth	5.8	5.8		4.8	
W/D	17.7	17.9		19.6	



Project Name	Stone Mountain
Cross Section	Reach 4 Cross-Section 7
Feature	Pool
Date	11/18/04
Crew	Bidelspach, Clinton

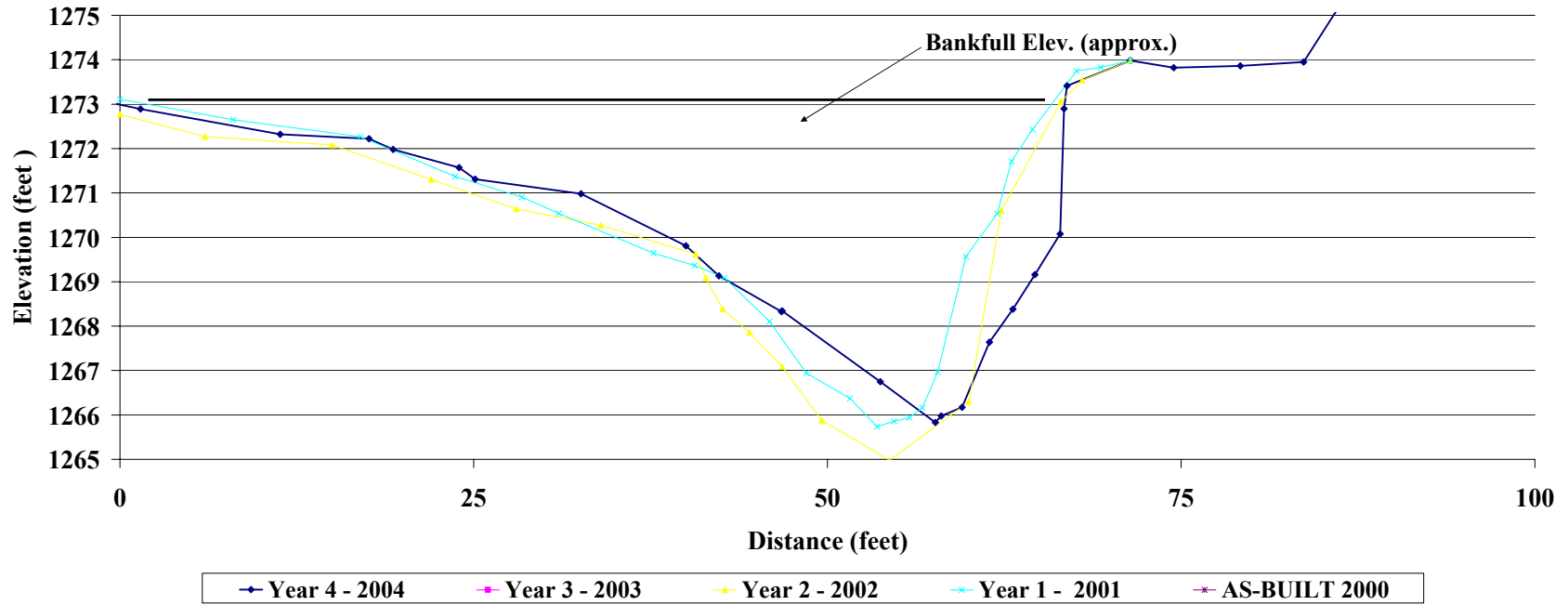
Year 4 - 2004 2004 Survey			Year 3 - 2003 2003 Survey			Year 2 - 2002 2002 Survey			Year 1 - 2001 2001 Survey			AS-BUILT 2000 AS-BUILT Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-22.6	1274.3			0.0	1272.8		0.0	1273.1	0.0	1272.7	LBKF			
-10.5	1273.7			6.0	1272.3		8.0	1272.3	8.0	1272.3				
1.4	1272.9			15.0	1272.1		17.0	1272.3	17.0	1272.3				
11.3	1272.3			22.0	1271.3		23.7	1271.4	23.7	1271.4				
17.6	1272.2	Bankfull		28.0	1270.6		28.4	1270.9	28.4	1270.9				
19.3	1272.0			34.0	1270.3		31.0	1270.5	31.0	1270.5				
24.0	1271.6			40.7	1269.6		37.7	1269.6	37.7	1269.6				
25.1	1271.3			41.4	1269.1	LEW	40.6	1269.4	40.6	1269.4				
32.6	1271.0			42.6	1268.4		42.7	1269.1	42.7	1269.1				
40.0	1269.8			44.5	1267.9		45.9	1268.1	45.9	1268.1				
42.3	1269.1	Water		46.8	1267.1		48.5	1266.9	48.5	1266.9				
46.8	1268.3			49.6	1265.9		51.6	1266.4	51.6	1266.4				
46.8	1268.3			54.4	1265.0		53.5	1265.7	53.5	1265.7				
53.7	1266.8			60.0	1266.3		54.7	1265.9	54.7	1265.9				
57.6	1265.8	Max Pool		62.3	1270.6		55.8	1265.9	55.8	1265.9				
58.1	1266.0			66.5	1273.1	RTOB	56.7	1266.2	56.7	1266.2				
59.5	1266.2			68.0	1273.5		57.8	1267.0	57.8	1267.0				
61.4	1267.6			71.4	1274.0	RPIN	59.8	1269.6	59.8	1269.6				
63.1	1268.4						62.0	1270.5	62.0	1270.5				
64.7	1269.2	Water					63.0	1271.7	63.0	1271.7				
66.5	1270.1						64.5	1272.4	64.5	1272.4				
66.7	1272.9						67.6	1273.8	67.6	1273.8	RBKF			
66.9	1273.4						69.3	1273.8	69.3	1273.8				
71.4	1274.0	Right Pin					71.4	1274.0	71.4	1274.0				
74.5	1273.8													
79.2	1273.9													
83.7	1274.0													
93.7	1278.9													
113.2	1279.0													



Photo of Cross-Section 7 - Reach 4 - Looking Downstream @ STA 32+70

	Year 4 - 2004	Year 3 - 2003	Year 2 - 2002	Year 1 - 2001	AS-BUILT 2000
Area	200.2		217.8	186.1	
Width	71.5		71.4	71.4	
Mean Depth	2.8		3.1	2.6	
Max Depth	7.4		8.2	7.5	
W/D	25.5		23.4	27.4	

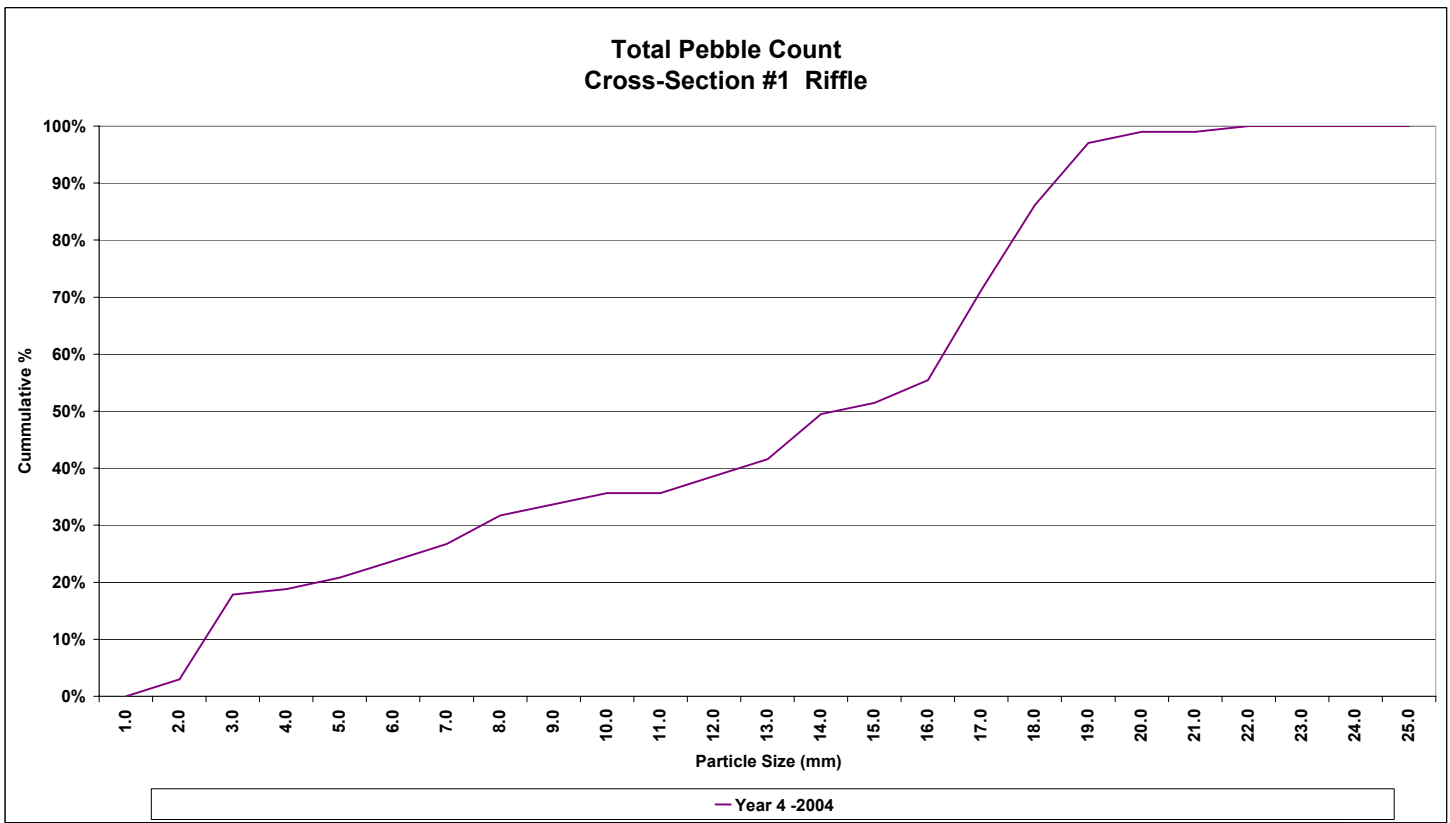
Stone Mountain - Pool Cross Section 7 Reach 4



Project Name	Stone Mountain Reach 2
Cross Section	#1
Feature	Riffle
Date	1/6/05
Crew	Baldpach, Clinton

Description	Material	As-Built -2000			Year 4 -2004			
		Size (mm)	Riffle - Bed	%	Riffle - Bank	Riffle - Bed	%	
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0.0%	
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	3	3.0%	
	fine sand	0.125	0	#DIV/0!	#DIV/0!	12	14.9%	
	medium sand	0.25	0	#DIV/0!	#DIV/0!	1	1.0%	
	course sand	0.50	0	#DIV/0!	#DIV/0!	2	2.0%	
	very course sand	1.0	0	#DIV/0!	#DIV/0!	3	3.0%	
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	3	3.0%	
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	5	5.0%	
	medium gravel	5.7	0	#DIV/0!	#DIV/0!	2	2.0%	
	course gravel	8.0	0	#DIV/0!	#DIV/0!	2	2.0%	
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0.0%	
	course gravel	16.0	0	#DIV/0!	#DIV/0!	3	3.0%	
	very course gravel	22.8	0	#DIV/0!	#DIV/0!	3	3.0%	
	very course gravel	32	0	#DIV/0!	#DIV/0!	8	7.9%	
	very course gravel	45	0	#DIV/0!	#DIV/0!	2	2.0%	
	very course gravel	64	0	#DIV/0!	#DIV/0!	4	4.0%	
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	4	4.0%	
	medium cobble	90	0	#DIV/0!	#DIV/0!	16	15.8%	
	large cobble	128	0	#DIV/0!	#DIV/0!	15	14.9%	
	very large cobble	180	0	#DIV/0!	#DIV/0!	11	10.9%	
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	2	2.0%	
	medium boulder	362	0	#DIV/0!	#DIV/0!	0	0.0%	
	large boulder	512	0	#DIV/0!	#DIV/0!	1	1.0%	
	very large boulder	1024	0	#DIV/0!	#DIV/0!	0	0.0%	
Bedrock	bedrock	2049	0	#DIV/0!	#DIV/0!	0	0.0%	
	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0.0%	
TOTAL / %of whole count			0	#DIV/0!		15	86	100.0%

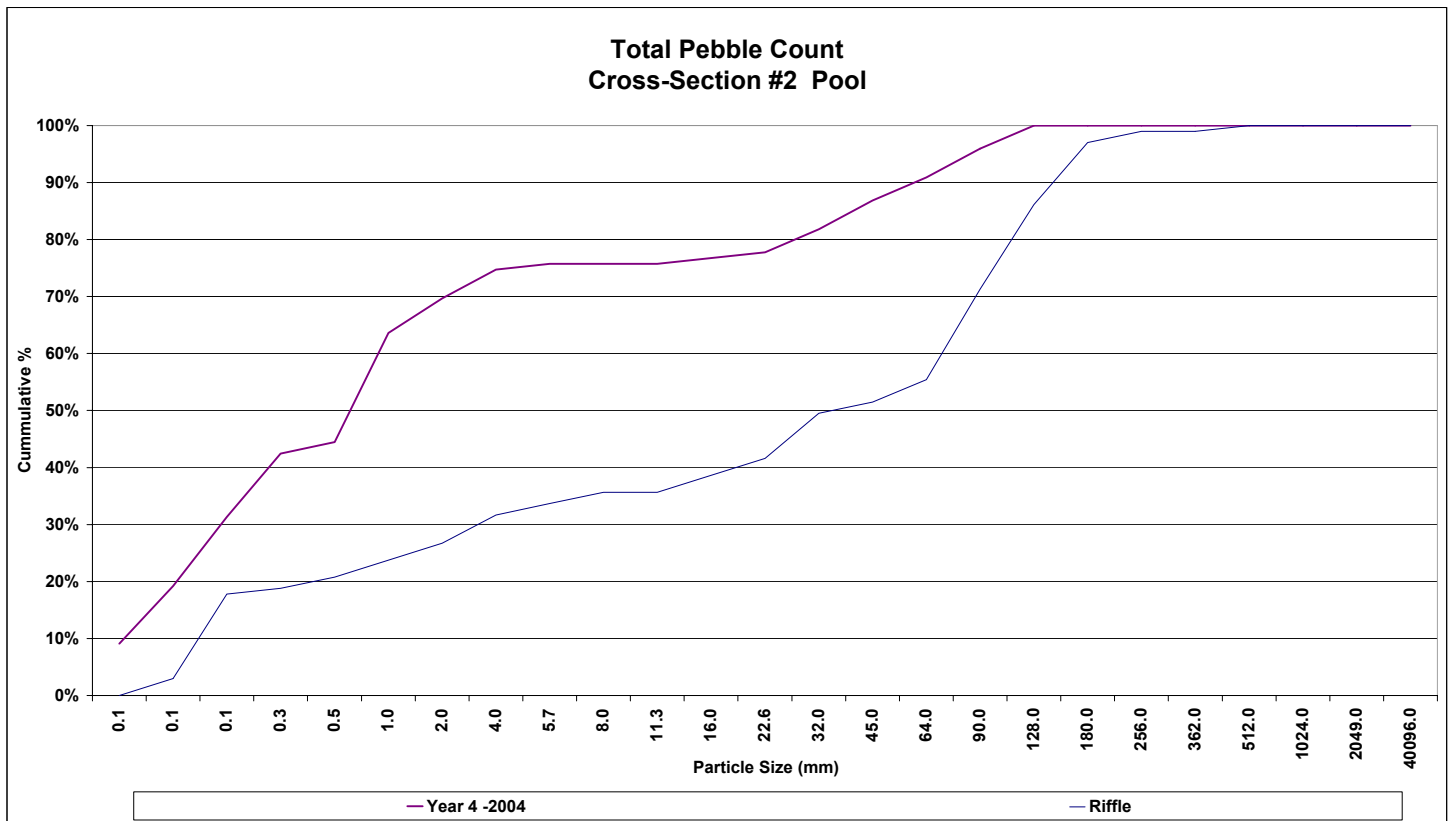
	d16	d35	d50	d85	d95
Year 4 -2004	0.18	8.74	42.50	147.52	206.07



Project Name	Stone Mountain Reach 2
Cross Section	#2
Feature	Pool
Date	1/6/05
Crew	Baldspach, Clinton

Description	Material	Size (mm)	As-Built -2000		Year 4 -2004		%	Cum %	
			Pool - Bed	%	Pool - Bank	Pool - Bed			
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	9	0	9.1%	9.1%
	very fine sand	0.062	0	#DIV/0!	#DIV/0!	10	0	10.1%	19.2%
Sand	fine sand	0.125	0	#DIV/0!	#DIV/0!	10	2	12.1%	31.3%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	10	1	11.1%	42.4%
	course sand	0.50	0	#DIV/0!	#DIV/0!	0	2	2.0%	44.4%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	0	19	19.2%	63.6%
	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	0	6	6.1%	69.7%
Gravel	fine gravel	4.0	0	#DIV/0!	#DIV/0!	0	5	5.1%	74.7%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	0	1	1.0%	75.8%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	75.8%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	0	0	0.0%	75.8%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	1	1.0%	76.8%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	1	1.0%	77.8%
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	4	4.0%	81.8%
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	5	5.1%	86.9%
	small cobble	64	0	#DIV/0!	#DIV/0!	0	4	4.0%	90.9%
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	5	5.1%	96.0%
Cobble	large cobble	128	0	#DIV/0!	#DIV/0!	0	4	4.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count						39	60	100.0%	100.0%

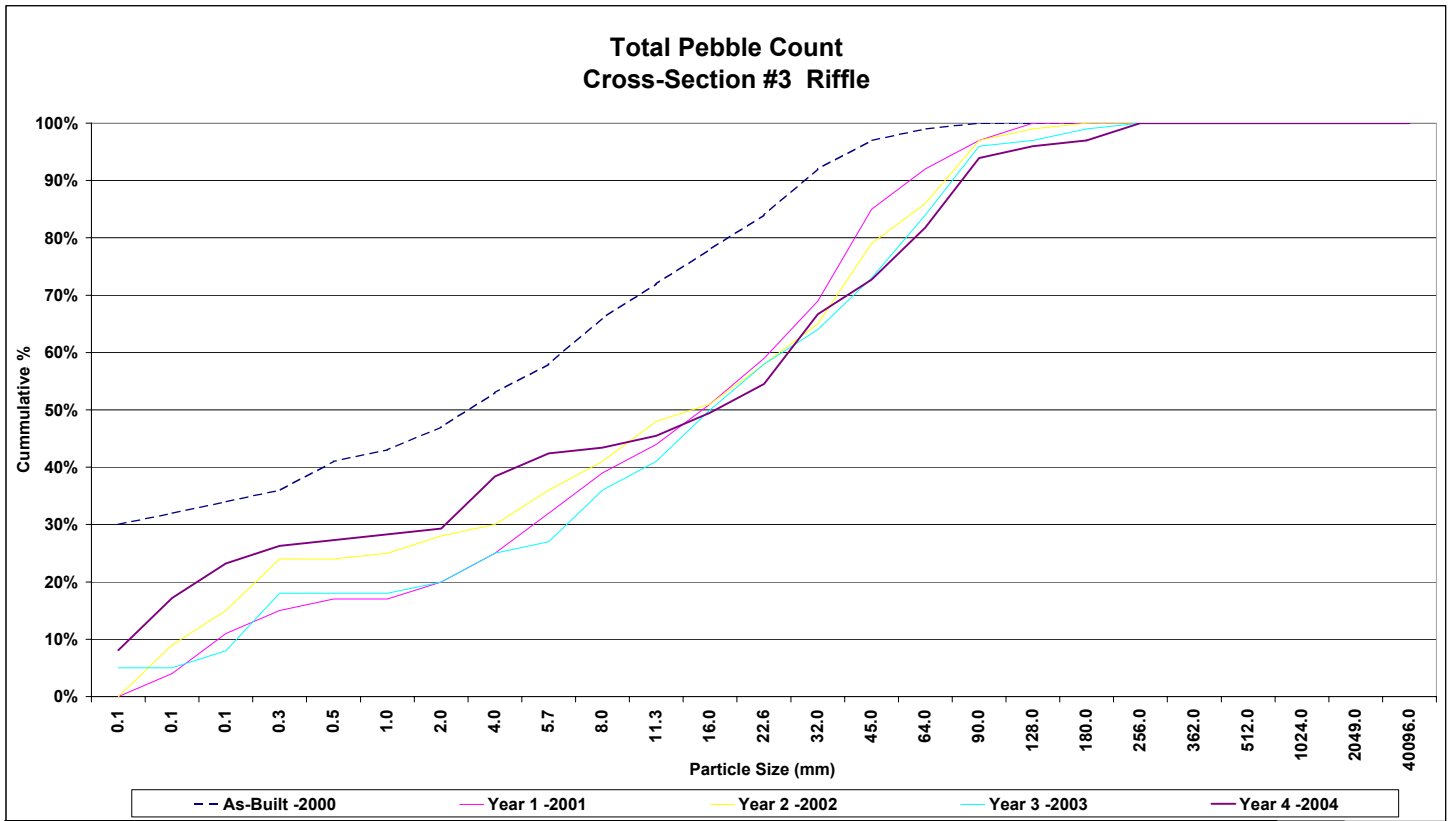
	d16	d35	d50	d85	d95
Year 4 -2004	0.08	0.25	0.97	45.41	102.92



Project Name	Stone Mountain Reach 2
Cross Section	#3
Feature	Riffle
Date	1/6/05
Crew	Baldspach, Clinton

Description	Material	As-Built -2000				Year 1 -2001				Year 2 -2002				Year 3 -2003				Year 4 -2004			
		Riffle - Bed	%	Cum %	%	Riffle - Bed	%	Cum %	%	Riffle - Bed	%	Cum %	%	Riffle - Bed	%	Cum %	Riffle - Bank	Riffle - Bed	%	Cum %	
Silt/Clay	all/clay	0.061	30	30.0%	30.0%	0	0.0%	0.0%	0	0.0%	0.0%	0.0%	5	5.0%	5.0%	8	8.1%	8.1%			
	very fine sand	0.062	2	2.0%	32.0%	4	4.0%	4.0%	9	9.0%	9.0%	0	0.0%	5.0%	9	9.1%	17.2%				
	fine sand	0.125	2	2.0%	34.0%	7	7.0%	11.0%	6	6.0%	15.0%	3	3.0%	8.0%	4	4.0%	21.2%				
	medium sand	0.25	2	2.0%	36.0%	4	4.0%	15.0%	9	9.0%	24.0%	10	10.0%	18.0%	0	0.0%	26.3%				
	course sand	0.50	5	5.0%	41.0%	2	2.0%	17.0%	0	0.0%	24.0%	0	0.0%	18.0%	0	0.0%	27.3%				
Gravel	very course sand	1.0	2	2.0%	43.0%	0	0.0%	17.0%	1	1.0%	25.0%	0	0.0%	18.0%	0	0.0%	28.3%				
	very fine gravel	2.0	4	4.0%	47.0%	3	3.0%	20.0%	3	3.0%	28.0%	2	2.0%	20.0%	0	0.0%	29.3%				
	fine gravel	4.0	6	6.0%	53.0%	5	5.0%	25.0%	2	2.0%	30.0%	5	5.0%	25.0%	0	0.0%	31.3%				
	fine gravel	5.7	5	5.0%	58.0%	7	7.0%	32.0%	6	6.0%	36.0%	2	2.0%	27.0%	0	0.0%	32.4%				
	medium gravel	8.0	8	8.0%	66.0%	7	7.0%	39.0%	5	5.0%	41.0%	9	9.0%	36.0%	0	0.0%	33.4%				
	medium gravel	11.3	6	6.0%	72.0%	5	5.0%	44.0%	7	7.0%	48.0%	5	5.0%	41.0%	0	0.0%	34.5%				
	course gravel	16.0	6	6.0%	78.0%	7	7.0%	51.0%	3	3.0%	51.0%	9	9.0%	50.0%	0	0.0%	35.5%				
	course gravel	22.6	6	6.0%	84.0%	8	8.0%	59.0%	7	7.0%	58.0%	8	8.0%	58.0%	0	0.0%	36.5%				
	very course gravel	32	8	8.0%	92.0%	10	10.0%	69.0%	7	7.0%	65.0%	6	6.0%	64.0%	0	0.0%	37.5%				
	very course gravel	45	5	5.0%	97.0%	16	16.0%	85.0%	14	14.0%	79.0%	9	9.0%	73.0%	0	0.0%	38.5%				
	small cobble	64	2	2.0%	99.0%	7	7.0%	92.0%	7	7.0%	86.0%	11	11.0%	84.0%	0	0.0%	39.5%				
	medium cobble	90	1	1.0%	100.0%	5	5.0%	97.0%	11	11.0%	97.0%	12	12.0%	96.0%	0	0.0%	40.5%				
	large cobble	128	0	0.0%	100.0%	3	3.0%	100.0%	2	2.0%	99.0%	1	1.0%	97.0%	0	0.0%	41.5%				
very large cobble	180	0	0.0%	100.0%	0	0.0%	100.0%	1	1.0%	100.0%	2	2.0%	99.0%	0	0.0%	42.5%					
Boulder	small boulder	256	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	1	1.0%	100.0%	0	0.0%	43.5%				
	small boulder	362	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	44.5%				
	medium boulder	512	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	45.5%				
	large boulder	1024	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	46.5%				
	very large boulder	2049	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	47.5%				
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	100.0%	0	0.0%	48.5%				
TOTAL / % of whole count			100	100.0%		100	100.0%		100	100.0%		100	100.0%		21	78	100.0%				

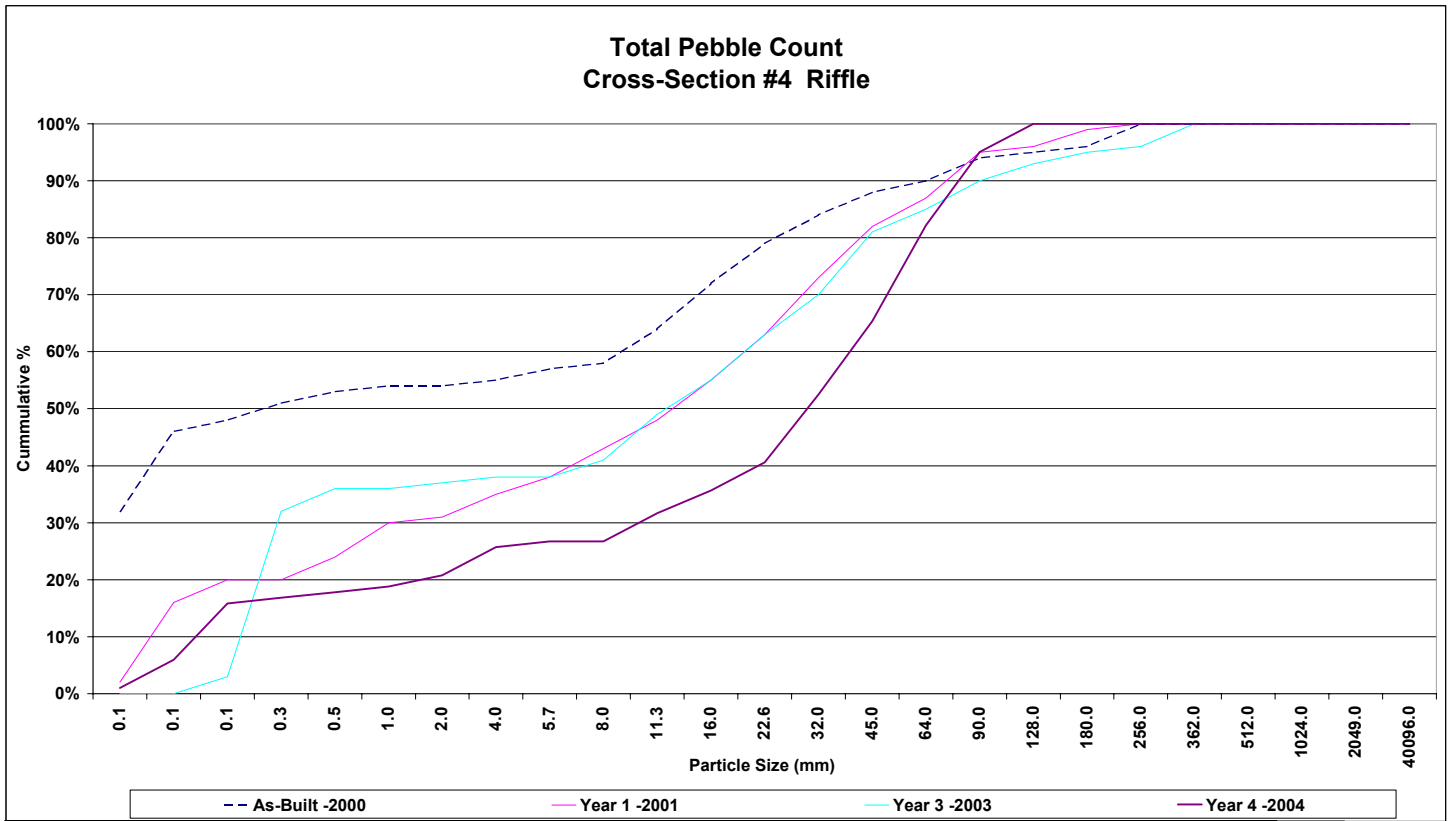
	d16	d35	d50	d85	d95
As-Built -2000	0.00	0.28	1.93	27.30	48.10
Year 4 -2004	0.09	4.16	20.10	82.76	132.62



Project Name	Stone Mountain Reach 2
Cross Section	#4
Feature	Riffle
Date	1/6/05
Crew	Baldspach, Clinton

Description	Material	As-Built -2000				Year 1 -2001			Year 2 -2002			Year 3 -2003			Year 4 -2004		
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %
Silt/Clay	all/clay	0.061	32	32.0%	32.0%	2	2.0%	2.0%	0	#DIV/0!	#DIV/0!	0	0.0%	0.0%	1	1.0%	1.0%
	very fine sand	0.062	14	14.0%	46.0%	14	14.0%	16.0%	0	#DIV/0!	#DIV/0!	0	0.0%	0.0%	5	5.0%	5.9%
	fine sand	0.125	2	2.0%	48.0%	4	4.0%	20.0%	0	#DIV/0!	#DIV/0!	3	3.0%	3.0%	10	10.0%	15.8%
	medium sand	0.25	3	3.0%	51.0%	0	0.0%	20.0%	0	#DIV/0!	#DIV/0!	29	29.0%	32.0%	1	1.0%	16.8%
	course sand	0.50	2	2.0%	53.0%	4	4.0%	24.0%	0	#DIV/0!	#DIV/0!	4	4.0%	36.0%	1	1.0%	17.8%
Gravel	very course sand	1.0	1	1.0%	54.0%	6	6.0%	30.0%	0	#DIV/0!	#DIV/0!	0	0.0%	36.0%	0	0.0%	18.8%
	very fine gravel	2.0	0	0.0%	54.0%	1	1.0%	31.0%	0	#DIV/0!	#DIV/0!	1	1.0%	37.0%	0	0.0%	20.8%
	fine gravel	4.0	1	1.0%	55.0%	4	4.0%	35.0%	0	#DIV/0!	#DIV/0!	1	1.0%	38.0%	0	0.0%	25.7%
	fine gravel	5.7	2	2.0%	57.0%	3	3.0%	38.0%	0	#DIV/0!	#DIV/0!	0	0.0%	38.0%	0	0.0%	26.7%
	medium gravel	8.0	1	1.0%	58.0%	5	5.0%	43.0%	0	#DIV/0!	#DIV/0!	3	3.0%	41.0%	0	0.0%	26.7%
	medium gravel	11.3	6	6.0%	64.0%	5	5.0%	48.0%	0	#DIV/0!	#DIV/0!	8	8.0%	49.0%	0	0.0%	31.7%
	course gravel	16.0	8	8.0%	72.0%	7	7.0%	55.0%	0	#DIV/0!	#DIV/0!	6	6.0%	55.0%	1	1.0%	35.6%
	course gravel	22.6	7	7.0%	79.0%	8	8.0%	63.0%	0	#DIV/0!	#DIV/0!	8	8.0%	63.0%	1	1.0%	40.6%
	very course gravel	32	5	5.0%	84.0%	10	10.0%	73.0%	0	#DIV/0!	#DIV/0!	7	7.0%	70.0%	0	0.0%	52.5%
	very course gravel	45	4	4.0%	88.0%	9	9.0%	82.0%	0	#DIV/0!	#DIV/0!	11	11.0%	81.0%	0	0.0%	65.3%
	small cobble	64	2	2.0%	90.0%	5	5.0%	87.0%	0	#DIV/0!	#DIV/0!	4	4.0%	85.0%	0	0.0%	82.2%
	medium cobble	90	4	4.0%	94.0%	8	8.0%	95.0%	0	#DIV/0!	#DIV/0!	5	5.0%	90.0%	0	0.0%	85.0%
	large cobble	128	1	1.0%	95.0%	1	1.0%	96.0%	0	#DIV/0!	#DIV/0!	3	3.0%	93.0%	0	0.0%	100.0%
very large cobble	180	1	1.0%	96.0%	3	3.0%	99.0%	0	#DIV/0!	#DIV/0!	2	2.0%	95.0%	0	0.0%	100.0%	
Boulder	small boulder	256	4	4.0%	100.0%	1	1.0%	100.0%	0	#DIV/0!	#DIV/0!	1	1.0%	96.0%	0	0.0%	100.0%
	small boulder	362	0	0.0%	100.0%	0	0.0%	100.0%	0	#DIV/0!	#DIV/0!	4	4.0%	100.0%	0	0.0%	100.0%
	medium boulder	512	0	0.0%	100.0%	0	0.0%	100.0%	0	#DIV/0!	#DIV/0!	0	0.0%	100.0%	0	0.0%	100.0%
	large boulder	1024	0	0.0%	100.0%	0	0.0%	100.0%	0	#DIV/0!	#DIV/0!	0	0.0%	100.0%	0	0.0%	100.0%
	very large boulder	2049	0	0.0%	100.0%	0	0.0%	100.0%	0	#DIV/0!	#DIV/0!	0	0.0%	100.0%	0	0.0%	100.0%
Bedrock	bedrock	40096	0	0.0%	100.0%	0	0.0%	100.0%	0	#DIV/0!	#DIV/0!	0	0.0%	100.0%	0	0.0%	100.0%
TOTAL / % of whole count			100	100.0%		100	100.0%		0	0.0%		100	100.0%		20	81	100.0%

	d16	d35	d50	d65	d95
As-Built -2000	0.00	0.07	0.31	38.50	154.00
Year 4 -2004	0.22	18.38	36.17	81.53	108.88



Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description	Point	Station	Elevation	Description
384	6.76	1285.12	Thalweg	383	-143.18	1287.18	Water	550	-252.48	1290.54	LBKF	553	-243.69	1290.46	RBKF
382	18.05	1285.06	Thalweg	387	-121.54	1287.17	Water	545	-208.17	1289.88	LBKF	549	-218.03	1289.54	RBKF
386	21.59	1285.06	Thalweg	385	-112.72	1287.14	Water	541	-143.02	1289.85	LBKF	551	-207.49	1289.99	RBKF
400	29.77	1285.02	Head of Pool	395	6.7	1287.15	Water	539	99.9	1289.6	LBKF	547	-201.02	1290.11	RBKF
390	47.88	1284.99	ground	536	27.19	1287.13	Water	533	6.44	1286.06	LBKF	544	-150.56	1290.16	RBKF
398	47.95	1283.56	Max Pool	401	29.47	1287.13	Water	529	52.2	1289.41	LBKF	543	-103.17	1290.28	RBKF
402	65.57	1284.42	ground	391	47.93	1287.04	Water	517	80.45	1286.56	LBKF	540	67.74	1289.94	RBKF
388	71.1	1285.05	Max Pool	399	48.97	1287.01	Water	522	125.1	1289.69	LBKF	534	49.41	1289.75	RBKF
404	85.2	1285.12	Thalweg	403	66.11	1287.01	Water	511	250.79	1289.19	LBKF	532	24.22	1290.57	RBKF
406	103.5	1285.76	Thalweg	389	71.19	1287.09	Water	510	288.6	1289.18	LBKF	530	9.76	1289.37	RBKF
410	120.3	1285.34	Head of Pool	405	85.19	1286.99	Water	508	334.83	1287.83	LBKF	527	34.01	1289.27	RBKF
412	129.02	1284.5	Max Pool	407	103.49	1287	Water	504	449.94	1287.19	LBKF	525	114.1	1288.1	RBKF
414	139.48	1284.94	ground	409	103.74	1287	Water	500	501.86	1287.61	LBKF	518	173.45	1287.79	RBKF
417	154.24	1285.3	Thalweg	411	122.42	1286.71	Water	660	588.85	1289.58	LBKF	514	201.42	1288.52	RBKF
421	159.91	1285.42	Thalweg	413	129.02	1286.69	Water	659	630.62	1289.59	LBKF	512	242.22	1288.14	RBKF
419	175.82	1285.25	Thalweg	415	139.6	1286.72	Water	646	652.74	1289.55	LBKF	503	380.17	1288.2	RBKF
423	186.5	1285.38	Thalweg	418	154.38	1286.73	Water	645	719.02	1289.37	LBKF	501	446.33	1287.5	RBKF
425	206.85	1285.5	Thalweg	422	159.83	1286.69	Water	644	759.5	1288.84	LBKF	497	505.08	1286.94	RBKF
427	231.23	1285.41	Thalweg	519	172.44	1286.69	Water	643	809.77	1288.06	LBKF	494	595.54	1286.87	RBKF
429	243.92	1285.01	Head of Pool	520	173.56	1286.58	Water	638	857.32	1288.11	LBKF	729	845.18	1288.15	RBKF
431	253.47	1284.58	Max Pool	420	175.57	1286.62	Water	811	1037.09	1288.13	LBKF	621	845.18	1288.15	RBKF
433	269.24	1284.84	ground	424	188.82	1286.62	Water	812	1114.83	1288.07	LBKF	620	896.39	1287.51	RBKF
435	287.62	1285.28	Thalweg	426	207.63	1286.67	Water	813	1216.17	1286.64	LBKF	728	896.39	1287.51	RBKF
437	315.48	1285.45	Head of Riffle	430	231.34	1286.52	Water	814	1254.14	1285.83	LBKF	727	921.19	1287.69	RBKF
439	346.58	1285.53	Thalweg	432	243.65	1286.55	Water	815	1341.46	1283.26	LBKF	726	942.87	1287.69	RBKF
441	372.75	1284.94	Thalweg	434	253.21	1286.57	Water	816	1385.09	1283.4	LBKF	619	921.19	1287.69	RBKF
474	394.82	1284.72	Thalweg	436	269.56	1286.53	Water	940	1395.28	1284.67	LBKF	726	943.87	1287.34	RBKF
476	410.97	1284.62	Thalweg	438	287.38	1286.45	Water	817	1432.25	1283.53	LBKF	725	953.31	1286.68	RBKF
478	437.56	1284.27	Thalweg	438	315.78	1286.35	Water	936	1487.24	1282.88	LBKF	617	953.31	1286.68	RBKF
480	453.56	1284.11	Thalweg	507	342.96	1285.93	Water	937	1537.77	1282.61	LBKF	616	975.21	1287.36	RBKF
482	482.03	1283.56	Thalweg	440	345.9	1285.89	Water	938	1636.9	1282.93	LBKF	724	975.21	1287.36	RBKF
484	500.33	1283.13	Thalweg	505	348.96	1285.87	Water	939	1684.28	1283.38	LBKF	615	1026.08	1287.43	RBKF
486	512.27	1282.92	Head of Pool	442	372.87	1285.65	Water	947	1788.79	1282.57	LBKF	723	1026.08	1287.43	RBKF
488	523.14	1282.47	Max Pool	475	395.02	1285.46	Water	944	1919.15	1284.27	LBKF	810	1090.56	1288.35	RBKF
490	548.1	1282.85	ground	477	411.15	1285.31	Water	904	1979.69	1283.72	LBKF	809	1130.48	1287.81	RBKF
677	556.31	1283.1	Thalweg	479	437.46	1285.2	Water	903	2015.12	1284.76	LBKF	808	1180.98	1286.27	RBKF
569	556.31	1283.14	Thalweg	481	453.48	1285.06	Water	1073	2038.29	1283.52	LBKF	821	1214.58	1284.24	RBKF
492	563.8	1283.12	Thalweg	483	482.33	1284.87	Water	902	2056.85	1283.35	LBKF	820	1267.17	1285.71	RBKF
652	597.56	1283.34	Thalweg	485	500.26	1284.86	Water	1074	2069.06	1282.87	LBKF	807	1300.42	1284.18	RBKF
654	621.16	1282.85	Head of Pool	499	502.21	1284.81	Water	1076	2098.67	1282.99	LBKF	819	1313.38	1285.1	RBKF
656	638.92	1281.75	Max Pool	498	506.97	1284.7	Water	1077	2111.19	1282.87	LBKF	806	1358.95	1284.28	RBKF
657	661.1	1281.69	Thalweg	489	512.37	1284.74	Water	1079	2121.02	1282.93	LBKF	818	1371.83	1284.5	RBKF
570	674.66	1281.29	Max Pool	487	523.15	1284.81	Water	1080	2125.17	1282.7	LBKF	805	1399.5	1283.71	RBKF
678	674.66	1281.29	Max Pool	491	547.96	1284.73	Water	1082	2139.14	1282.27	LBKF	804	1453.87	1283.62	RBKF
601	700.02	1281.72	Thalweg	493	563.62	1284.73	Water	1083	2155.06	1282.2	LBKF	803	1492.51	1283.88	RBKF
709	700.02	1281.72	Thalweg	651	564.97	1284.61	Water	1085	2171.26	1282.07	LBKF	802	1543.94	1283.42	RBKF
602	730.75	1283.19	Head of Glide	653	613.4	1284.61	Water	1086	2183.98	1281.49	LBKF	935	1579.62	1285.87	RBKF
710	730.75	1283.19	Head of Glide	655	630.12	1284.58	Water	1088	2251.44	1282.6	LBKF	934	1619.4	1285.74	RBKF
711	748.83	1283.02	Thalweg	658	666.8	1284.63	Water	1096	2322.2	1280.95	LBKF	933	1641.35	1285.08	RBKF
603	748.83	1283.02	Thalweg	668	693.6	1284.66	Water	1089	2326.31	1279.46	LBKF	932	1670.85	1284.46	RBKF
712	765.33	1281.56	Max Pool	580	693.6	1284.66	Water	1095	2333.8	1280.72	LBKF	931	1764.44	1284.11	RBKF
604	765.33	1281.56	Max Pool	698	696.75	1284.63	Water	1090	2343.24	1278.57	LBKF	930	1851.86	1285.25	RBKF
713	789.53	1281.43	Thalweg	590	696.75	1284.63	Water	1091	2407.56	1278.79	LBKF	929	1885.69	1285.07	RBKF
605	789.53	1281.43	Thalweg	625	759.62	1284.66	Water	1092	2428.33	1279.06	LBKF	928	1956.33	1283.77	RBKF
714	812.56	1282.74	Head of Glide	626	771.81	1284.61	Water	1094	2447.23	1280.03	LBKF	927	2024.07	1283.68	RBKF
606	812.56	1282.74	Head of Glide	627	798.89	1284.63	Water	1156	2466.08	1281.62	LBKF	1069	2028.99	1282.91	RBKF
715	830.56	1283.68	Head of Riffle	628	835.87	1284.58	Water	1093	2474.85	1278.52	LBKF	1068	2072.53	1282.78	RBKF
607	830.56	1283.68	Head of Riffle	630	871.67	1284.08	Water	1155	2509.23	1280.7	LBKF	1067	2115	1282.25	RBKF
716	867.1	1283.29	Head of Run	630	886.63	1283.96	Water	1154	2519.73	1280.58	LBKF	1063	2280.23	1280.91	RBKF
608	867.1	1283.29	Head of Run	631	904.91	1283.93	Water	1153	2523.29	1279.42	LBKF	1058	2400.12	1280.74	RBKF
717	902.33	1281.34	Thalweg	632	919.37	1283.86	Water	1147	2535.5	1277.57	LBKF	1057	2407.02	1279.98	RBKF
609	902.33	1281.34	Thalweg	634	978.35	1283.78	Water	1148	2550.9	1278.04	LBKF	1056	2411.15	1279.77	RBKF

Station	Elevation	Description	Station	Elevation	Description	Station	Elevation	Description	Station	Elevation	Description
162.0	1305.79	2003-Thalweg	169.0	1305.9	2002-Thalweg	162.0	1306.3	2001-Thalweg	162.0	1306.0	2000-Thalweg
179.0	1306.02	2003-Thalweg	215.0	1305.5	2002-Thalweg	200.0	1305.3	2001-Thalweg	224.0	1305.3	2000-Thalweg
195.0	1306.11	2003-Thalweg	226.0	1305.3	2002-Thalweg	227.0	1305.0	2001-Thalweg	258.0	1304.2	2000-Thalweg
232.5	1304.78	2003-Thalweg	249.0	1304.6	2002-Thalweg	239.0	1304.3	2001-Thalweg	287.0	1302.4	2000-Thalweg
258.5	1304.43	2003-Thalweg	257.0	1304.2	2002-Thalweg	277.0	1302.0	2001-Thalweg	365.4	1304.8	2000-Thalweg
278.0	1303.39	2003-Thalweg	271.0	1302.3	2002-Thalweg	316.0	1305.0	2001-Thalweg	387.0	1302.2	2000-Thalweg
297.0	1302.67	2003-Thalweg	279.0	1302.9	2002-Thalweg	365.0	1304.9	2001-Thalweg	404.7	1304.0	2000-Thalweg
335.0	1304.67	2003-Thalweg	292.0	1302.5	2002-Thalweg	390.0	1302.3	2001-Thalweg	505.6	1303.7	2000-Thalweg
364.5	1304.91	2003-Thalweg	295.0	1302.6	2002-Thalweg	402.0	1303.2	2001-Thalweg	576.9	1301.6	2000-Thalweg
370.7	1304.17	2003-Thalweg	296.0	1302.3	2002-Thalweg	455.7	1303.3	2001-Thalweg	602.3	1302.8	2000-Thalweg
406.9	1303.68	2003-Thalweg	305.0	1302.6	2002-Thalweg	488.9	1303.8	2001-Thalweg	665.7	1304.0	2000-Thalweg
427.4	1303.93	2003-Thalweg	315.0	1303.3	2002-Thalweg	514.8	1302.6	2001-Thalweg	691.0	1303.3	2000-Thalweg
461.8	1303.78	2003-Thalweg	328.0	1302.7	2002-Thalweg	595.6	1303.1	2001-Thalweg	726.0	1303.8	2000-Thalweg
497.7	1303.88	2003-Thalweg	333.0	1303.4	2002-Thalweg	668.7	1304.3	2001-Thalweg	747.0	1302.0	2000-Thalweg
512.4	1303.23	2003-Thalweg	336.6	1304.6	2002-Thalweg	726.0	1303.8	2001-Thalweg	759.0	1301.6	2000-Thalweg
531.4	1302.25	2003-Thalweg	343.0	1303.7	2002-Thalweg	742.0	1300.7	2001-Thalweg	782.0	1303.0	2000-Thalweg
559.7	1301.82	2003-Thalweg	354.8	1303.5	2002-Thalweg	763.0	1301.9	2001-Thalweg	882.0	1302.3	2000-Thalweg
603.8	1301.68	2003-Thalweg	362.1	1304.9	2002-Thalweg	782.0	1303.2	2001-Thalweg	910.0	1303.5	2000-Thalweg
623.5	1303.33	2003-Thalweg	366.6	1304.2	2002-Thalweg	890.0	1302.0	2001-Thalweg	942.0	1302.0	2000-Thalweg
655.0	1302.91	2003-Thalweg	372.1	1303.0	2002-Thalweg	896.0	1301.2	2001-Thalweg	987.0	1300.7	2000-Thalweg
726.0	1303.55	2003-Thalweg	379.4	1302.4	2002-Thalweg	933.0	1301.9	2001-Thalweg	1002.0	1299.3	2000-Thalweg
732.0	1303.28	2003-Thalweg	393.9	1303.3	2002-Thalweg	987.0	1300.3	2001-Thalweg	1025.0	1300.6	2000-Thalweg
761.5	1302.54	2003-Thalweg	403.9	1303.8	2002-Thalweg	1015.0	1301.2	2001-Thalweg	1059.0	1299.4	2000-Thalweg
769.0	1302.73	2003-Thalweg	456.6	1303.4	2002-Thalweg	1060.0	1300.5	2001-Thalweg	1073.0	1300.9	2000-Thalweg
812.0	1302.65	2003-Thalweg	494.8	1302.9	2002-Thalweg	1104.0	1301.1	2001-Thalweg	1124.0	1300.1	2000-Thalweg
839.0	1302.59	2003-Thalweg	514.8	1302.1	2002-Thalweg	1136.0	1301.3	2001-Thalweg	1187.0	1300.7	2000-Thalweg
886.0	1302.01	2003-Thalweg	546.6	1301.6	2002-Thalweg	1187.0	1301.0	2001-Thalweg	1231.0	1300.6	2000-Thalweg
896.0	1301.38	2003-Thalweg	562.0	1300.9	2002-Thalweg	1203.0	1301.1	2001-Thalweg	1243.0	1300.2	2000-Thalweg
908.0	1300.48	2003-Thalweg	572.9	1301.9	2002-Thalweg	1253.0	1300.4	2001-Thalweg	1289.0	1300.8	2000-Thalweg
930.0	1301.57	2003-Thalweg	609.3	1302.4	2002-Thalweg	1263.0	1300.5	2001-Thalweg	1317.0	1299.8	2000-Thalweg
973.0	1301.08	2003-Thalweg	621.1	1303.6	2002-Thalweg	1317.0	1299.7	2001-Thalweg	1330.0	1297.7	2000-Thalweg
984.0	1300.15	2003-Thalweg	652.0	1303.9	2002-Thalweg	1324.0	1298.9	2001-Thalweg	1344.0	1298.9	2000-Thalweg
1010.0	1299.94	2003-Thalweg	726.0	1303.8	2002-Thalweg	1351.0	1298.8	2001-Thalweg	1352.0	1299.1	2000-Thalweg
1039.0	1300.42	2003-Thalweg	729.0	1302.8	2002-Thalweg	1387.0	1298.4	2001-Thalweg	1387.0	1298.4	2000-Thalweg
1058.0	1300.99	2003-Thalweg	738.0	1302.4	2002-Thalweg	1417.0	1297.8	2001-Thalweg	1404.0	1296.9	2000-Thalweg
1094.0	1301.13	2003-Thalweg	767.0	1302.4	2002-Thalweg	1470.0	1296.6	2001-Thalweg	1417.0	1297.8	2000-Thalweg
1097.0	1300.1	2003-Thalweg	774.0	1303.0	2002-Thalweg	1511.0	1296.4	2001-Thalweg	1470.0	1296.8	2000-Thalweg
1115.0	1299.42	2003-Thalweg	851.0	1302.8	2002-Thalweg	1521.0	1295.9	2001-Thalweg	1511.0	1294.5	2000-Thalweg
1135.0	1300.83	2003-Thalweg	872.0	1302.2	2002-Thalweg						
1158.0	1299.77	2003-Thalweg	881.0	1302.0	2002-Thalweg						
1200.0	1300.71	2003-Thalweg	886.0	1301.1	2002-Thalweg						
1217.0	1300.39	2003-Thalweg	901.0	1300.7	2002-Thalweg						
1223.0	1300.05	2003-Thalweg	904.0	1300.2	2002-Thalweg						
1241.0	1298.96	2003-Thalweg	922.0	1300.5	2002-Thalweg						
1273.0	1299.67	2003-Thalweg	928.0	1301.7	2002-Thalweg						
1317.0	1300.23	2003-Thalweg	963.0	1301.1	2002-Thalweg						
1324.0	1297.63	2003-Thalweg	976.0	1300.9	2002-Thalweg						
1329.0	1297.6	2003-Thalweg	982.0	1299.8	2002-Thalweg						
1357.0	1298.03	2003-Thalweg	993.0	1299.6	2002-Thalweg						
1364.0	1298.33	2003-Thalweg	1007.0	1299.7	2002-Thalweg						
1387.2	1299.01	2003-Thalweg	1038.0	1299.9	2002-Thalweg						
1392.0	1298.57	2003-Thalweg	1052.0	1300.7	2002-Thalweg						
1401.0	1297.07	2003-Thalweg	1067.0	1300.9	2002-Thalweg						
1417.0	1296.5	2003-Thalweg	1084.0	1300.6	2002-Thalweg						
1425.0	1296.54	2003-Thalweg	1096.0	1300.5	2002-Thalweg						
			1101.0	1300.4	2002-Thalweg						
			1107.5	1300.0	2002-Thalweg						
			1115.0	1299.6	2002-Thalweg						
			1126.0	1300.5	2002-Thalweg						
			1148.0	1300.1	2002-Thalweg						
			1190.0	1300.5	2002-Thalweg						
			1213.0	1300.5	2002-Thalweg						
			1222.0	1300.7	2002-Thalweg						
			1236.0	1299.8	2002-Thalweg						
			1260.0	1299.7	2002-Thalweg						
			1272.0	1300.3	2002-Thalweg						
			1317.0	1299.8	2002-Thalweg						
			1325.0	1297.9	2002-Thalweg						
			1333.0	1298.1	2002-Thalweg						
			1361.0	1298.3	2002-Thalweg						
			1384.0	1298.8	2002-Thalweg						
			1387.0	1298.4	2002-Thalweg						
			1418.0	1297.2	2002-Thalweg						
			1426.0	1297.0	2002-Thalweg						
			1458.0	1296.1	2002-Thalweg						
			1464.0	1296.6	2002-Thalweg						
			1508.0	1295.1	2002-Thalweg						

Station	Elevation	Description	Station	Elevation	Description	Station	Elevation	Description	Station	Elevation	Description
-466.1	1286.3	2003-Thalweg	-466.1	1287.4	2002-Thalweg	-466.1	1288.1	2001-Thalweg	-466.1	1288.9	2000-Thalweg
-461.1	1287.1	2003-Thalweg	-461.1	1286.6	2002-Thalweg	-461.1	1286.7	2001-Thalweg	-462.1	1287.6	2000-Thalweg
-383.1	1287.0	2003-Thalweg	-451.8	1285.6	2002-Thalweg	-451.1	1286.3	2001-Thalweg	-449.1	1287.4	2000-Thalweg
-363.1	1283.4	2003-Thalweg	-433.1	1287.6	2002-Thalweg	-437.1	1288.3	2001-Thalweg	-419.1	1289.5	2000-Thalweg
-333.1	1286.6	2003-Thalweg	-383.1	1286.4	2002-Thalweg	-388.1	1287.6	2001-Thalweg	-382.6	1287.1	2000-Thalweg
-295.1	1286.3	2003-Thalweg	-363.1	1283.7	2002-Thalweg	-382.6	1286.4	2001-Thalweg	-343.1	1288.2	2000-Thalweg
-146.1	1285.6	2003-Thalweg	-331.1	1286.6	2002-Thalweg	-378.6	1287.1	2001-Thalweg	-306.1	1287.2	2000-Thalweg
-79.1	1283.9	2003-Thalweg	-306.1	1286.5	2002-Thalweg	-362.1	1283.9	2001-Thalweg	-166.1	1285.4	2000-Thalweg
-1.1	1284.7	2003-Thalweg	-262.1	1285.8	2002-Thalweg	-344.1	1286.6	2001-Thalweg	-40.1	1285.0	2000-Thalweg
60.9	1283.0	2003-Thalweg	-198.4	1285.6	2002-Thalweg	-336.1	1287.4	2001-Thalweg	39.9	1285.0	2000-Thalweg
98.9	1286.4	2003-Thalweg	-166.1	1285.7	2002-Thalweg	-306.1	1286.5	2001-Thalweg	110.9	1286.6	2000-Thalweg
118.9	1284.7	2003-Thalweg	-118.1	1285.4	2002-Thalweg	-292.1	1285.3	2001-Thalweg	123.9	1284.5	2000-Thalweg
123.9	1283.8	2003-Thalweg	-45.2	1285.5	2002-Thalweg	-263.1	1286.0	2001-Thalweg	144.9	1286.3	2000-Thalweg
144.9	1284.9	2003-Thalweg	-28.1	1285.3	2002-Thalweg	-235.1	1286.2	2001-Thalweg	186.9	1285.3	2000-Thalweg
258.9	1284.9	2003-Thalweg	37.9	1284.1	2002-Thalweg	-173.1	1285.6	2001-Thalweg	224.9	1286.4	2000-Thalweg
508.9	1282.5	2003-Thalweg	61.2	1284.7	2002-Thalweg	-146.1	1285.6	2001-Thalweg	248.9	1286.8	2000-Thalweg
618.9	1282.6	2003-Thalweg	78.9	1284.1	2002-Thalweg	-116.1	1286.1	2001-Thalweg	422.9	1285.2	2000-Thalweg
647.9	1281.2	2003-Thalweg	86.9	1285.3	2002-Thalweg	-79.1	1286.0	2001-Thalweg	469.9	1284.8	2000-Thalweg
684.9	1280.8	2003-Thalweg	95.9	1286.0	2002-Thalweg	-42.1	1285.2	2001-Thalweg	663.9	1283.8	2000-Thalweg
718.9	1281.7	2003-Thalweg	107.9	1284.3	2002-Thalweg	11.9	1286.1	2001-Thalweg	767.9	1283.9	2000-Thalweg
735.9	1282.6	2003-Thalweg	133.9	1285.3	2002-Thalweg	41.9	1284.8	2001-Thalweg	848.9	1282.4	2000-Thalweg
752.9	1281.4	2003-Thalweg	151.5	1285.8	2002-Thalweg	82.9	1284.6	2001-Thalweg	860.4	1282.9	2000-Thalweg
776.9	1280.9	2003-Thalweg	217.6	1285.3	2002-Thalweg	102.9	1286.6	2001-Thalweg	875.9	1284.0	2000-Thalweg
808.9	1280.0	2003-Thalweg	307.9	1285.6	2002-Thalweg	113.9	1286.3	2001-Thalweg	907.9	1284.3	2000-Thalweg
828.9	1282.0	2003-Thalweg	339.1	1285.3	2002-Thalweg	119.9	1284.8	2001-Thalweg	995.9	1283.6	2000-Thalweg
837.9	1283.6	2003-Thalweg	379.3	1284.9	2002-Thalweg	138.9	1285.7	2001-Thalweg	1136.9	1283.5	2000-Thalweg
868.9	1283.2	2003-Thalweg	484.9	1283.7	2002-Thalweg	148.9	1286.4	2001-Thalweg	1158.9	1282.5	2000-Thalweg
882.9	1283.1	2003-Thalweg	534.9	1283.4	2002-Thalweg	166.9	1286.4	2001-Thalweg	1251.9	1281.4	2000-Thalweg
892.9	1282.3	2003-Thalweg	556.4	1283.1	2002-Thalweg	194.9	1285.9	2001-Thalweg	1345.9	1280.5	2000-Thalweg
905.9	1281.3	2003-Thalweg	608.9	1283.8	2002-Thalweg	257.9	1286.1	2001-Thalweg	1351.9	1279.2	2000-Thalweg
927.9	1280.6	2003-Thalweg	619.9	1283.4	2002-Thalweg	298.9	1286.3	2001-Thalweg	1353.9	1279.5	2000-Thalweg
949.9	1280.6	2003-Thalweg	665.9	1281.0	2002-Thalweg	398.9	1285.3	2001-Thalweg	1367.9	1278.2	2000-Thalweg
1002.9	1282.6	2003-Thalweg	708.9	1282.0	2002-Thalweg	415.9	1285.3	2001-Thalweg	1391.9	1280.4	2000-Thalweg
1070.9	1282.1	2003-Thalweg	713.9	1282.3	2002-Thalweg	448.9	1284.9	2001-Thalweg	1413.9	1279.1	2000-Thalweg
1124.9	1282.8	2003-Thalweg	739.6	1283.0	2002-Thalweg	524.9	1284.1	2001-Thalweg	1433.9	1278.7	2000-Thalweg
1140.9	1278.6	2003-Thalweg	757.9	1282.5	2002-Thalweg	585.9	1284.1	2001-Thalweg	1450.9	1279.6	2000-Thalweg
1180.9	1280.0	2003-Thalweg	818.9	1282.6	2002-Thalweg	637.9	1284.4	2001-Thalweg	1504.9	1279.9	2000-Thalweg
1221.9	1279.7	2003-Thalweg	837.9	1283.5	2002-Thalweg	662.9	1282.6	2001-Thalweg	1578.9	1277.3	2000-Thalweg
1256.9	1280.0	2003-Thalweg	867.9	1282.4	2002-Thalweg	678.9	1283.0	2001-Thalweg	1633.9	1278.6	2000-Thalweg
1273.9	1279.6	2003-Thalweg	915.9	1283.5	2002-Thalweg	704.9	1283.7	2001-Thalweg	1856.9	1276.5	2000-Thalweg
1310.9	1279.6	2003-Thalweg	983.9	1282.9	2002-Thalweg	732.9	1283.6	2001-Thalweg	1901.9	1280.6	2000-Thalweg
1348.9	1279.0	2003-Thalweg	1124.9	1283.0	2002-Thalweg	752.9	1284.5	2001-Thalweg	2009.9	1279.2	2000-Thalweg
1362.9	1279.9	2003-Thalweg	1138.9	1279.4	2002-Thalweg	781.9	1284.0	2001-Thalweg	2080.9	1277.8	2000-Thalweg
1390.9	1279.2	2003-Thalweg	1163.9	1280.4	2002-Thalweg	823.9	1283.8	2001-Thalweg	2113.9	1277.6	2000-Thalweg
1408.9	1279.9	2003-Thalweg	1220.9	1281.3	2002-Thalweg	856.9	1284.3	2001-Thalweg	2217.9	1278.9	2000-Thalweg
1419.9	1278.4	2003-Thalweg	1259.9	1280.4	2002-Thalweg	862.9	1283.4	2001-Thalweg	2244.9	1277.2	2000-Thalweg
1450.9	1279.5	2003-Thalweg	1331.9	1280.0	2002-Thalweg	872.9	1284.5	2001-Thalweg	2252.9	1278.8	2000-Thalweg
1549.9	1278.3	2003-Thalweg	1340.9	1278.5	2002-Thalweg	891.9	1284.3	2001-Thalweg	2279.9	1278.5	2000-Thalweg
1567.9	1276.3	2003-Thalweg	1345.9	1279.8	2002-Thalweg	911.9	1284.6	2001-Thalweg	2410.9	1273.6	2000-Thalweg
1590.9	1276.7	2003-Thalweg	1371.9	1279.6	2002-Thalweg	960.9	1283.9	2001-Thalweg	2529.9	1278.1	2000-Thalweg
1595.9	1276.1	2003-Thalweg	1408.9	1280.0	2002-Thalweg	1040.9	1283.3	2001-Thalweg	2565.9	1275.5	2000-Thalweg
1602.9	1279.6	2003-Thalweg	1421.9	1278.4	2002-Thalweg	1115.9	1283.2	2001-Thalweg	2611.9	1275.7	2000-Thalweg
1623.9	1276.9	2003-Thalweg	1442.9	1279.5	2002-Thalweg	1137.9	1283.8	2001-Thalweg	2629.9	1274.7	2000-Thalweg
1653.9	1278.7	2003-Thalweg	1472.9	1279.6	2002-Thalweg	1153.9	1280.3	2001-Thalweg	2653.9	1275.5	2000-Thalweg
1679.9	1277.7	2003-Thalweg	1541.9	1278.7	2002-Thalweg	1167.9	1280.6	2001-Thalweg	2728.9	1273.3	2000-Thalweg
1741.9	1278.7	2003-Thalweg	1565.9	1276.3	2002-Thalweg	1200.9	1282.1	2001-Thalweg	2768.9	1272.7	2000-Thalweg
1781.9	1277.6	2003-Thalweg	1613.9	1280.0	2002-Thalweg	1266.9	1281.6	2001-Thalweg	2777.9	1271.9	2000-Thalweg
1825.9	1275.9	2003-Thalweg	1633.9	1276.8	2002-Thalweg	1292.9	1281.5	2001-Thalweg	2809.9	1273.2	2000-Thalweg
1856.9	1277.5	2003-Thalweg	1655.9	1278.1	2002-Thalweg	1353.9	1281.0	2001-Thalweg	2838.9	1273.1	2000-Thalweg
1869.9	1276.4	2003-Thalweg	1697.4	1278.6	2002-Thalweg	1365.9	1279.5	2001-Thalweg	2931.9	1271.8	2000-Thalweg
1898.9	1278.0	2003-Thalweg	1717.9	1278.2	2002-Thalweg	1373.9	1280.4	2001-Thalweg	2983.9	1269.9	2000-Thalweg
1950.9	1278.4	2003-Thalweg	1758.9	1278.9	2002-Thalweg	1388.9	1279.0	2001-Thalweg	3003.9	1268.8	2000-Thalweg
1955.9	1278.2	2003-Thalweg	1843.9	1276.8	2002-Thalweg	1397.9	1280.3	2001-Thalweg	3011.9	1269.7	2000-Thalweg
2015.9	1278.2	2003-Thalweg	1886.9	1278.9	2002-Thalweg	1416.9	1280.5	2001-Thalweg	3091.9	1271.6	2000-Thalweg
2084.9	1278.9	2003-Thalweg	1910.9	1279.5	2002-Thalweg	1439.9	1281.1	2001-Thalweg	3103.9	1270.4	2000-Thalweg
2131.9	1275.6	2003-Thalweg	1933.9	1279.4	2002-Thalweg	1451.9	1279.2	2001-Thalweg	3121.9	1271.6	2000-Thalweg
2172.9	1276.7	2003-Thalweg	2003.9	1278.9	2002-Thalweg	1466.9	1280.6	2001-Thalweg	3201.9	1270.3	2000-Thalweg
2210.9	1277.7	2003-Thalweg	2086.9	1278.5	2002-Thalweg	1502.9	1280.4	2001-Thalweg	3240.9	1269.7	2000-Thalweg
2234.9	1275.3	2003-Thalweg	2100.9	1279.0	2002-Thalweg	1530.9	1280.4	2001-Thalweg	3296.9	1268.3	2000-Thalweg
2256.9	1276.4	2003-Thalweg	2111.9	1276.5	2002-Thalweg	1561.9	1279.2	2001-Thalweg	3321.9	1268.7	2000-Thalweg
2322.9	1276.9	2003-Thalweg	2152.9	1276.4	2002-Thalweg	1591.9	1276.9	2001-Thalweg	3335.9	1267.5	2000-Thalweg
2389.9	1275.4	2003-Thalweg	2177.9	1277.7	2002-Thalweg	1605.9	1277.4	2001-Thalweg	3356.9	1268.8	2000-Thalweg
2489.9	1272.6	2003-Thalweg	2233.9	1278.2	2002-Thalweg	1631.9	1279.4	2001-Thalweg	3441.9	1267.5	2000-Thalweg
2541.9	1276.5	2003-Thalweg	2251.9	1278.1	2002-Thalweg	1648.9	1277.6	2001-Thalweg	3486.9	1268.9	2000-Thalweg
2548.9	1272.7	2003-Thalweg	2271.9	1276.0	2002-Thalweg	1668.9	1278.9	2001-Thalweg	3514.9	1268.3	2000-Thalweg
2575.9	1275.3	2003-Thalweg	2299.9	1277.4	2002-Thalweg	1687.9	1279.8	2001-Thalweg	3526.9	1266.2	2000-Thalweg
2631.9	1271.8	2003-Thalweg	2344.9	1277.0	2002-Thalweg	1701.9	1279.0	2001-Thalweg	3552.9	1266.9	2000-Thalweg
2717.9	1273.6	2003-Thalweg	2363.9	1275.5	2002-Thalweg	1737.9	1279.1	2001-Thalweg			

EAST PRONG ROARING RIVER
STREAM RESTORATION,
Wilkes County, North Carolina

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NC ECOSYSTEM
ENHANCEMENT PROGRAM

*ANNUAL MONITORING REPORT
ADDENDUM*

Prepared by:
North Carolina State University, Water Quality Group,
NC Stream Restoration Institute

NC STATE UNIVERSITY



For:
Ecosystem Enhancement Program



MARCH 30, 2004

2003 Addendum to the Stone Mountain River Restoration Monitoring Report

1 *Purpose*

Morphological field investigation and data analysis was conducted on September 24, 2003 and January 7, 2004 in order to monitor the post construction morphology on the East Prong Roaring River stream restoration site. A three-person team from NCSU performed the field reconnaissance. A geomorphic survey was completed. The monitoring results include assessment of stream bank stability as well as stream morphology. Field reconnaissance involved the re-surveying of permanent cross-sections at riffles and pools, longitudinal profiles, and modified Wolman pebble counts. Vegetation monitoring was performed in July of 2003 by a two-person team. Vegetation plots were sampled for monitoring and evaluation. Photo reference locations were also documented for continued monitoring for the Year 2003. Also included in this report addendum is a summary of the maintenance to date for this project and any potential future concerns.

2 *Summary*

2.1 *Morphology*

Cross Sections

Field data was collected in 2003 and 2004 on the permanent cross sections throughout Reaches 2 and 4. Overlaying these sections on previous survey data, as shown in Appendices A and B, shows any changes that have taken place in the channel with regards changes in the width/depth ratio, cross-sectional area, and entrenchment ratio. This is useful information over time to determine the stability of the channel. Most of the cross sections surveyed show little to no change from 2000 to 2003. The changes that did occur include deepening of pools (increased habitat), and a slight narrowing of the channel in some areas. These results indicate overall stability within the channel.

Longitudinal Profile

Longitudinal profiles were surveyed in 2003 and 2004. They were each plotted together with previous surveys to show any changes in the bed form over the previous year. Inverts of cross vanes and permanent cross sections were used as control points so that the annual surveys would be accurately compared. The results of the profiles revealed some deepening of the pools, little to no change in riffles, and proper functioning of the grade control structures. The average slope of the channel has also remained stable.

Pebble Counts

The pebble count data collected in 2003 was revealing as to the degree of the coarsening of the channel substrate. There have been at least three bankfull events since construction in 2000 and the bed material has coarsened up significantly. The changes in bed material indicate improved habitat and removal of fine material that was present immediately after construction.

2.2 Photo Points

The photo points taken along the channel and constructed wetlands and ponds in Reaches 2 and 4 show the vegetation that has come up and survived (including transplants). Also, the channel appears stable with no development of unstable depositional features or erosion of the banks in these areas.

2.3 Vegetation

No additional plants were installed in 2003. There was a marked reduction in surviving bare root plants in Reach 2 and the upper portion of Reach 4 (Appendix C). Deer browse continues to be a problem at this site. Many bare root plants and few live stakes have survived deer browse, but have been limited in vertical growth as a result. As in last years survey results, black walnut and sycamore seem to be the least browsed species.

Natural regeneration was surveyed with the regular plots again this growing season. The numbers were not as abundant as in 2003, but still relatively high. Seedlings range from 1 to 3 years old are abundant throughout the project area. The majority species is sycamore, tulip poplar, river birch, Virginia pine, sweet gum, black cherry, tag alder, and spice bush. Deer browse does not seem to be a problem with these plants.

Bare root survival was above 80% in all plots, however, stem count was low in plots 3 and 4. This number should also not be misinterpreted; it is relative only to this season. Live bare roots were more numerous in 2003. Extrapolated averages across 4 bare root plots gave an overall project average of **330 trees per acre** that are surviving. Live plants included sycamore, sugarberry, black cherry, river birch, black gum, green ash, black walnut, willow oak, tag alder, spice bush, witch hazel, and silky dogwood. Only taller black walnut and sycamore bare roots planted this season were less affected by deer browse. Other survivors were browsed lower to the ground.

Live stake survival was again extremely low. This may be attributed to droughty conditions during growing season and in some cases, washout from flooding. Deer browse was also a contributing factor. It was noted that foot traffic up and down the staked banks was often heavy in select places and that many stakes were dislodged or removed completely.

Herbaceous cover was determined in bare root plots and was greater than 90% in all plots. Switchgrass, rushes, and sedges were exceptionally robust. No more seeding is required.

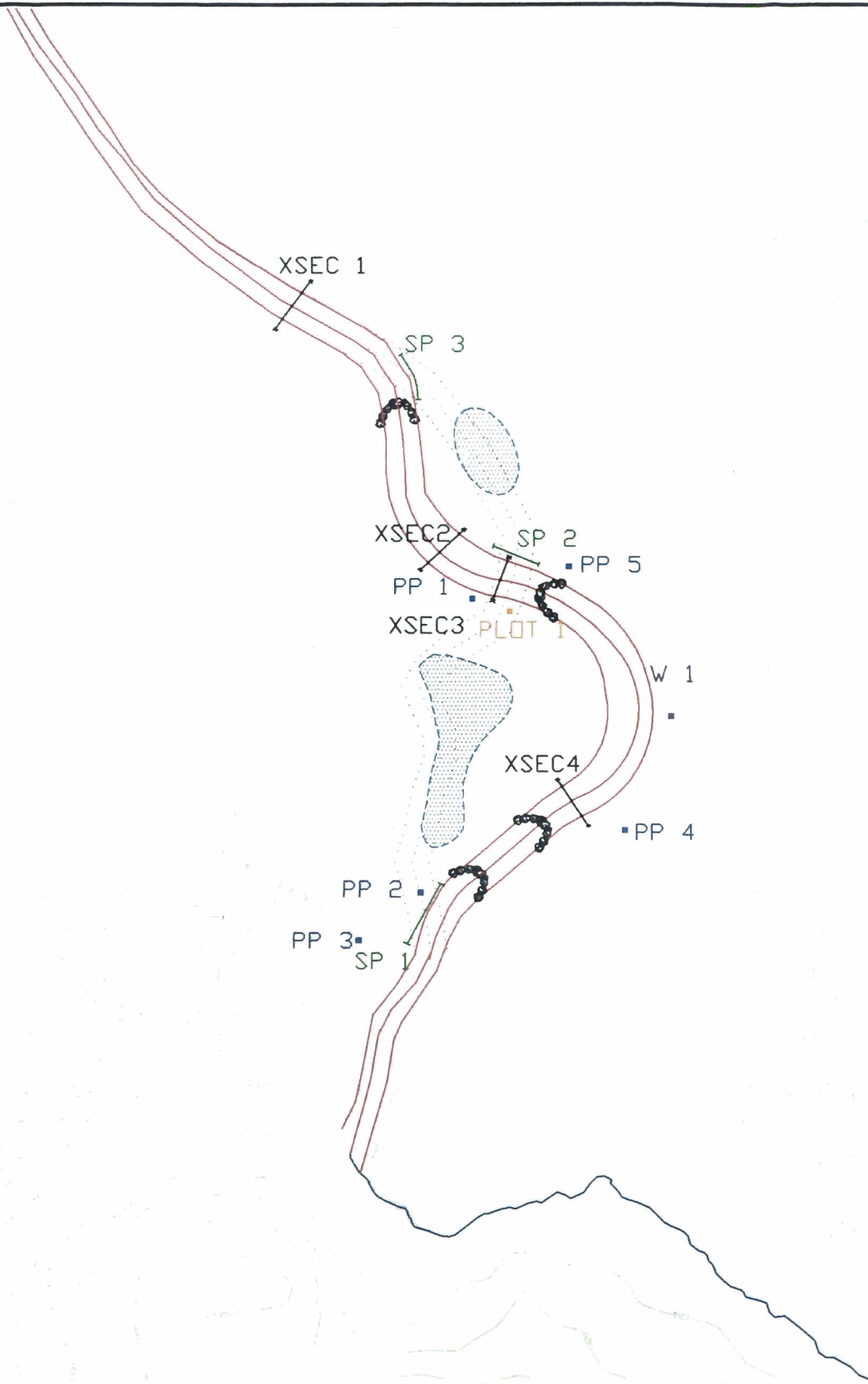
2.3 Project Maintenance

Since November 2000, when the project was completed, there have been two scheduled maintenance events. The first one was in May of 2001, when a failed log cross vane was removed. Also at this time, some grading/stabilization was performed on an eroding stream bank and bioengineering techniques, such as brush mattresses and fascines, were installed. The second was in November 2002, when a two more log cross vanes

was repaired (logs removed and replaced with boulders). One of these structures was in Reach 2 and the other in Reach 4. The two maintenance sites have fairly good access allowing for minimal disturbance of the existing vegetation. NCSU personnel make frequent site visits to the project when in the area, and are constantly monitoring the visual status of the structures and stream banks. The repaired cross vane in Reach 4 continues to be of concern as it is the sole grade control for a very steep riffle. Over the past year there have been several large flow events, with more than one overtopping the banks of the river. This has led to erosion in several meander bends where woody vegetation was not established. NCSU recommends some repair work be considered for the severely eroding areas in 2004. Also, a replanting is scheduled for the Fall/Winter of 2004-2005 of woody vegetation at least two years old. Ideally the bank repair work will be completed immediately before the replanting.

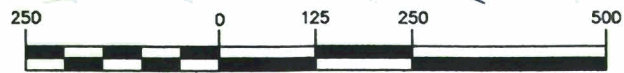
ATTACHMENT A

Plan View Maps for Reaches 2 & 4



LEGEND

- CROSS SECTION (XSEC)
- PHOTO POINT (PP)
- WELL (W)
- STAKE PLOT (SP)
- PLOT
- OLD CHANNEL

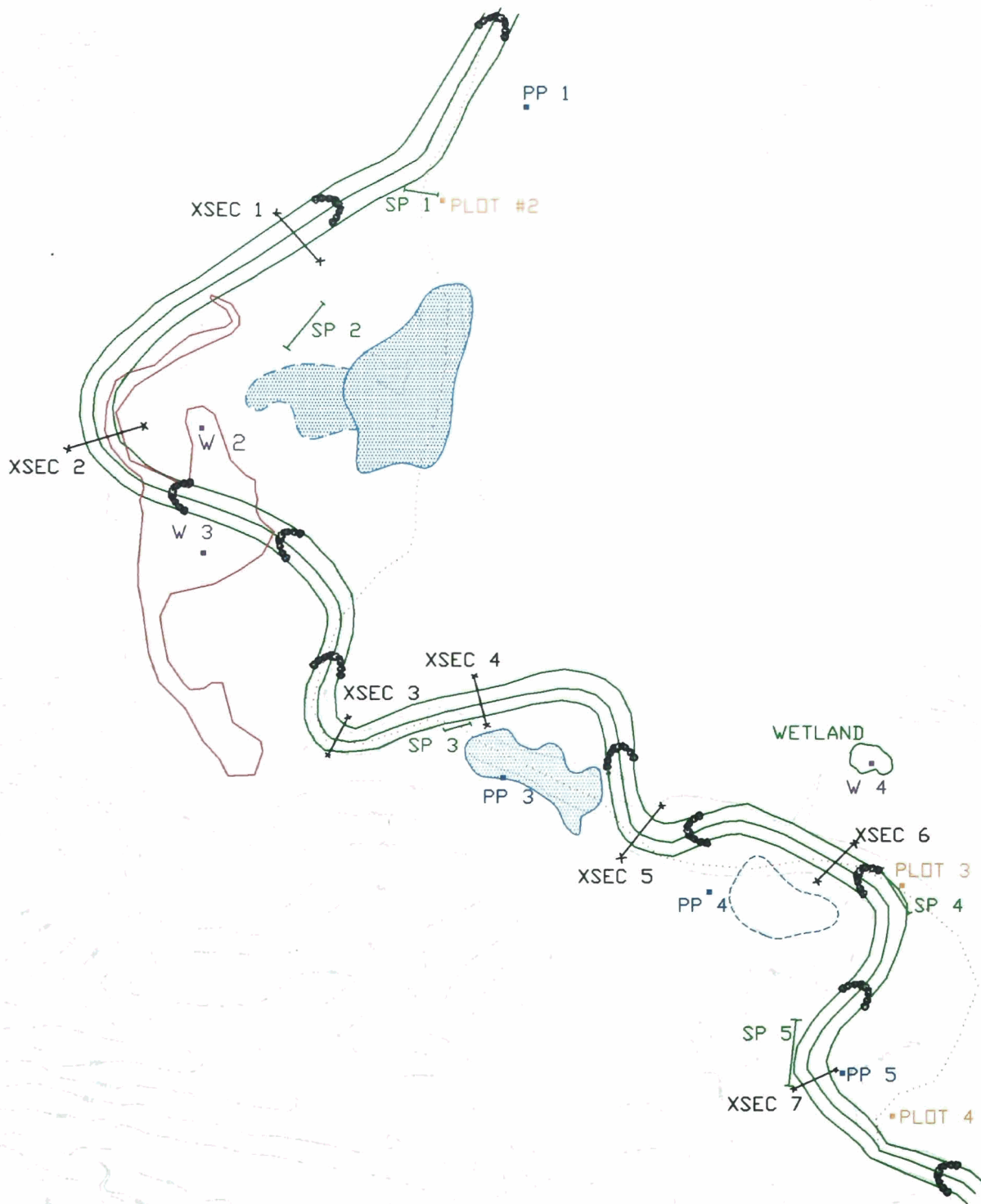


(IN FEET)
1 inch = 250 ft.

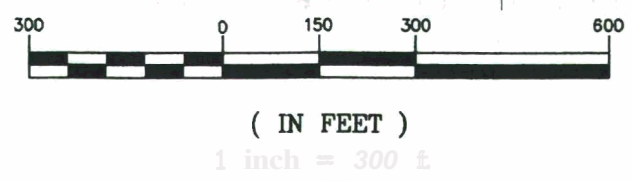

NORTH CAROLINA STREAM RESTORATION INSTITUTE
 NCSU WATER QUALITY GROUP
 NCSU BOX 7637 • RALEIGH, NORTH CAROLINA 27695-7637

PROJECT: EAST PRONG ROARING RIVER
 LOCATION: STONE MOUNTAIN STATE PARK
 DATE: JANUARY 22, 2003
 SCALE: 1" = 250'
 SECTION: REACH 2

FIGURE
 1 OF
 2



LEGEND	
	CROSS SECTION (XSEC)
	PHOTO POINT (PP)
	WELL (W)
	STAKE PLOT (SP)
	PLOT
	OLD CHANNEL



	NORTH CAROLINA STREAM RESTORATION INSTITUTE NCSU WATER QUALITY GROUP NCSU BOX 7637 • RALEIGH, NORTH CAROLINA 27696-7637
	PROJECT: EAST PRONG ROARING RIVER LOCATION: STONE MOUNTAIN STATE PARK DATE: JANUARY 22, 2003 SCALE: 1" = 300' SECTION: REACH 4
	FIGURE 2 OF 2

APPENDIX A

**REACH 2:
STREAM GEOMETRY AND SUBSTRATE DATA
YR 2003 SURVEY**

Cross Section R2-XSEC1 RIFFLE

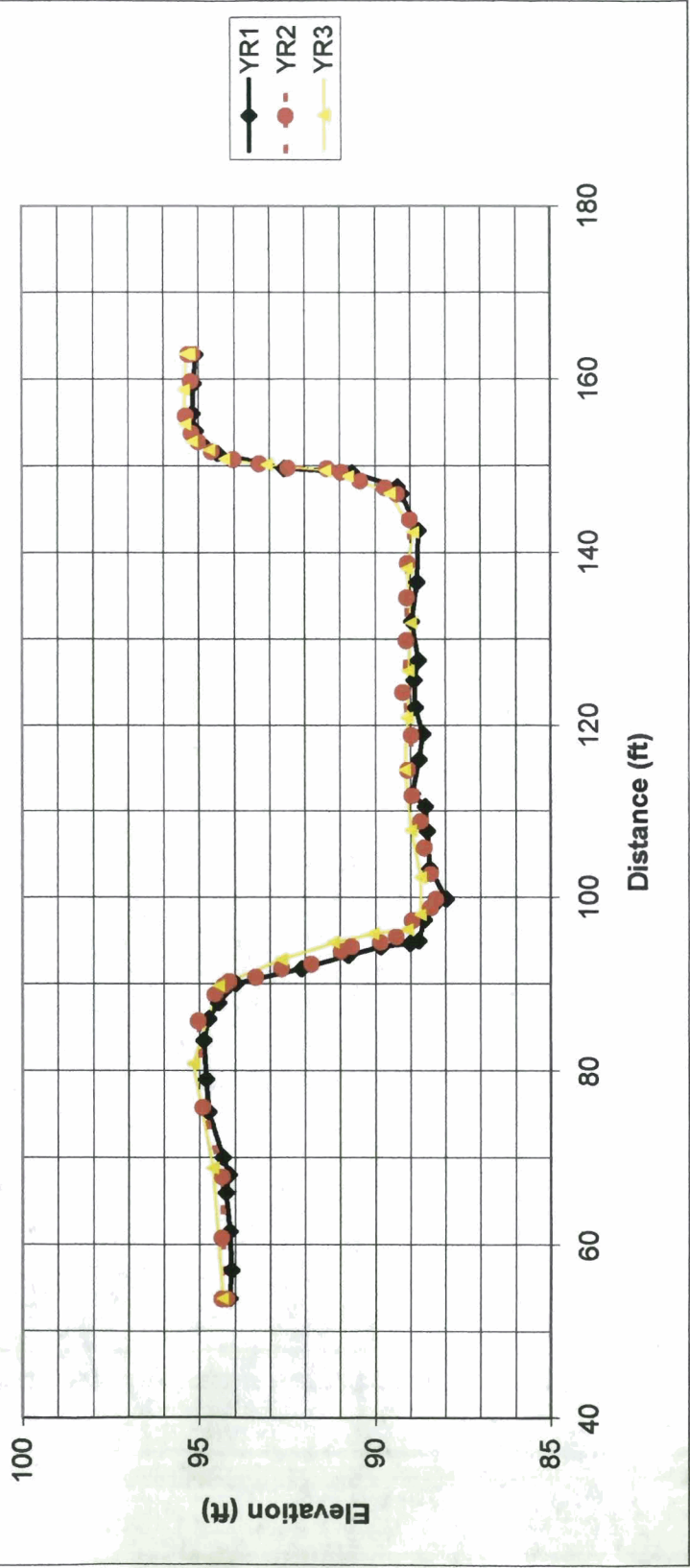
STONE MTN RESTORATION - REACH 2
 Yadkin River Basin, Wilkes County, North Caroli
 Dani Wise

Sep-03

Survey Data					
NOTES	STA	HI	FS	ELEV	REV STA
	0	100	5.65	94.35	53.8
	15	100	5.38	94.62	68.8
	27	100	4.82	95.18	80.8
	36	100	5.55	94.45	89.8
	39	100	7.33	92.67	92.8
	41	100	8.82	91.18	94.8
	42	100	9.94	90.06	95.8
	42.5	100	10.92	89.08	96.3
	44.2	100	11.28	88.72	98
	48.5	100	11.3	88.7	102.3
	54	100	11.02	88.98	107.8
	61	100	10.85	89.15	114.8
	67	100	10.92	89.08	120.8
	72.5	100	10.95	89.05	126.3
	78	100	11.02	88.98	131.8
	84.3	100	10.92	89.08	138.1
	88.5	100	11.08	88.92	142.3
	93	100	10.43	89.57	146.8
	95	100	9.24	90.76	148.8
	95.6	100	8.6	91.4	149.4
	96.3	100	6.93	93.07	150.1
	97	100	5.73	94.27	150.8
	98	100	5.3	94.7	151.8
	99	100	4.82	95.18	152.8
	101	100	4.62	95.38	154.8
	105	100	4.6	95.4	158.8
	109.1	100	4.64	95.36	162.9
	109.1	100	4.75	95.25	162.9

R2-XSEC1	Feature	Type	Wfpa	LBKF	RBKF	ELEV/bkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	RIFFLE	C4	450	90.0	151.4	93.98	61.4	4.2	14.6	257.9	6.0	7.3
YR 2	RIFFLE	C4	450	90.3	150.8	94.01	60.5	4.0	15.2	241.4	5.7	7.4
YR 3	RIFFLE	C4	450	89.8	150.8	94.27	61.0	3.9	15.6	239.1	5.6	7.4

STONE MTN RESTORATION - REACH 2
Cross Section R2-XSEC1 RIFFLE



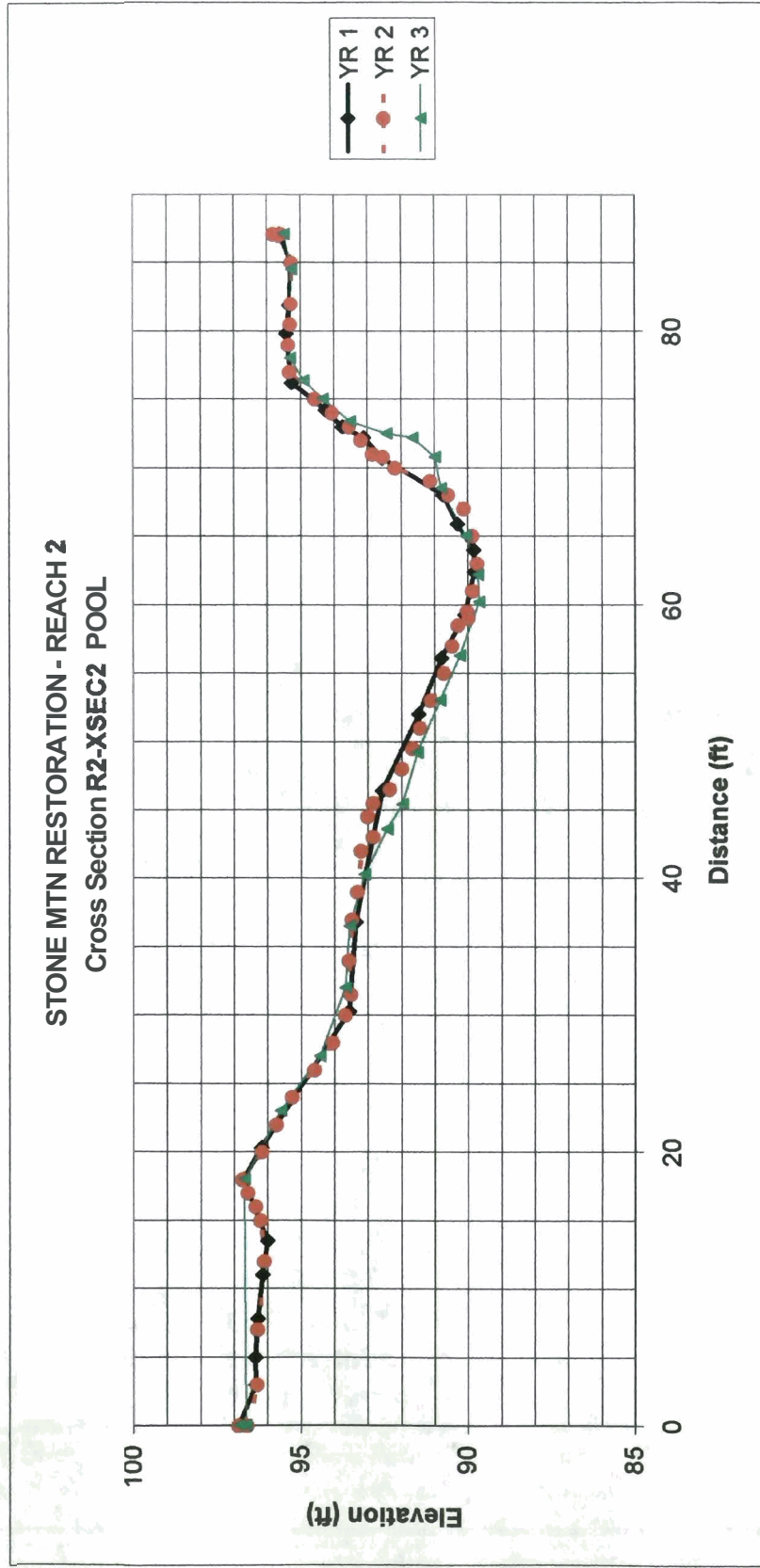
Cross Section R2-XSEC2 POOL

STONE MTN RESTORATION - REACH 2
 Yadkin River Basin, Wilkes County, North Caroli
 Dani Wise

Sep-03

Survey Data					
NOTES	STA	HI	FS	ELEV	
LPIN	0	100	2.32	97.68	96.85
GRND	0	100	2.54	97.46	96.63
	18	100	2.48	97.52	96.69
	23	100	3.57	96.43	95.60
	27	100	4.74	95.26	94.43
	32	100	5.5	94.5	93.67
	36.5	100	5.62	94.38	93.55
	40.3	100	6.08	93.92	93.09
LEW	43.6	100	6.74	93.26	92.43
	45.4	100	7.2	92.8	91.97
	49.2	100	7.64	92.36	91.53
	53	100	8.34	91.66	90.83
	56.3	100	8.92	91.08	90.25
	60.2	100	9.5	90.5	89.67
	62.2	100	9.48	90.52	89.69
	65	100	9.11	90.89	90.06
	68.5	100	8.36	91.64	90.81
	70.8	100	8.18	91.82	90.99
REW	72.2	100	7.52	92.48	91.65
	72.5	100	6.74	93.26	92.43
	73.4	100	5.66	94.34	93.51
	75	100	4.84	95.16	94.33
	76.4	100	4.26	95.74	94.91
	78	100	3.87	96.13	95.30
	84.5	100	3.9	96.1	95.27
RPIN	87.1	100	3.69	96.31	95.48

R2-XSEC2	Feature	Type	Wfpa	LBKF	RBKF	ELEV/bkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	POOL	C4	200	18.0	74.2	94.06	56.2	3.2	17.4	181.2	4.3	3.6
YR 2	POOL	C4	200	18.0	75.0	94.56	57	3.6	15.8	205.2	4.8	3.5
YR 3	POOL	C4	200	18.0	75.0	94.33	57	3.5	16.2	200.9	4.7	3.5

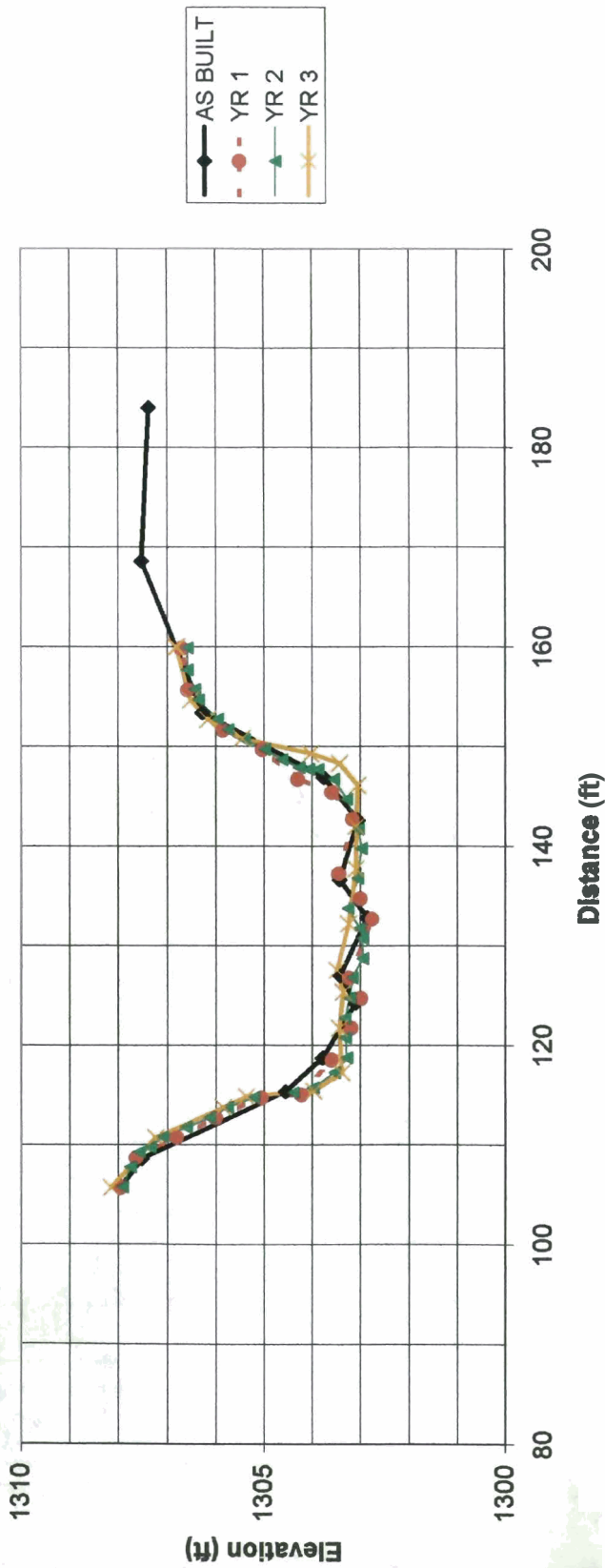


Cross Section R2-XSEC3 POOL**STONE MTN RESTORATION - REACH
Yadkin River Basin, Wilkes County, Nc
Dani Wise****Sep-03****Survey Data**

STA	FS	ELEV	REVISE STA
0	3.86	1308.14	105.7
5	4.77	1307.23	110.7
8	6.16	1305.84	113.7
9.1	6.63	1305.37	114.8
9.7	8.04	1303.96	115.4
11.5	8.62	1303.38	117.2
16.0	8.57	1303.43	121.7
19.6	8.64	1303.36	125.3
21.8	8.52	1303.48	127.5
26.5	8.75	1303.25	132.2
32.0	8.91	1303.09	137.7
36.3	8.91	1303.09	142
40.4	8.95	1303.05	146.1
42.6	8.56	1303.44	148.3
43.6	7.97	1304.03	149.3
45.1	6.54	1305.46	150.8
47	5.84	1306.16	152.7
49	5.48	1306.52	154.7
54.3	5.18	1306.82	160
54.3	5.21	1306.79	160

R2-XSEC3	Feature	Type	Wfpa	LBKF	RBKF	ELEV/bkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	RIFFLE	C4	300	108.6	168.6	1307.52	60.0	2.8	21.6	166.7	4.7	5.0
YR 1	RIFFLE	C4	300	81.0	132.2	1307.63	51.2	3.3	15.5	169.2	4.9	5.9
YR 2	RIFFLE	C4	300	112.7	154.7	1306.35	42.0	4.0	10.4	169.2	4.9	7.1
YR 3	RIFFLE	C4	300	112.7	154.7	1306.35	42.0	4.0	10.4	170.0	4.9	7.1

STONE MTN RESTORATION - REACH 2
Cross Section R2-XSEC3 RIFFLE



Cross Section R2-XSEC4 RIFFLE

STONE MTN RESTORATION - REACH 2
Yadkin River Basin, Wilkes County, North Caroli
Dani Wise

Sep-03

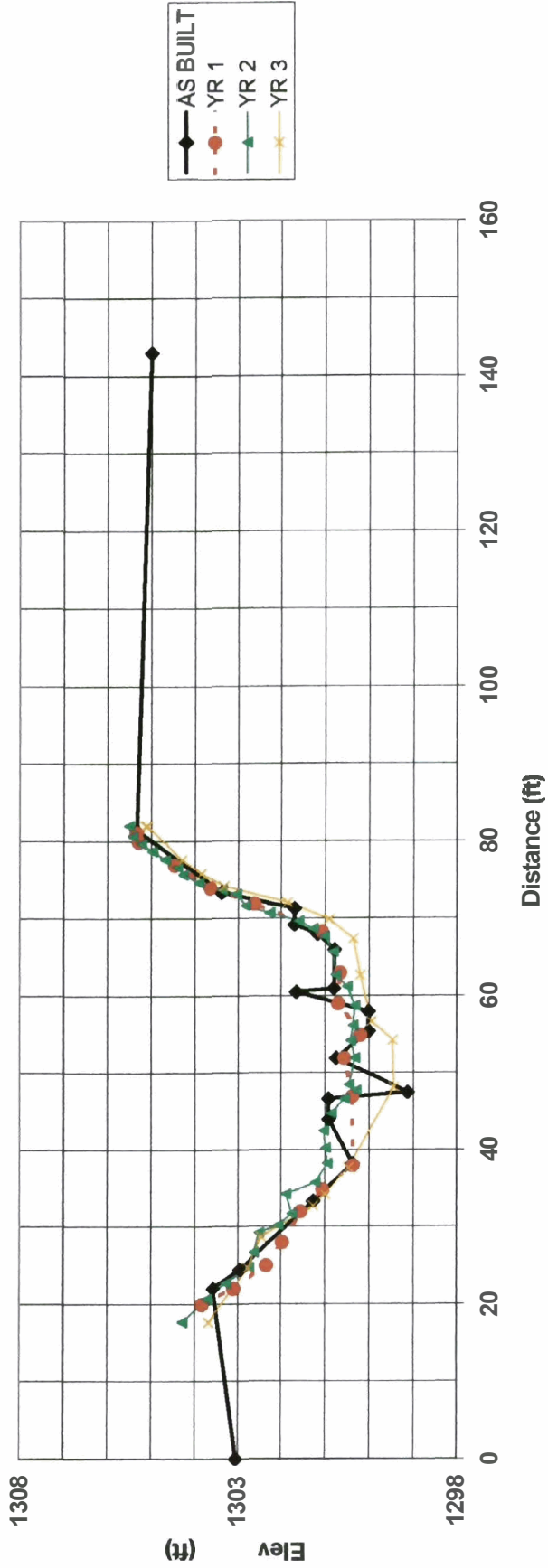
Survey Data

STA	FS	REV.STA	ELEV
0	6.72	17.7	1303.68
7	7.63	24.7	1302.77
11	7.95	28.7	1302.45
15	9.13	32.7	1301.27
16.5	9.39	34.2	1301.01
20	9.93	37.7	1300.47
30.5	10.96	48.2	1299.44
36.6	10.93	54.3	1299.47
39	10.45	56.7	1299.95
45	10.2	62.7	1300.2
49.7	10.04	67.4	1300.36
52.2	9.49	69.9	1300.91
54.4	8.54	72.1	1301.86
56.5	7.09	74.2	1303.31
58.2	6.55	75.9	1303.85
60	6.11	77.7	1304.29
64.3	5.31	82	1305.09
64.3	5.28	82	1305.12

R2-XSEC4	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	RIFFLE	C4	200	22.0	73.4	1303.57	51.4	2.5	20.9	126.2	4.4	3.9
YR 1	RIFFLE	C4	200	20.0	74.0	1303.82	54.0	2.3	23.1	126.2	3.6	3.7
YR 2	RIFFLE	C4	200	22.0	74.7	1303.57	52.7	2.5	21.3	130.4	3.3	3.8
YR 3	RIFFLE	C4	200	17.7	75.9	1303.68	58.2	2.9	19.8	171.1	4.2	3.4

STONE MTN RESTORATION - REACH 2

Cross Section R2-XSEC4 RIFFLE



Longitudinal Profile - 2003 Survey

STONE MTN RESTORATION - REACH 2
 Yadkin River Basin, Wilkes County, North Carolina
 Dani Johnson

	Head First Riffle	0	1308.8
	Head Last Riffle	1263	1299.6
	Valley Length (ft)	950	
	Channel Length (ft)	1263	
	Elev Change (ft)	9.25	

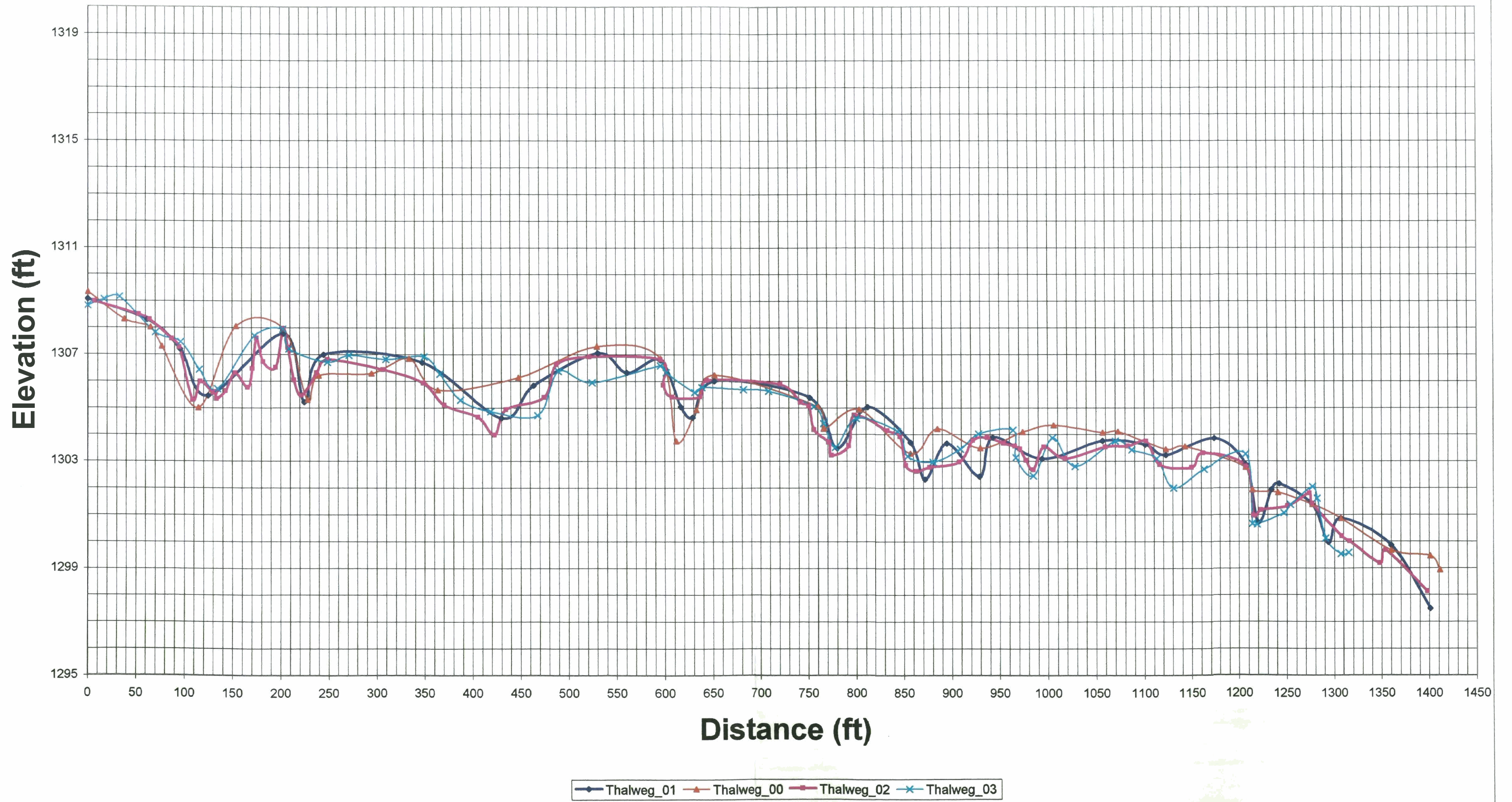
Chan Slope (ft/ft)	0.0073
Valley Slope (ft/ft)	0.0097
Sinuosity, K	1.33

HI for graph 1320

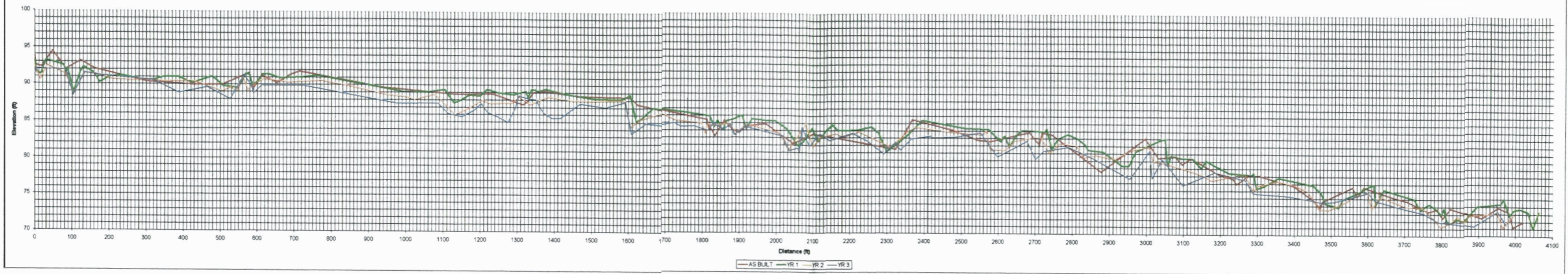
2003 Survey Data

TP	NOTE	revise STA	STA	HI	FS TW	FS WS	WATER DEPTH	ELEV TW	ELEV WS	revise TW	revise ELEV
		0	0	100	11.18	10.29	0.89	88.82	89.71	1308.82	1320
		17	17	100	10.95	10.34	0.61	89.05	89.66	1309.05	1320
		33	33	100	10.86	10.44	0.42	89.14	89.56	1309.14	1320
	run	70.5	70.5	100	12.19	11.14	1.05	87.81	88.86	1307.81	1320
	Head of pool	96.5	96.5	100	12.54	11.2	1.34	87.46	88.8	1307.46	1320
		116	116	100	13.58	11.24	2.34	86.42	88.76	1306.42	1320
		135	135	100	14.3	11.28	3.02	85.7	88.72	1305.7	1320
		173	163	100	12.3	11.28	1.02	87.7	88.72	1307.7	1320
	1 bs=5.44,xvane 1	202.5	192.5	94.26	6.32	5.69	0.63	87.94	88.57	1307.94	1314.3
		208.7	198.7	94.26	7.06	6.25	0.81	87.2	88.01	1307.2	1314.3
		249	239	94.26	7.55	6.25	1.3	86.71	88.01	1306.71	1314.3
		271.8	261.8	94.26	7.3	6.35	0.95	86.96	87.91	1306.96	1314.3
		310	300	94.26	7.45	6.62	0.83	86.81	87.64	1306.81	1314.3
		350	340	94.26	7.35	6.66	0.69	86.91	87.6	1306.91	1314.3
		366.4	356.4	94.26	8	6.66	1.34	86.26	87.6	1306.26	1314.3
		387.5	377.5	94.26	8.98	6.71	2.27	85.28	87.55	1305.28	1314.3
		419	409	94.26	9.41	6.71	2.7	84.85	87.55	1304.85	1314.3
		468	458	94.26	9.55	6.73	2.82	84.71	87.53	1304.71	1314.3
		490	480	94.26	7.9	6.75	1.15	86.36	87.51	1306.36	1314.3
		525	515	94.26	8.32	6.87	1.45	85.94	87.39	1305.94	1314.3
		596	561	94.26	7.68	6.95	0.73	86.58	87.31	1306.58	1314.3
		602	567	94.26	7.95	7.31	0.64	86.31	86.95	1306.31	1314.3
		631.5	596.5	94.26	8.69	7.41	1.28	85.57	86.85	1305.57	1314.3
	2 bs=7.40	639	604	95.36	9.6	8.58	1.02	85.76	86.78	1305.76	1315.4
		682	647	95.36	9.68	8.68	1	85.68	86.68	1305.68	1315.4
		709	674	95.36	9.74	8.75	0.99	85.62	86.61	1305.62	1315.4
	3 bs=4.94,jhook	756	721	92.05	7.01	5.93	1.08	85.04	86.12	1305.04	1312.1
		766	731	92.05	7.64	6.34	1.3	84.41	85.71	1304.41	1312.1
		778	743	92.05	8.54	6.41	2.13	83.51	85.64	1303.51	1312.1
		800	765	92.05	7.45	6.45	1	84.6	85.6	1304.6	1312.1
	jhook	843	808	92.05	7.94	6.58	1.36	84.11	85.47	1304.11	1312.1
		854	819	92.05	8.87	6.84	2.03	83.18	85.21	1303.18	1312.1
		880	845	92.05	9.08	6.78	2.3	82.97	85.27	1302.97	1312.1
		909	874	92.05	8.6	6.76	1.84	83.45	85.29	1303.45	1312.1
		928	893	92.05	8.03	6.75	1.28	84.02	85.3	1304.02	1312.1
	rock vane	964	929	92.05	7.89	6.8	1.09	84.16	85.25	1304.16	1312.1
	scour	967	932	92.05	8.92	7.22	1.7	83.13	84.83	1303.13	1312.1
		985	950	92.05	9.6	7.2	2.4	82.45	84.85	1302.45	1312.1
		1005	970	92.05	8.19	9.25	-1.06	83.86	82.8	1303.86	1312.1
		1028	993	92.05	9.25	7.22	2.03	82.8	84.83	1302.8	1312.1
	4 bs=6.44	1070	1035	93.95	10.21	9.12	1.09	83.74	84.83	1303.74	1314
		1087	1052	93.95	10.53	9.41	1.12	83.42	84.54	1303.42	1314
	log vane	1113	1078	93.95	10.87	9.73	1.14	83.08	84.22	1303.08	1314
	pool	1131	1096	93.95	11.96	9.81	2.15	81.99	84.14	1301.99	1314
		1163	1128	93.95	11.25	9.75	1.5	82.7	84.2	1302.7	1314
	xvane3	1207	1160	93.95	10.69	9.8	0.89	83.26	84.15	1303.26	1314
		1214	1167	93.95	13.29	10.9	2.39	80.66	83.05	1300.66	1314
		1219	1172	93.95	13.32	10.9	2.42	80.63	83.05	1300.63	1314
		1247	1200	93.95	12.89	10.95	1.94	81.06	83	1301.06	1314
		1254	1207	93.95	12.59	10.95	1.64	81.36	83	1301.36	1314
	xvane4	1277.2	1225.2	93.95	11.91	10.98	0.93	82.04	82.97	1302.04	1314
		1282	1230	93.95	12.35	11.46	0.89	81.6	82.49	1301.6	1314
		1291	1239	93.95	13.85	12.23	1.62	80.1	81.72	1300.1	1314
		1307	1255	93.95	14.42	12.44	1.98	79.53	81.51	1299.53	1314
		1315	1263	93.95	14.38	12.72	1.66	79.57	81.23	1299.57	1314

Longitudinal Profile



LONGITUDINAL PROFILE - STONE MOUNTAIN



Longitudinal Profile

STONE MTN RESTORATION

Yadkin River Basin, Wilkes County, North Carolina
Dani Wise

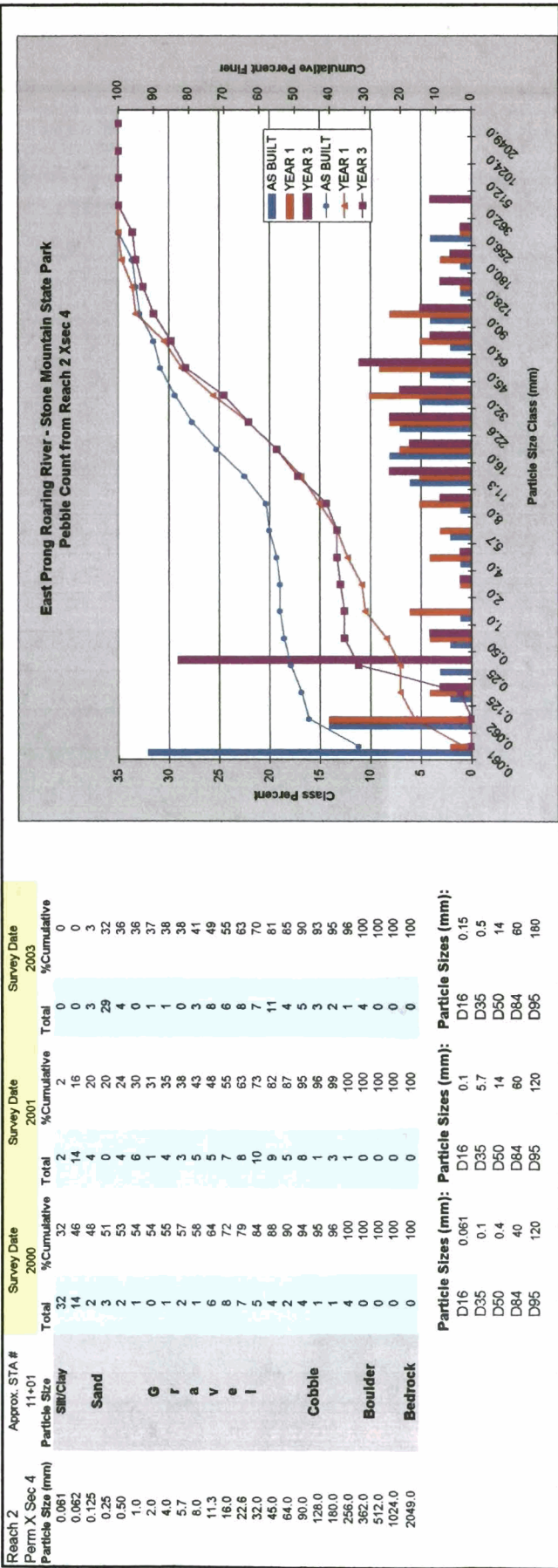
Head First Riffle 0
Head Last Riffle 4089
Valley Length (ft)
Channel Length (ft) 4089
Elev Change (ft) 0

STA (ft)
ELEV (ft)
94.88
74.91

Chan Slope (ft/ft) 0.005
Valley Slope (ft/ft)
Sinuosity, K

YEAR 3 (2003) DATA

TP	NOTE	STA	HI	FS			RTOB			ELEV			REVISED			TW			
				TW	WS	RT	WS	RT	WS	RT	WS	RT	WS	RT	WS	RT	WS	RT	WS
		0	103.13	9.29	8.25		93.84	94.88		91.34									
		5	103.13	8.53			94.6			92.1									
	XVANE 1	83	103.13	8.63			94.5			92									
		103	103.13	12.19	9.43		90.94	93.7		88.44									
		133	103.13	10.04	9.56		93.09	95.63		91.59									
		171	103.13	10.38	9.96		92.75	93.17		91.25									
		320	103.13	11.03	10.16		92.1	92.97		90.6									
		387	103.13	12.7			90.43			88.93									
		465	103.13	11.94	10.12		91.19	93.01		89.69									
1	bs=4.16	527	102.9	12.75	9.38		89.54	92.91		88.04									
	XVANE 2	580	102.9	9.41			92.88			91.38									
		600	102.9	11.07	9.7		91.22	92.59		89.72									
		605	102.9	10.85	9.76		90.32	92.59		88.82									
		626	102.9	10.97	9.7		91.44	92.53		89.94									
		740	102.9	10.89	9.8		91.4	92.49		89.9									
		990	102.9	13.25	11.64		89.04	90.65		87.54									
		1100	100.73	11.62	10.13		89.11	90.6		86.16									
2		1129	100.73	13.07	10.2		87.66	90.53		85.76									
		1166	100.73	13.47			87.26			86.69									
		1200	100.73	12.54	10.18		88.19	90.55		86.69									
		1217	100.73	11.63			89.1			87.6									
		1234	100.73	12.86	10.22		87.87	90.51		86.37									
		1258	100.73	13.38	10.2		87.35	90.53		85.85									
		1290	100.73	14.25			86.48			84.98									
		1310	100.73	12.27	10.25		88.46	90.48		86.96									
3	XVANE 3	1322	98.01	7.89			90.12			88.62									
		1353	98.01	8.34	7.6		89.67	90.41		88.17									
		1367	98.01	8.39	7.65		89.62	90.36		88.12									
		1377	98.01	9.26	8.09		88.75	89.92		87.25									
		1390	98.01	10.24	8.1		87.77	89.91		86.27									
		1412	98.01	10.89	8.11		87.12	89.9		85.62									
		1434	98.01	10.89	8.15	6.56	87.12	89.86		85.62									
		1487	98.01	8.91	8.1		89.1	89.91		87.6									
		1555	98.01	9.41	8.23		88.6	89.78		87.1									
	XVANE 4	1622	98.01	8.68	8.31		89.33	89.7		87.83									
		1638	98.01	12.96	10.9		85.05	87.11		83.55									
		1678	95.94	9.49	8.84		86.45	87.1		84.95									
4		1719	95.94	9.73	7.9		86.21	88.04		84.71									
		1754	95.94	9.4	8.13		86.54	87.81		85.04									
		1771	95.94	9.86	8.24		86.08	87.7		84.58									
		1808	95.94	9.83	8.32		86.11	87.62		84.61									
		1846	95.94	10.44	8.31		85.5	87.63		84									
		1860	95.94	9.5	8.34		86.44	87.6		84.94									
		1888	95.94	10.28	8.44		85.66	87.5		84.16									
		1919	95.94	9.53	8.45		86.41	87.49		84.91									
	XVANE 5	1930	95.94	11.03	9.18		84.91	86.76		83.41									
		1961	95.94	9.94	9.16		86	86.78		84.5									
		2060	95.94	11.11	9.48		84.83	86.46		83.33									
		2078	95.94	13.15	9.54		82.79	86.4		81.29									
		2101	95.94	12.77	9.51		83.17	86.43		81.67									
5		2106	94.57	11.96	8.19		82.61	86.38		81.11									
		2113	94.57	8.44			86.13	94.57		84.63									
		2134	94.57	11.18	8.24		83.39	86.33		81.89									
		2164	94.57	9.42	8.32		85.15	86.25		83.65									
		2190	94.57	10.4	8.36		84.17	86.21		82.67									
		2252	94.57	9.36	8.38		85.21	86.19		83.71									
		2292	94.57	10.45	8.52		84.12	86.05		82.62									
		2336	94.57	12.16	8.59	3.49	82.41	85.98		80.91									
		2367	94.57	10.59	8.57		83.98	86		82.48									
		2380	94.57	11.63	8.55		82.94	86.02		81.44									
		2409	94.57	10.08	8.55		84.49	86.02		82.99									
		2461	94.57	9.72	8.72		84.85	85.85		83.35									
6		2466	94.63	9.95			84.68	94.63		83.18									
		2526	94.63	9.92	9.15		84.71	85.48		83.21									
		2595	94.63	9.28	5.27		85.35	89.36		83.85									
		2642	94.63	12.55	9.27		82.08	85.36		80.58									
		2683	94.63	11.45	9.3		83.18	85.33		81.68									
		2721	94.63	10.42	9.39		84.21	85.24		82.71									
		2745	94.63	12.86	10.7		81.77	83.93		80.27									
		2767	94.63	11.74	10.69		82.89	83.94		81.39									
		2833	94.63	11.2			83.43	94.63		81.93									
		2900	94.63	12.74	11.7		81.89	82.93		80.39									
7	XVANE 7	3000	95.23	16.13	12.63		79.1	82.6		77.6									
		3024	95.23	12.23			83	95.23		81.5									
		3031	95.23	16			79.23	95.23		77.73									
		3058	95.23	13.39	14.6		81.84	80.63		80.34									
		3114	95.23	16.93	14.92		78.3	80.31		76.8									
8	XSEC 6	3200	95.23	15.16	15.17		80.07	80.06		78.57									
	XVANE 8	3273	89.62	10.61	10.1		79.01	79.52		77.51									
		3295	89.62	12.41	10.51		77.21	79.11		75.71									
		3386	89.62	12.71	11.16		76.91												

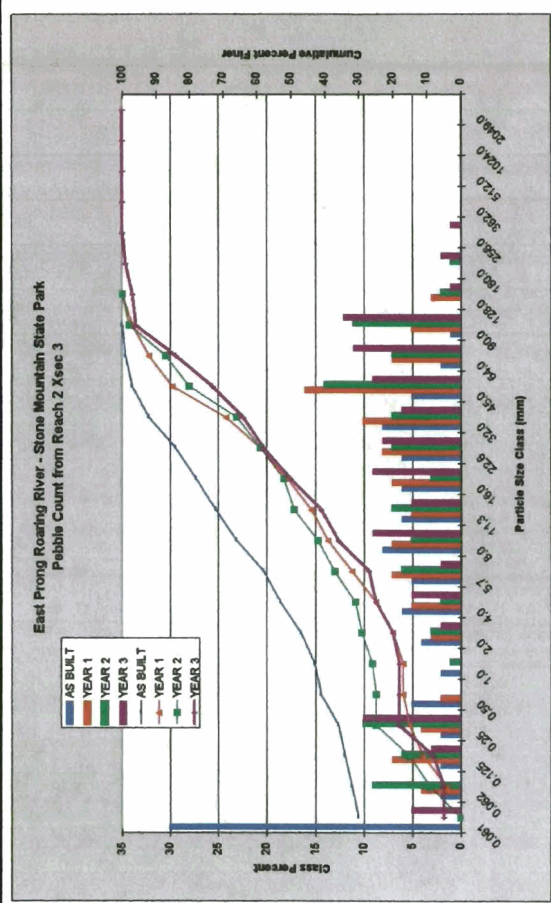


Reach 2 Perm X Sec 4 Particle Size (mm)	Approx. STA # 11+01 Particle Size Silt/Clay	Survey Date 2000		Survey Date 2001		Survey Date 2003	
		Total	%Cumulative	Total	%Cumulative	Total	%Cumulative
0.061	Silt/Clay	32	32	2	2	0	0
0.062		14	46	14	16	0	0
0.125	Sand	2	48	4	20	3	3
0.25		3	51	0	20	29	32
0.50		2	53	4	24	4	36
1.0		1	54	6	30	0	36
2.0	G	0	54	1	31	1	37
4.0	r	1	55	4	35	1	38
5.7	a	2	57	3	38	0	38
8.0	v	1	58	5	43	3	41
11.3	e	6	64	5	48	8	49
16.0	i	8	72	7	55	6	55
22.6		7	79	8	63	8	63
32.0		5	84	10	73	7	70
45.0		4	88	9	82	11	81
64.0	Cobble	2	90	5	87	4	85
90.0		4	94	8	95	5	90
126.0		1	95	1	96	3	93
180.0		1	96	3	99	2	95
256.0		4	100	1	100	1	96
362.0	Boulder	0	100	0	100	4	100
512.0		0	100	0	100	0	100
1024.0		0	100	0	100	0	100
2048.0	Bedrock	0	100	0	100	0	100

Particle Sizes (mm):	Particle Sizes (mm):	Particle Sizes (mm):
D16	D16	D16
D35	D35	D35
D50	D50	D50
D84	D84	D84
D95	D95	D95
	D120	D120
	D150	D150
	D180	D180
	D200	D200
	D250	D250
	D300	D300
	D350	D350
	D400	D400
	D450	D450
	D500	D500
	D560	D560
	D630	D630
	D710	D710
	D800	D800
	D900	D900
	D1000	D1000
	D1120	D1120
	D1250	D1250
	D1400	D1400
	D1600	D1600
	D1800	D1800
	D2000	D2000

Reach 2 Perm X Sec 3 Particle Size (mm)	Approx. STA # 4+61	Survey Date 2000		Survey Date 2001		Survey Date 2002		Survey Date 2003	
		Total	% Cumulative	Total	% Cumulative	Total	% Cumulative	Total	% Cumulative
0.062	Silt/Clay	30	30	0	0	0	0	0	0
0.125	Sand	2	32	4	4	9	9	0	0
0.25		2	34	7	11	6	16	3	8
0.50		2	36	4	15	10	26	10	18
1.0	G	2	43	0	17	0	26	0	16
2.0		4	51	8	28	1	39	2	20
4.0		5	57	8	31	2	41	2	25
8.0	F	5	62	7	32	6	37	2	27
16.0		6	68	7	39	6	42	9	36
32.0		6	72	5	44	7	41	5	41
64.0	V	6	78	7	51	3	52	9	60
128.0		6	84	8	59	7	59	6	66
256.0		6	92	10	69	7	66	6	64
512.0	I	8	97	15	85	14	80	9	73
1024.0		2	99	7	92	7	87	11	84
2048.0		1	100	5	97	11	86	12	86
	Cobble	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
	Boulder	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
	Bedrock	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0

Particle Sizes (mm):	Particle Sizes (mm):	Particle Sizes (mm):	Particle Sizes (mm):
D16	0.061	D16	0.5
D35	0.2	D35	8
D50	4	D50	20
D64	28	D64	50
D85	40	D85	65
		D16	0.28
		D35	5
		D50	12
		D64	60
		D85	65



APPENDIX B

REACH 4:
STREAM GEOMETRY AND SUBSTRATE DATA
YR 2003 SURVEY

Cross Section R4-XSEC1 RIFFLE**STONE MTN RESTORATION**

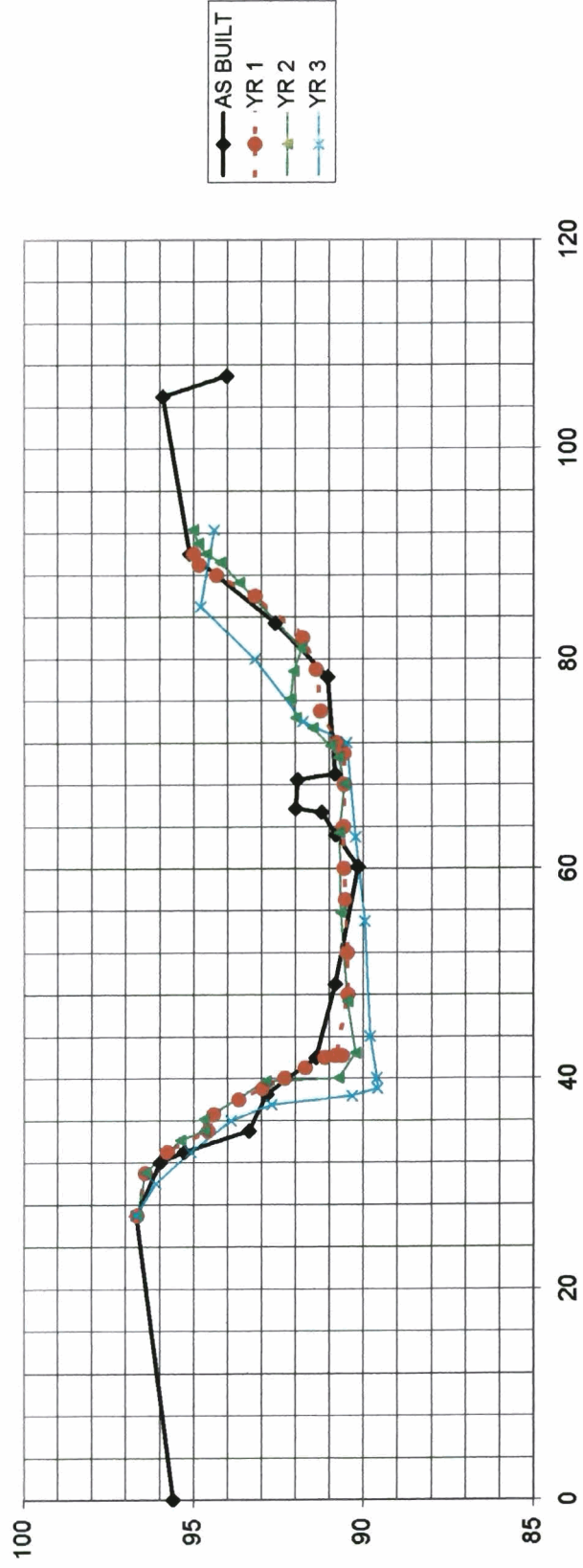
Yadkin River Basin, Wilkes County, North Carolina

Dani Wise

YEAR 3 (2003)			HI = 100		
NOTES	Survey Data		Adjusted Stations/Elev		
	STA	FS	ELEV	STA	ELEV
	0	5.09	97.78	27	96.7
	3	5.21	97.2	30	96.12
	6	6.12	96.17	33	95.09
	9	7.31	94.98	36	93.9
	10.5	8.5	93.79	37.5	92.71
	11.3	10.87	91.42	38.3	90.34
	12	11.62	90.67	39	89.59
	13	11.6	90.69	40	89.61
	17	11.41	90.88	44	89.8
	28	11.24	91.05	55	89.97
	36	10.97	91.32	63	90.24
	45	10.71	91.58	72	90.5
	47	9.42	92.87	74	91.79
	53	8.02	94.27	80	93.19
	58	6.42	95.87	85	94.79
grad	65.3	6.81	95.48	92.3	94.4

R4-XSEC 1	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	RIFFLE	C	200	32.0	90.0	95.27	58.0	3.8	15.2	221.9	5.1	3.4
YR 1	RIFFLE	C	200	33.0	90.0	95.77	57.0	3.8	14.9	218.0	5.1	3.5
YR 2	RIFFLE	C	200	34.0	91.0	95.00	57.0	3.5	16.2	200.1	4.7	3.5
YR 3	RIFFLE	C	200	33.0	92.0	94.40	59.0	3.6	16.4	212.4	4.8	3.4

STONE MTN RESTORATION
Cross Section R4-XSEC1 RIFFLE



Cross Section R4-XSEC2 POOL

STONE MTN RESTORATION

Yadkin River Basin, Wilkes County, North Carolina

Dani Wise

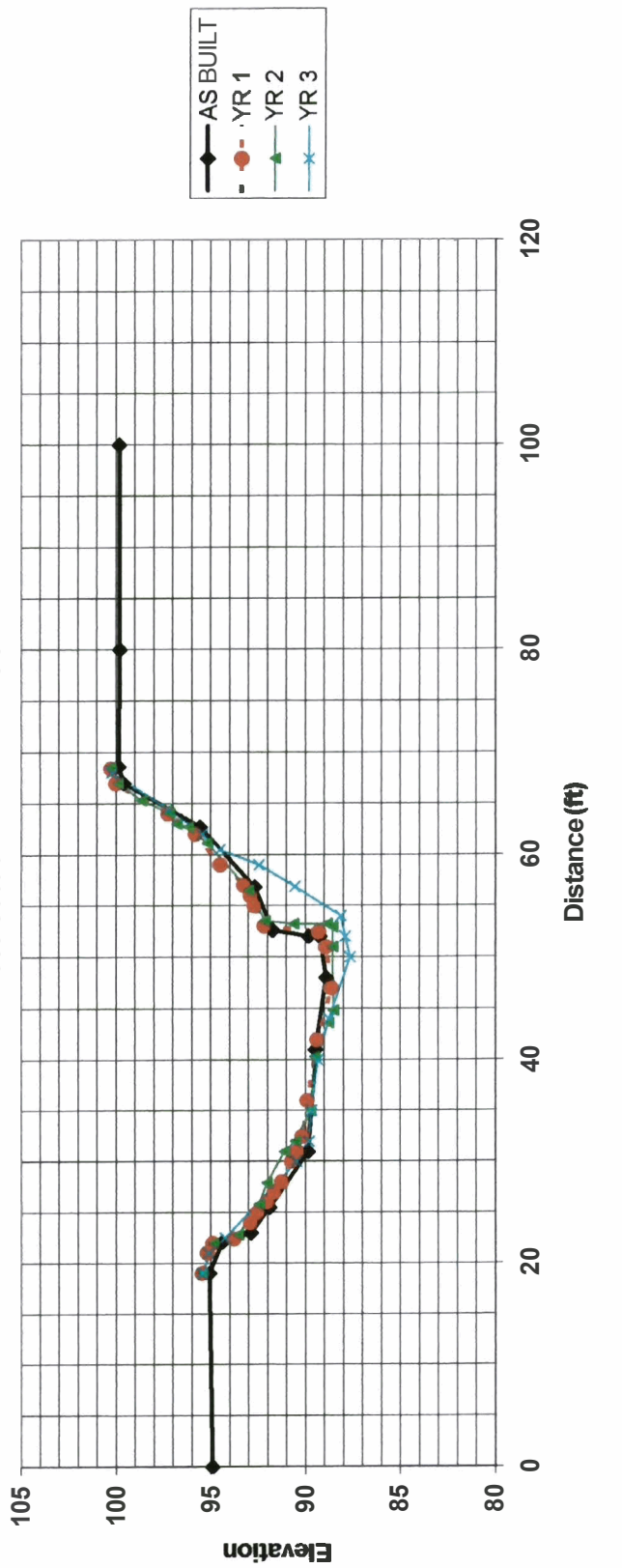
YEAR 3 (2003)

HI = 100

NOTES	Survey Data			Adjusted Stations/Elev	
	STA	FS	ELEV	STA	ELEV
LTopPin	0	5.25	95.48	19	95.48
grad	0	5.29	95.44	19	95.44
LTOB	2	5.6	95.13	21	95.13
	3.5	6.47	94.26	22.5	94.26
LEW	11	10.23	90.5	30	90.5
	13	10.89	89.84	32	89.84
	16	11.04	89.69	35	89.69
	21	11.35	89.38	40	89.38
	25	11.95	88.78	44	88.78
	31	13.05	87.68	50	87.68
	33	12.81	87.92	52	87.92
	35	12.56	88.17	54	88.17
REW	37.9	10.14	90.59	56.9	90.59
	40	8.25	92.48	59	92.48
	41.5	6.18	94.55	60.5	94.55
RBKFL	43	5.25	95.48	62	95.48
	45.5	3.44	97.29	64.5	97.29
RTOB	49	0.48	100.25	68	100.25

R4-XSEC2	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	POOL	C	200	19.0	62.7	95.06	43.7	4.3	10.1	189.7	6.2	4.6
YR 1	POOL	C	200	19.0	62.0	95.48	43	4.8	9.0	204.7	6.8	4.7
YR 2	POOL	C	200	19.0	61.1	95.20	42.1	4.6	9.1	194.5	6.6	4.8
YR 3	POOL	C	200	19.0	62.0	95.48	43	5.5	7.9	234.8	7.8	4.7

STONE MTN RESTORATION
Cross Section R4-XSEC2 POOL



Cross Section R4-XSEC3 POOL

STONE MTN RESTORATION

Yadkin River Basin, Wilkes County, North Carolina

Dani Wise

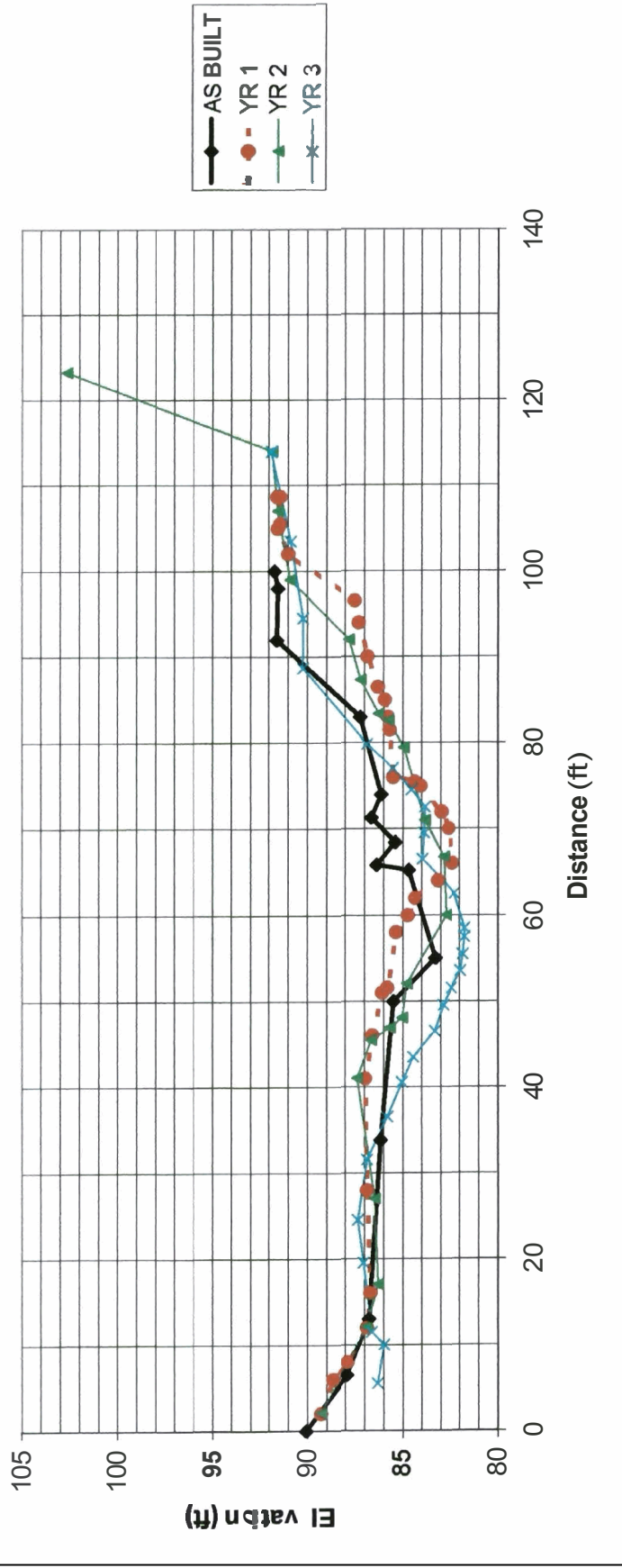
YEAR 3 (2003)

HI = 94.57

NOTES	Survey Data			Adjusted Stations/Elev	
	STA	FS	ELEV	STA	ELEV
	0				
	4	6.39	88.18	5.5	86.32
	8.5	6.73	87.84	10	85.98
	10	6.08	88.49	11.5	86.63
	18	5.65	88.92	19.5	87.06
top bar	23	5.35	89.22	24.5	87.36
	30	5.83	88.74	31.5	86.88
	35	6.9	87.67	36.5	85.81
	39	7.66	86.91	40.5	85.05
lew	42	8.24	86.33	43.5	84.47
	45	9.36	85.21	46.5	83.35
	48	9.82	84.75	49.5	82.89
	50	10.25	84.32	51.5	82.46
	52	10.72	83.85	53.5	81.99
	54	10.86	83.71	55.5	81.85
	56	10.94	83.63	57.5	81.77
	57	10.94	83.63	58.5	81.77
	61	10.41	84.16	62.5	82.3
	65	8.72	85.85	66.5	83.99
	68	8.82	85.75	69.5	83.89
	71	8.86	85.71	72.5	83.85
rew	73	8.16	86.41	74.5	84.55
	75.5	7.17	87.4	77	85.54
	78.3	5.83	88.74	79.8	86.88
	87.2	2.45	92.12	88.7	90.26
	93	2.45	92.12	94.5	90.26
	102	1.82	92.75	103.5	90.89
rtop	112.5	0.8	93.77	114	91.91
rgrnd	112.5	0.86	93.71	114	91.85

R4-XSEC 3	Feature	Type	Wfpa	LBKF	RBKF	ELEV/bkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	POOL	C	200	6.5	92.0	87.92	85.5	2.8	31.0	235.9	4.6	2.3
YR 1	POOL	C	200	8.0	96.5	87.89	88.5	3.3	26.8	292.0	5.5	2.3
YR 2	POOL	C	200	6.0	92.0	87.82	86.0	3.1	28.1	263.2	5.1	2.3
YR 3	POOL	C	200	5.5	85.0	87.50	79.5	3.4	23.2	271.9	5.7	2.5

STONE MTN RESTORATION
Cross Section R4-XSEC3 POOL



Cross Section R4-XSEC4 RIFFLE

STONE MTN RESTORATION

**Yadkin River Basin, Wilkes County, North Carolina
Dani Wise**

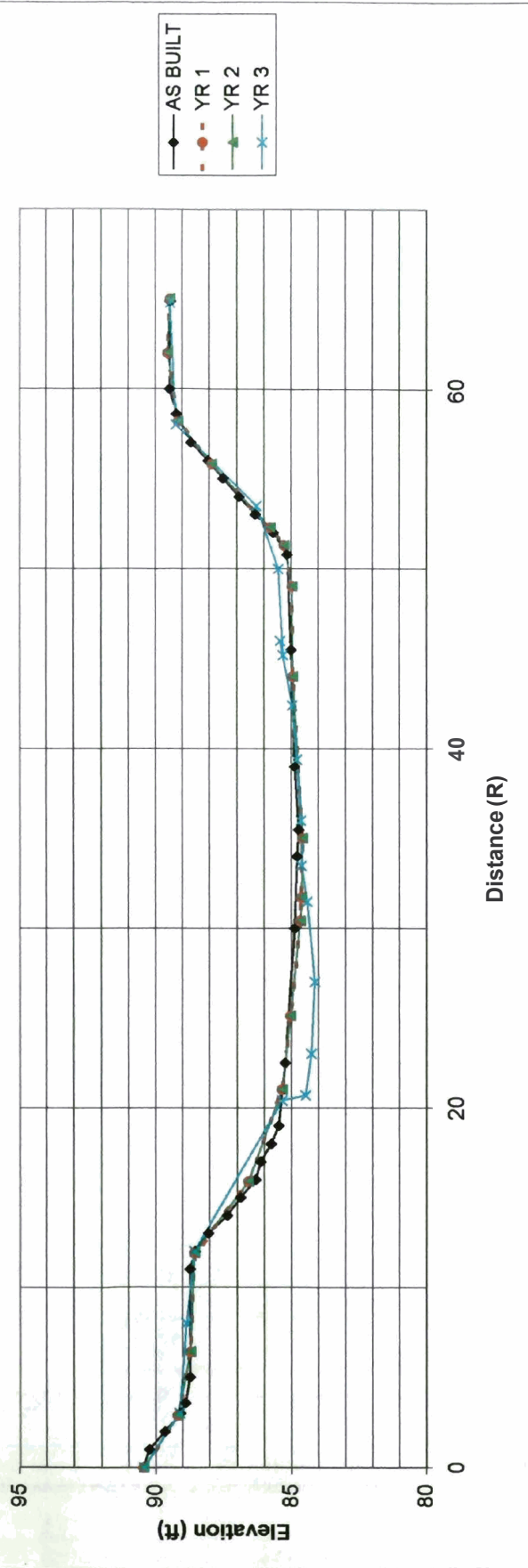
YEAR 3 (2003)

HI = 94.63

NOTES	Survey Data			ADJUSTED	
	STA	FS	ELEV	STA	ELEV
ftop	0	3.78	90.85	0	90.45
	3	5.09	89.54	3	89.14
	8	5.36	89.27	8	88.87
	12	5.65	88.98	12	88.58
lfrw	20.4	8.88	85.75	20.4	85.35
	20.7	9.73	84.9	20.7	84.5
	23	9.95	84.68	23	84.28
	27	10.07	84.56	27	84.16
	31.5	9.8	84.83	31.5	84.43
	33.5	9.59	85.04	33.5	84.64
	36	9.56	85.07	36	84.67
	39.4	9.42	85.21	39.4	84.81
	42.4	9.25	85.38	42.4	84.98
	46	8.8	85.83	46	85.43
	50	8.74	85.89	50	85.49
rew	45.2	8.91	85.72	45.2	85.32
	53.5	7.93	86.7	53.5	86.3
rpin	58	4.97	89.66	58	89.26
	64.8	4.77	89.86	64.8	89.46

R4-XSEC4	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
AS BUILT	POOL	C	200	11.0	57.0	88.73	46.0	3.0	15.3	138.0	4.0	4.3
YR 1	POOL	C	200	11.9	58.0	88.73	46.1	3.1	15.0	141.8	4.1	4.3
YR 2	POOL	C	200	11.9	58.0	89.18	46.1	3.5	13.4	159.1	4.6	4.3
YR 3	POOL	C	200	12.0	58.0	89.26	46.0	3.8	12.0	176.0	5.1	4.3

STONE MTN RESTORATION
Cross Section R4-XSEC4 RIFFLE



Cross Section R4-XSEC5 POOL

STONE MTN RESTORATION

Yadkin River Basin, Wilkes County, North Carolina

Dani Wise

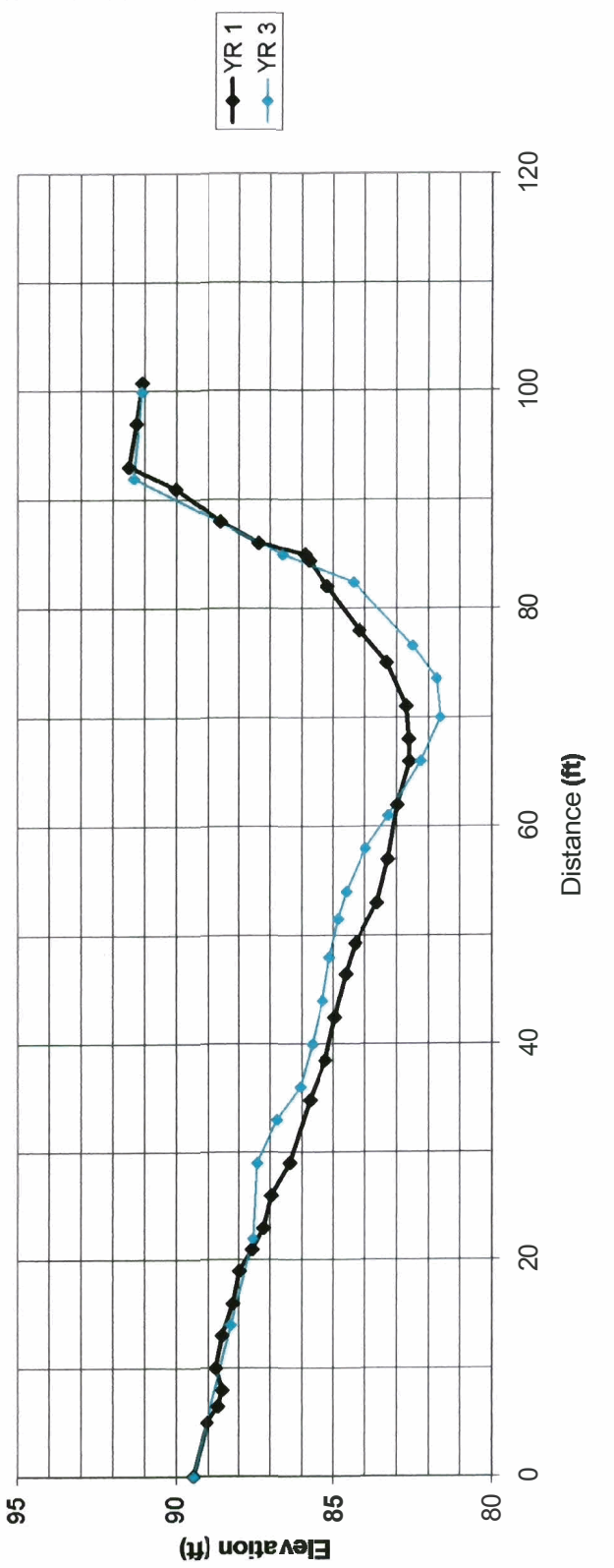
YEAR 3 (2003)

HI= 95.23

NOTES	Survey Data			REVISED	
	STA	FS	ELEV	STA	ELEV
	0	7.56	87.67	0	89.45
	14	8.76	86.47	14	88.25
	22	9.45	85.78	22	87.56
	29	9.58	85.65	29	87.43
	33	10.21	85.02	33	86.80
	36	10.95	84.28	36	86.06
	40	11.33	83.9	40	85.68
	44	11.64	83.59	44	85.37
	48	11.86	83.37	48	85.15
	51.5	12.15	83.08	51.5	84.86
	54	12.41	82.82	54	84.60
	58	13.01	82.22	58	84.00
	61	13.72	81.51	61	83.29
	66	14.75	80.48	66	82.26
	70	15.37	79.86	70	81.64
	73.5	15.25	79.98	73.5	81.76
	76.5	14.49	80.74	76.5	82.52
rew	82.4	12.62	82.61	82.4	84.39
	85	10.39	84.84	85	86.62
rtob	92	5.65	89.58	92	91.36
tpin	100	5.92	89.31	100	91.09

R4-XSEC5	Feature	Type	Wfpa	LBKF	RBKF	ELEV/bkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	POOL	C	200	21.0	86.0	87.57	65.0	3.0	21.7	194.3	5.0	3.1
YR 3	POOL	C	200	22.0	85.0	87.56	63.0	3.5	18.0	223.0	5.9	3.2

STONE MTN RESTORATION
Cross Section R4-XSEC5 POOL



Cross Section R4-XSEC 6 RIFFLE

STONE MTN RESTORATION

**Yadkin River Basin, Wilkes County, North Carolina
Dani Wise**

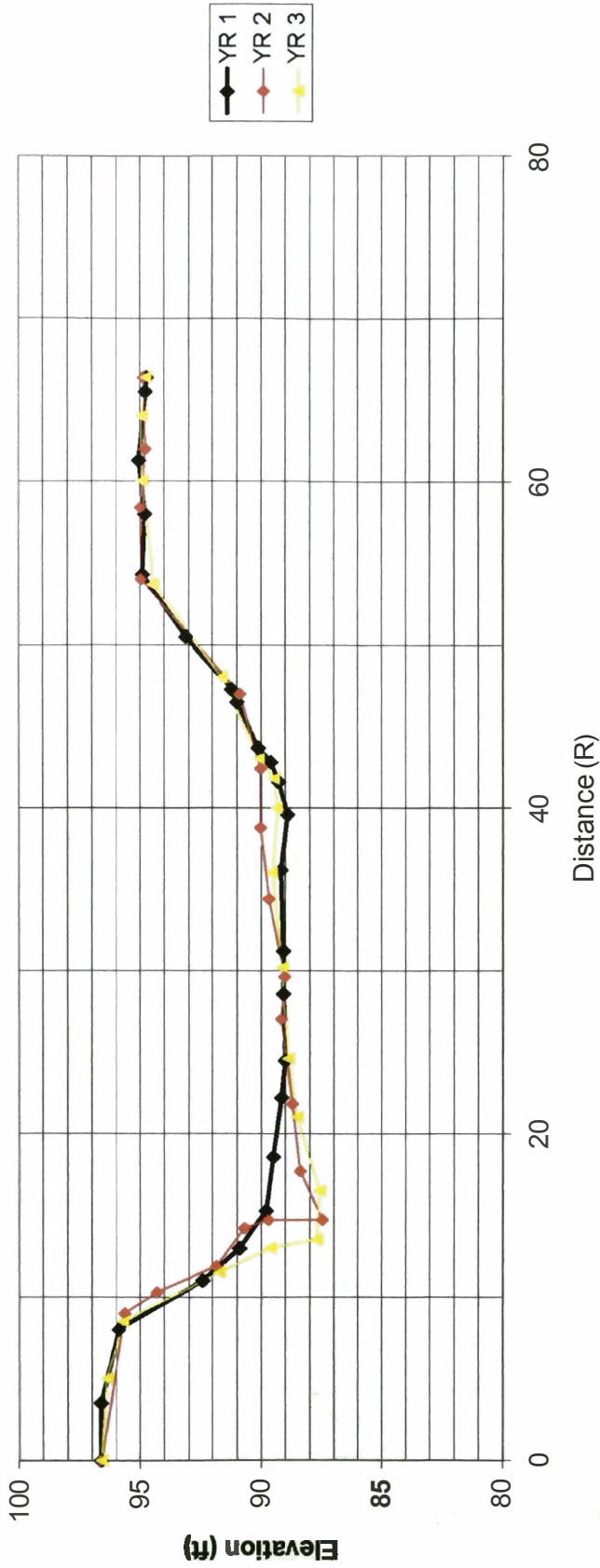
YEAR 3 (2003)

HI = 95.23

NOTES	Survey Data			ADJUSTE	ADJUSTED
	STA	FS	ELEV	STA	ELEV
lpin	0	2.45	92.78	0	96.64
	5	2.68	92.55	5	96.41
ltob	8.5	3.4	91.83	8.5	95.69
	11.5	7.35	87.88	11.5	91.74
lew	13	9.44	85.79	13	89.65
	13.5	11.34	83.89	13.5	87.75
	16.5	11.47	83.76	16.5	87.62
	21	10.55	84.68	21	88.54
	24.6	10.19	85.04	24.6	88.9
	30.2	9.93	85.3	30.2	89.16
	36	9.54	85.69	36	89.55
rew	40	9.74	85.49	40	89.35
	41.8	9.62	85.61	41.8	89.47
	43	9	86.23	43	90.09
rtob	48	7.45	87.78	48	91.64
	53.7	4.59	90.64	53.7	94.5
	60	4.16	91.07	60	94.93
	64	4.15	91.08	64	94.94
	66.4	4.32	90.91	66.4	94.77

R4-XSEC6	Feature	Type	Wfpa	LBF	RBKF	ELEVbkt	Wbkt	Dbkf	WID	Abkf	Dmax	ER
YR 1	RIFFLE	C	200	8.0	54.3	94.90	46.3	4.4	10.4	205.9	6.0	4.3
YR 2	RIFFLE	C	200	9.0	54.0	94.97	46.0	5.2	8.6	236.0	7.5	4.4
YR 3	RIFFLE	C	200	8.5	53.7	94.50	45.2	5.2	8.7	233.8	6.9	4.4

STONE MTN RESTORATION
Cross Section R4-XSEC6 RIFFLE



Cross Section R4-XSEC7 POOL

STONE MTN RESTORATION

Yadkin River Basin, Wilkes County, North Carolina

Dani Wise

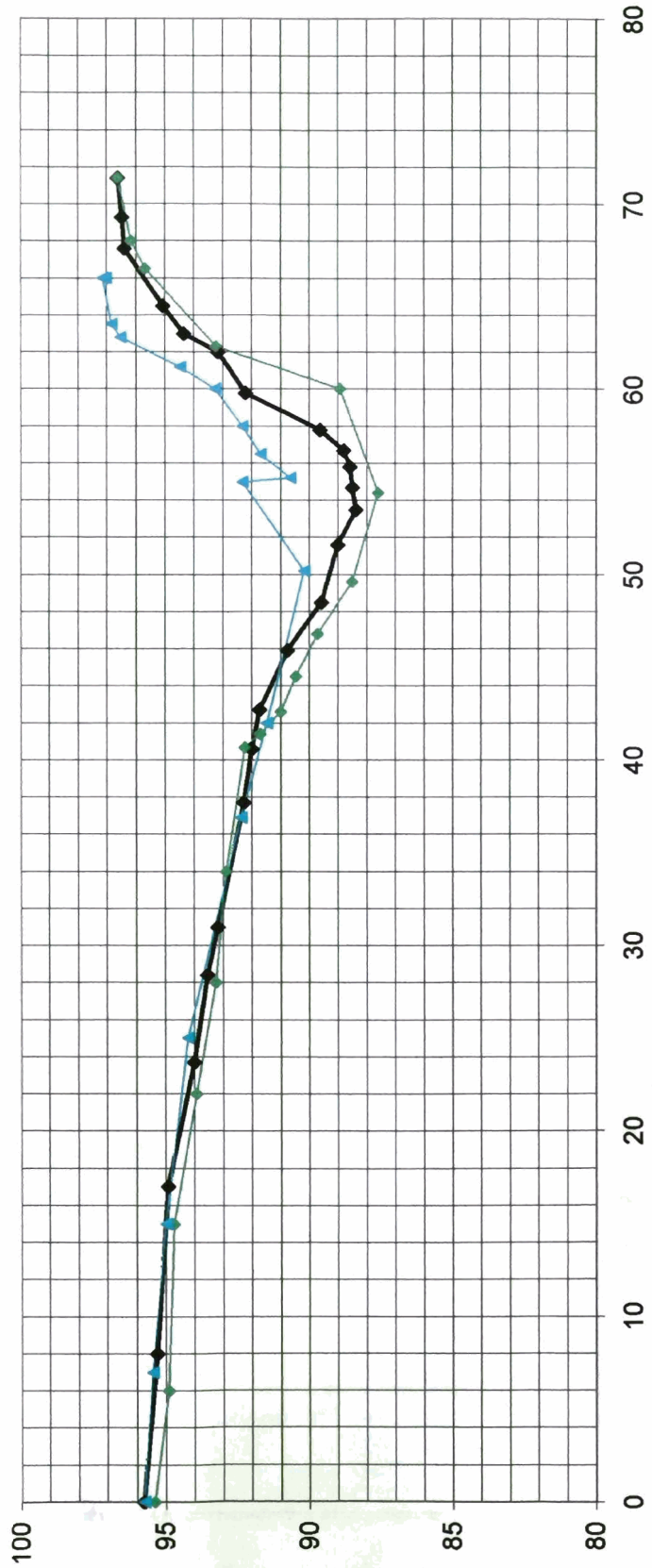
YEAR 3 (2003)

HI = 100

NOTES	Survey Data			ADJUSTED	
	STA	FS	ELEV	STA	ELEV
	0	3.49	96.51	0	95.75
	7	3.77	96.23	7	95.47
	15	4.23	95.77	15	95.01
	25	5	95	25	94.24
lew	36.9	6.86	93.14	36.9	92.38
	42	7.74	92.26	42	91.5
tw	50.2	9.04	90.96	50.2	90.2
ws	55	6.89	93.11	55	92.35
	55.2	8.56	91.44	55.2	90.68
	56.5	7.54	92.46	56.5	91.7
rew	58	6.9	93.1	58	92.34
	60	5.95	94.05	60	93.29
	61.2	4.75	95.25	61.2	94.49
	62.8	2.7	97.3	62.8	96.54
	63.5	2.39	97.61	63.5	96.85
tpiw	66	2.09	97.91	66	97.15
bpiw	66	2.19	97.81	66	97.05

R4-XSEC7	Feature	Type	Wfpa	LBKF	RBKF	ELEVbkf	Wbkf	Dbkf	W/D	Abkf	Dmax	ER
YR 1	POOL	C	200	17.0	64.5	94.91	47.5	3.9	12.2	185.0	6.5	4.2
YR 2	POOL	C	200	15.0	66.5	94.72	51.5	4.3	12.1	219.4	7.1	3.9
YR 3	POOL	C	200	15.0	62.8	95.01	47.8	3.4	14.2	160.6	4.8	4.2

STONE MTN RESTORATION
Cross Section R4-XSEC7 POOL



APPENDIX C

**VEGETATION MONITORING DATA
YR 2003 SURVEY**

Appendix C
Stone Mountain Vegetation Survey: Year 3
 Survey Dates: 7-10-03

BARE ROOT PLOTS					
Reach	Plot #	Live/Total Stems	% survivability	% Herbaceous Cover	Natural Regeneration (Stems)
2	1	1/5	20	>90	44
4	2	20/20	100	>90	153
4	3	6/6	100	>90	94
4	4	6/6	100	>90	>300

LIVE STAKE PLOTS				
Reach	Plot #	Live/Total Stems	% Survivability	Natural Regeneration (Stems)
2	1	4/6	67	18
2	2	12/22	55	67
2	3	2/15	13	13
4	1	3/15	20	23
4	2	0/0	0	0
4	3	13/22	60	51
4	4	4/7	57	40
4	5	1/1	100	15

APPENDIX D

**PHOTO REFERENCE POINTS
YR 2003 SURVEY**



Reach 2: Photo Point 1 (2003)



Reach 2: Photo Point 2 (2003)



Reach 2: Photo Point 3 (2003)



Reach 2: Photo Point 4 (2003)



Reach 2: Photo Point 5 (2003)



Reach 4: Photo Point 1 (2003)



Reach 4: Photo Point 2 (2003)



Reach 4: Photo Point 3 (2003)



Reach 4: Photo Point 4 (2003)



Reach 4: Photo Point 5 (2003)



Reach 4: Photo Point 6 (2003)