Jumping Run Creek
Payne Dairy Farm
Stream Restoration

Executive Summary of Preliminary Design

Alexander County, North Carolina

prepared for:

N.C. Wetlands Restoration Program
—NCDENR DWQ—

prepared by:

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April 2000
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1.0 Introduction

North Carolina Department of Environment and Natural Resources (NCDENR) - Wetlands Restoration Program (WRP) identified through its search process a site in Alexander County for potential stream restoration. The site is known as the Payne Dairy Farm and currently contains an operating dairy. WRP has purchased a 40.217-acre easement along 7500 feet of Jumping Run and 1300 feet of an unnamed tributary to Jumping Run.

Kimley-Horn and Associates (KHA) has performed the necessary fieldwork and data collection to complete the preliminary design plan for the restoration of Jumping Run located inside this easement. This document is a brief summary of the fieldwork and results, data collection, design procedures, and methodologies that went into the preparation of the preliminary design plans.

2.0 Existing Conditions

2.1 Site Description

This site is located in the Upper Catawba River Basin (Hydrologic Unit # 03050101) in Alexander County, North Carolina. The site is located less than two miles to the southeast of Taylorsville, North Carolina. Refer to Cover Sheet on Preliminary Plan for location maps.

The site contains approximately 7,500 + feet of stream located on two main parcels. The site contains Jumping Run and 1300 $\pm$ feet of an unnamed tributary. Jumping Run is classified as a WS-IV stream. The upstream parcel, which contains approximately 4000$\pm$ feet of Jumping Run, is located north of Henry Road (SR 1614). The downstream parcel, which contains 3500$\pm$ feet of Jumping Run and the unnamed tributary, is located to the west of Paul Payne Store Road (SR 1605). The segment of Jumping Run Creek between SR 1614 and SR 1605 is not associated with this project. Refer to Sheet 2 of the Preliminary Design Plans for Overall Site Map.

Currently, the majority of the site is active pasture. Cattle have unlimited access to the stream and wetlands on the upstream parcel and very limited access on the downstream parcel. Payne Dairy Farm on the section between SR 1605 and the tributary installed exclusionary fencing in the past year.

2.2   Stream Condition

Large portions of the stream appear to have been straightened and relocated to one side of the valley. This was most likely done to maximize to amount of pasture. The combination of the cattle accessing the stream and the channel straightening has caused the stream to incise. This degradation is most severe on the upstream parcel (north of SR 1614) and on the tributary on the downstream parcel. Jumping Run downstream of SR 1605 is more stable vertically due to the presence of bedrock.

Based on a qualitative assessment and quantitative geomorphic field surveys the upstream reach was classified as an incised 'E' and 'C' stream type with excessive/unstable bank heights. In many places the stream is classified as a 'G' stream type. This classification is based on the Rosgen Morphologic Stream Classification. A complete summary of the Morphologic Description is provided in Appendix A.

2.3   Watershed

The drainage area for Jumping Run is between 0.6 and 2.5 square miles. The majority of the watershed is active pasture and agriculture. However, in recent years there has been in increase in low-density residential development in the watershed. It is believed that residential development will continue based on new lots being subdivided and signs for future subdivisions. However, it was determined that the watershed as a whole would remain "rural" with the continued major land use being agriculture, active pasture and woodland with only a small percentage of low density development. Hydrology and Morphology was predicted based on a future "rural" watershed.

3.0   Project Description (Goals and Objectives)

The project goal was to assess the feasibility of stream restoration and develop preliminary plans. The objective of this project is to restore Jumping Run from an altered/degraded stream corridor,

including adjacent riparian zones and flood prone areas, to its natural or referenced, stable condition. The ultimate goal of the project is to improve water quality, and the natural function of Jumping Run.

4.0   Methodology

4.1   Field Work

KHA performed the following fieldwork to assess the feasibility of restoration and to complete the preliminary design:

- Delineation of 6.38 acres of on-site Wetlands
- Rosgen Level II Classification of Streams
- Detailed Topographic Survey of Easement
- Watershed Condition and Potential Assessment
- Verification of Regional Curves at Gage Site
- Morphologic Survey of Reference Reach
- Natural Communities (Existing, Reference) Assessment

Wetlands on the project site were not identified on the NWI maps but were extensive based on field surveys. All wetlands inside the WRP easement were mapped because they will serve as a constraint for the horizontal location of the stream. The easement purchased by WRP includes all wetlands for preservation. However, the goals of this project did not include wetland creation, restoration or enhancement.

4.2   The Reference Reach

A stable stream in the same watershed as Jumping Run was chosen as a reference to serve as blueprint for the stable dimension, pattern, and profile. Glade Creek just downstream 1000 feet downstream of SR 1604, was used as a reference. Refer to Appendix B for location and Watershed Map. The fieldwork was performed in accordance with the techniques outlined in "Stream Channel Reference Sites: An Illustrated Guide to Field Techniques" and the "Reference Reach Field Book". A summary of the Geomorphic Characterization and Morphological Descriptions and Survey Summary is included in Appendix B. A total station, Digital Terrain Model (DTM) survey was not performed on the reference reach as it was on the project site.

WRP, KHA, and the Alexander County Natural Resource Conservation Service (NRCS), searched for additional sites. However, only the one stable site was identified.

4.3 Verification of Regional Curves at Gage Station

The North Carolina Rural Piedmont Regional Curves were verified at a Gage Station 2142000 at Lower Little River near Hearing Spring. This gage was the closest gage to the project site. The watershed area, discharge, bankfull width, and bankfull depth for the gage site were plotted on each curve to confirm that the curves were valid for this region. The North Carolina Rural Piedmont Regional Curves are provided in Appendix C. The points for Gage Station 2142000 are added to the curves. A detailed morphologic survey was not performed at the gage because the channel was a "G" channel and was not to be used as a reference for design. Based on the gage site, the regional curves are valid for this geographic region and can be used as a basis for design.

4.4 Regime Equations

In developing the preliminary plans for the project site the NC Regional Curves and reference reach information had to be supplemented by regime equations and empirical relations for determining plan dimension. Equations like the Leopold and Wolman (1960) equations were used to calculate and verify plan features such as meander wavelength, radius of curvature, and meander amplitude. These calculations are included in Appendix D.

4.5 Hydraulic Model

HEC-RAS was used to model the existing stream condition. The bankfull flow, 2, 10, 25, 50, and 100-year events were modeled. The bankfull flow was calculated from the NC Rural Piedmont regional curve. The other storm events were calculated using the Rural Regression Equation for the Blue-Ridge Piedmont, NC.

The model gave the designers a better understanding of predicted water surface elevations, water surface profiles, velocities, bank / channel shear stress, and stream power. This information was used to validate the preliminary design of the channel dimensions (i.e. wetted perimeter and hydraulic radius). The existing conditions HEC-RAS model summary tables are included in Appendix E.

The proposed channel will be modeled in detail as a comparison to the existing channel to aid in the final design of stabilization techniques, erosion control materials, and final channel dimension. The model will be completed upon confirmation of the preliminary plans by WRP.

4.6   Natural Communities

Existing natural communities and species were identified through field identification, both adjacent to the stream and at the reference reach site. Additional proposed species were added based on communication with county and state resources, communication with private sector suppliers and contractors, and literature review.

4.7   Sediment Transport Analysis

Upstream Segment

Sand and finer materials dominate the bed of the upstream segment. Allowable shear stress criteria are not very useful for design of channels with beds dominated by sands or finer materials. Sand beds are generally in motion at bankfull discharges and their shear stress values are much larger than those indicated by the Shields Criterion. In addition, because the channel on the upstream project segment is being relocated it is anticipated that the particle size distribution of the bed will change from silt/sand to sand/gravel. This was confirmed by looking at the particle distribution upstream of the site. Also, anticipated substrate soil sample was taken by auguring down to the proposed bankfull depth in the flood plain soils. The channel bed upstream, off the Payne property, has sand and gravel dominated bed. The soil auger samples verified the presence of gravel in the proposed new channel location (the current floodplain).

Stream power is the product of bankfull velocity and shear stress. The channel dimensions of the proposed channel matches the channel dimensions of the channel just upstream of the site. Since it is likely that the new channel will have a similar particle size distribution to the channel upstream of the project. Therefore, if the channel dimensions and slope are matched then the stream power will be similar for the proposed channel. If the stream power is similar, the proposed channel will have the same capacity to move the D50 particle as the channel just upstream of the site. During construction, the new channel dimensions will be verified based on the actual particle distribution using Shields Criterion or the Army Corp. Equations.

Downstream Segment

The downstream segment is controlled by bedrock. Therefore, a sediment analysis is not appropriate since the entire bed will be mobile during bankfull events.

5.0   Natural Channel Design

The proposed natural channel design takes into account the existing conditions / stability, the cause of the disequilibrium, and the potential and/or morphological character of the natural stable form. This natural stable form was determined based on the methodologies described previously and David Rosgen's paper "A Geomorphic Approach to Restoration of Incised Rivers".

The following is a summary of proposed restoration for each stream segment. Details of the preliminary design contained in attached preliminary plans.

Upstream Segment

A Priority 1 restoration is proposed on the upstream segment of Jumping Run, north of SR 1614. Appendix F contains a Description and Summary of Incised River Restoration. 4,325 Feet of existing "G" and incised "E" channel will be converted to 4,419 feet of "C" channel on the original floodplain using a combination of relic channel, existing channel, and new construction. Specific morphological measurements for both the existing and proposed channel can be found in Appendix A.

Downstream Segment

The downstream segment is vertically controlled by bedrock. This bedrock has prevented the channel from incising to the same point as the upstream segment. However, the channel dimension and pattern are unstable. Placement of log vane structures in combination with bank stabilization/modification will provide for the minimum meander width ratio for a stable "C" channel. In addition, the in-stream structures will create a low flow channel with a lower width to depth ratio and improve the pool to pool spacing. Specific morphological measurements for both the existing and proposed channel can be found in Appendix A.

Tributary

A Priority 1 restoration including a culvert removal is proposed on the last 120 feet of the tributary before its confluence with Jumping Run. This will improve the angle of the confluence, and restore an unstable "G" stream type to a stable stream type "C / B" transition

Pattern, Dimension, and Structures

Refer to the preliminary plans for proposed stream location / relocation, structures type locations & details, fencing location and details, bank stabilization techniques, and proposed pattern and dimension for both the upstream and downstream segments.

6.0   Vegetation Plan

The preliminary planting scheme has been developed based on the United States Forest Service (USFS) recommendations for riparian buffers. The buffer will consist of three zones from the top of bank to 100 feet from the top of bank. Zone 1 (0 to 20 feet from the top of bank) is the stream bank zone consisting of tree and shrub species typically found along stream banks in the region. Zone 2 (20 to 80 feet from the top of bank) is a forested riparian area consisting of selected tree and shrub species, with varying tolerances of inundation and saturation, to be selectively planted based on microtopography and moisture regime. Zone 3 (80 to 100 feet from the top of bank) is a grass filter strip designed to promote dispersed flow into the forested riparian zone (Zone 2). Zones 1 and 2 will be planted with container and/or bare root seedlings depending on available stock, design plans, climate, and cost. Planting spacing will be determined based on planting type, and will be included in final design plans. It is anticipated that Zone 3 will be seeded using a mix of native species. The entire easement will be planted or preserved. The riparian buffer is shown in plan view. A preliminary species list is also included in the preliminary plan.

In addition to the riparian buffer zones, the final vegetation plan will include planting specifications for stream bank stabilization. This is anticipated to be achieved primarily through live stakes and joint planting, as well as seeding (native species). A typical cross section of the anticipated live stake installation is included in the preliminary plan.

7.0   Fencing Plan

Exclusionary Fencing will be installed along the entire easement. Several stream crossings will be maintained so cattle can move in a controlled manner from one side of the easement to the other. NRCS will work with Payne Dairy to provide alternative water sources for the cattle. The anticipated locations of the fence and crossings are shown in the preliminary plan.

8.0   Monitoring Plan

As-Built Plans will be completed and submitted to the agencies that will document that the intent of the project was implemented in the field. The As-Built Plans will verify the constructed channel is of the design pattern, dimension, and profile.

Biological, geomorphic, and vegetative monitoring will be performed on the proposed constructed stream segment to determine success.

Biological Monitoring

Biological monitoring will include monitoring benthic macroinvertebrates per NCDENR's protocol. Biological monitoring will be conducted by and be the responsibility of NCDENR's Wetland 401 Group. The monitoring will consist of pre-construction and post-construction sampling. The current NCDENR standard for monitoring will be used. The NCDENR Wetland 401 Group will determine the biological monitoring procedures and schedule.

Geomorphic Monitoring

Geomorphic monitoring will be the responsibility of WRP. Vertical bed stability will be verified using monumented cross-sections and scour chains. The cross-sections will be located in both pool and riffle sections. Scour chains will be installed in appropriate features to verify entrainment size, and scour depths. Lateral bed stability will be verified using monumented cross-sections and bank pins. Existing and departures of a frequency of particle size distribution will be measured using the modified Wolman pebble count

8

method. The location of the monumented cross-sections, scour chains, bank pins, and pebble count transects will be finalized during construction and shown on the As-Built Plans. Soil Bioengineering success should be monitored. Documentation will occur at pre-established stations each year as well as at specific locations that do not appear to be as successful based on a visual reconnaissance of the corridor.

The morphology of the stream is to be monitored a minimum of once a year for 5 years after construction. It is also recommended to survey the stream after major (>2 year) storm events during this period.

Vegetative Buffer Monitoring

Vegetation survival inside the riparian buffer will be documented for a 5-year period through photograph documentation of the entire length of the corridor in which buffers were planted. Documentation will occur at pre-established stations each year as well as at specific locations that do not appear to be as successful based on a visual reconnaissance of the corridor. Vegetation survival of target dominant species will be confirmed.

9.0   Summary

The attached preliminary plans restore Jumping Run and adjacent riparian zones and flood prone areas from a state of disequilibrium to a stable, referenced, natural condition. The preliminary design is based on a geomorphic approach to restoration using Rosgen's Stream Classification System. Use of, historical and existing field indicators, regime equations, and a hydraulic computer model (HEC-RAS) supplemented this methodology.

The attached design restores the geomorphic dimension, pattern and profile of over 5,700 feet of Jumping Run. In addition, the entire 40.2 acre easement will be fenced to exclude the cattle and a vegetative buffer will be planted / preserved along the entire 8,300 linear feet of Jumping Run and unnamed tributaries contained inside the easement.

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Appendix A

Morphological Measurement Tables

Morphological Measurement Table
Downstream Of SR 1605

Variables	Existing*	Proposed	NC Rural Piedmont Regional Curves & Regime Eq.	USGS Station** 2142000	Reference Reach
1 Stream Type (Rosgen)	C5/6-1	C5-1	-	G4/5	B4-1c
2 Drainage Area (sq mi)	2.2	2.2	2.2	28.2	1.81 sq miles
3 Bankfull Width (ft.)	25-35	20-24	10-35 (20 avg.)	35	16
4 Bankfull Depth (ft.)	1.7	1.7	1-3 (2 avg.)	4.7	1.7
5 Width / Depth Ratio (ft.)	12.5-17.5	12-14	10	7.6	10
6 Bankfull Cross-Sectional Area (ft^2)	42-60	34-41	18-70(30avg.)	161	24
7 Bankfull Mean Velocity (fps)	3-4.3	4.4-5.6	6	6.4	-
8 Bankfull Discharge (cfs)	180	180	55-450 (180 avg.)	1040	-
9 Bankfull Max Depth (ft.)	2	2.5	-	5.0	4-4.5
10 Width of Floodprone Area (ft.)	125-205	125-205	-	48	30
11 Entrenchment Ratio	4.3-6.1	3-6	>2.2	1.37	1.9
12 Meander Length (ft.)	150	150	224	-	n/a
13 Ratio of Meander Length to Bankfull Width	5.8-7.1	6.3-7.5	11.2	-	n/a
14 Radius of Curvature (ft.)	30-70	30-70	52	-	n/a
15 Ratio of Radius of Curv. To Bankfull Width	1.3-3	1.25-1.5	2.6	-	n/a
16 Belt Width (ft.)	80	80	73	-	n/a
17 Meander Width Ratio	3.5	3.5	2.6	-	n/a
18 Sinuosity (Stream Length / Valley Length)	1.05	1.05	>1.2	-	1.2
19 Valley Slope (ft/ft)	0.0065	0.0065	-	-	0.012
20 Average Slope (ft/ft)	0.0055	0.0055	-	-	0.0096
21 Pool Slope (ft/ft)	0.002-0.005	0.002-0.005	-	-	0.007-0.009
22 Ratio of Pool Slope to Avg. Slope	0.4-0.9	0.4-0.9	-	-	1.1-1.36
23 Maximum Pool Depth (ft.)	2-2.5	2.5-3	-	-	3
24 Ratio of Pool Depth to Avg. Bankfull Depth	1.2-1.5	1.5-2	-	-	1.2 - 1.75
25 Pool Width (ft.)	*	35	-	-	16
26 Ratio of Pool Width to Bankfull Width	*	1.0-1.2	-	-	1.0
27 Pool to Pool Spacing (ft.)	100	100	-	-	70
28 Ratio of Pool Pool Spacing to Bankfull Width	4.3	4.3	5.6	-	4.4
29 Bank HT Ratio (Low Bank / Bankfull) (ft.)	1.3	1.0-1.2	1.0	-	-

* Field indicators in the existing channel were dificult to identify due to heavy disturbance from cattle, severe bank erosion, and overall channel instability.

** The USGS Gage was used to verify the accuracy of the NC Rural Piedmont Curves for the Physiogeographic region of the project.

Detail Measurements were not taken because the channel was a "G" channel and was not to be used as a reference.

Morphological Measurement Table
Upstream of SR 1614 (North Section)

Variables	Existing*	Proposed	NC Rural Piedmont Regional Curves & Regime Eq.	USGS Station** 2142000	Reference Reach
1 Stream Type (Rosgen)	E6, G6, C4/5	C5/4	-	G4/5	B4-1c
2 Drainage Area (sq mi)	1.2	1.2	1.2	28.2	1.81 sq miles
3 Bankfull Width (ft.)	12-21*	12-20avg	12-20	35	16
4 Bankfull Depth (ft.)	1.0-1.8*	1.5-1.8	1.5-1.8	4.7	1.7
5 Width / Depth Ratio (ft.)	7-21*	6.7-13.3	6.7-13	7.6	10
6 Bankfull Cross-Sectional Area (ft²)	12-24*	18-25	18-25	161	24
7 Bankfull Mean Velocity (fps)	3.1-8.3	3-5.5	3.0-5.5	6.4	-
8 Bankfull Discharge (cfs)	75-100	75-100	75-100	1040	-
9 Bankfull Max Depth (ft.)	1.8	2.5	-	5.0	4-4.5
10 Width of Floodprone Area (ft.)	13-75	120±	-	48	30
11 Entrenchment Ratio	1-6	5.6-10	>2.2	1.37	1.9
12 Meander Length (ft.)	50	150	134-180	-	n/a
13 Ratio of Meander Length to Bankfull Width	2.1-4.1	7-13	8.4	-	n/a
14 Radius of Curvature (ft.)	16-45	42-100	42-57	-	n/a
15 Ratio of Radius of Curv. To Bankfull Width	1.3-2.1	3.5-5	3.5	-	n/a
16 Belt Width (ft.)	130	200	42	-	n/a
17 Meander Width Ratio	7.2	12.5	4.3	-	n/a
18 Sinuosity (Stream Length / Valley Length)	1.14	1.4+	>1.4	-	1.2
19 Valley Slope (ft/ft)	0.0092	0.0092	-	-	0.012
20 Average Slope (ft/ft)	0.0081	0.0066	-	-	0.0096
21 Pool Slope (ft/ft)	0.004-0.006	.002-.005	-	-	0.007-0.009
22 Ratio of Pool Slope to Avg. Slope	0.5-0.75	0.2 -0.75	-	-	1.1-1.36
23 Maximum Pool Depth (ft.)	2-3	5.4	-	-	3
24 Ratio of Pool Depth to Avg. Bankfull Depth	1.6-2.0	3	-	-	1.2 - 1.75
25 Pool Width (ft.)	*	12-22	13-24	-	16
26 Ratio of Pool Width to Bankfull Width	*	1-1.1	-	-	1.0
27 Pool to Pool Spacing (ft.)	50	45-100	-	-	70
28 Ratio of Pool Pool Spacing to Bankfull Width	2.4-4.2	2.3-6.3	5.7	-	4.4
29 Bank HT Ratio (Low Bank / Bankfull) (ft.)	1.7-2.2	1.0 - 1.1	1.0	-	-

* Field indicators in the existing channel were dificult to identify due to heavy disturbance from cattle, severe bank erosion, and overall channel instability.

** The USGS Gage was used to verify the accuracy of the NC Rural Piedmont Curves for the Physiogeographic region of the project.

Detail Measurements were not taken because the channel was a "G" channel and was not to be used as a reference.

Appendix B

Reference Reach

Reference Reach

STREAM CLASSIFICATION WORKSHEET

Party: Kimley-Horn and Asssociates (WRW, CWE)   Date: 1/14/2000
State: NC   County: Alexander Location: 1000 ft D/S of Boston Rd. (SR
Stream: Glade Creek   Drainage Area: 1070 Acres (1.7 sqmi)

Bankfull Measurements:

Width   16   Depth   1.7   W/D   9.4

Entrenchment Ratio (Floodprone Width/Bankfull width):

Floodprone width is water level at 2x maximum depth in bankfull cross-section,
or width of inermediate floodplain (10-50 yr. event)
Bankfull Width   16   Floodprone Width   30
Entrenchment Ratio   1.9
    Slight = 2.2 +   Moderate=1.41-2.2   Entrenched = 1.0-1.4

Sinuosity (Stream Length/Valley Length) or (Valley Slope/Channel Slope):

Stream Length (S_L)   Valley Slope (V_s)   0.012
Valley Length (V_L)   Channel Slope (C_s)   0.00956
Sinuosity (S_L/V_L)   Sinuosity (V_s/C_s)   1.2552301

Dominant Channel Soils:

Bed Materials   various
Description of Soil Profiles (from base of bank to top)

Right: @ Sta 2+20 (0-2' 10YR 3/1, 2-2.5' 10YR 3/2, 2.5-3' 10YR 4/4 w/ 5YR 5/8 incl.
         3-5' 7.5YR 5/6 Loamy Sand)
Left: Same Compostiion as Rt.
Bank Slope (Horizontal to Vertical)   L   1:1.3   R   1:1.2

Riparian Vegetation:

Left Bank: See Photo   Right Bank: See Photo
% Total Area (Mass L   R
% Total Ht w/ Roots L   R
Ratio of Actual Bank Height to Bankfull Height

Water Surface Slope

Water surface slope is the "riffle" to "riffle" water surface representing the bankfull stage
gradient for a length of approximately 20 to 30 bankfull channel widths.
    S =   0.0096

STREAM TYPE   B4-1c   Remarks   Bebrock present

STREAM CLASSIFICATION WORKSHEET
REFERENCE REACH

Party: Kimley-Horn and Asssociates (WRW, CWE)   Date: 1/14/00
State: NC   County: Alexander   Location: 1000 ft D/S of Boston Rd. (SR
Stream: Glade Creek   Drainage Area: 1070 Acres (1.7 sqmi)

Bankfull Measurements:

Width ___16___   Depth ___1.7___   W/D ___9.4___

Entrenchment Ratio (Floodprone Width/Bankfull width):

Floodprone width is water level at 2x maximum depth in bankfull cross-section, or width of inermediate floodplain (10-50 yr. event)

Bankfull Width ___16___   Floodprone Width ___30___

Entrenchment Ratio ___1.9___

Slight = 2.2 +   Moderate=1.41-2.2   Entrenched = 1.0-1.4

Sinuosity (Stream Length/Valley Length) or (Valley Slope/Channel Slope):

Stream Length (S_L) _____	Valley Slope (V_s) 0.012
Valley Length (V_L) _____	Channel Slope (C_s) 0.00956
Sinuosity (S_L/V_L) _____	Sinuosity (V_s/C_s) 1.2552301

Dominant Channel Soils:

Bed Materials _____various_____

Description of Soil Profiles (from base of bank to top)

Right: @ Sta 2+20 (0-2' 10YR 3/1, 2-2.5' 10YR 3/2, 2.5-3' 10YR 4/4 w/ 5YR 5/8 incl.
3-5' 7.5YR 5/6 Loamy Sand)

Left: _____Same Compostiion as Rt._____

Bank Slope (Horizontal to Vertical)   L ___1:1.3___   R ___1:1.2___

Riparian Vegetation:

Left Bank: ___See Photo___   Right Bank: ___See Photo___

% Total Area (Mass L   R

% Total Ht w/ Roots L   R

Ratio of Actual Bank Height to Bankfull Height

Water Surface Slope

Water surface slope is the "riffle" to "riffle" water surface representing the bankfull stage gradient for a length of approximately 20 to 30 bankfull channel widths.

S = ___0.0096___

STREAM TYPE ___B4-1c___ Remarks _____Bebrock present_____

Longitudinal Profile

Station	Description	WS ELEV	TW ELEV
0	NICK PT	994.00	993.70
20	END RIF	992.21	992.11
40	POOL	992.18	991.40
47	NICK PT	992.14	991.80
55	TOP RIF	991.92	991.44
70	RIF	991.63	991.25
90	RUN/ END RIF	991.35	990.99
100	POOL	991.35	990.72
133	TOP RIF	991.30	991.06
150	END RIF	990.85	990.47
175	POOL	990.62	989.04
185	TOP RIF	990.60	990.23
195	RIF	990.53	990.26
205	END RIF	990.43	990.34
220	POOL	990.49	989.56

Longitudinal Profile
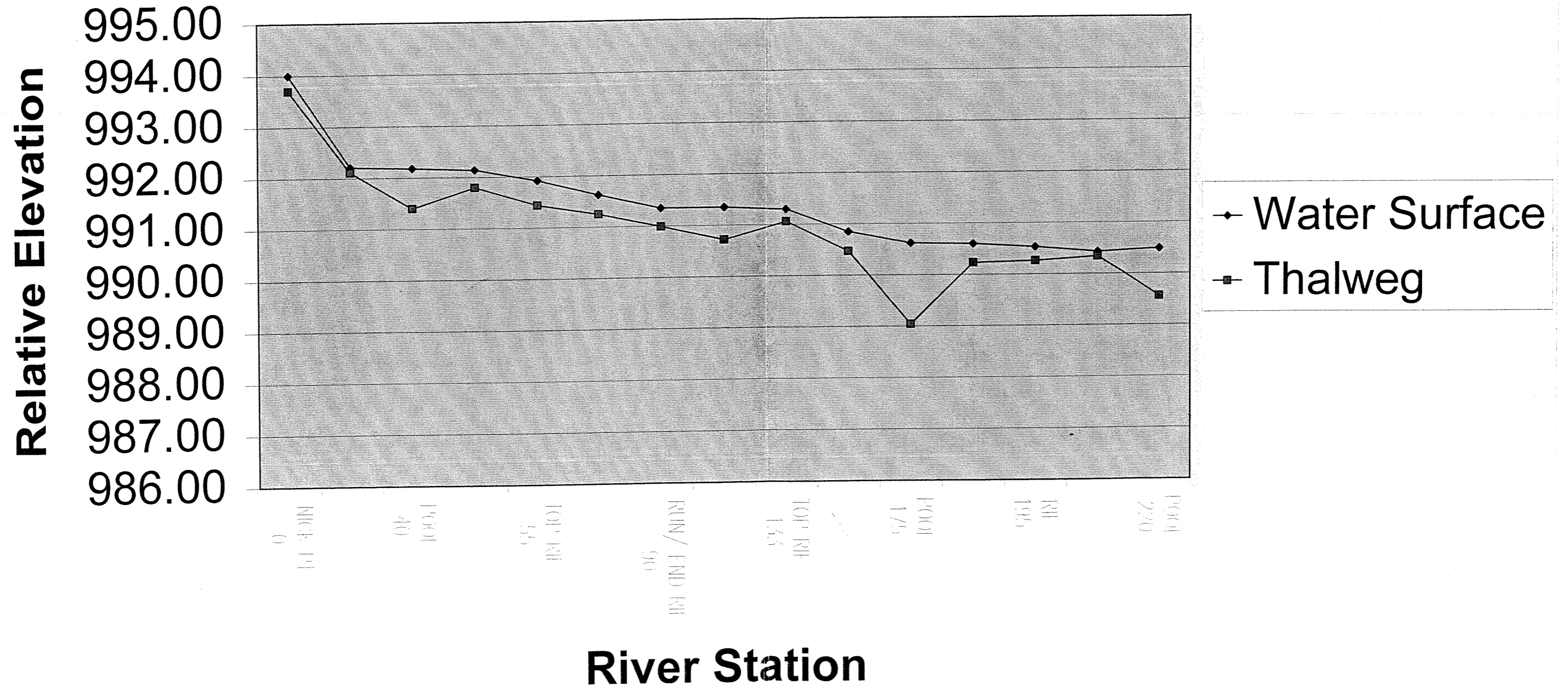
Kimley-Horn and Associates, Inc.

PEBBLE COUNT   Site REF # ! (Glade Creek)

Metric (mm)	English (inches)	Particle	Count	Tot #	% Tot	% Cum	Count	Tot #	% Tot	% Cum	Count	Tot #	% Tot	% Cum
<.062	<.002	Silt/Clay		5	6.25	6.25								
						6.25								
.062-0.25	.002-.01	Fine Sand			0	6.25								
0.25-.5	.01-.012	Med. Sand		5	6.25	12.5								
.5-1.0	.02-.04	Coarse Sand			0	12.5								
1.0-2.0	.04-.08	Vy Coarse Sand		13	16.25	28.75								
						28.75								
2-8	.08-.32	Fine Gravel		12	15	43.75								
8-16	.32-.63	Med Gravel		3	3.75	47.5								
16-32	.63-1.26	Coarse Gravel		7	8.75	56.25								
32-64	1.26-2.51	Vy Coarse Gravel		4	5	61.25								
64-128	2.51-5.0	Small Cobbles		8	10	71.25								
128-256	5.0-10.1	Large Cobbles		6	7.5	78.75								
256-512	10.1-10.2	Sm. Boulders												
512-1024	20.2-40.3	Med Boulders												
1024-2048	40.3-80.6	Lg. Boulders												
2048-4096	80.6-161	Vy Lg Boulders												
		Bed Rock		17	21.25	100								

sum   80

Project: Payne Dairy Farm Jumping Run Creek Stream Restoration
Date: 2/23/2000
Reference Site: Glade Creek D/S of Bosto Rd.
Stream Name: Glade Creek

X-Section @ Approx. STA 1+33 (Riffle)

Station	Description	Elev	
0.0	G.S. @ Rebar LB	997.22	
5.0	HT LB	996.02	
8.0	LB	994.88	
9.0	LB	994.27	
11.0	MT LB	993.06	
11.6	LB	992.37	
12.0	LB	991.80	
12.8	EOW	991.28	991.3
12.8	SB	991.09	
15.0	SB	991.19	
17.0	SB	991.20	
18.0	TW	990.97	
19.0	SB	991.24	
20.0	SB	991.12	
22.0	SB	991.17	
24.0	SB	991.11	
25.0	SB	991.10	
26.0	SB	991.06	
27.0	EOW	991.33	991.3
27.5	BF	992.50	
27.8	BF	992.73	
29.5	RB	993.77	
31.0	RB	994.72	
32.0	HT RB	996.34	
35.0	HT RB	997.50	

* All elevations are based on a relative BM at X-Section STA +38 (nail in oak tree)

X-Section @ Sta 1+33

Relative Elevation (y-axis): 998.00, 996.00, 994.00, 992.00, 990.00, 988.00, 986.00

G.S. @	EOW	SB	RB
Rebar LB	12.8	22.0	29.5
0.0			
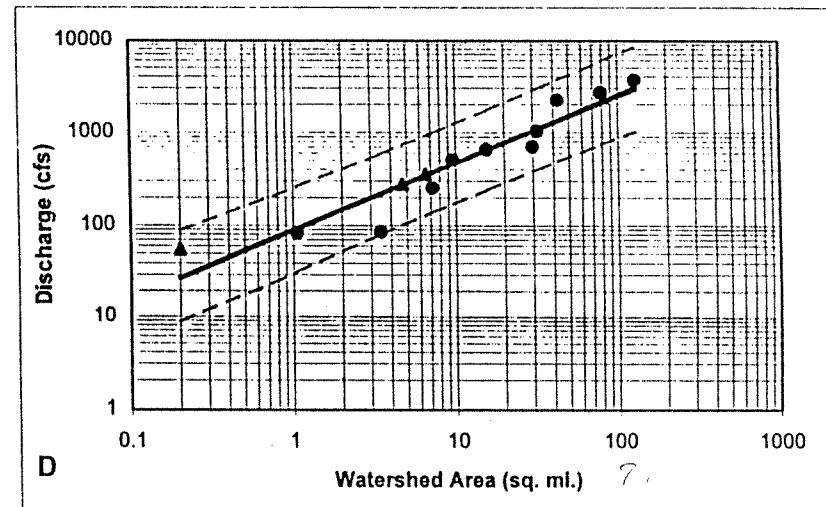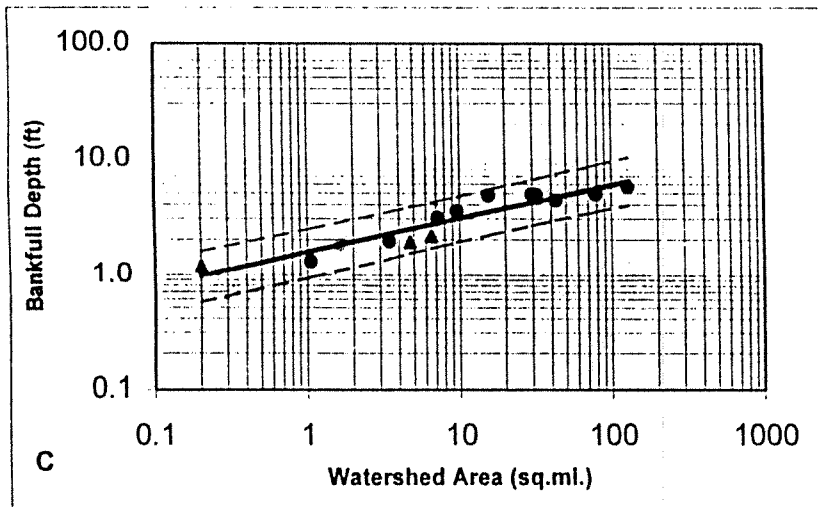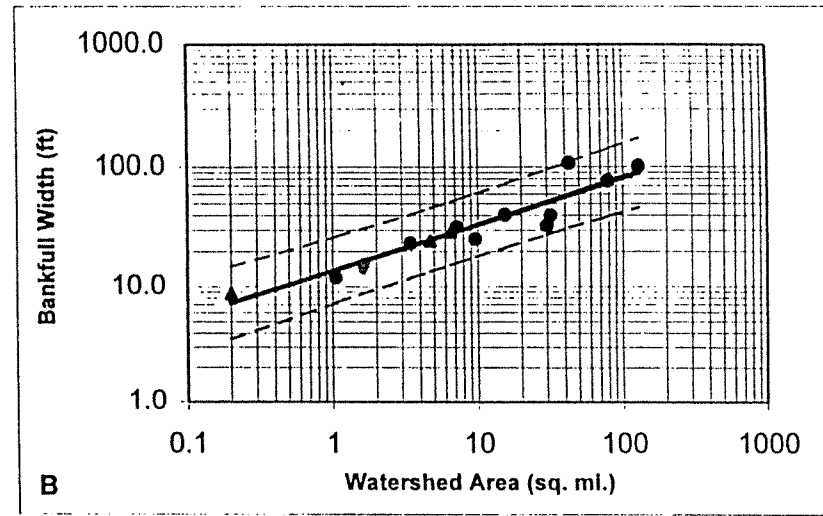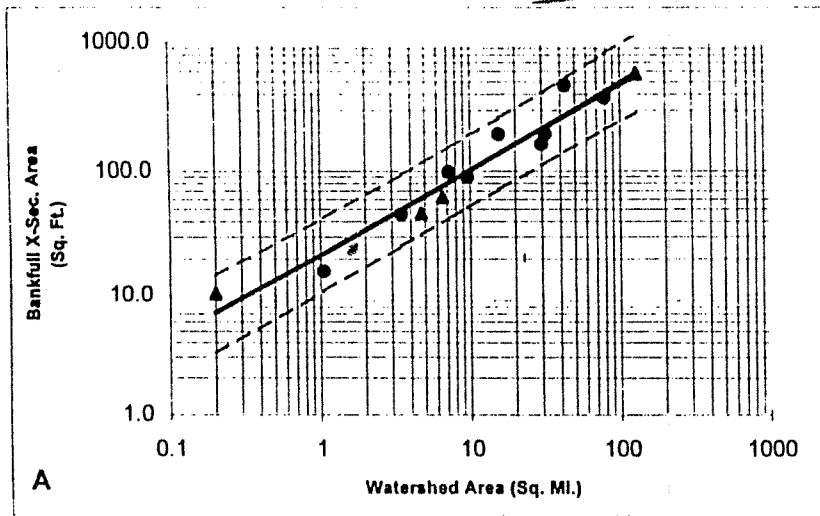
Station

Figure 2: Bankfull hydraulic geometry relationships for rural Piedmont North Carolina Streams. The four graphs represent: a) cross sectional area, b) width, c) depth, and d) discharge. The circles represent gage stations and the triangles represent ungaged streams.

Appendix C

NC Rural Piedmont
Regional Curves

NC Rural Piedmont Regional Curve
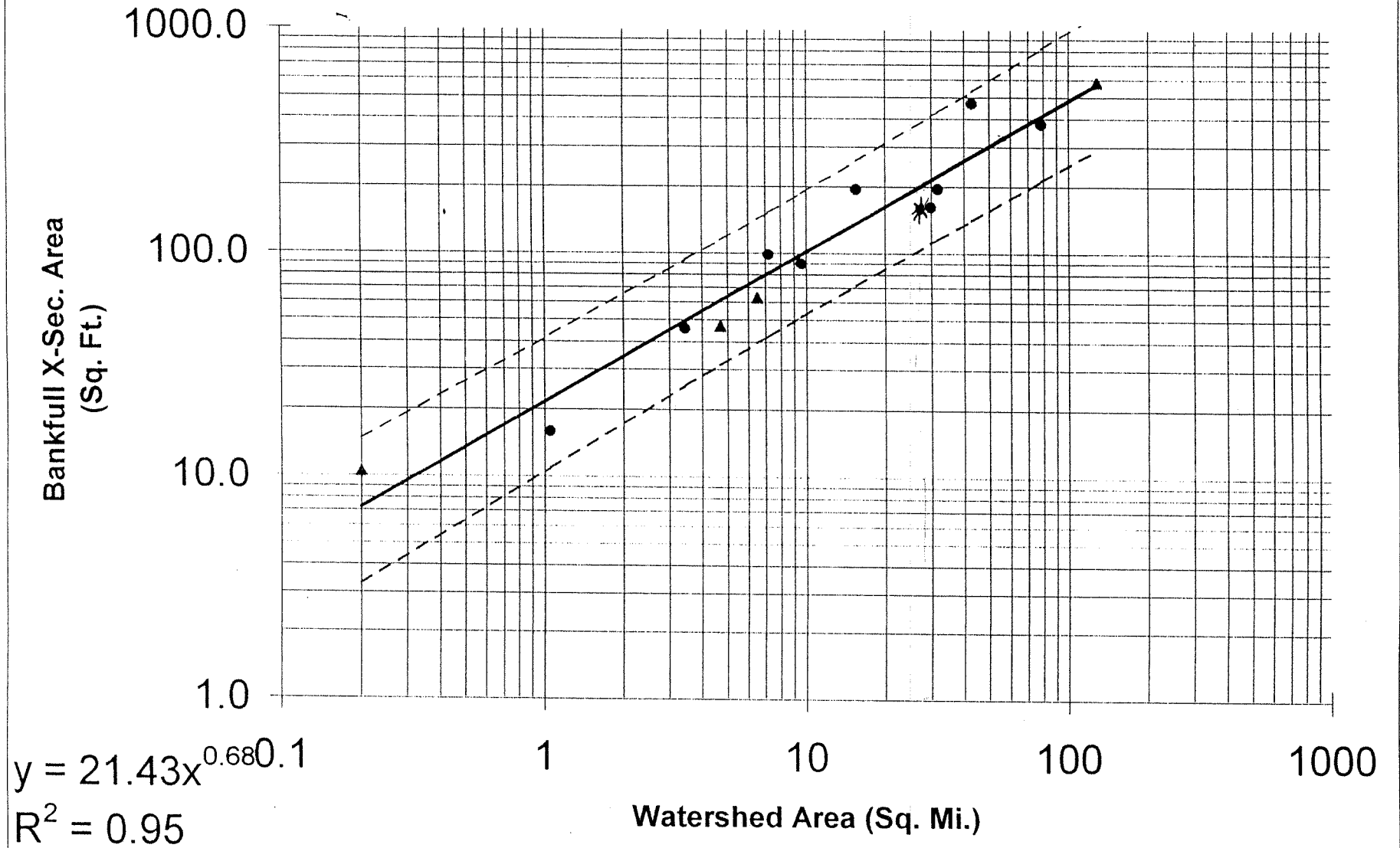
Y-axis: Bankfull X-Sec. Area (Sq. Ft.)

X-axis: Watershed Area (Sq. Mi.)

$y = 21.43x^{0.68}$

$R^2 = 0.95$

* USGS GAGE STA 2142000 @ LOWER LITTLE RIVER NEAR ALL HEALING SPRING

NC Rural Piedmont Regional Curve

Chart plotting Discharge (cfs) on the y-axis (logarithmic scale from 1.0 to 10000.0) versus Watershed Area (sq. mi.) on the x-axis (logarithmic scale from 0.1 to 1000).

$y = 66.57x^{0.89}$

$R^2 = 0.97$

Discharge (cfs) (y-axis label)

Watershed Area (sq. mi.) (x-axis label)

✳ USGS GAGE STA 2142000 @ LOWER LITTLE RIVER NEAR ALL HEALING SPRING

NC Rural Piedmont Regional Curve

$y = 11.89x^{0.43}$

$R^2 = 0.81$

Bankfull Width (ft) vs. Watershed Area (sq. mi.)
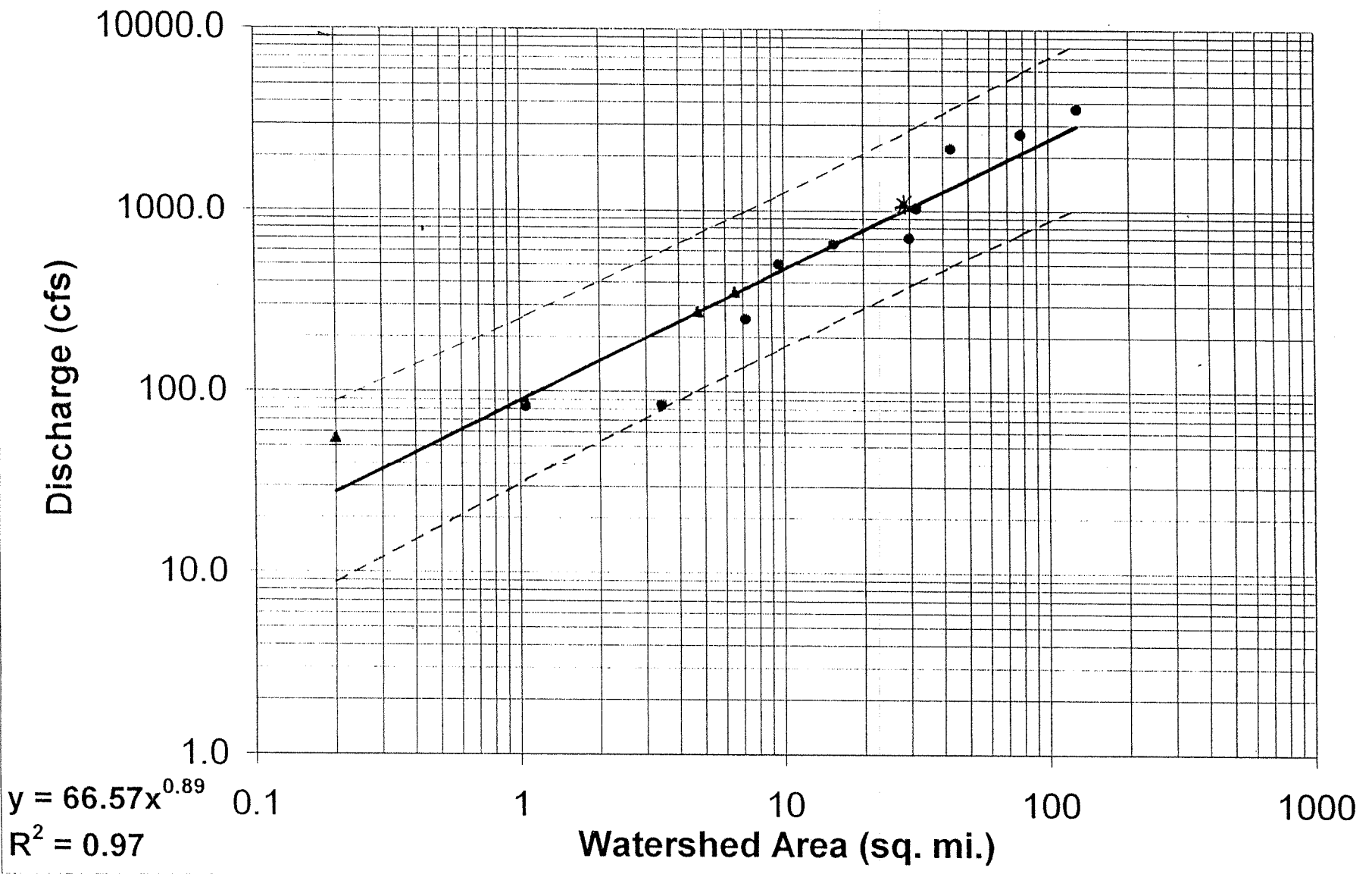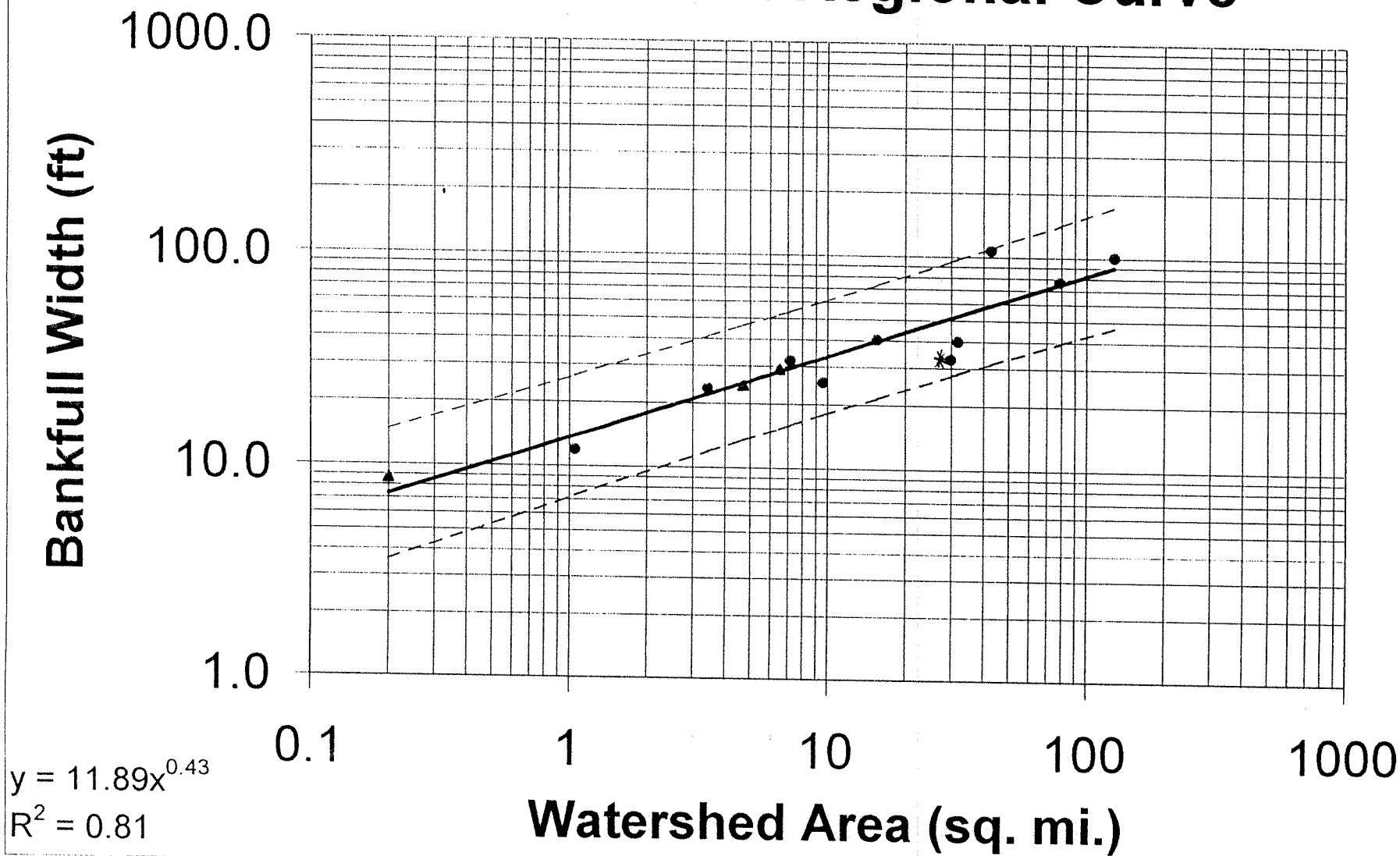
✳ USGS GAGE STA ⊕ 2142000 ⊕ LOWER LITTLE RIVER NEAR ALL HEALING SPRING

NC Rural Piedmont Regional Curve

$y = 1.5x^{0.32}$

$R^2 = 0.88$

Bankfull Depth (ft) (y-axis: 0.1, 1.0, 10.0, 100.0)

Watershed Area (sq.mi.) (x-axis: 0.1, 1, 10, 100, 1000)
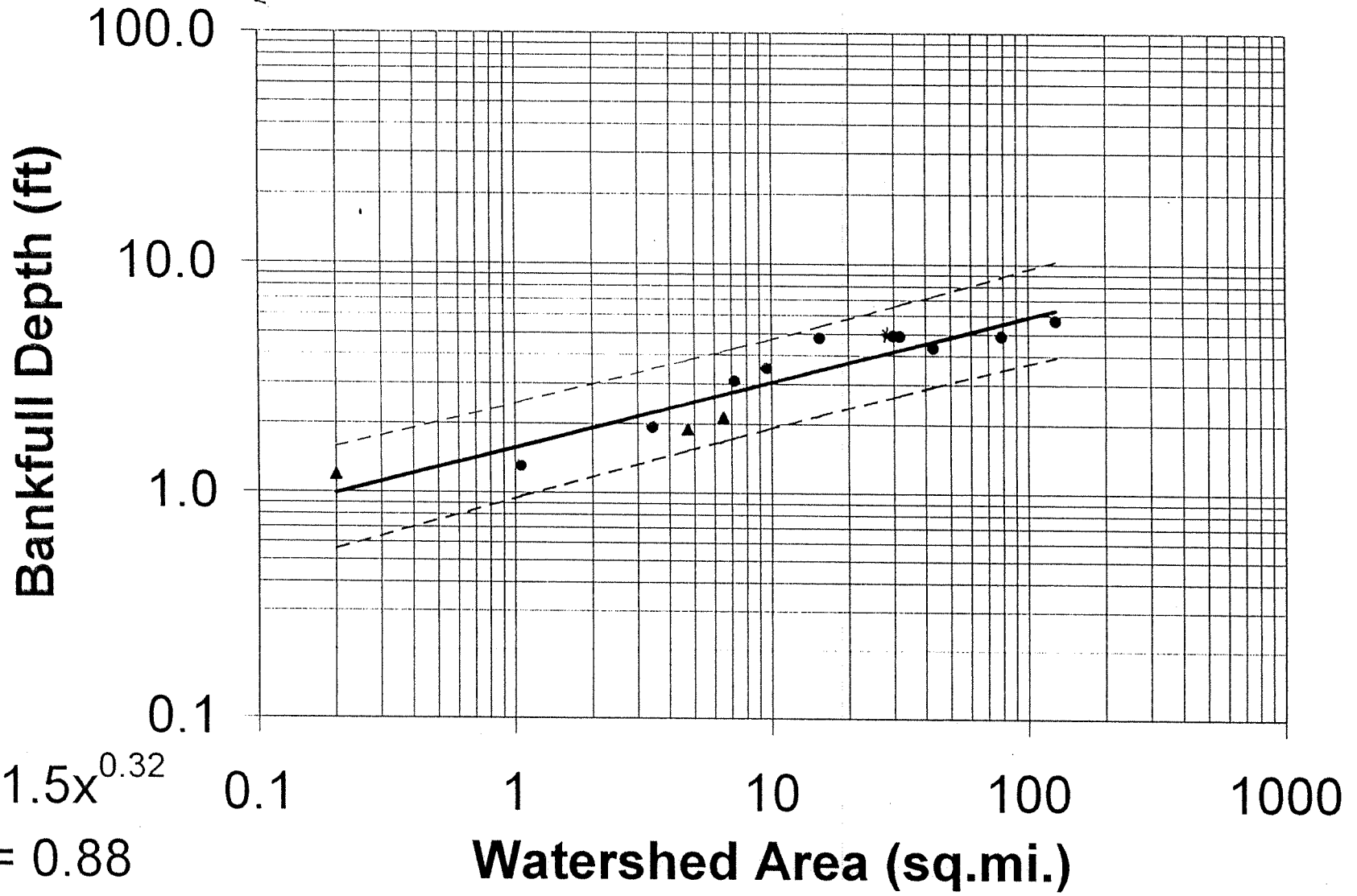
✳ USGS GAGE STA 2142000 @ LOWER LITTLE RIVER NEAR ALL HEALING SPRING

Stream Name	Gage Station ID	Drainage Area (mi2)	Stream Type (Rosgen)	Bankfull Discharge (cfs)	Bankfull Xsec Area (ft2)	Bankfull Width (ft)	Bankfull Mean Depth (ft)	Water Surface Slope (ft/ft)	Return Interval (Years)	Exceedence Probability (%)
Sal's Branch	Reference Reach	0.2	E4	55.4	10.4	8.7	1.2	0.0109	n/a	n/a
Humpy Creek	02117030	1.05	E5	83	15.8	12.0	1.3	0.0060	1.7	59
Dutchmans	02123567	3.44	C5	85.1	45.6	23.5	1.9	0.0170	1	100
Mill Creek	Reference Reach	4.7	E4	277	46.7	24.5	1.9	0.0080	n/a	n/a
Upper Mitchell River	Reference Reach	6.5	B4c	356	62.5	29.2	2.1	0.0095	n/a	n/a
Norwood Creek	0214253830	7.18	E5	253.7	98.8	32.0	3.1	0.0008	1.1	91
North Pott's Creek	02121180	9.6	E5	507.2	89.6	25.4	3.5	0.0012	1.7	59
Tick Creek	02101800	15.5	E	655.3	194	40.5	4.8	0.0005	1.3	77
Moon Creek	02075160	29.9	E5	708.8	162	33.0	4.9	0.0015	1.8	56
Long Creek	02144000	31.8	E5	1041	195	40.0	4.9	0.0010	1.4	71
Little Yadkin River	02114450	42.8	G5	2236	469	77.5	6.0	0.0018	1.4	71
Mitchell River	02112360	78.8	C	2681	377	77.0	4.9	0.0030	1.6	63
Fisher River	02113000	128	C3	3687	578	101	5.7	0.0023	1.4	71

Table 1: Hydraulic geometry, survey summary, and flood frequency analyses for gaged and ungaged stream reaches.

Bankfull width and mean depth corrected for Little Yadkin River

Appendix D

Regime Equations

Plan View Calcs   U/S   SEGMENT

- Leopold & Wolman Equation (1960) to predict Meander Length, Amplitude, & mean radius of Curvature

- Input into Equation is bankfull surface width
- Bankfull Surface Width obtained from Regional Curves

- Regional Curves verified w/ Reference Reach

U/S OF TRIB $W_{BKF} = 12'$ Avg $[6' - 25']$

Meander Length $= L_m = 10.9 W^{1.01} = 134' [67' - 281']$

Amplitude $= A = 2.7 W^{1.1} = 42' [20' - 93']$

radius of Curvature $= R_c = \left(\frac{L_m}{4.7}\right)^{1.02} = 30' [15 - 65']$

SR 1614 — Trib $W_{BKF} = 16'$ AVG $[8 - 30']$

Meander Length $= L_m = 10.9 W^{1.01} = 180'$

Amplitude $= A = 2.7 W^{1.1} = 57'$

Radius of Curvature $= R_c = \left(\frac{L_m}{4.7}\right)^{1.02} = 42'$

* These #'s can be used as check (i.e. general rule)

Plan View Calcs D/S SEGMENT (D/s oF SR 1605)

- Leopold & Wolman Equation to predict
  Meander Length, Amplitude, & Mean Radius of Curvature

- Input into Eq is Bankfull Surface Width
- Bankfull Surface Width obtained from Regional Curves
- Regional Curves Verified w/ Reference Reach / Gage Site

D/S of SR 1605 $W_{BKF} = 20'$ Avg (10-35)

Meander Length $= L_m = 10.9 \, W^{1.01} = 224' \, (111' - 395')$

Amplitude $= A = 2.7 \, W^{1.1} = 73' \, (34' - 135)$

Radius of Curvature $= R_c = \left(\frac{L_m}{4.7}\right)^{1.02} = 52' \, (25 - 92')$

Appendix E

HEC-RAS Model
Existing Conditions

Upstream Segment
Jumping Run
North of SR 1614

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB	Shear Total
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Upstream	3850.	75.00	1096.00	1097.62	1097.11	1097.71	0.002342	2.39	31.38	30.77	0.42	0.15			0.15
Upstream	3850.	120.00	1096.00	1097.91	1097.35	1098.05	0.002784	2.96	40.55	32.77	0.47	0.21			0.21
Upstream	3850.	275.00	1096.00	1098.56	1097.97	1098.85	0.003902	4.37	62.91	36.31	0.59	0.41			0.41
Upstream	3850.	385.00	1096.00	1098.90	1098.31	1099.28	0.004209	5.01	82.58	66.70	0.62	0.51	0.06		0.32
Upstream	3850.	480.00	1096.00	1099.17	1098.64	1099.59	0.004061	5.33	104.35	87.92	0.62	0.56	0.09	0.02	0.30
Upstream	3850.	590.00	1096.00	1099.48	1098.97	1099.90	0.003602	5.47	133.02	96.76	0.60	0.56	0.14	0.05	0.31
Upstream	3800.	75.00	1096.00	1097.49		1097.58	0.001610	2.39	36.87	48.22	0.36	0.13	0.02	0.02	0.08
Upstream	3800.	120.00	1096.00	1097.72		1097.87	0.002293	3.17	49.48	59.58	0.44	0.22	0.05	0.05	0.12
Upstream	3800.	275.00	1096.00	1098.18		1098.56	0.004518	5.27	83.48	88.21	0.65	0.56	0.16	0.19	0.26
Upstream	3800.	385.00	1096.00	1098.40		1098.93	0.005744	6.36	103.81	95.37	0.75	0.79	0.26	0.29	0.39
Upstream	3800.	480.00	1096.00	1098.56		1099.22	0.006663	7.18	119.73	100.85	0.81	0.98	0.34	0.37	0.49
Upstream	3800.	590.00	1096.00	1098.72		1099.53	0.007643	8.02	136.57	106.36	0.88	1.20	0.44	0.46	0.61
Upstream	3750.	75.00	1096.00	1096.93	1096.93	1097.32	0.015446	4.99	15.03	19.55	1.00	0.70			0.70
Upstream	3750.	120.00	1096.00	1097.32	1097.32	1097.61	0.008778	4.53	41.72	101.63	0.79	0.53	0.12	0.12	0.22
Upstream	3750.	275.00	1096.00	1097.76	1097.76	1098.18	0.009488	5.97	89.30	116.45	0.87	0.82	0.35	0.27	0.45
Upstream	3750.	385.00	1096.00	1097.98	1097.98	1098.48	0.010116	6.77	115.39	123.45	0.92	1.00	0.48	0.38	0.58
Upstream	3750.	480.00	1096.00	1098.15	1098.15	1098.71	0.010194	7.26	137.70	129.27	0.94	1.11	0.57	0.44	0.67
Upstream	3750.	590.00	1096.00	1098.32	1098.32	1098.95	0.010608	7.86	159.97	135.00	0.98	1.27	0.67	0.50	0.78
Upstream	3700.	75.00	1094.00	1095.09	1095.41	1096.14	0.036399	8.20	9.15	10.76	1.57	1.84			1.84
Upstream	3700.	120.00	1094.00	1095.43	1095.85	1096.75	0.034159	9.20	13.05	12.24	1.57	2.15			2.15
Upstream	3700.	275.00	1094.00	1096.60	1096.91	1097.55	0.013193	8.09	53.78	104.33	1.07	1.40	0.21	0.21	0.42
Upstream	3700.	385.00	1094.00	1096.90	1097.18	1097.88	0.012471	8.70	84.91	109.16	1.06	1.54	0.41	0.29	0.60
Upstream	3700.	480.00	1094.00	1097.10	1097.38	1098.12	0.012197	9.16	107.84	113.38	1.07	1.65	0.54	0.36	0.72
Upstream	3700.	590.00	1094.00	1097.33	1097.58	1098.36	0.011562	9.51	134.80	119.59	1.08	1.72	0.64	0.41	0.80
Upstream	3650.	75.00	1094.00	1095.35	1095.12	1095.63	0.007075	4.22	17.75	16.94	0.73	0.45			0.45
Upstream	3650.	120.00	1094.00	1095.72	1095.47	1096.10	0.007290	4.92	24.38	18.82	0.76	0.57			0.57
Upstream	3650.	275.00	1094.00	1096.61	1096.48	1096.86	0.003437	4.68	94.43	111.71	0.57	0.44	0.12	0.06	0.18
Upstream	3650.	385.00	1094.00	1097.03	1096.68	1097.22	0.002443	4.45	142.93	120.64	0.49	0.37	0.14	0.08	0.18
Upstream	3650.	480.00	1094.00	1097.33	1096.82	1097.51	0.002047	4.40	181.11	128.02	0.46	0.35	0.15	0.08	0.18
Upstream	3650.	590.00	1094.00	1097.64	1096.97	1097.82	0.001796	4.41	221.99	135.47	0.44	0.34	0.16	0.08	0.18
Upstream	3600.	75.00	1093.00	1094.44	1094.44	1095.03	0.014053	6.17	12.20	12.15	1.00	0.95	0.02		0.81
Upstream	3600.	120.00	1093.00	1095.00	1095.00	1095.58	0.009992	6.29	25.38	35.04	0.87	0.89	0.19		0.43
Upstream	3600.	275.00	1093.00	1096.01	1096.01	1096.53	0.009175	6.75	77.25	73.41	0.84	0.97	0.48		0.58
Upstream	3600.	385.00	1093.00	1096.29	1096.29	1096.94	0.010078	7.72	98.41	77.68	0.90	1.22	0.64	0.04	0.77
Upstream	3600.	480.00	1093.00	1096.49	1096.49	1097.24	0.010766	8.44	114.61	80.83	0.94	1.42	0.79	0.08	0.92
Upstream	3600.	590.00	1093.00	1096.74	1096.74	1097.55	0.010762	9.00	135.21	84.69	0.96	1.56	0.91	0.11	1.03
Upstream	3550.	75.00	1091.37	1093.71	1092.83	1093.84	0.001999	2.86	26.20	16.85	0.40	0.18			0.18
Upstream	3550.	120.00	1091.37	1094.26	1093.23	1094.42	0.002397	3.23	37.64	27.10	0.45	0.23	0.02		0.20
Upstream	3550.	275.00	1091.37	1095.20	1094.30	1095.51	0.002627	4.52	71.50	46.14	0.50	0.39	0.10	0.04	0.25
Upstream	3550.	385.00	1091.37	1095.48	1094.73	1095.95	0.003485	5.59	85.67	52.81	0.59	0.58	0.16	0.08	0.34
Upstream	3550.	480.00	1091.37	1095.65	1095.09	1096.27	0.004369	6.51	94.86	56.49	0.67	0.76	0.23	0.12	0.45
Upstream	3550.	590.00	1091.37	1095.79	1095.44	1096.63	0.005559	7.57	102.95	59.35	0.76	1.02	0.32	0.18	0.59
Upstream	3500.	75.00	1092.00	1093.52		1093.69	0.004028	3.29	22.77	20.71	0.55	0.27			0.27
Upstream	3500.	120.00	1092.00	1094.11		1094.28	0.002731	3.31	37.63	38.66	0.48	0.25	0.02	0.01	0.16
Upstream	3500.	275.00	1092.00	1095.12		1095.36	0.002119	4.11	101.36	90.41	0.46	0.32	0.08	0.08	0.15
Upstream	3500.	385.00	1092.00	1095.42		1095.75	0.002587	4.91	130.68	102.79	0.52	0.44	0.13	0.13	0.20
Upstream	3500.	480.00	1092.00	1095.61		1096.02	0.003072	5.58	150.35	110.12	0.57	0.56	0.17	0.18	0.26
Upstream	3500.	590.00	1092.00	1095.79		1096.30	0.003828	6.30	170.55	117.17	0.62	0.69	0.23	0.24	0.33
Upstream	3450.	75.00	1090.65	1092.76		1093.32	0.011756	6.05	12.40	8.66	0.89	0.88			0.88
Upstream	3450.	120.00	1090.65	1093.41		1094.01	0.009348	6.31	22.70	22.87	0.81	0.88	0.19		0.52
Upstream	3450.	275.00	1090.65	1094.80		1095.18	0.006473	5.60	92.33	101.39	0.71	0.67	0.28	0.07	0.36
Upstream	3450.	385.00	1090.65	1094.96	1094.96	1095.51	0.008897	6.90	109.37	109.54	0.84	1.00	0.45	0.13	0.54
Upstream	3450.	480.00	1090.65	1095.16	1095.16	1095.76	0.008942	7.36	132.53	115.91	0.86	1.10	0.55	0.18	0.62
Upstream	3450.	590.00	1090.65	1095.35	1095.35	1096.01	0.009276	7.91	154.96	120.00	0.88	1.24	0.68	0.24	0.72
Upstream	3400.	75.00	1090.00	1092.01	1091.96	1092.67	0.013950	6.55	11.45	8.07	0.97	1.03			1.03
Upstream	3400.	120.00	1090.00	1092.53	1092.53	1093.41	0.014534	7.51	15.98	9.28	1.01	1.28			1.28
Upstream	3400.	275.00	1090.00	1093.95	1093.95	1094.70	0.012279	7.16	46.24	35.38	0.97	1.14	0.55		0.92
Upstream	3400.	385.00	1090.00	1094.38	1094.52	1095.06	0.009294	7.16	101.96	151.50	0.88	1.07	0.31	0.19	0.38
Upstream	3400.	480.00	1090.00	1094.54	1094.69	1095.28	0.009881	7.76	126.78	159.09	0.91	1.22	0.43	0.28	0.48
Upstream	3400.	590.00	1090.00	1094.71	1094.88	1095.51	0.010234	8.29	154.39	166.80	0.94	1.36	0.54	0.37	0.58
Upstream	3350.	75.00	1090.00	1091.67		1091.98	0.010154	4.47	16.78	18.52	0.83	0.54			0.54
Upstream	3350.	120.00	1090.00	1091.68	1091.87	1092.45	0.024951	7.04	17.04	18.66	1.30	1.33			1.33
Upstream	3350.	275.00	1090.00	1092.10	1092.67	1093.87	0.043413	10.67	25.76	22.81	1.77	2.85			2.85
Upstream	3350.	385.00	1090.00	1092.57	1093.10	1094.20	0.030962	10.24	37.61	27.45	1.54	2.46			2.46
Upstream	3350.	480.00	1090.00	1092.95	1093.48	1094.46	0.024148	9.84	48.77	31.30	1.39	2.18			2.18
Upstream	3350.	590.00	1090.00	1093.32	1093.82	1094.75	0.019674	9.64	65.58	59.71	1.28	2.01		0.23	1.29
Upstream	3300.	75.00	1090.00	1091.47		1091.59	0.004664	2.84	26.45	33.50	0.56	0.22			0.22
Upstream	3300.	120.00	1090.00	1091.98	1091.40	1092.09	0.002574	2.62	45.81	41.59	0.44	0.17			0.17
Upstream	3300.	275.00	1090.00	1093.12	1091.98	1093.22	0.001117	2.61	132.70	115.79	0.32	0.14	0.04	0.03	0.08
Upstream	3300.	385.00	1090.00	1093.61	1092.32	1093.72	0.000983	2.82	201.37	167.65	0.31	0.15	0.05	0.04	0.07
Upstream	3300.	480.00	1090.00	1093.92	1092.53	1094.04	0.000951	3.00	257.72	190.54	0.31	0.16	0.06	0.05	0.08
Upstream	3300.	590.00	1090.00	1094.22	1092.75	1094.35	0.000950	3.20	316.28	204.81	0.32	0.18	0.07	0.06	0.09
Upstream	3250.	75.00	1089.00	1090.80	1090.63	1091.22	0.009204	5.19	14.46	11.92	0.83	0.66			0.66
Upstream	3250.	120.00	1089.00	1091.14	1091.08	1091.78	0.011848	6.43	18.66	13.41	0.96	0.96			0.96
Upstream	3250.	275.00	1089.00	1092.21	1092.21	1093.02	0.010355	7.24	40.89	42.82	0.95	1.11	0.07	0.09	0.60
Upstream	3250.	385.00	1089.00	1092.77	1092.77	1093.54	0.007354	7.29	77.07	86.76	0.83	1.03	0.17	0.19	0.40
Upstream	3250.	480.00	1089.00	1093.12	1093.12	1093.88	0.006344	7.43	112.59	114.81	0.79	1.02	0.21	0.24	0.38
Upstream	3250.	590.00	1089.00	1093.42	1093.42	1094.19	0.005958	7.72	149.79	134.34	0.78	1.07	0.25	0.29	0.41
Upstream	3200.	75.00	1089.00	1090.12	1090.12	1090.55	0.014684	5.31	14.11	16.25	1.01	0.76			0.76
Upstream	3200.	120.00	1089.00	1090.45	1090.45	1091.02	0.013659	6.10	19.66	17.23	1.01	0.92			0.92
Upstream	3200.	275.00	1089.00	1091.76	1091.36	1092.31	0.006748	5.98	45.98	23.96	0.76	0.75			0.75
Upstream	3200.	385.00	1089.00	1091.59	1091.84	1092.89	0.016769	9.13	42.16	23.09	1.19	1.78			1.78
Upstream	3200.	480.00	1089.00	1092.04	1092.47	1093.31	0.013861	9.07	54.36	62.58	1.11	1.68	0.02	0.03	0.73
Upstream	3200.	590.00	1089.00	1092.39	1092.78	1093.67	0.011686	9.24	84.73	110.04	1.04	1.65	0.14	0.20	0.55

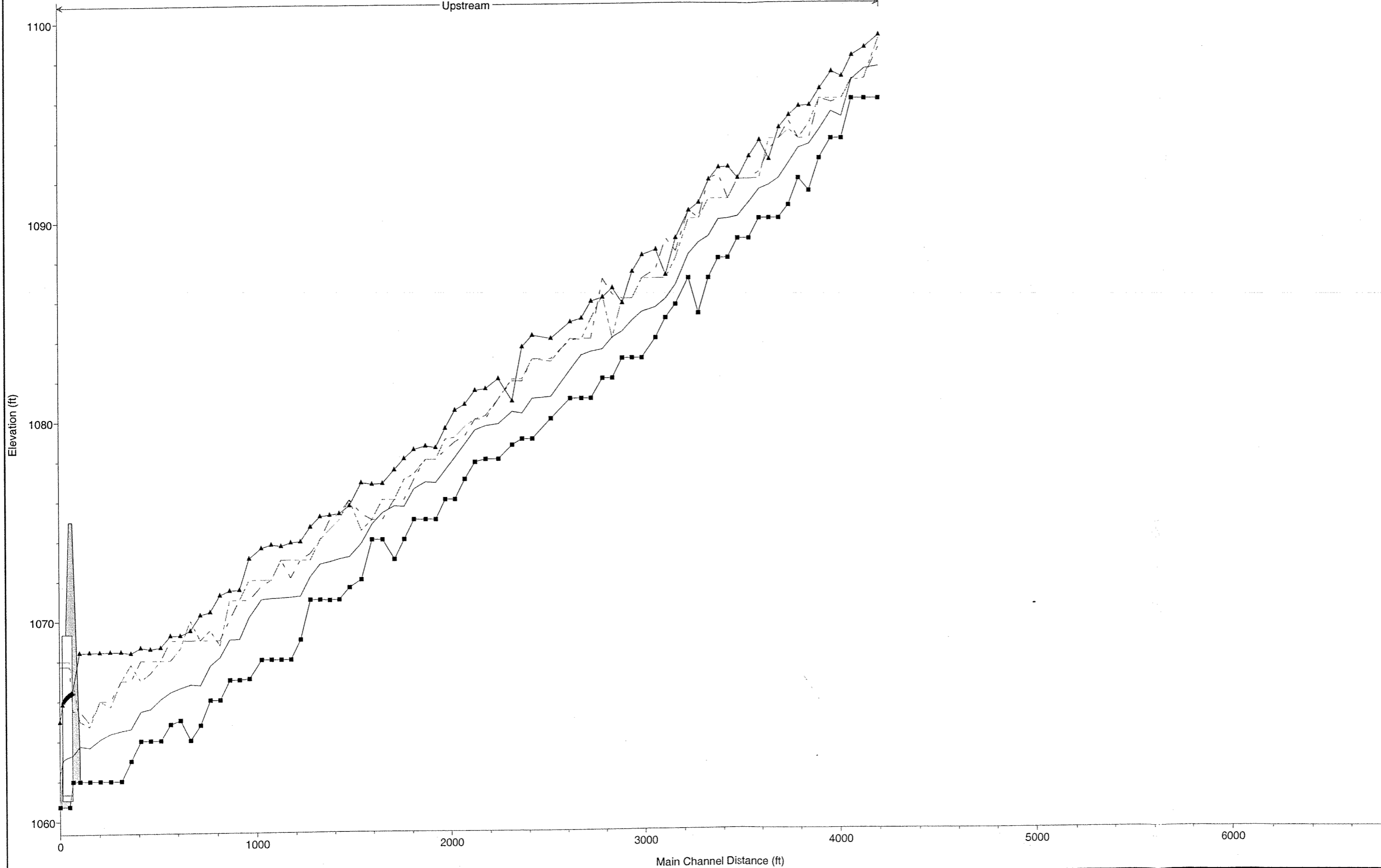| Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Chan (lb/sq ft)	Shear LOB (lb/sq ft)	Shear ROB (lb/sq ft)	Shear Total (lb/sq ft)
Upstream	3150	75.00	1088.02	1090.00	1089.29	1090.04	0.000858	1.50	50.15	46.21	0.25	0.06			0.06
Upstream	3150	120.00	1088.02	1090.72	1089.48	1090.75	0.000436	1.42	84.79	50.22	0.19	0.04			0.04
Upstream	3150	275.00	1088.02	1092.07		1092.11	0.000305	1.63	200.90	131.46	0.17	0.05	0.01	0.01	0.03
Upstream	3150	385.00	1088.02	1092.37	1090.21	1092.43	0.000408	2.02	244.15	155.66	0.20	0.07	0.01	0.02	0.04
Upstream	3150	480.00	1088.02	1092.59	1090.41	1092.67	0.000486	2.31	279.43	171.40	0.23	0.09	0.02	0.02	0.05
Upstream	3150	590.00	1088.02	1092.82	1090.64	1092.91	0.000566	2.61	319.93	187.12	0.25	0.12	0.02	0.03	0.06
Upstream	3100	75.00	1088.00	1089.95		1089.99	0.000838	1.74	43.16	29.45	0.25	0.07			0.07
Upstream	3100	120.00	1088.00	1090.67		1090.73	0.000622	1.83	65.49	32.02	0.23	0.07			0.07
Upstream	3100	275.00	1088.00	1092.05		1092.09	0.000521	1.76	198.70	151.91	0.21	0.06		0.02	0.04
Upstream	3100	385.00	1088.00	1092.35		1092.41	0.000629	2.10	247.09	172.34	0.24	0.09	0.00	0.03	0.05
Upstream	3100	480.00	1088.00	1092.56		1092.64	0.000706	2.36	285.62	187.33	0.26	0.11	0.01	0.04	0.07
Upstream	3100	590.00	1088.00	1092.78		1092.88	0.000777	2.62	329.38	203.02	0.28	0.13	0.01	0.05	0.08
Upstream	3050	75.00	1087.00	1089.11	1089.11	1089.82	0.014825	6.78	11.10	7.96	1.01	1.10			1.10
Upstream	3050	120.00	1087.00	1089.67	1089.67	1090.56	0.014254	7.57	15.85	9.08	1.01	1.29			1.29
Upstream	3050	275.00	1087.00	1091.55	1091.55	1091.99	0.004694	6.00	107.04	152.27	0.61	0.69		0.15	0.20
Upstream	3050	385.00	1087.00	1091.79	1091.79	1092.30	0.005547	6.78	145.03	157.98	0.67	0.86		0.25	0.31
Upstream	3050	480.00	1087.00	1091.95	1091.95	1092.51	0.006414	7.46	169.28	161.51	0.73	1.03		0.34	0.41
Upstream	3050	590.00	1087.00	1092.13	1092.13	1092.74	0.006945	8.03	200.03	171.91	0.76	1.18	0.03	0.43	0.49
Upstream	3000	75.00	1085.23	1088.79	1087.08	1088.83	0.000454	1.66	45.13	21.16	0.20	0.06			0.06
Upstream	3000	120.00	1085.23	1089.34	1087.42	1089.41	0.000588	2.09	57.35	22.92	0.23	0.08			0.08
Upstream	3000	275.00	1085.23	1090.34	1088.33	1090.51	0.001064	3.29	101.67	104.99	0.33	0.19	0.01	0.02	0.06
Upstream	3000	385.00	1085.23	1090.61	1088.83	1090.86	0.001489	4.11	134.65	133.86	0.39	0.29	0.03	0.04	0.09
Upstream	3000	480.00	1085.23	1090.78	1089.21	1091.11	0.001879	4.76	157.94	145.64	0.44	0.39	0.05	0.06	0.13
Upstream	3000	590.00	1085.23	1090.96	1089.61	1091.37	0.002287	5.42	184.46	157.85	0.49	0.49	0.07	0.09	0.16
Upstream	2950	75.00	1087.00	1088.20	1088.20	1088.72	0.014143	5.78	12.98	12.63	1.00	0.88			0.86
Upstream	2950	120.00	1087.00	1088.60	1088.60	1089.27	0.013250	6.56	18.28	13.83	1.01	1.02			1.02
Upstream	2950	275.00	1087.00	1089.89	1089.89	1090.37	0.005992	6.05	87.05	122.57	0.72	0.74		0.17	0.26
Upstream	2950	385.00	1087.00	1090.19	1090.19	1090.70	0.006263	6.58	127.56	140.91	0.75	0.85		0.27	0.35
Upstream	2950	480.00	1087.00	1090.38	1090.38	1090.93	0.006574	7.02	155.45	145.77	0.77	0.95		0.35	0.43
Upstream	2950	590.00	1087.00	1090.55	1090.55	1091.16	0.007167	7.64	180.38	149.99	0.82	1.10	0.03	0.44	0.53
Upstream	2900	75.00	1085.68	1086.66	1086.85	1087.45	0.026790	7.16	10.48	11.92	1.34	1.39			1.39
Upstream	2900	120.00	1085.68	1086.99	1087.25	1088.05	0.025427	8.29	14.48	12.40	1.35	1.71			1.71
Upstream	2900	275.00	1085.68	1087.89	1088.52	1089.59	0.022418	10.45	26.33	13.75	1.33	2.34			2.34
Upstream	2900	385.00	1085.68	1088.56	1089.04	1090.02	0.016587	9.93	50.45	51.37	1.18	2.01	0.11	0.42	0.98
Upstream	2900	480.00	1085.68	1089.00	1089.37	1090.31	0.012417	9.70	76.92	70.69	1.05	1.81	0.21	0.51	0.82
Upstream	2900	590.00	1085.68	1089.42	1089.68	1090.60	0.009770	9.51	113.41	94.27	0.96	1.65	0.31	0.53	0.72
Upstream	2850	75.00	1085.00	1085.96	1086.18	1086.70	0.043995	6.89	10.89	19.88	1.64	1.48			1.48
Upstream	2850	120.00	1085.00	1086.44	1086.46	1086.92	0.015265	5.57	21.55	24.40	1.04	0.83			0.83
Upstream	2850	275.00	1085.00	1086.72	1087.15	1088.14	0.035285	9.57	28.73	27.06	1.64	2.30			2.30
Upstream	2850	385.00	1085.00	1086.95	1087.55	1088.80	0.038674	10.90	35.31	29.27	1.75	2.86			2.86
Upstream	2850	480.00	1085.00	1087.16	1087.86	1089.24	0.036542	11.57	41.64	32.86	1.74	3.08		0.15	2.84
Upstream	2850	590.00	1085.00	1087.39	1088.17	1089.66	0.033335	12.11	51.05	46.32	1.70	3.23		0.34	2.26
Upstream	2800	75.00	1084.00	1085.54	1084.92	1085.66	0.002248	2.71	27.69	21.61	0.42	0.17			0.17
Upstream	2800	120.00	1084.00	1086.15	1085.22	1086.28	0.001780	2.88	42.12	27.87	0.39	0.18		0.02	0.16
Upstream	2800	275.00	1084.00	1087.51	1086.00	1087.68	0.001401	3.36	96.34	62.38	0.37	0.21	0.00	0.05	0.13
Upstream	2800	385.00	1084.00	1088.07	1086.46	1088.28	0.001337	3.74	137.16	88.60	0.37	0.25	0.03	0.06	0.13
Upstream	2800	480.00	1084.00	1088.43	1086.82	1088.67	0.001350	4.05	170.28	94.95	0.38	0.28	0.05	0.09	0.15
Upstream	2800	590.00	1084.00	1088.79	1087.22	1089.05	0.001387	4.38	204.85	101.15	0.39	0.32	0.07	0.11	0.17
Upstream	2750	75.00	1083.00	1085.31		1085.48	0.002776	3.24	23.15	15.46	0.47	0.24			0.24
Upstream	2750	120.00	1083.00	1085.92		1086.13	0.002541	3.62	33.18	17.37	0.46	0.28			0.28
Upstream	2750	275.00	1083.00	1087.26		1087.54	0.002649	4.28	68.96	52.05	0.49	0.36	0.02	0.03	0.21
Upstream	2750	385.00	1083.00	1087.82		1088.14	0.002384	4.68	105.34	81.12	0.48	0.40	0.06	0.07	0.19
Upstream	2750	480.00	1083.00	1088.16		1088.53	0.002376	5.04	137.16	100.08	0.49	0.45	0.09	0.10	0.20
Upstream	2750	590.00	1083.00	1088.52		1088.92	0.002344	5.36	174.85	113.43	0.50	0.49	0.11	0.13	0.22
Upstream	2700	75.00	1083.00	1084.88		1085.25	0.006607	4.88	15.36	9.45	0.68	0.55			0.55
Upstream	2700	120.00	1083.00	1085.23		1085.85	0.010969	6.32	18.99	11.78	0.88	0.92			0.92
Upstream	2700	275.00	1083.00	1086.37	1086.37	1087.25	0.010223	7.60	41.80	37.63	0.90	1.19	0.21	0.12	0.66
Upstream	2700	385.00	1083.00	1086.82	1086.82	1087.86	0.009810	8.43	60.96	46.72	0.91	1.38	0.42	0.25	0.75
Upstream	2700	480.00	1083.00	1087.34	1087.34	1088.28	0.007474	8.28	92.10	74.93	0.82	1.26	0.49	0.21	0.55
Upstream	2700	590.00	1083.00	1087.70	1087.70	1088.67	0.007002	8.62	122.80	93.17	0.81	1.31	0.56	0.27	0.56
Upstream	2650	75.00	1083.00	1084.34	1084.34	1084.77	0.014925	5.26	14.27	17.04	1.01	0.75			0.75
Upstream	2650	120.00	1083.00	1084.67	1084.67	1085.22	0.013753	5.97	20.11	18.56	1.01	0.89			0.89
Upstream	2650	275.00	1083.00	1085.18	1085.54	1086.47	0.023424	9.11	30.20	21.90	1.37	1.93			1.93
Upstream	2650	385.00	1083.00	1085.54	1086.03	1087.08	0.024272	9.97	38.61	25.11	1.42	2.23			2.23
Upstream	2650	480.00	1083.00	1085.76	1086.37	1087.57	0.026015	10.78	44.51	27.11	1.48	2.55			2.55
Upstream	2650	590.00	1083.00	1086.06	1086.68	1087.99	0.024268	11.16	54.23	54.08	1.46	2.63	0.04	0.08	1.48
Upstream	2600	75.00	1082.00	1084.04	1083.25	1084.17	0.002064	2.87	31.21	39.45	0.41	0.19		0.03	0.10
Upstream	2600	120.00	1082.00	1084.51	1083.63	1084.66	0.002023	3.27	51.64	47.78	0.42	0.22		0.08	0.13
Upstream	2600	275.00	1082.00	1085.66	1084.59	1085.87	0.001890	4.00	115.09	70.14	0.43	0.30		0.14	0.19
Upstream	2600	385.00	1082.00	1086.19	1084.97	1086.42	0.001960	4.35	157.31	97.96	0.44	0.34	0.02	0.19	0.19
Upstream	2600	480.00	1082.00	1086.53	1085.23	1086.78	0.002002	4.71	192.37	110.52	0.46	0.39	0.05	0.21	0.21
Upstream	2600	590.00	1082.00	1086.82	1085.56	1087.12	0.002144	5.16	227.11	125.48	0.48	0.45	0.08	0.25	0.24
Upstream	2550	75.00	1082.00	1083.46	1083.46	1083.93	0.012070	5.64	16.38	20.57	0.94	0.80		0.30	0.57
Upstream	2550	120.00	1082.00	1084.07		1084.46	0.007230	5.33	30.53	26.26	0.75	0.64		0.34	0.49
Upstream	2550	275.00	1082.00	1085.18		1085.68	0.006228	6.25	72.10	52.59	0.73	0.79		0.38	0.51
Upstream	2550	385.00	1082.00	1085.70		1086.23	0.005984	6.63	104.15	70.28	0.73	0.85		0.42	0.53
Upstream	2550	480.00	1082.00	1086.06		1086.60	0.005774	6.84	134.02	118.93	0.72	0.88	0.02	0.46	0.40
Upstream	2550	590.00	1082.00	1086.43		1086.94	0.005200	6.91	182.13	141.68	0.69	0.87	0.12	0.47	0.41
Upstream	2500	75.00	1081.00	1083.35	1082.53	1083.51	0.002609	3.28	22.87	14.14	0.45	0.24			0.24
Upstream	2500	120.00	1081.00	1083.95		1084.17	0.002629	3.74	32.06	16.21	0.47	0.29			0.29
Upstream	2500	275.00	1081.00	1084.95		1085.39	0.003622	5.39	62.30	45.39	0.58	0.55	0.11		0.30
Upstream	2500	385.00	1081.00	1085.40		1085.94	0.003851	6.15	100.90	111.84	0.61	0.68	0.13	0.08	0.21
Upstream	2500	480.00	1081.00	1085.86		1086.34	0.003119	6.06	161.20	151.19	0.56	0.63	0.14	0.13	0.20

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Chan (lb/sq ft)	Shear LOB (lb/sq ft)	Shear ROB (lb/sq ft)	Shear Total (lb/sq ft)
Upstream	2500.	590.00	1081.00	1086.31		1086.71	0.002513	5.88	232.94	169.40	0.52	0.57	0.17	0.15	0.21
Upstream	2450.	75.00	1081.00	1083.17		1083.37	0.003148	3.59	20.87	12.56	0.49	0.29			0.29
Upstream	2450.	120.00	1081.00	1083.74		1084.01	0.003459	4.18	28.73	14.73	0.53	0.37			0.37
Upstream	2450.	275.00	1081.00	1084.60		1085.17	0.004967	6.20	63.14	71.68	0.67	0.73	0.11	0.13	0.27
Upstream	2450.	385.00	1081.00	1084.85		1085.67	0.006826	7.59	83.57	91.26	0.78	1.07	0.19	0.22	0.37
Upstream	2450.	480.00	1081.00	1085.01		1086.05	0.008166	8.72	98.23	102.69	0.87	1.39	0.27	0.33	0.48
Upstream	2450.	590.00	1081.00	1085.22		1086.41	0.008976	9.56	121.91	119.39	0.93	1.63	0.35	0.42	0.56
Upstream	2400.	75.00	1081.00	1082.42	1082.41	1082.99	0.013950	6.06	12.38	10.67	0.99	0.92			0.92
Upstream	2400.	120.00	1081.00	1082.86	1082.86	1083.61	0.013893	6.96	17.25	11.86	1.02	1.13			1.13
Upstream	2400.	275.00	1081.00	1084.25	1084.25	1084.83	0.006914	6.39	68.42	90.47	0.77	0.83	0.19	0.08	0.32
Upstream	2400.	385.00	1081.00	1084.60	1084.60	1085.23	0.006830	7.01	101.89	104.69	0.79	0.96	0.30	0.16	0.41
Upstream	2400.	480.00	1081.00	1084.83	1084.83	1085.52	0.006905	7.50	127.89	114.52	0.80	1.06	0.38	0.21	0.47
Upstream	2400.	590.00	1081.00	1084.92	1084.92	1085.83	0.008910	8.71	138.59	118.33	0.92	1.41	0.53	0.30	0.64
Upstream	2350.	75.00	1080.00	1081.10	1081.10	1081.54	0.014372	5.32	14.09	16.25	1.01	0.76			0.76
Upstream	2350.	120.00	1080.00	1081.61	1081.43	1082.04	0.008484	5.27	22.75	17.60	0.82	0.66			0.66
Upstream	2350.	275.00	1080.00	1083.44	1082.30	1083.76	0.002418	4.62	68.82	54.05	0.48	0.39	0.05	0.04	0.19
Upstream	2350.	385.00	1080.00	1083.82	1082.79	1084.27	0.002921	5.52	96.19	89.47	0.54	0.54	0.09	0.06	0.19
Upstream	2350.	480.00	1080.00	1084.01	1083.30	1084.59	0.003572	6.35	114.63	105.24	0.61	0.70	0.13	0.09	0.24
Upstream	2350.	590.00	1080.00	1084.18	1083.85	1084.91	0.004341	7.23	132.64	109.40	0.68	0.89	0.20	0.15	0.32
Upstream	2300.	75.00	1079.00	1081.02	1079.90	1081.08	0.000787	1.89	39.69	23.95	0.26	0.08			0.08
Upstream	2300.	120.00	1079.00	1081.70		1081.77	0.000706	2.11	56.75	26.38	0.25	0.09			0.09
Upstream	2300.	275.00	1079.00	1083.51		1083.60	0.000501	2.42	138.24	103.09	0.23	0.10	0.01	0.01	0.04
Upstream	2300.	385.00	1079.00	1083.94		1084.07	0.000618	2.91	188.48	132.71	0.26	0.14	0.03	0.02	0.05
Upstream	2300.	480.00	1079.00	1084.18		1084.33	0.000749	3.33	220.78	141.93	0.29	0.18	0.04	0.03	0.07
Upstream	2300.	590.00	1079.00	1084.40		1084.60	0.000897	3.77	253.43	148.48	0.32	0.23	0.06	0.05	0.09
Upstream	2250.	75.00	1079.00	1080.28	1080.28	1080.91	0.015907	6.35	11.81	9.52	1.00	1.02			1.02
Upstream	2250.	120.00	1079.00	1080.75	1080.75	1081.59	0.015574	7.37	16.28	9.75	1.01	1.27			1.27
Upstream	2250.	275.00	1079.00	1082.08	1082.08	1083.41	0.013944	9.24	30.45	20.34	0.96	1.73	0.07	0.04	1.06
Upstream	2250.	385.00	1079.00	1083.38	1083.38	1083.95	0.004703	6.88	132.34	143.03	0.59	0.85	0.18	0.23	0.26
Upstream	2250.	480.00	1079.00	1083.60	1083.60	1084.21	0.005097	7.41	164.58	149.34	0.62	0.97	0.26	0.30	0.34
Upstream	2250.	590.00	1079.00	1083.82	1083.82	1084.46	0.005484	7.94	197.73	155.56	0.65	1.09	0.34	0.38	0.42
Upstream	2200.	75.00	1078.70	1080.37	1079.69	1080.49	0.002215	2.82	26.59	19.06	0.42	0.18			0.18
Upstream	2200.	120.00	1078.70	1080.89	1080.01	1081.05	0.002191	3.24	37.06	21.24	0.43	0.23			0.23
Upstream	2200.	275.00	1078.70	1081.93	1080.87	1082.24	0.002754	4.46	64.43	39.77	0.51	0.39	0.04		0.27
Upstream	2200.	385.00	1078.70	1080.51	1081.35	1083.19	0.044070	13.14	29.29	19.61	1.89	3.91			3.91
Upstream	2200.	480.00	1078.70	1080.90	1081.75	1083.48	0.034663	12.90	37.21	21.27	1.72	3.58			3.58
Upstream	2200.	590.00	1078.70	1081.36	1082.46	1083.75	0.026162	12.40	47.57	23.21	1.53	3.15			3.15
Upstream	2150.	75.00	1078.00	1079.76		1080.19	0.009011	5.24	14.84	15.47	0.82	0.66	0.07		0.51
Upstream	2150.	120.00	1078.00	1080.19		1080.74	0.009379	6.02	23.22	23.25	0.85	0.82	0.21		0.55
Upstream	2150.	275.00	1078.00	1081.21	1081.21	1081.90	0.008172	7.11	60.65	68.55	0.84	1.02	0.43	0.10	0.44
Upstream	2150.	385.00	1078.00	1081.64	1081.64	1082.37	0.007428	7.63	96.25	100.29	0.82	1.11	0.53	0.19	0.44
Upstream	2150.	480.00	1078.00	1082.02	1082.02	1082.67	0.006097	7.56	141.64	134.17	0.76	1.04	0.53	0.22	0.40
Upstream	2150.	590.00	1078.00	1082.26	1082.26	1082.94	0.006189	8.01	174.22	139.23	0.78	1.14	0.59	0.31	0.48
Upstream	2100.	75.00	1078.00	1079.67		1079.81	0.002698	2.98	25.19	19.62	0.46	0.21			0.21
Upstream	2100.	120.00	1078.00	1080.11		1080.30	0.003190	3.48	34.70	27.40	0.51	0.28	0.02		0.25
Upstream	2100.	275.00	1078.00	1080.88	1080.31	1081.24	0.003795	4.92	68.40	63.16	0.60	0.49	0.11	0.07	0.25
Upstream	2100.	385.00	1078.00	1081.25	1080.75	1081.71	0.004039	5.68	95.28	82.34	0.63	0.61	0.15	0.13	0.29
Upstream	2100.	480.00	1078.00	1081.51	1081.08	1082.05	0.004215	6.19	119.77	101.89	0.66	0.70	0.16	0.18	0.31
Upstream	2100.	590.00	1078.00	1081.79	1081.40	1082.40	0.004281	6.65	151.70	124.46	0.67	0.79	0.20	0.21	0.32
Upstream	2050.	75.00	1077.88	1079.48		1079.63	0.003994	3.29	22.82	20.55	0.55	0.27			0.27
Upstream	2050.	120.00	1077.88	1079.90		1080.11	0.003869	3.68	33.08	27.48	0.56	0.32	0.04		0.28
Upstream	2050.	275.00	1077.88	1080.73		1081.04	0.003352	4.64	88.57	83.90	0.56	0.43	0.14	0.10	0.22
Upstream	2050.	385.00	1077.88	1081.14		1081.49	0.003198	5.10	125.58	95.85	0.56	0.49	0.19	0.15	0.26
Upstream	2050.	480.00	1077.88	1081.44		1081.81	0.003176	5.46	154.69	104.22	0.57	0.54	0.24	0.18	0.29
Upstream	2050.	590.00	1077.88	1081.73		1082.15	0.003193	5.85	186.56	113.35	0.58	0.60	0.27	0.21	0.33
Upstream	2000.	75.00	1077.00	1078.75	1078.75	1079.24	0.013659	5.74	14.77	16.34	0.99	0.84	0.40		0.72
Upstream	2000.	120.00	1077.00	1079.19 −	1079.19	1079.73	0.013844	6.05	23.15	24.54	1.01	0.91	0.47		0.77
Upstream	2000.	275.00	1077.00	1080.09	1080.09	1080.73	0.008564	6.87	62.73	63.59	0.87	0.98	0.36	0.11	0.51
Upstream	2000.	385.00	1077.00	1080.46	1080.46	1081.19	0.008252	7.57	88.67	78.29	0.88	1.12	0.47	0.19	0.57
Upstream	2000.	480.00	1077.00	1080.74	1080.74	1081.52	0.007911	8.01	112.14	89.20	0.88	1.21	0.54	0.25	0.61
Upstream	2000.	590.00	1077.00	1081.02	1081.02	1081.86	0.007706	8.47	138.52	99.99	0.89	1.31	0.61	0.31	0.65
Upstream	1950.	75.00	1076.00	1078.09	1077.38	1078.19	0.001980	2.61	32.12	26.82	0.40	0.16	0.08		0.14
Upstream	1950.	120.00	1076.00	1078.59	1077.69	1078.71	0.002121	2.88	47.36	34.55	0.42	0.19	0.12		0.17
Upstream	1950.	275.00	1076.00	1079.57	1078.54	1079.76	0.002056	3.66	97.55	77.68	0.44	0.27	0.09	0.03	0.16
Upstream	1950.	385.00	1076.00	1080.16	1078.90	1080.36	0.001611	3.81	149.94	97.88	0.41	0.27	0.12	0.05	0.15
Upstream	1950.	480.00	1076.00	1080.45	1079.25	1080.68	0.001707	4.19	178.79	105.66	0.42	0.31	0.14	0.08	0.18
Upstream	1950.	590.00	1076.00	1080.81	1079.51	1081.07	0.001656	4.45	218.63	115.56	0.43	0.34	0.16	0.10	0.19
Upstream	1900.	75.00	1076.00	1077.46	1077.46	1077.95	0.013433	5.66	14.58	16.84	0.97	0.82	0.29		0.68
Upstream	1900.	120.00	1076.00	1077.85	1077.85	1078.45	0.013055	6.32	21.85	20.35	0.98	0.96	0.46		0.81
Upstream	1900.	275.00	1076.00	1078.77	1078.77	1079.50	0.012000	7.14	47.07	35.99	0.99	1.13	0.59		0.92
Upstream	1900.	385.00	1076.00	1078.96	1078.95	1080.09	0.016526	8.89	54.15	39.87	1.18	1.70	0.83		1.32
Upstream	1900.	480.00	1076.00	1079.55	1079.55	1080.45	0.009257	8.05	86.18	62.07	0.93	1.27	0.55	0.18	0.77
Upstream	1900.	590.00	1076.00	1079.86	1079.86	1080.83	0.008726	8.49	106.74	70.52	0.92	1.36	0.61	0.25	0.80
Upstream	1850.	75.00	1075.00	1076.83	1076.70	1077.24	0.009557	5.21	16.43	16.43	0.84	0.67	0.30		0.58
Upstream	1850.	120.00	1075.00	1077.34	1077.14	1077.78	0.008693	5.50	25.94	21.60	0.82	0.70	0.40		0.61
Upstream	1850.	275.00	1075.00	1078.11	1078.18	1078.90	0.012171	7.39	47.72	44.69	1.01	1.19	0.51	0.04	0.78
Upstream	1850.	385.00	1075.00	1078.62	1078.62	1079.39	0.008743	7.49	78.33	74.55	0.90	1.12	0.51	0.18	0.56
Upstream	1850.	480.00	1075.00	1078.58	1078.91	1079.84	0.014661	9.57	75.26	73.50	1.16	1.85	0.85	0.26	0.91
Upstream	1850.	590.00	1075.00	1078.81	1079.18	1080.22	0.014860	10.31	92.42	79.21	1.18	2.07	0.94	0.45	1.05
Upstream	1800.	75.00	1075.00	1076.88		1076.96	0.001743	2.38	36.99	33.83	0.37	0.13	0.07		0.12
Upstream	1800.	120.00	1075.00	1077.42		1077.51	0.001569	2.53	60.68	57.07	0.36	0.14	0.06		0.10
Upstream	1800.	275.00	1075.00	1078.20	1077.22	1078.36	0.002028	3.46	129.23	140.64	0.43	0.24	0.08	0.01	0.12
Upstream	1800.	385.00	1075.00	1078.47	1077.63	1078.67	0.002280	4.00	170.14	157.88	0.47	0.31	0.12	0.03	0.15

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB	Shear Total
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Upstream	1800.	480.00	1075.00	1078.67	1077.90	1078.90	0.002464	4.40	202.49	170.28	0.49	0.37	0.16	0.05	0.18
Upstream	1800.	590.00	1075.00	1078.87	1078.31	1079.14	0.002641	4.79	237.65	179.45	0.52	0.43	0.20	0.08	0.22
Upstream	1750.	75.00	1075.00	1078.52		1076.77	0.006005	3.98	18.84	17.16	0.67	0.40			0.40
Upstream	1750.	120.00	1075.00	1077.13		1077.36	0.004158	3.82	37.99	78.77	0.58	0.34	0.03		0.12
Upstream	1750.	275.00	1075.00	1078.04		1078.23	0.002390	3.93	140.59	169.40	0.47	0.31	0.13	0.04	0.12
Upstream	1750.	385.00	1075.00	1078.30		1078.53	0.002706	4.52	185.83	177.76	0.51	0.39	0.18	0.08	0.18
Upstream	1750.	480.00	1075.00	1078.49		1078.75	0.002932	4.95	219.88	184.22	0.54	0.46	0.22	0.12	0.22
Upstream	1750.	590.00	1075.00	1078.68		1078.97	0.003162	5.38	255.54	190.76	0.57	0.53	0.27	0.16	0.26
Upstream	1700.	75.00	1074.00	1075.65	1075.65	1076.29	0.014251	6.42	11.68	9.15	1.00	1.01			1.01
Upstream	1700.	120.00	1074.00	1076.18	1076.18	1076.97	0.012548	7.13	17.52	15.84	0.97	1.14	0.10		0.79
Upstream	1700.	275.00	1074.00	1077.57	1077.57	1078.03	0.004940	6.40	114.83	162.64	0.65	0.77	0.21	0.11	0.21
Upstream	1700.	385.00	1074.00	1077.88	1077.88	1078.33	0.004956	6.84	168.41	182.19	0.66	0.85	0.27	0.19	0.28
Upstream	1700.	480.00	1074.00	1078.04	1078.04	1078.53	0.005503	7.44	198.22	187.90	0.70	0.99	0.35	0.26	0.36
Upstream	1700.	590.00	1074.00	1078.20	1078.20	1078.74	0.006116	8.08	228.18	193.45	0.75	1.15	0.44	0.34	0.45
Upstream	1650.	75.00	1073.00	1075.68	1074.13	1075.73	0.000539	1.81	46.96	38.71	0.21	0.07	0.01		0.04
Upstream	1650.	120.00	1073.00	1076.09	1074.46	1076.17	0.000768	2.36	66.36	61.23	0.26	0.11	0.02	0.00	0.05
Upstream	1650.	275.00	1073.00	1076.86	1075.39	1077.03	0.001294	3.65	145.71	140.32	0.35	0.24	0.07	0.03	0.08
Upstream	1650.	385.00	1073.00	1077.22	1075.98	1077.43	0.001478	4.18	201.48	160.64	0.38	0.30	0.10	0.06	0.11
Upstream	1650.	480.00	1073.00	1077.48	1076.48	1077.72	0.001611	4.56	244.39	172.43	0.40	0.35	0.13	0.09	0.14
Upstream	1650.	590.00	1073.00	1077.75	1076.90	1078.00	0.001730	4.94	291.31	184.52	0.42	0.40	0.16	0.11	0.17
Upstream	1600.	100.00	1074.00	1075.34	1075.16	1075.61	0.006902	4.19	27.59	43.40	0.72	0.44	0.09		0.27
Upstream	1600.	163.00	1074.00	1075.59	1075.52	1076.01	0.008875	5.36	39.78	57.71	0.84	0.68	0.18		0.38
Upstream	1600.	375.00	1074.00	1076.29	1076.29	1076.82	0.007617	6.52	108.75	127.08	0.84	0.88	0.37	0.18	0.41
Upstream	1600.	525.00	1074.00	1076.55	1076.55	1077.20	0.008466	7.48	142.24	136.59	0.90	1.11	0.52	0.30	0.55
Upstream	1600.	650.00	1074.00	1076.81	1076.81	1077.47	0.007925	7.80	179.60	152.09	0.89	1.16	0.55	0.36	0.58
Upstream	1600.	805.00	1074.00	1077.19		1077.78	0.006237	7.64	241.33	169.24	0.81	1.06	0.53	0.38	0.55
Upstream	1550.	100.00	1074.00	1074.77	1074.77	1075.08	0.014564	4.49	24.29	43.50	0.98	0.59	0.22		0.51
Upstream	1550.	163.00	1074.00	1075.03	1075.03	1075.41	0.012978	5.07	36.72	64.24	0.97	0.69	0.17		0.46
Upstream	1550.	375.00	1074.00	1075.42	1075.59	1076.20	0.017167	7.49	71.23	101.81	1.18	1.33	0.44	0.24	0.75
Upstream	1550.	525.00	1074.00	1076.28	1075.91	1076.63	0.004336	5.35	176.19	145.20	0.65	0.57	0.26	0.15	0.33
Upstream	1550.	650.00	1074.00	1076.77	1075.99	1077.05	0.002829	4.97	252.14	166.30	0.54	0.46	0.24	0.11	0.26
Upstream	1550.	805.00	1074.00	1077.24		1077.50	0.002182	4.87	335.41	184.26	0.49	0.42	0.24	0.12	0.25
Upstream	1500.	100.00	1072.00	1073.82	1072.88	1073.66	0.000856	1.59	63.00	53.03	0.26	0.06			0.06
Upstream	1500.	163.00	1072.00	1074.38	1073.25	1074.43	0.000685	1.73	94.08	58.48	0.24	0.07			0.07
Upstream	1500.	375.00	1072.00	1075.72	1073.78	1075.79	0.000494	2.06	190.14	84.17	0.22	0.08	0.01	0.02	0.07
Upstream	1500.	525.00	1072.00	1076.41		1076.49	0.000441	2.27	252.49	98.36	0.22	0.09	0.01	0.02	0.07
Upstream	1500.	650.00	1072.00	1076.85		1076.95	0.000441	2.46	298.24	109.42	0.22	0.10	0.02	0.03	0.07
Upstream	1500.	805.00	1072.00	1077.30		1077.41	0.000459	2.70	349.21	120.38	0.23	0.12	0.03	0.03	0.08
Upstream	1450.	100.00	1071.61	1073.15	1073.15	1073.68	0.013727	5.82	17.18	16.56	1.01	0.86			0.86
Upstream	1450.	163.00	1071.61	1073.58	1073.58	1074.25	0.012763	6.58	24.75	18.69	1.01	1.02			1.02
Upstream	1450.	375.00	1071.61	1074.62	1074.62	1075.61	0.011323	8.00	46.87	23.96	1.01	1.32			1.32
Upstream	1450.	525.00	1071.61	1075.24	1075.24	1076.32	0.010888	8.35	62.91	29.36	1.00	1.39			1.39
Upstream	1450.	650.00	1071.70	1075.70	1075.70	1076.77	0.010747	8.31	78.23	36.60	1.00	1.38			1.38
Upstream	1450.	805.00	1071.61	1076.14	1076.14	1077.23	0.009790	8.39	99.33	68.26	0.97	1.37	0.04	0.08	0.87
Upstream	1400.	100.00	1071.00	1073.05	1072.28	1073.19	0.002332	3.02	33.08	22.56	0.44	0.21			0.21
Upstream	1400.	163.00	1071.00	1073.59	1072.69	1073.78	0.002466	3.53	46.24	26.06	0.47	0.26			0.26
Upstream	1400.	375.00	1071.00	1074.76	1073.67	1075.10	0.002787	4.63	81.07	33.15	0.52	0.41			0.41
Upstream	1400.	525.00	1071.00	1075.12	1074.19	1075.61	0.003688	5.63	95.07	52.32	0.61	0.59		0.02	0.41
Upstream	1400.	650.00	1071.00	1075.31	1074.58	1075.96	0.004543	6.46	109.60	103.30	0.68	0.76		0.04	0.30
Upstream	1400.	805.00	1071.00	1074.47	1074.97	1076.44	0.018123	11.28	71.47	31.36	1.31	2.48			2.48
Upstream	1350.	100.00	1070.98	1072.90		1073.06	0.002721	3.23	30.94	21.42	0.47	0.24			0.24
Upstream	1350.	163.00	1070.98	1073.42		1073.64	0.002855	3.82	42.70	23.72	0.50	0.31			0.31
Upstream	1350.	375.00	1070.98	1074.60		1074.95	0.002934	4.85	105.92	112.41	0.54	0.45		0.07	0.17
Upstream	1350.	525.00	1070.98	1074.99		1075.42	0.003361	5.54	157.39	158.21	0.58	0.56		0.12	0.21
Upstream	1350.	650.00	1070.98	1075.23		1075.71	0.003493	5.97	198.30	168.58	0.60	0.64	0.02	0.17	0.25
Upstream	1350.	805.00	1070.98	1075.51	1075.19	1076.02	0.003554	6.38	245.39	173.75	0.62	0.70	0.05	0.23	0.31
Upstream	1300.	100.00	1071.00	1072.79	-	1072.93	0.002293	3.03	33.02	22.02	0.44	0.21			0.21
Upstream	1300.	163.00	1071.00	1073.30		1073.50	0.002542	3.63	44.86	24.47	0.47	0.28			0.28
Upstream	1300.	375.00	1071.00	1074.51		1074.81	0.002302	4.52	128.59	165.77	0.48	0.38	0.04	0.05	0.11
Upstream	1300.	525.00	1071.00	1074.92		1075.25	0.002324	4.98	198.61	176.98	0.49	0.44	0.07	0.11	0.16
Upstream	1300.	650.00	1071.00	1075.17		1075.53	0.002454	5.38	242.98	181.44	0.51	0.50	0.09	0.15	0.20
Upstream	1300.	805.00	1071.00	1075.44		1075.83	0.002575	5.80	292.60	185.31	0.53	0.56	0.12	0.20	0.25
Upstream	1250.	100.00	1071.00	1072.16	1072.16	1072.68	0.013826	5.68	17.62	17.82	1.01	0.83			0.83
Upstream	1250.	163.00	1071.00	1072.57	1072.57	1073.22	0.012764	6.46	25.22	19.66	1.01	0.99			0.99
Upstream	1250.	375.00	1071.00	1073.54	1073.54	1074.52	0.010931	8.00	50.13	34.67	1.00	1.31	0.07	0.25	0.96
Upstream	1250.	525.00	1071.00	1074.41	1074.41	1075.05	0.004998	6.88	142.37	162.22	0.72	0.86	0.16	0.17	0.27
Upstream	1250.	650.00	1071.00	1074.65	1074.65	1075.33	0.005021	7.29	182.91	166.78	0.73	0.94	0.19	0.25	0.34
Upstream	1250.	805.00	1071.00	1074.90	1074.90	1075.62	0.005216	7.82	224.20	171.31	0.75	1.05	0.24	0.33	0.42
Upstream	1200.	100.00	1069.00	1071.18	1070.75	1071.43	0.005313	3.99	25.05	20.69	0.64	0.39			0.39
Upstream	1200.	163.00	1069.00	1072.01	1071.22	1072.22	0.002836	3.69	44.23	25.60	0.49	0.29			0.29
Upstream	1200.	375.00	1069.00	1073.28	1072.19	1073.59	0.002667	4.48	88.04	64.45	0.51	0.39	0.02	0.03	0.22
Upstream	1200.	525.00	1069.00	1073.66	1072.74	1074.09	0.003105	5.33	119.42	102.85	0.56	0.52	0.07	0.06	0.22
Upstream	1200.	650.00	1069.00	1073.92	1073.09	1074.44	0.003387	5.90	149.70	131.05	0.59	0.62	0.11	0.10	0.24
Upstream	1200.	805.00	1069.00	1074.23	1073.60	1074.81	0.003494	6.39	197.22	164.84	0.61	0.70	0.14	0.14	0.26
Upstream	1150.	100.00	1068.00	1071.13		1071.25	0.001710	2.80	35.75	21.02	0.38	0.17			0.17
Upstream	1150.	163.00	1068.00	1071.97		1072.19	0.001394	2.94	55.36	25.74	0.35	0.17			0.17
Upstream	1150.	375.00	1068.00	1073.23		1073.47	0.001578	4.02	114.65	112.57	0.40	0.29	0.06	0.02	0.10
Upstream	1150.	525.00	1068.00	1073.61		1073.94	0.001946	4.81	162.00	139.45	0.45	0.40	0.10	0.06	0.14
Upstream	1150.	650.00	1068.00	1073.87		1074.27	0.002181	5.34	201.17	159.16	0.48	0.48	0.13	0.09	0.17
Upstream	1150.	805.00	1068.00	1074.18		1074.63	0.002311	5.80	253.32	171.68	0.51	0.55	0.16	0.13	0.21
Upstream	1100.	100.00	1068.00	1071.10		1071.18	0.000833	2.32	43.10	19.13	0.27	0.11			0.11
Upstream	1100.	163.00	1068.00	1071.93		1072.04	0.000917	2.69	60.50	22.95	0.29	0.14			0.14
Upstream	1100.	375.00	1068.00	1073.14		1073.39	0.001590	4.06	104.26	119.49	0.40	0.29	0.01	0.01	0.08

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB	Shear Total
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Upstream	1100.	525.00	1068.00	1073.47		1073.84	0.002092	4.97	145.96	131.74	0.48	0.42	0.03	0.06	0.14
Upstream	1100.	650.00	1068.00	1073.69		1074.15	0.002467	5.61	176.05	140.36	0.51	0.53	0.05	0.10	0.19
Upstream	1100.	805.00	1068.00	1073.94		1074.49	0.002840	6.29	212.05	149.51	0.55	0.65	0.08	0.15	0.25
Upstream	1050.	100.00	1068.00	1071.07		1071.14	0.000655	2.11	47.38	20.34	0.24	0.09			0.09
Upstream	1050.	163.00	1068.00	1071.90		1072.00	0.000711	2.50	65.14	22.74	0.26	0.12			0.12
Upstream	1050.	375.00	1068.00	1073.16		1073.31	0.000776	3.31	215.78	147.02	0.29	0.18	0.02	0.05	0.07
Upstream	1050.	525.00	1068.00	1073.53		1073.72	0.000995	3.97	270.54	155.24	0.33	0.25	0.03	0.08	0.11
Upstream	1050.	650.00	1068.00	1073.77		1074.00	0.001169	4.46	308.85	160.58	0.36	0.31	0.05	0.11	0.14
Upstream	1050.	805.00	1068.00	1074.04		1074.32	0.001355	4.98	352.95	166.08	0.39	0.38	0.07	0.15	0.18
Upstream	1000.	100.00	1068.00	1071.02		1071.11	0.000816	2.31	43.24	18.80	0.27	0.11			0.11
Upstream	1000.	163.00	1068.00	1071.84		1071.95	0.000909	2.68	60.82	23.44	0.29	0.14	0.00		0.13
Upstream	1000.	375.00	1068.00	1073.08		1073.26	0.000992	3.60	181.77	119.10	0.32	0.22	0.06	0.06	0.09
Upstream	1000.	525.00	1068.00	1073.40		1073.65	0.001350	4.43	220.60	125.47	0.38	0.32	0.10	0.10	0.15
Upstream	1000.	650.00	1068.00	1073.60		1073.92	0.001670	5.08	245.80	129.30	0.43	0.41	0.13	0.15	0.19
Upstream	1000.	805.00	1068.00	1073.81		1074.22	0.002066	5.83	273.05	133.32	0.48	0.54	0.18	0.20	0.26
Upstream	950.	100.00	1067.05	1070.15	1070.15	1070.90	0.022725	6.95	14.39	9.61	1.00	1.27			1.27
Upstream	950.	163.00	1067.05	1070.76	1070.76	1071.71	0.022155	7.83	20.81	11.22	1.01	1.51			1.51
Upstream	950.	375.00	1067.05	1072.58	1072.58	1073.09	0.008120	6.54	113.81	125.71	0.65	0.90	0.39	0.30	0.42
Upstream	950.	525.00	1067.05	1072.87	1072.87	1073.45	0.009361	7.34	152.49	134.88	0.70	1.11	0.54	0.49	0.61
Upstream	950.	650.00	1067.05	1073.09	1073.09	1073.69	0.010016	7.81	181.92	140.58	0.72	1.24	0.64	0.65	0.75
Upstream	950.	805.00	1067.05	1073.27	1073.27	1073.95	0.011357	8.52	208.68	144.32	0.77	1.46	0.80	0.86	0.95
Upstream	900.	100.00	1067.00	1069.04	1068.59	1069.44	0.006440	5.07	19.74	11.34	0.68	0.58			0.58
Upstream	900.	163.00	1067.00	1069.75	1069.17	1070.26	0.006271	5.74	28.41	13.06	0.69	0.69			0.69
Upstream	900.	375.00	1067.00	1069.92	1070.61	1072.25	0.027155	12.25	30.60	13.50	1.43	3.12			3.12
Upstream	900.	525.00	1067.00	1071.18	1071.77	1072.79	0.013237	10.29	66.78	118.19	1.05	2.00	0.11	0.14	0.45
Upstream	900.	650.00	1067.00	1071.51	1072.02	1073.08	0.012162	10.57	107.22	128.82	1.02	2.04	0.24	0.37	0.61
Upstream	900.	805.00	1067.00	1071.84	1072.30	1073.32	0.011176	10.79	150.65	135.84	1.00	2.06	0.37	0.56	0.75
Upstream	850.	100.00	1067.00	1069.03		1069.19	0.002315	3.28	30.66	17.71	0.44	0.23			0.23
Upstream	850.	163.00	1067.00	1069.81		1070.01	0.001964	3.62	45.94	28.39	0.41	0.26	0.01		0.18
Upstream	850.	375.00	1067.00	1071.00	1069.75	1071.40	0.002611	5.19	91.30	143.63	0.50	0.48	0.15	0.00	0.10
Upstream	850.	525.00	1067.00	1071.33	1070.45	1071.89	0.003407	6.31	139.69	151.46	0.58	0.69	0.21	0.07	0.19
Upstream	850.	650.00	1067.00	1071.48	1070.93	1072.20	0.004318	7.29	161.76	154.17	0.66	0.90	0.29	0.13	0.28
Upstream	850.	805.00	1067.00	1071.70	1071.70	1072.55	0.004914	8.08	197.60	158.48	0.71	1.09	0.37	0.21	0.37
Upstream	800.	100.00	1066.00	1068.15	1068.15	1068.90	0.014127	6.96	14.37	9.74	1.01	1.13			1.13
Upstream	800.	163.00	1066.00	1068.75	1068.75	1069.73	0.013517	7.92	20.57	10.70	1.01	1.36			1.36
Upstream	800.	375.00	1066.00	1070.42	1070.42	1071.18	0.005840	7.80	104.23	102.30	0.73	1.08	0.26	0.26	0.36
Upstream	800.	525.00	1066.00	1070.90	1070.90	1071.65	0.005629	8.33	160.58	129.36	0.73	1.18	0.33	0.35	0.43
Upstream	800.	650.00	1066.00	1071.25	1071.25	1071.96	0.005198	8.47	210.66	146.78	0.71	1.19	0.32	0.40	0.48
Upstream	800.	805.00	1066.00	1071.51	1071.51	1072.26	0.005602	9.13	248.61	153.65	0.75	1.35	0.36	0.52	0.56
Upstream	750.	100.00	1066.00	1067.73	1067.60	1068.16	0.009640	5.25	19.06	16.41	0.86	0.67			0.67
Upstream	750.	163.00	1066.00	1068.48	1068.03	1068.87	0.005461	5.01	32.55	19.33	0.68	0.55			0.55
Upstream	750.	375.00	1066.00	1070.01	1069.11	1070.46	0.003223	5.50	90.76	97.50	0.57	0.55	0.10	0.06	0.18
Upstream	750.	525.00	1066.00	1070.23	1069.94	1070.93	0.004675	6.95	113.66	113.64	0.69	0.86	0.18	0.12	0.29
Upstream	750.	650.00	1066.00	1070.41	1070.39	1071.29	0.005568	7.89	135.95	127.14	0.76	1.08	0.25	0.19	0.37
Upstream	750.	805.00	1066.00	1070.56	1070.77	1071.70	0.007009	9.11	155.45	137.57	0.86	1.42	0.35	0.28	0.49
Upstream	700.	100.00	1064.75	1066.75	1066.75	1067.53	0.014570	7.12	14.05	9.06	1.01	1.18			1.18
Upstream	700.	163.00	1064.75	1067.39	1067.39	1068.40	0.013987	8.04	20.28	10.25	1.01	1.40			1.40
Upstream	700.	375.00	1064.75	1069.58	1069.58	1070.24	0.005158	6.97	103.92	127.48	0.65	0.88	0.09	0.17	0.25
Upstream	700.	525.00	1064.75	1069.99	1069.99	1070.68	0.005287	7.59	160.51	148.22	0.67	1.01	0.16	0.29	0.35
Upstream	700.	650.00	1064.75	1070.26	1070.26	1070.96	0.005465	8.06	201.50	162.61	0.69	1.11	0.21	0.36	0.41
Upstream	700.	805.00	1064.75	1070.51	1070.51	1071.27	0.005823	8.65	245.14	177.02	0.72	1.26	0.26	0.46	0.49
Upstream	650.	100.00	1064.00	1066.78	1065.83	1066.97	0.002342	3.49	28.66	14.62	0.44	0.26			0.26
Upstream	650.	163.00	1064.00	1067.34	1066.34	1067.62	0.002895	4.33	42.32	31.61	0.50	0.37	0.06		0.23
Upstream	650.	375.00	1064.00	1068.86	1067.73	1069.23	0.002819	5.14	98.43	44.47	0.51	0.48	0.23		0.35
Upstream	650.	525.00	1064.00	1069.19	1068.33	1069.75	0.004024	6.42	133.20	157.82	0.62	0.73	0.27	0.04	0.20
Upstream	650.	650.00	1064.00	1069.48	1068.75	1070.09	0.004215	6.88	182.51	176.12	0.64	0.82	0.31	0.11	0.26
Upstream	650.	805.00	1064.00	1069.84	1069.61	1070.43	0.004068	7.06	248.52	195.16	0.63	0.85	0.34	0.19	0.31
Upstream	600.	100.00	1065.00	1066.62		1066.82	0.003575	3.65	27.40	18.87	0.53	0.31			0.31
Upstream	600.	163.00	1065.00	1067.18		1067.46	0.003415	4.25	38.37	19.92	0.54	0.38			0.38
Upstream	600.	375.00	1065.00	1068.65		1069.06	0.003490	5.14	83.15	98.92	0.57	0.51		0.03	0.18
Upstream	600.	525.00	1065.00	1068.98		1069.54	0.004339	6.13	118.70	119.23	0.64	0.70		0.11	0.26
Upstream	600.	650.00	1065.00	1069.24		1069.87	0.004549	6.65	157.14	155.43	0.67	0.80	0.05	0.16	0.28
Upstream	600.	805.00	1065.00	1069.60		1070.22	0.004160	6.84	215.65	171.43	0.65	0.81	0.09	0.23	0.32
Upstream	550.	100.00	1064.81	1066.42		1066.63	0.004099	3.71	28.92	19.96	0.56	0.32			0.32
Upstream	550.	163.00	1064.81	1067.02		1067.28	0.003461	4.15	39.31	21.30	0.54	0.37			0.37
Upstream	550.	375.00	1064.81	1068.61		1068.89	0.002077	4.44	138.94	131.08	0.44	0.36		0.08	0.13
Upstream	550.	525.00	1064.81	1068.97		1069.31	0.002496	5.14	186.62	137.74	0.49	0.47		0.14	0.21
Upstream	550.	650.00	1064.81	1069.24		1069.62	0.002673	5.51	230.30	164.57	0.52	0.53	0.04	0.19	0.23
Upstream	550.	805.00	1064.81	1069.60		1069.98	0.002569	5.76	290.81	174.86	0.52	0.56	0.08	0.23	0.26
Upstream	500.	100.00	1064.00	1066.08		1066.40	0.004800	4.54	22.03	12.54	0.60	0.46			0.46
Upstream	500.	163.00	1064.00	1066.40		1067.00	0.007876	6.24	26.11	13.23	0.78	0.83			0.83
Upstream	500.	375.00	1064.00	1068.07	1068.07	1068.69	0.006379	6.48	87.05	128.14	0.74	0.84	0.01	0.13	0.26
Upstream	500.	525.00	1064.00	1068.46	1068.46	1069.10	0.006008	6.97	139.31	139.75	0.74	0.92	0.09	0.26	0.37
Upstream	500.	650.00	1064.00	1068.66	1068.66	1069.38	0.006573	7.62	167.08	145.58	0.78	1.07	0.13	0.35	0.46
Upstream	500.	805.00	1064.00	1069.43		1069.84	0.003184	6.20	293.20	176.63	0.57	0.66	0.14	0.30	0.32
Upstream	450.	100.00	1064.00	1065.59	1065.55	1066.01	0.012718	5.18	19.29	21.28	0.96	0.71			0.71
Upstream	450.	163.00	1064.00	1066.09		1066.52	0.008704	5.22	31.22	25.55	0.83	0.65			0.65
Upstream	450.	375.00	1064.00	1067.57	1066.79	1067.92	0.003379	4.85	102.03	116.85	0.57	0.46		0.07	0.18
Upstream	450.	525.00	1064.00	1068.22	1067.04	1068.52	0.002345	4.71	189.14	157.84	0.49	0.40	0.02	0.12	0.17
Upstream	450.	650.00	1064.00	1068.58	1067.81	1068.87	0.002128	4.86	250.83	182.42	0.48	0.41	0.05	0.14	0.18
Upstream	450.	805.00	1064.00	1069.51		1069.68	0.001023	3.99	443.29	229.73	0.35	0.26	0.06	0.11	0.12
Upstream	400.	100.00	1064.00	1065.46		1065.61	0.003757	3.06	32.70	32.12	0.53	0.24			0.24
Upstream	400.	163.00	1064.00	1066.09		1066.23	0.002327	2.95	55.35	40.10	0.44	0.20			0.20

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB	Shear Total
		(cfs)	(m)	(m)	(ft)	(m)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
Upstream	400.	375.00	1064.00	1067.66		1067.77	0.000909	2.76	193.43	168.88	0.30	0.14		0.03	0.06
Upstream	400.	525.00	1064.00	1068.29		1068.40	0.000723	2.81	313.84	215.68	0.28	0.14	0.01	0.05	0.07
Upstream	400.	650.00	1064.00	1068.65		1068.76	0.000688	2.95	394.60	233.54	0.28	0.15	0.02	0.06	0.07
Upstream	400.	805.00	1064.00	1069.55		1069.62	0.000385	2.57	620.04	264.41	0.22	0.10	0.02	0.05	0.06
Upstream	350.	100.00	1063.00	1064.60	1064.60	1065.24	0.013520	6.40	15.62	12.45	1.01	0.99			0.99
Upstream	350.	163.00	1063.00	1065.13	1065.13	1065.93	0.012679	7.21	22.61	14.22	1.01	1.16			1.16
Upstream	350.	375.00	1063.00	1066.38	1066.38	1067.56	0.011384	8.72	43.03	18.46	1.01	1.51			1.51
Upstream	350.	525.00	1063.00	1067.59	1067.59	1068.26	0.005281	6.94	134.59	172.13	0.71	0.88	0.14	0.15	0.25
Upstream	350.	650.00	1063.00	1068.38		1068.68	0.002281	5.25	297.53	226.38	0.49	0.47	0.12	0.16	0.19
Upstream	350.	805.00	1063.00	1069.47		1069.59	0.000833	3.78	566.29	264.70	0.31	0.22	0.07	0.11	0.11
Upstream	300.	100.00	1062.00	1064.50	1063.79	1064.74	0.003357	3.91	25.58	14.74	0.52	0.33			0.33
Upstream	300.	163.00	1062.00	1065.11	1064.29	1065.44	0.003698	4.65	35.08	16.51	0.56	0.44			0.44
Upstream	300.	375.00	1062.00	1066.52	1065.55	1067.01	0.003772	5.77	94.65	102.24	0.59	0.62		0.10	0.21
Upstream	300.	525.00	1062.00	1067.57	1066.64	1067.80	0.001664	4.51	275.79	235.15	0.41	0.35	0.05	0.12	0.12
Upstream	300.	650.00	1062.00	1068.45		1068.56	0.000760	3.50	498.75	264.13	0.28	0.19	0.06	0.09	0.09
Upstream	300.	805.00	1062.00	1069.48		1069.54	0.000384	2.84	780.67	282.54	0.21	0.12	0.05	0.07	0.07
Upstream	250.	100.00	1062.00	1064.36		1064.56	0.002642	3.60	27.81	15.07	0.47	0.28			0.28
Upstream	250.	163.00	1062.00	1064.95		1065.25	0.003115	4.41	36.96	16.42	0.52	0.39			0.39
Upstream	250.	375.00	1062.00	1066.37		1066.81	0.002953	5.54	120.76	209.17	0.53	0.54	0.03	0.07	0.11
Upstream	250.	525.00	1062.00	1067.58		1067.71	0.000851	3.65	403.38	249.20	0.30	0.21	0.06	0.08	0.08
Upstream	250.	650.00	1062.00	1068.45		1068.52	0.000455	3.00	628.18	267.04	0.23	0.14	0.05	0.07	0.07
Upstream	250.	805.00	1062.00	1069.48		1069.52	0.000264	2.56	912.23	285.08	0.18	0.09	0.04	0.05	0.05
Upstream	200.	100.00	1062.00	1064.09		1064.38	0.005608	4.15	24.09	18.98	0.65	0.41			0.41
Upstream	200.	163.00	1062.00	1064.78		1065.05	0.004035	4.18	39.17	24.13	0.58	0.38			0.38
Upstream	200.	375.00	1062.00	1066.43		1066.63	0.001623	3.91	180.68	189.90	0.40	0.28	0.05	0.07	0.09
Upstream	200.	525.00	1062.00	1067.57		1067.66	0.000614	2.98	415.35	221.28	0.26	0.15	0.06	0.06	0.07
Upstream	200.	650.00	1062.00	1068.44		1068.50	0.000368	2.62	618.96	246.24	0.21	0.11	0.05	0.05	0.06
Upstream	200.	805.00	1062.00	1069.47		1069.51	0.000229	2.34	884.71	269.30	0.17	0.08	0.04	0.04	0.05
Upstream	150.	100.00	1062.00	1063.68		1064.04	0.006386	4.83	20.68	13.82	0.70	0.54			0.54
Upstream	150.	163.00	1062.00	1064.33		1064.77	0.006376	5.34	30.61	18.81	0.71	0.62		0.03	0.59
Upstream	150.	375.00	1062.00	1066.42		1066.54	0.001013	3.39	270.62	205.08	0.32	0.20	0.06	0.08	0.08
Upstream	150.	525.00	1062.00	1067.56		1067.62	0.000432	2.68	518.28	225.67	0.22	0.11	0.05	0.06	0.06
Upstream	150.	650.00	1062.00	1068.43		1068.48	0.000279	2.42	719.10	240.65	0.18	0.09	0.05	0.05	0.05
Upstream	150.	805.00	1062.00	1069.46		1069.50	0.000187	2.22	973.58	254.52	0.15	0.07	0.04	0.04	0.04
Upstream	100.	100.00	1062.00	1063.76	1063.11	1063.82	0.001439	1.96	50.97	47.35	0.33	0.10			0.10
Upstream	100.	163.00	1062.00	1064.53	1063.36	1064.58	0.000679	1.83	89.27	52.39	0.25	0.07			0.07
Upstream	100.	375.00	1062.00	1066.45	1063.93	1066.49	0.000278	1.77	224.01	88.89	0.17	0.05	0.01	0.01	0.04
Upstream	100.	525.00	1062.00	1067.56	1064.25	1067.61	0.000193	1.80	337.50	120.42	0.15	0.05	0.01	0.01	0.03
Upstream	100.	650.00	1062.00	1068.42	1064.49	1068.47	0.000154	1.82	454.87	157.21	0.14	0.05	0.01	0.01	0.03
Upstream	100.	805.00	1062.00	1069.44	1064.77	1069.49	0.000118	1.79	651.96	203.48	0.13	0.04	0.01	0.01	0.02
Upstream	40	Culvert													
Upstream	0.	100.00	1060.74	1062.35	1062.14	1062.72	0.008004	4.86	20.59	17.01	0.78	0.57			0.57
Upstream	0.	163.00	1060.74	1062.80	1062.57	1063.31	0.008002	5.70	28.61	18.41	0.81	0.73			0.73
Upstream	0.	375.00	1060.74	1063.92	1063.63	1064.76	0.008007	7.33	51.19	22.25	0.85	1.06			1.06
Upstream	0.	525.00	1060.74	1064.54	1064.25	1065.53	0.008006	7.99	65.74	25.08	0.87	1.21			1.21
Upstream	0.	650.00	1060.74	1064.97	1064.69	1066.08	0.008003	8.43	77.06	27.06	0.88	1.31			1.31
Upstream	0.	805.00	1060.74	1065.47	1065.17	1066.68	0.008002	8.83	91.20	29.99	0.89	1.40			1.40

Up All Run   Plan 02   3/2/00

Upstream

Legend

WS Q50

WS Q (BKF)

Ground

LOB

ROB

Elevation (ft)

Main Channel Distance (ft)

1 in Horiz. = 500 ft   1 in Vert. = 5 ft

Up All Run   Plan 02   3/2/00
78
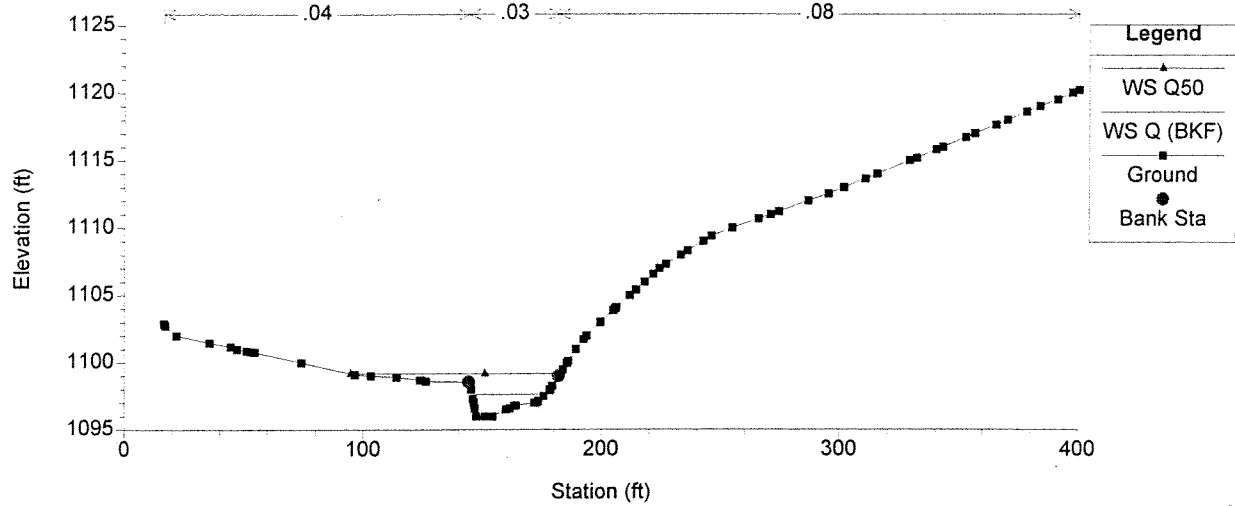
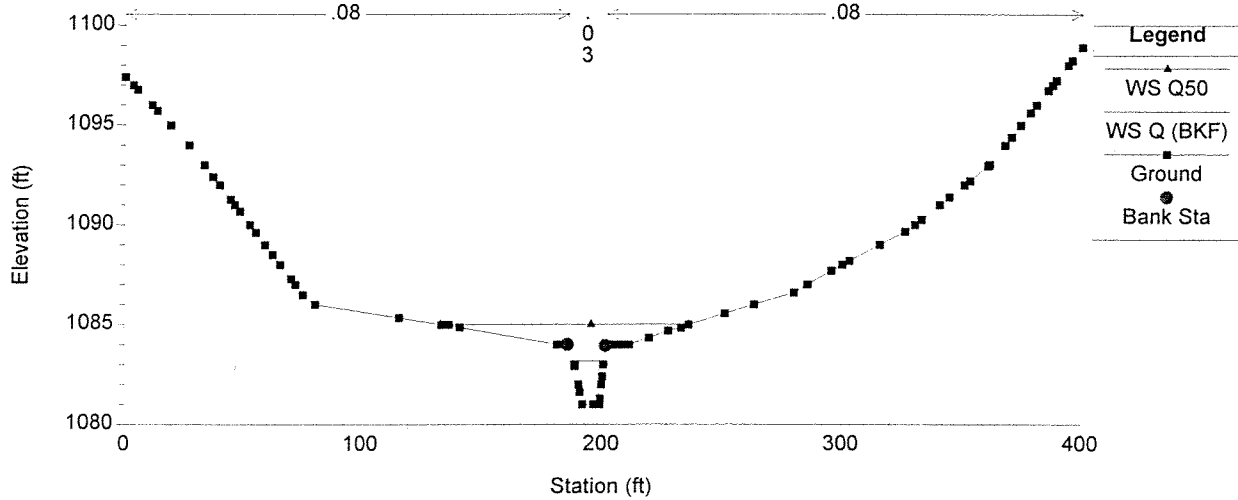Up All Run   Plan 02   3/2/00
77
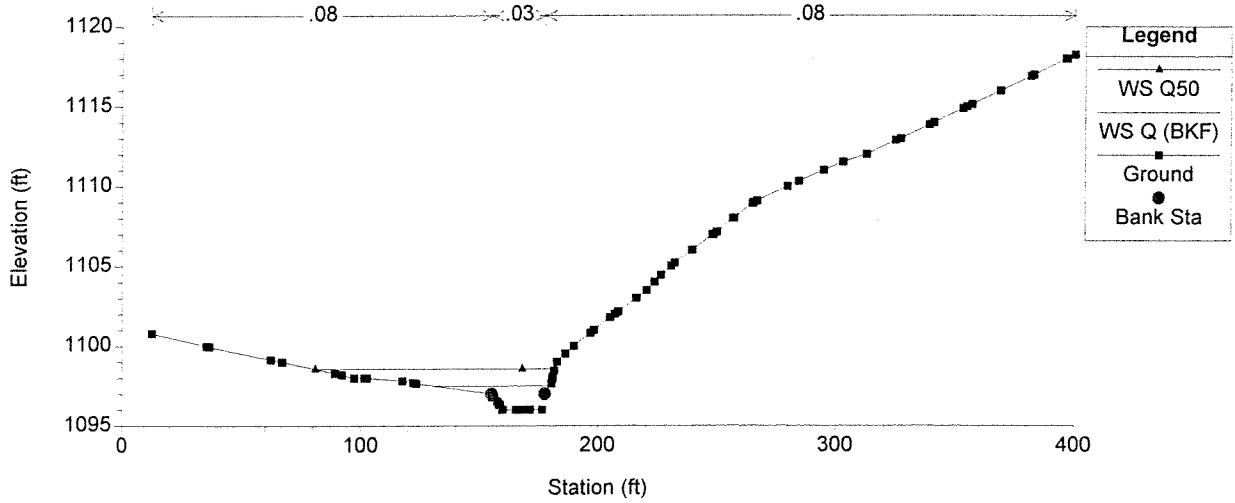
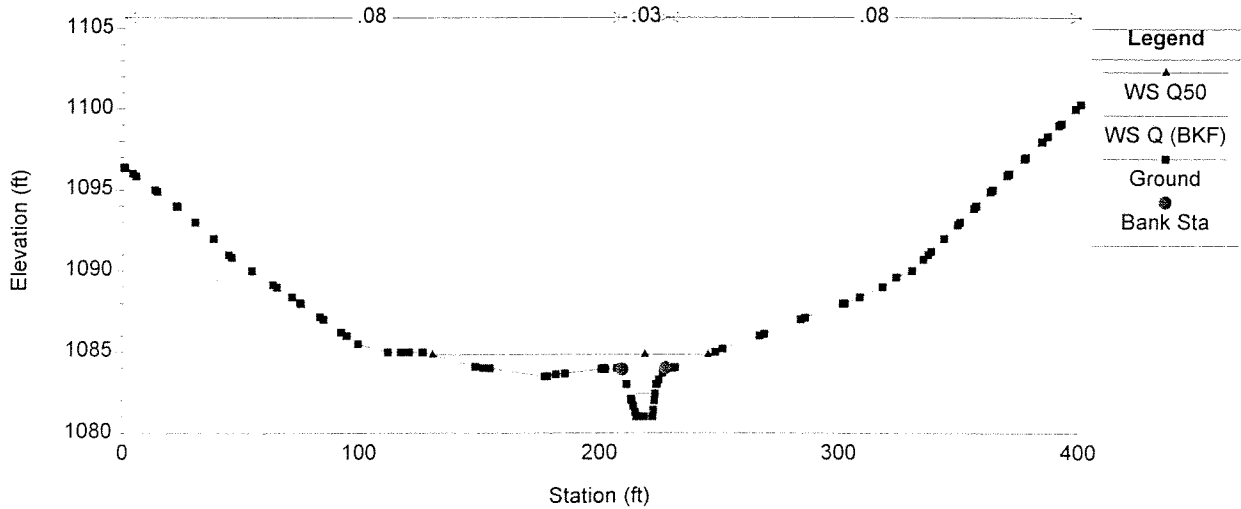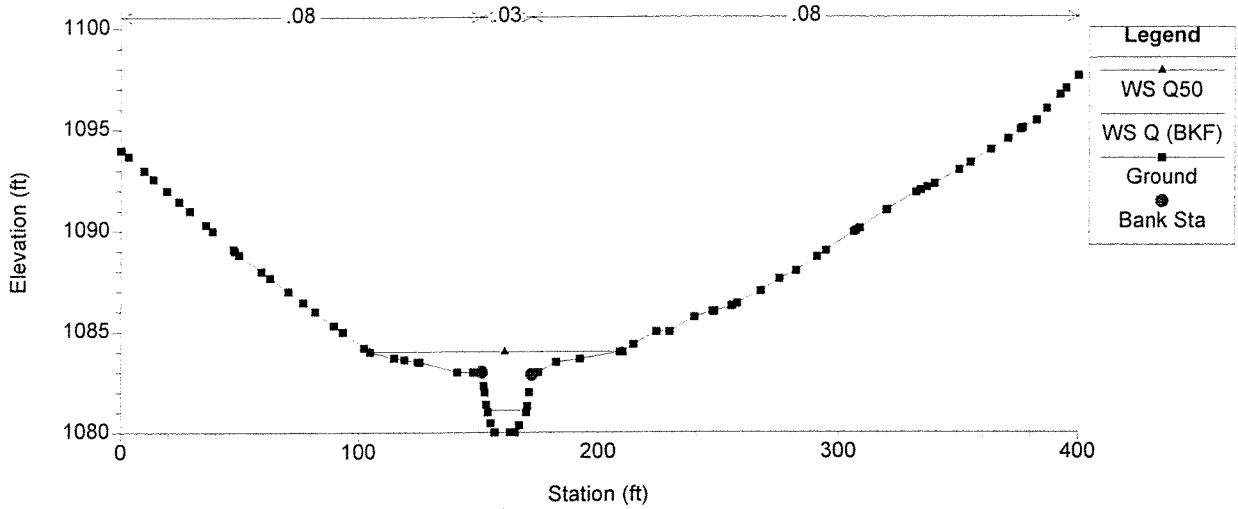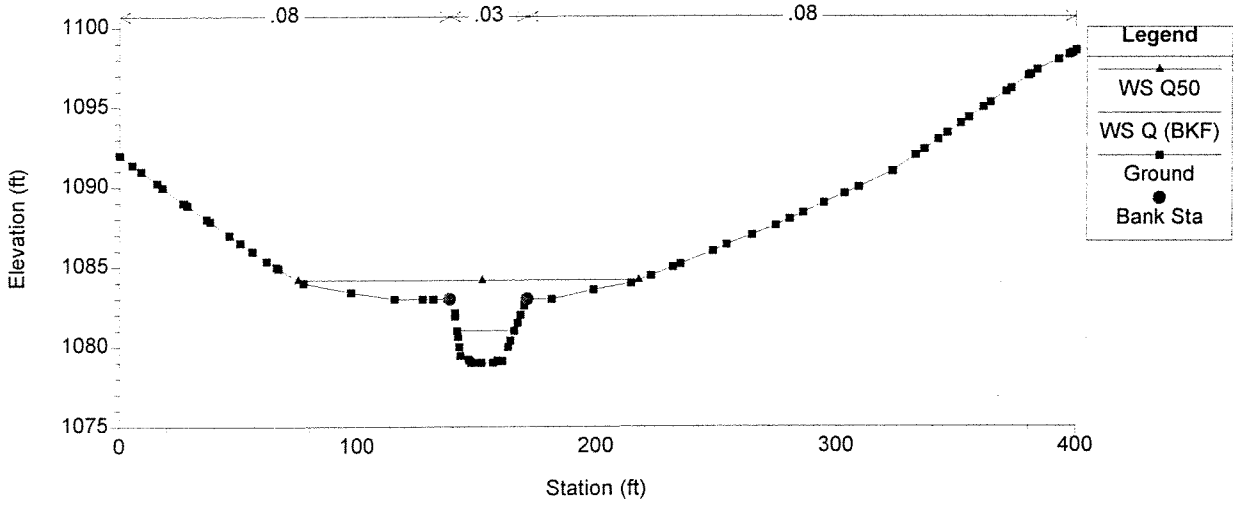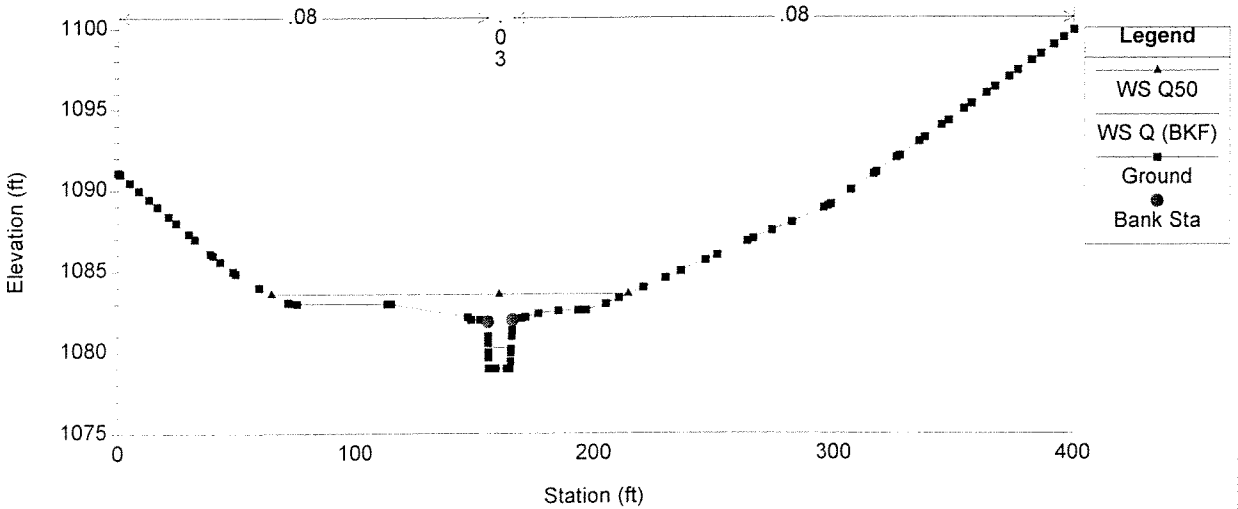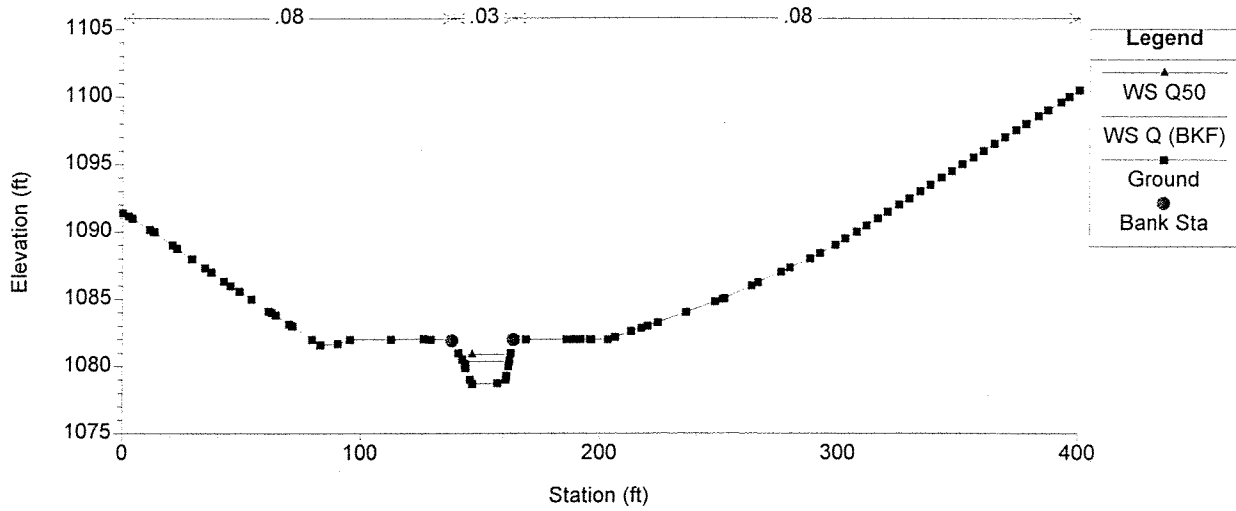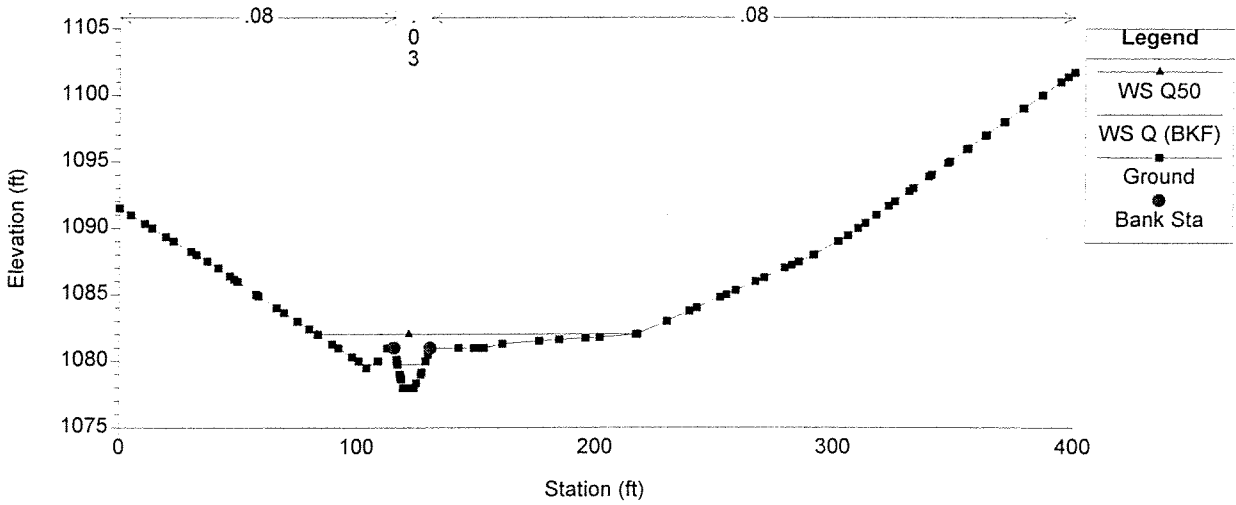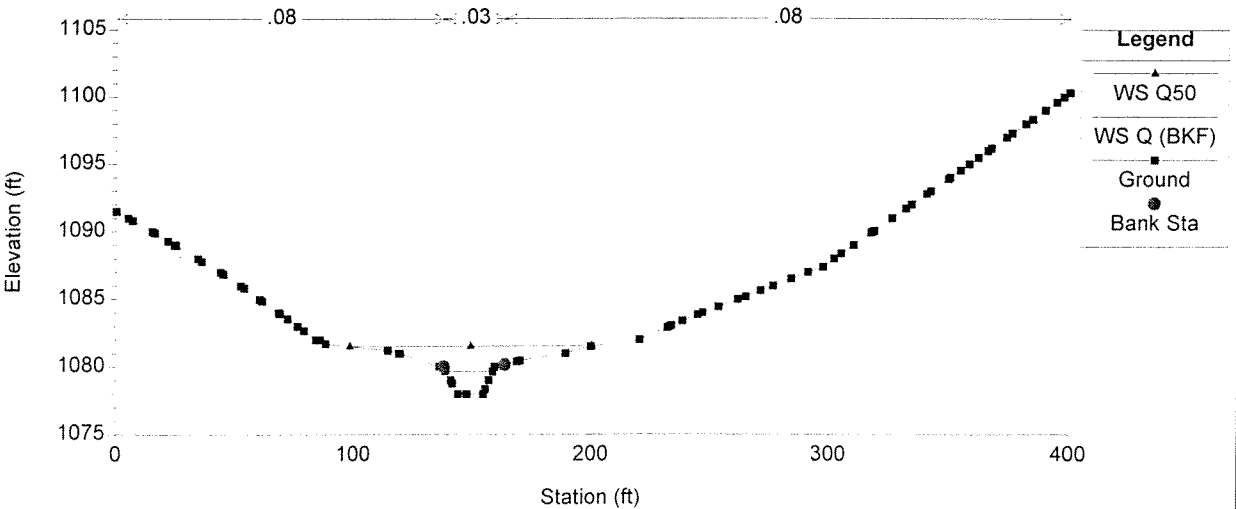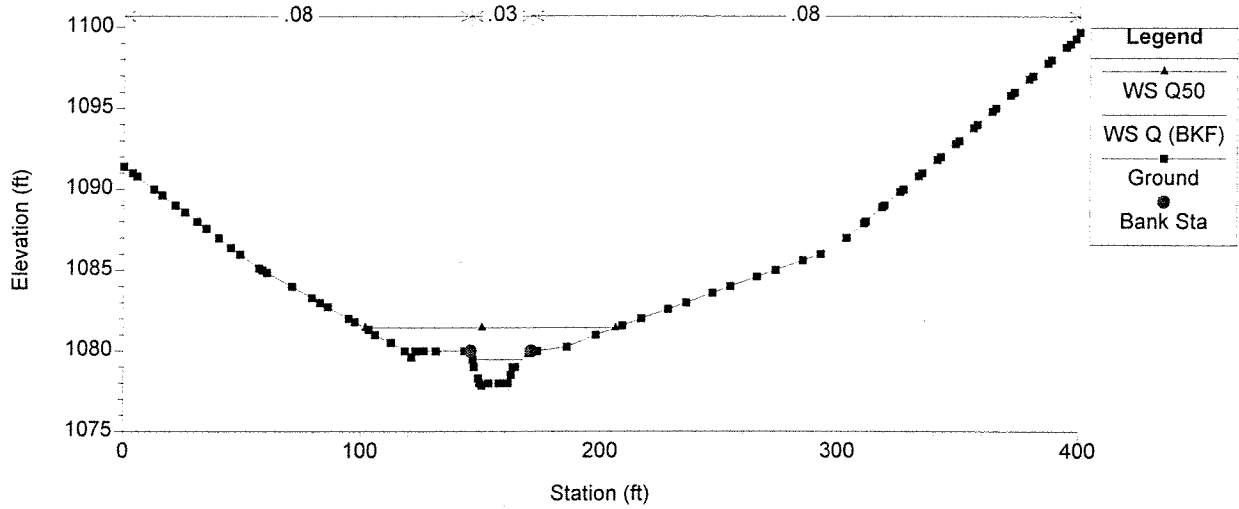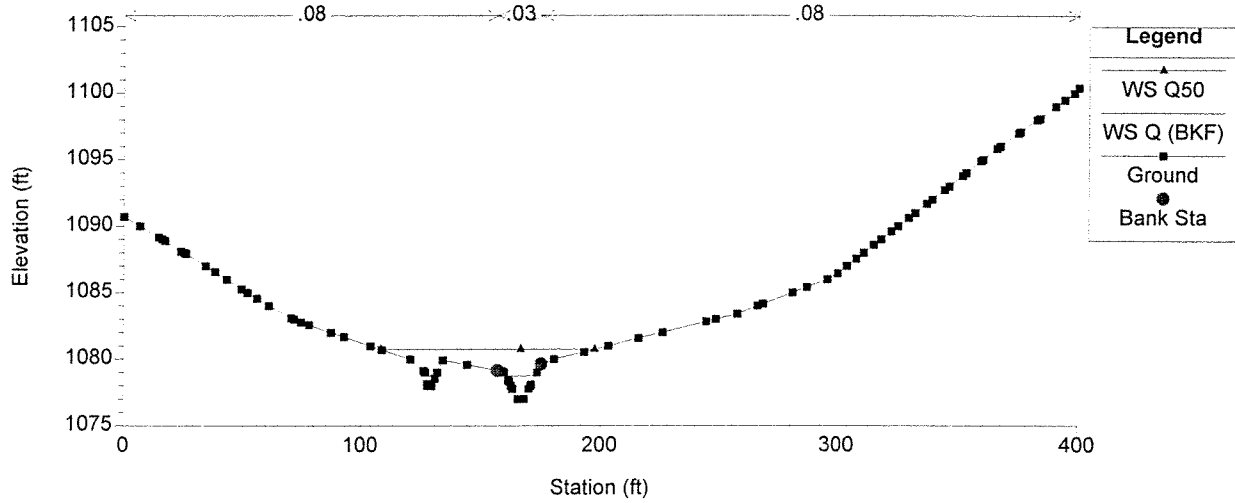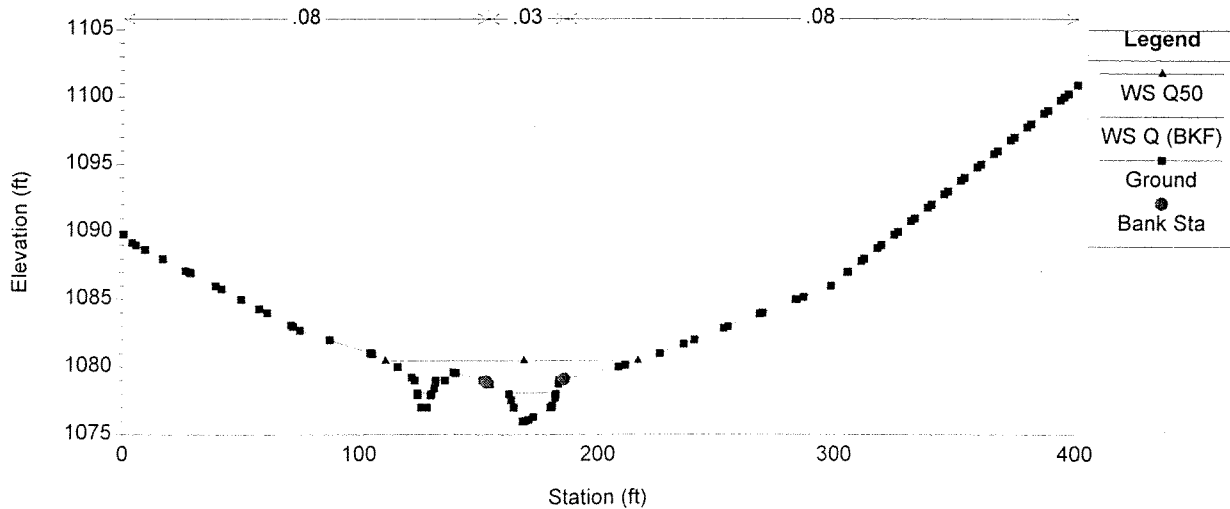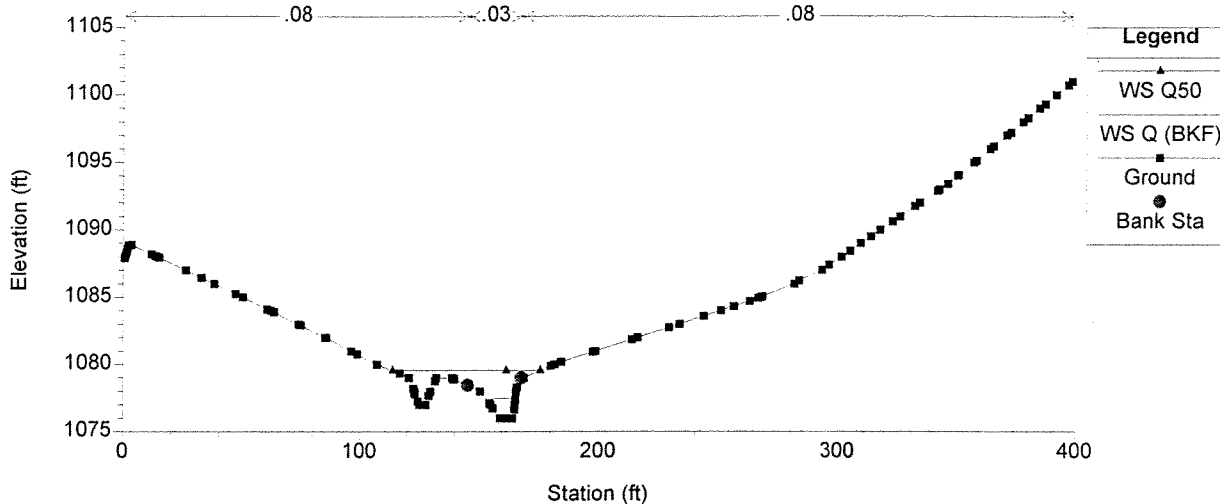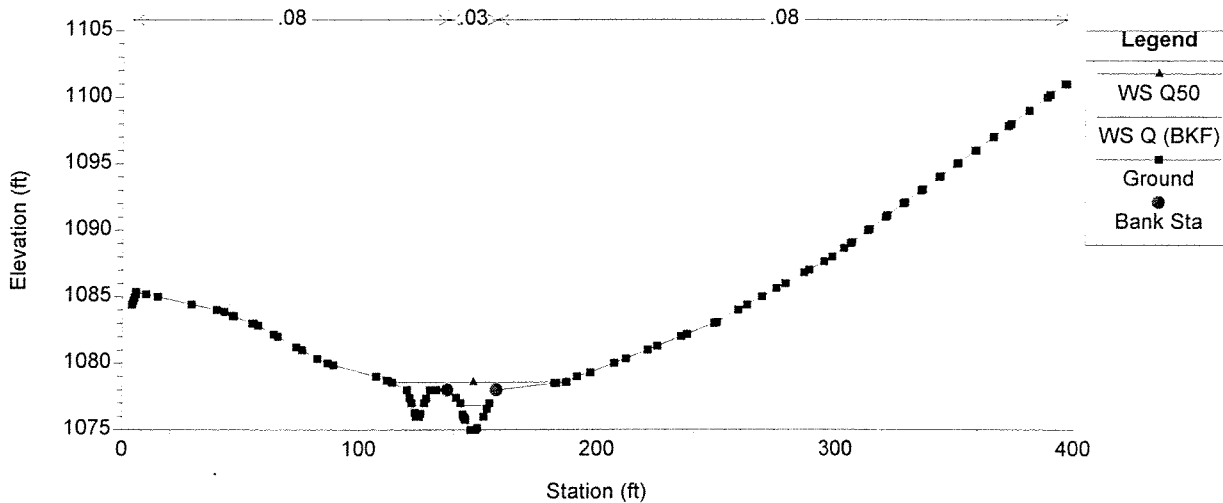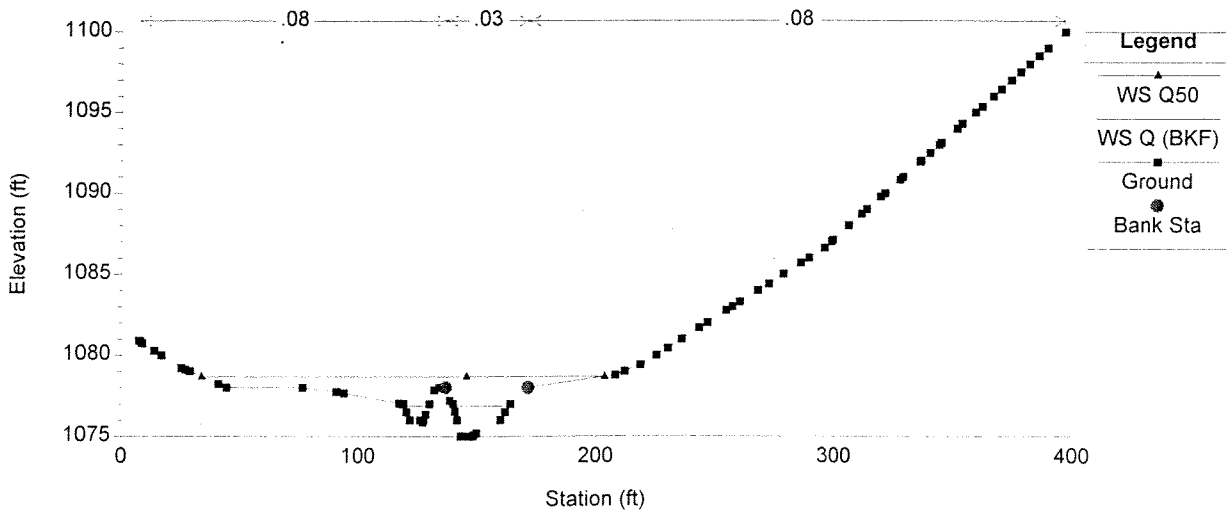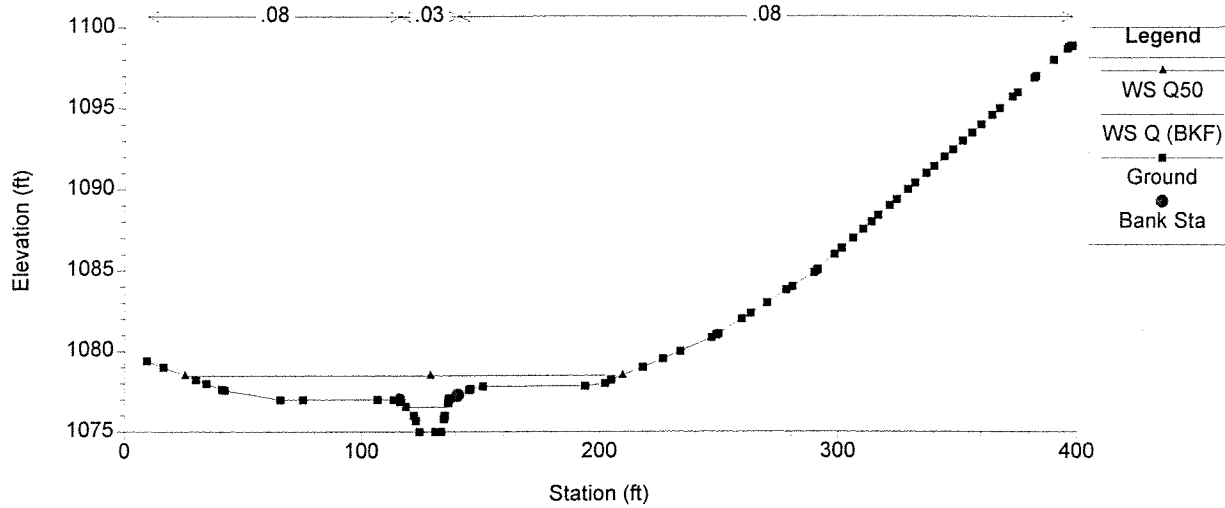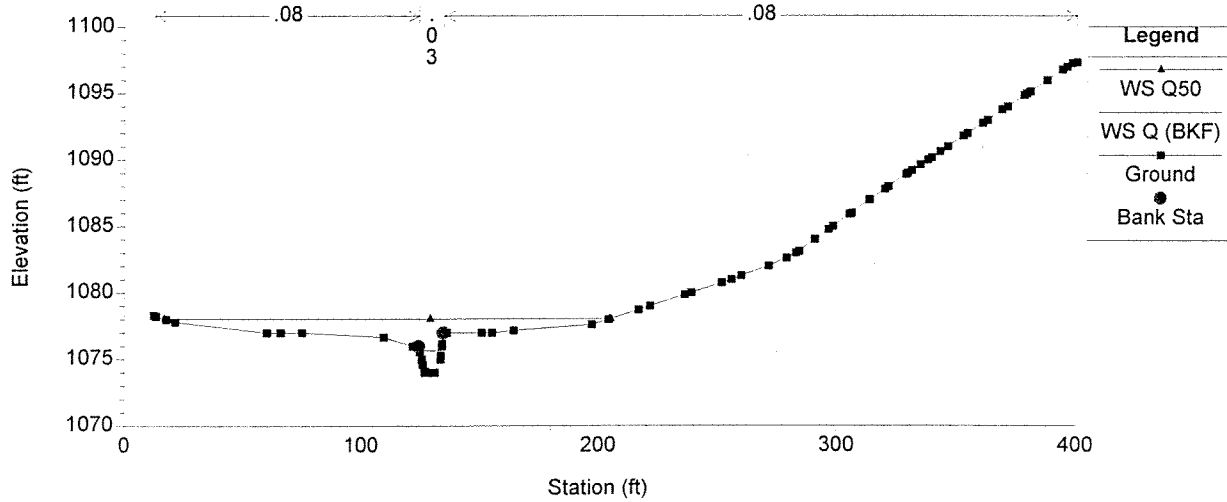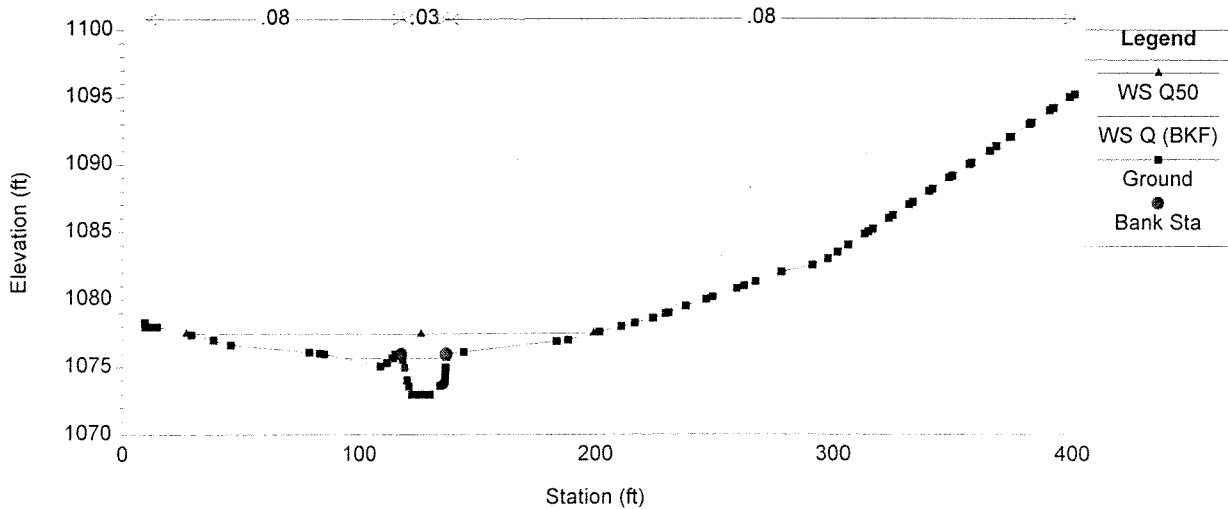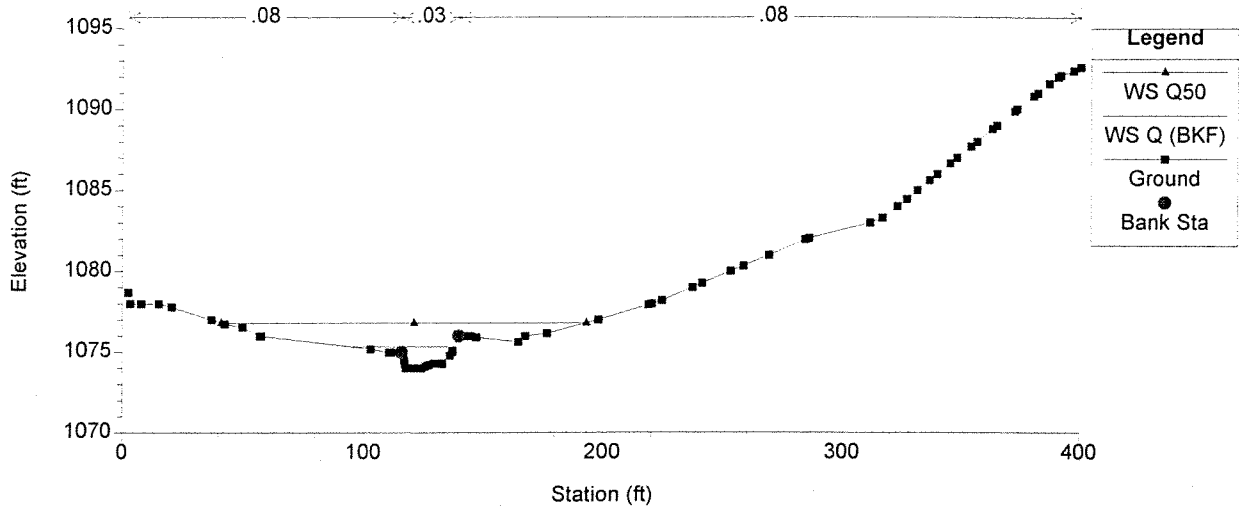Up All Run   Plan 02   3/2/00
76
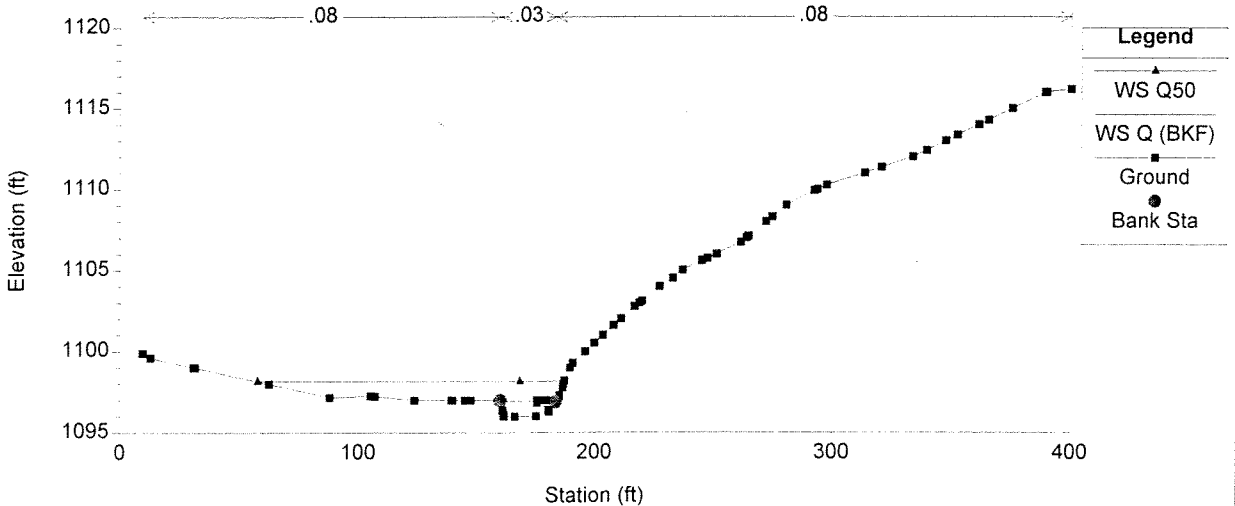
Up All Run   Plan 02   3/2/00
75
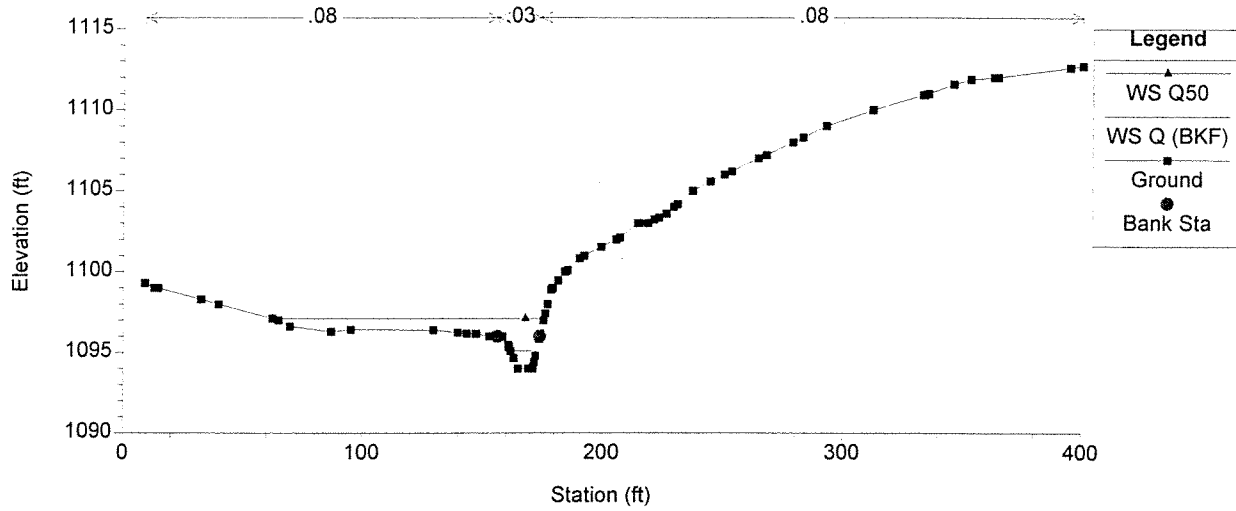
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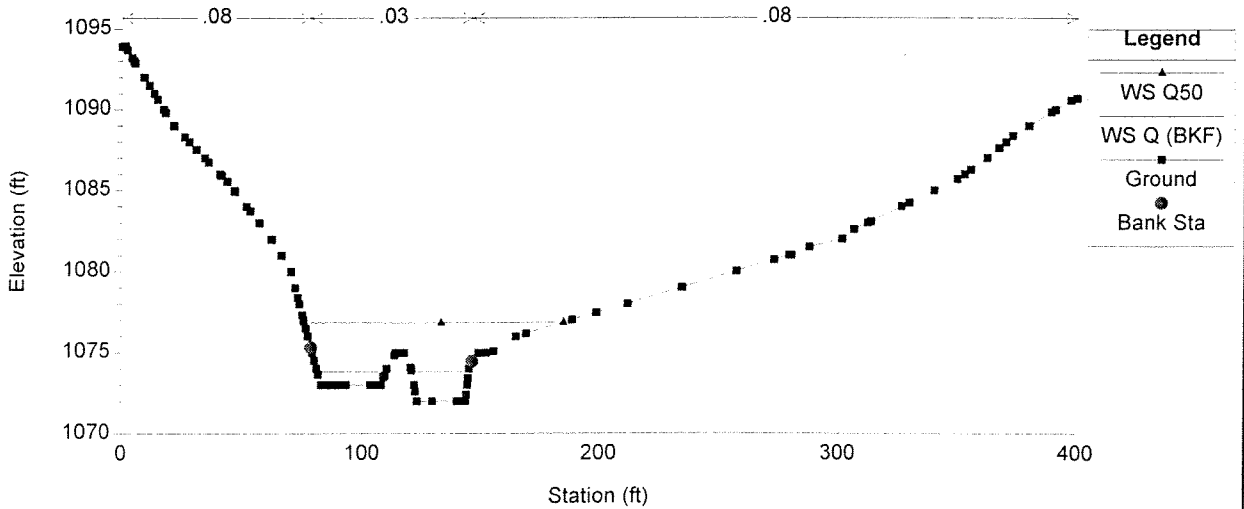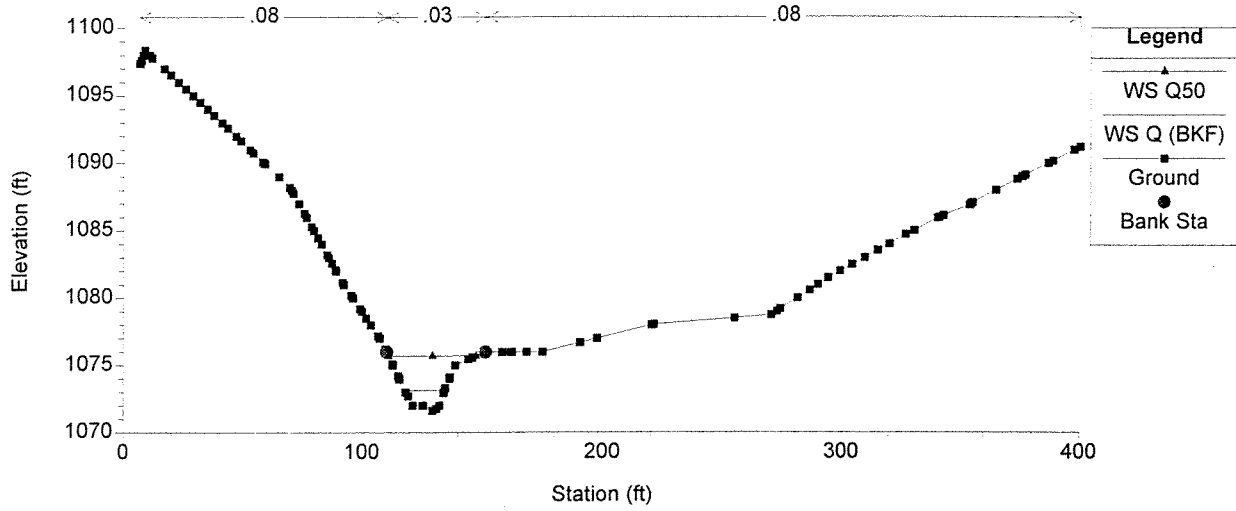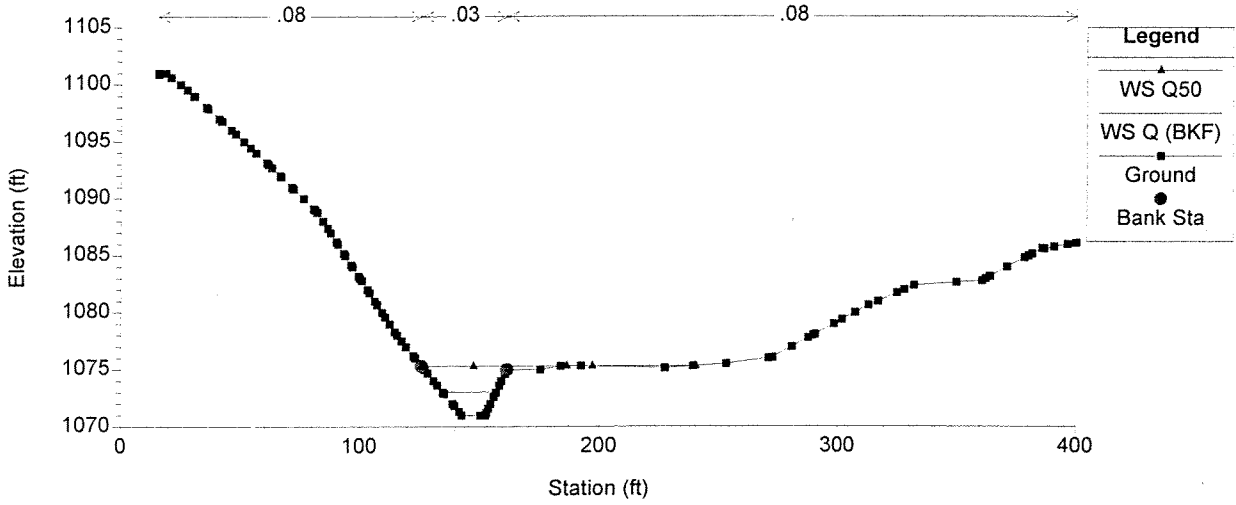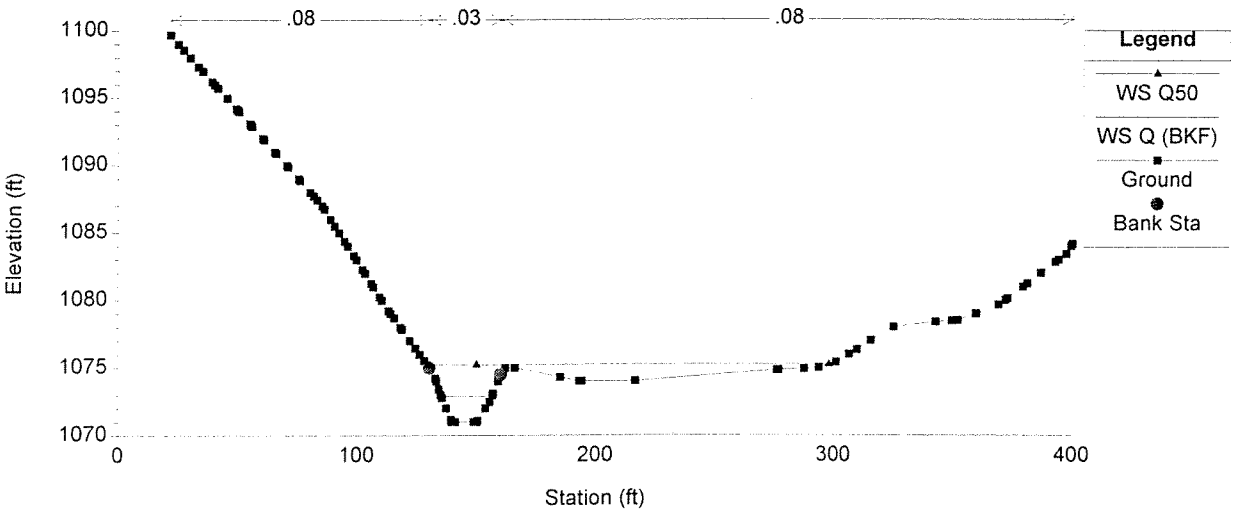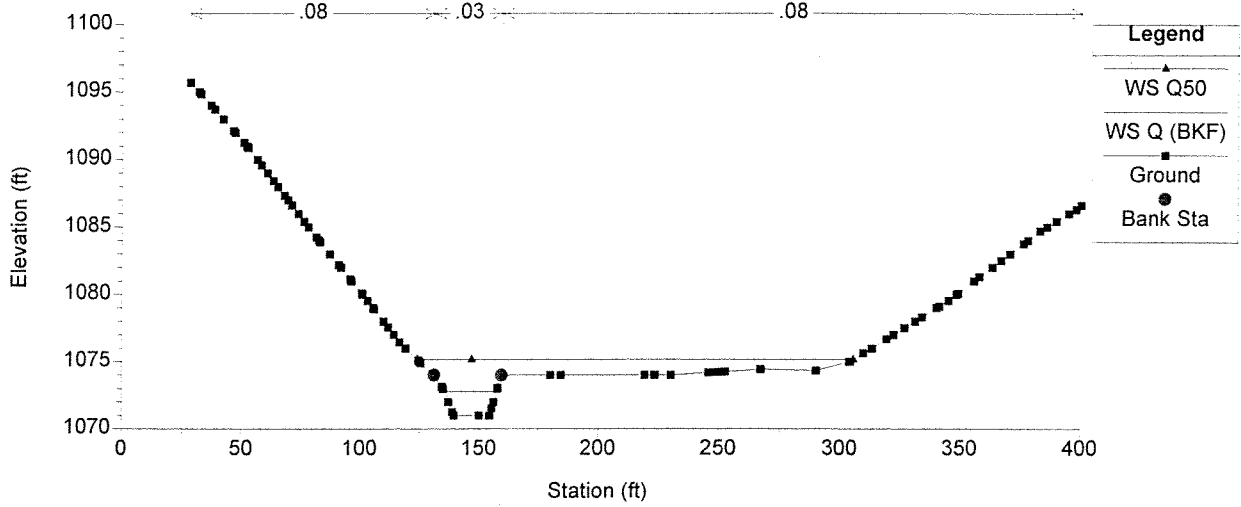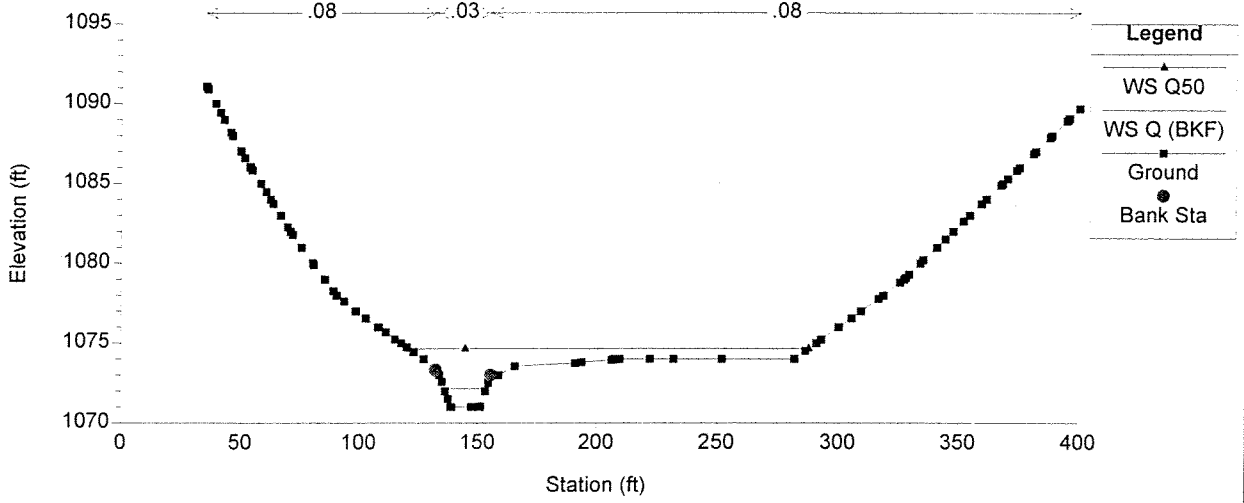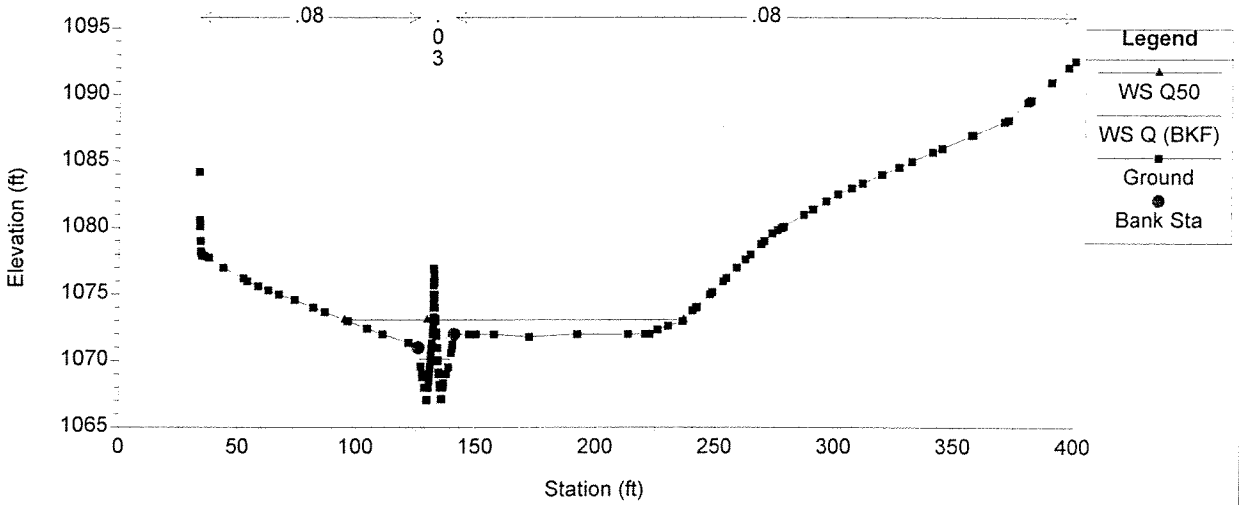74
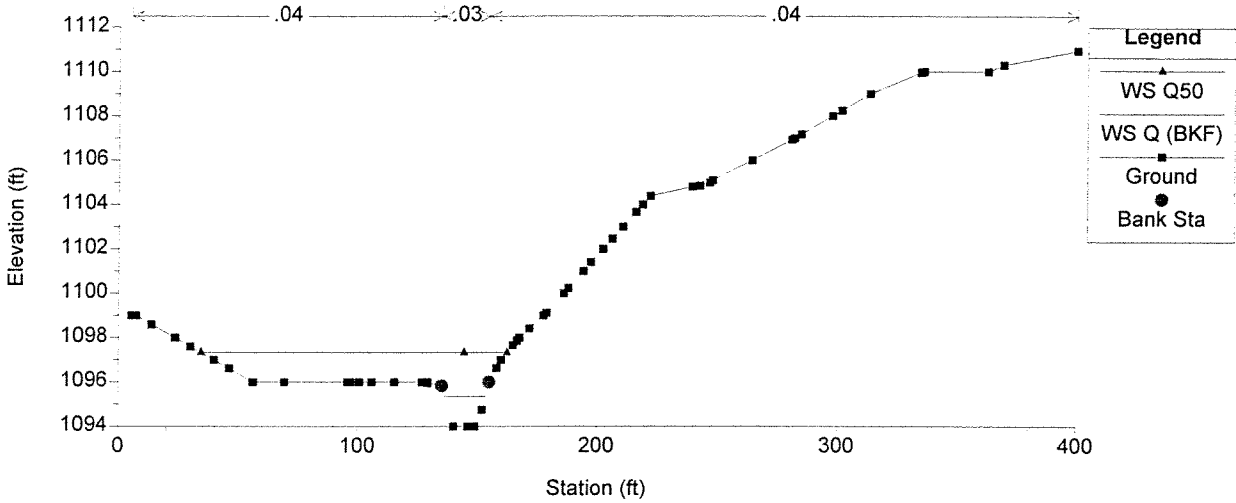
Up All Run   Plan 02   3/2/00
73
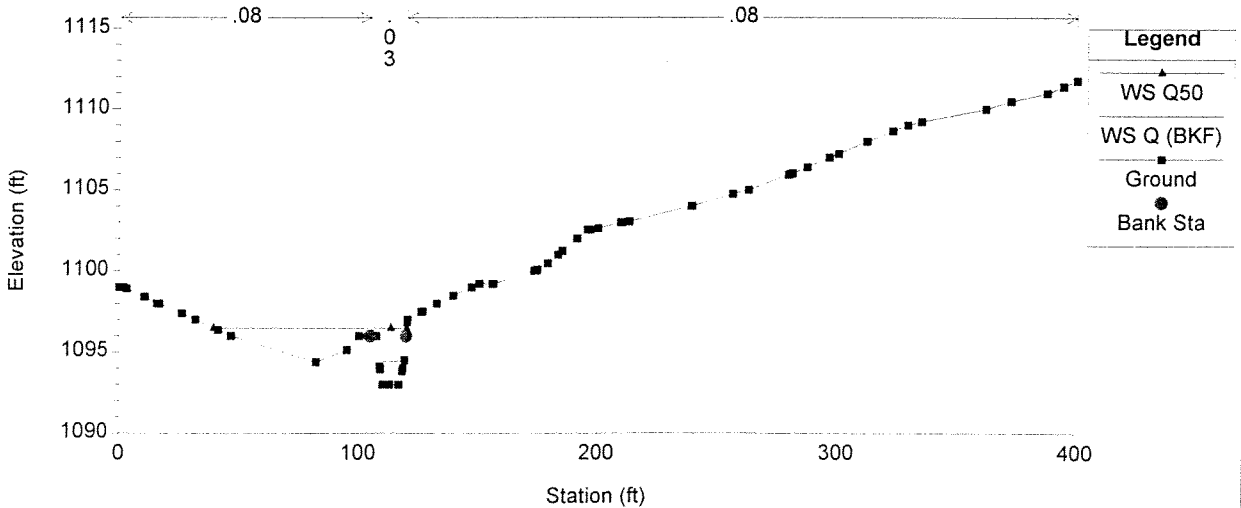
Up All Run   Plan 02   3/2/00
72

.08   .03   .08

Elevation (ft)

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Station (ft)

Up All Run   Plan 02   3/2/00
71

.08   .03   .08

Elevation (ft)

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Station (ft)

Up All Run   Plan 02   3/2/00
70

.08   .03   .08

Elevation (ft)

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Station (ft)
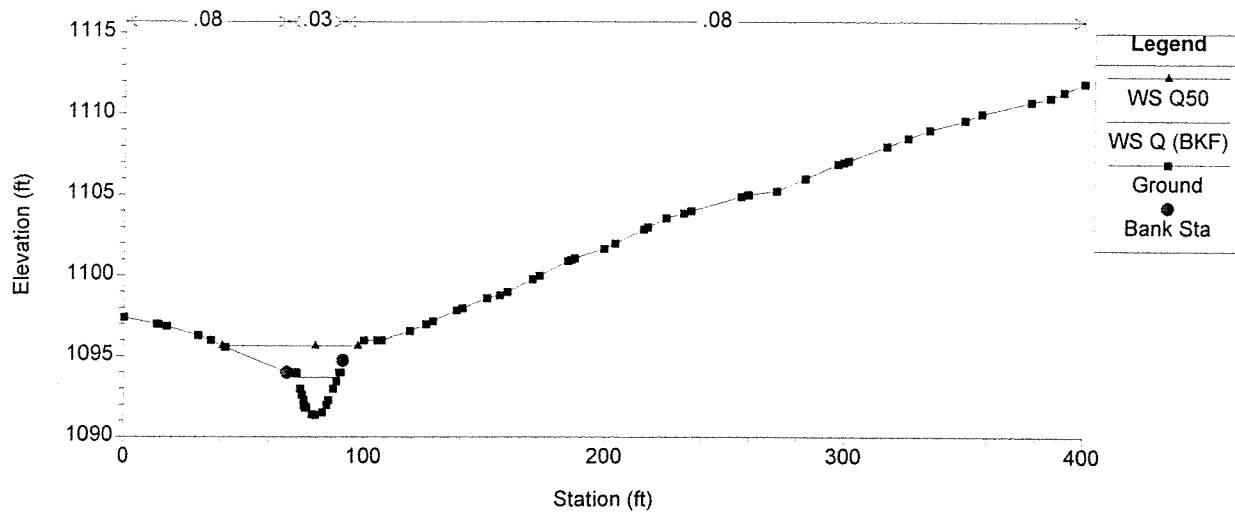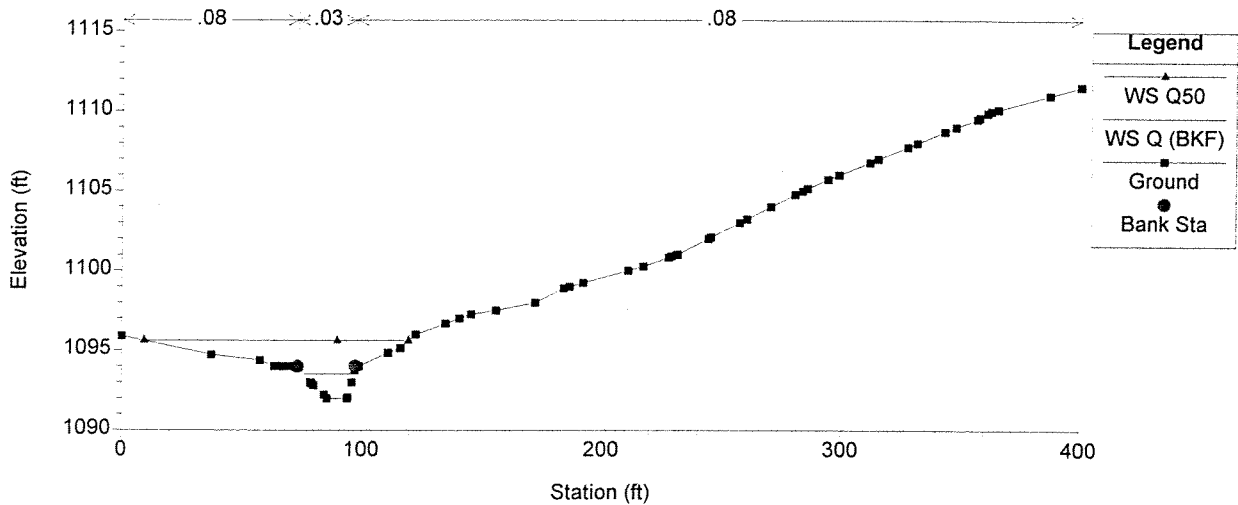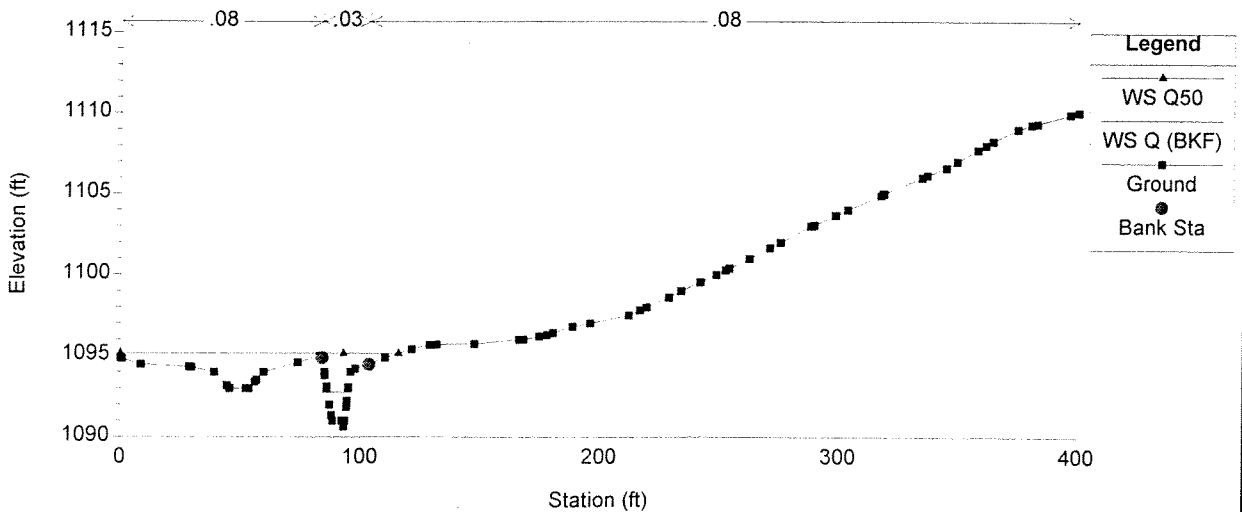
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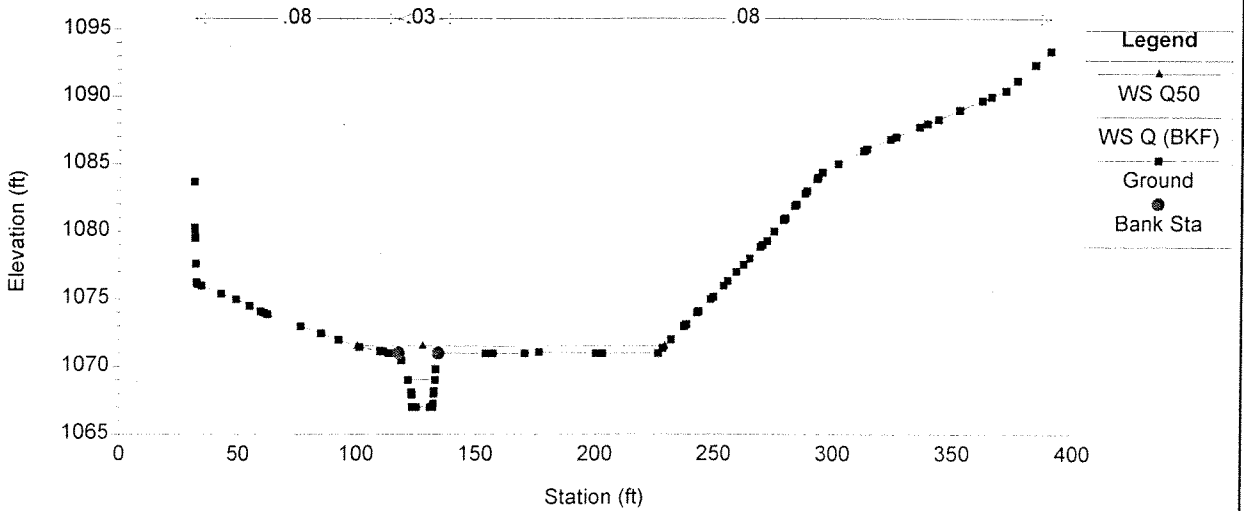69
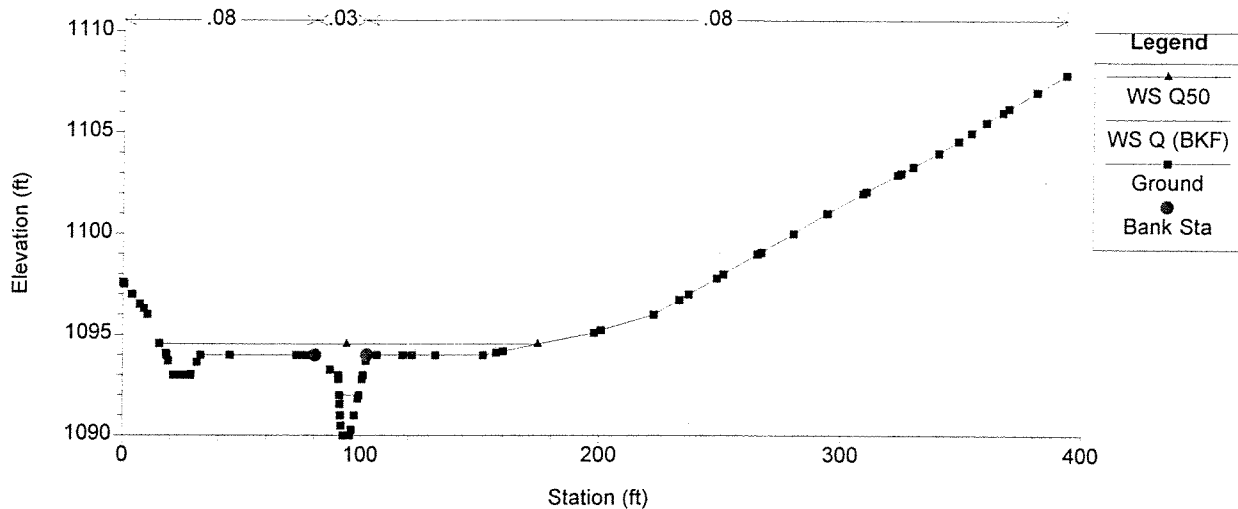
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68
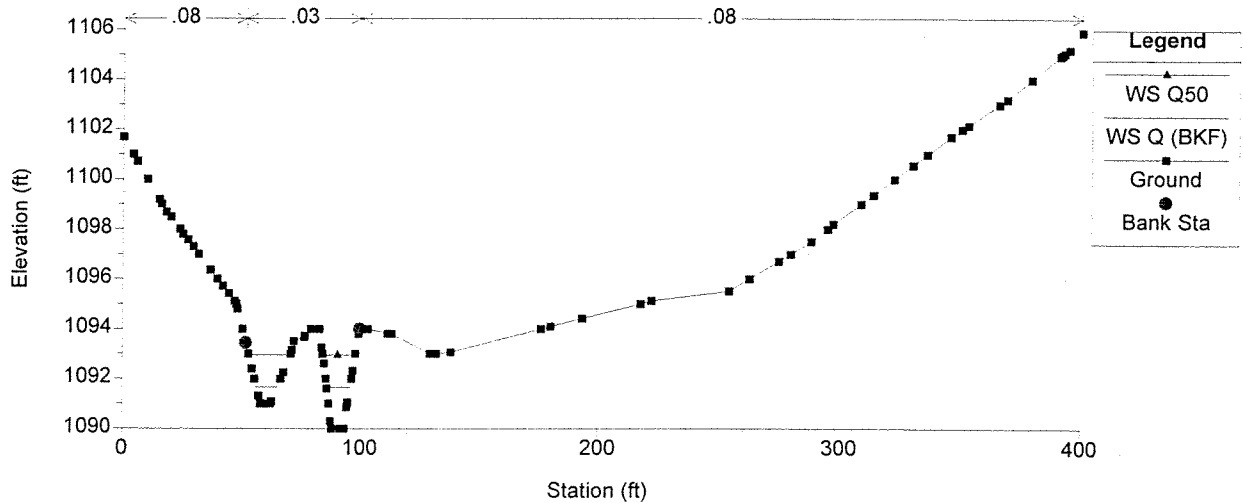
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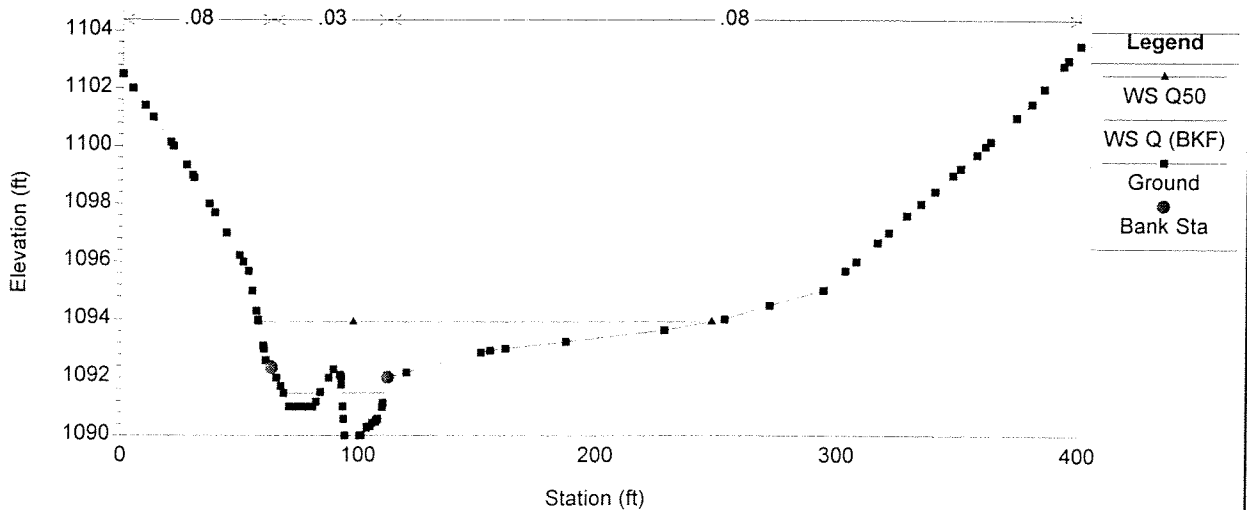
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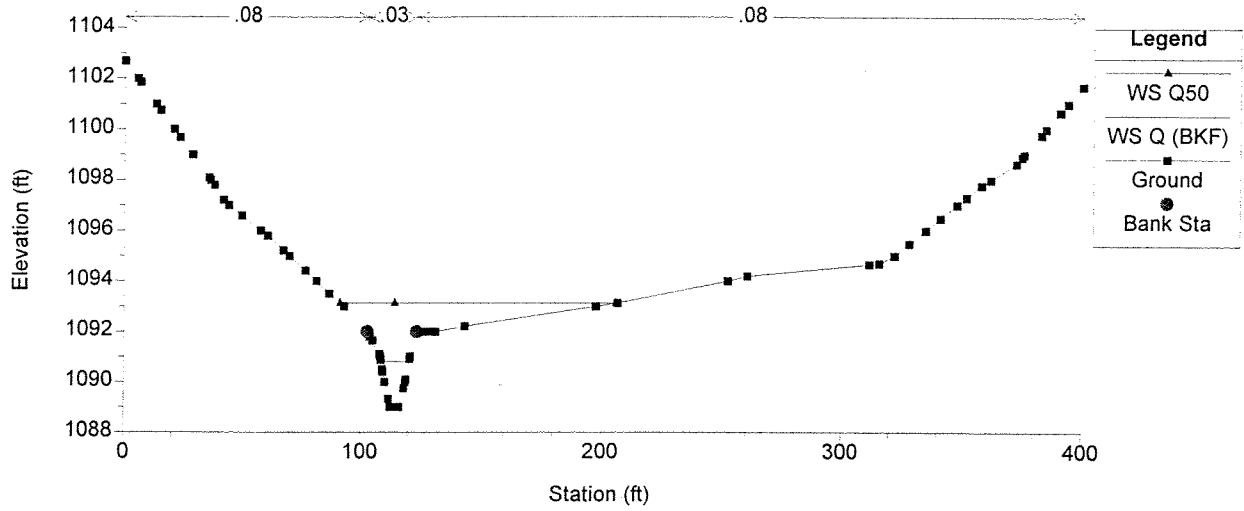
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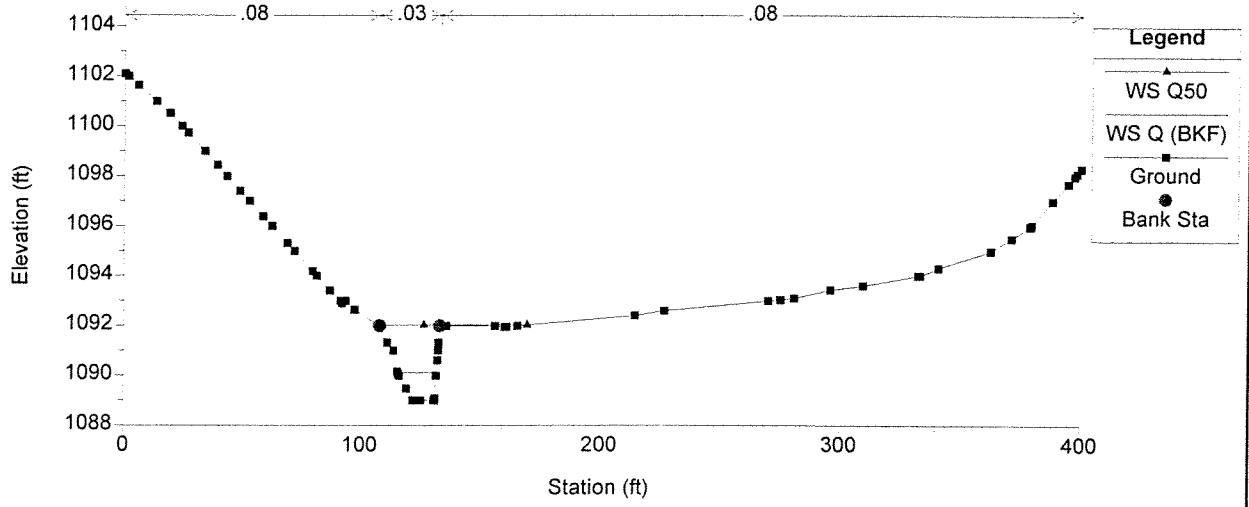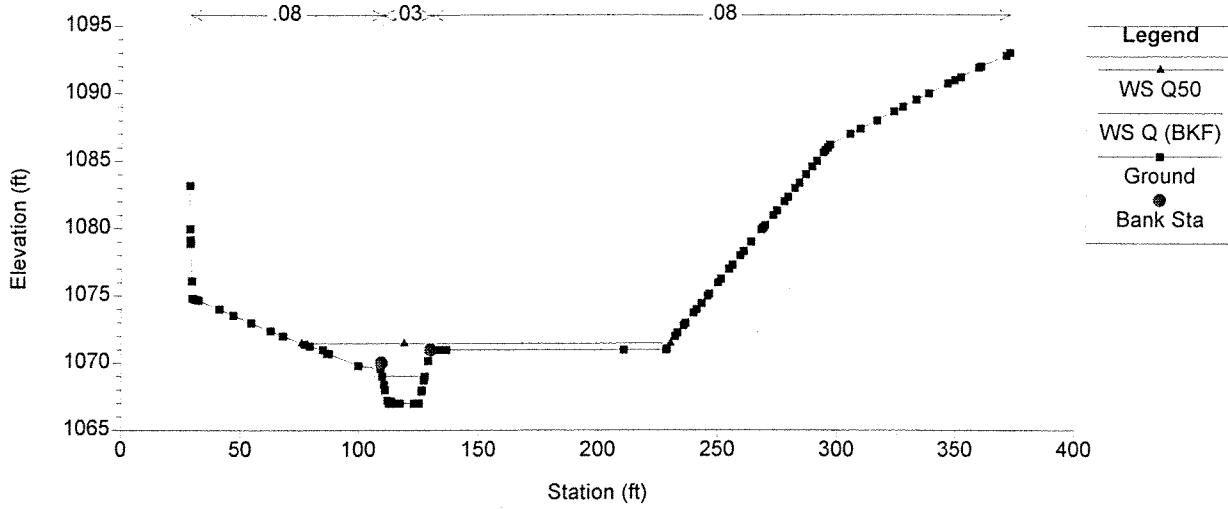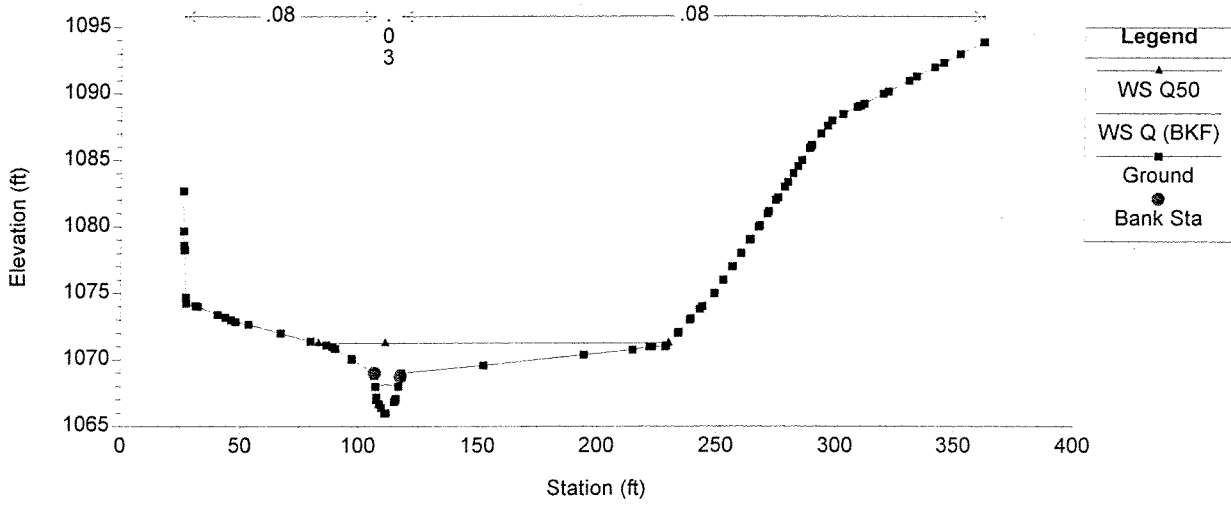

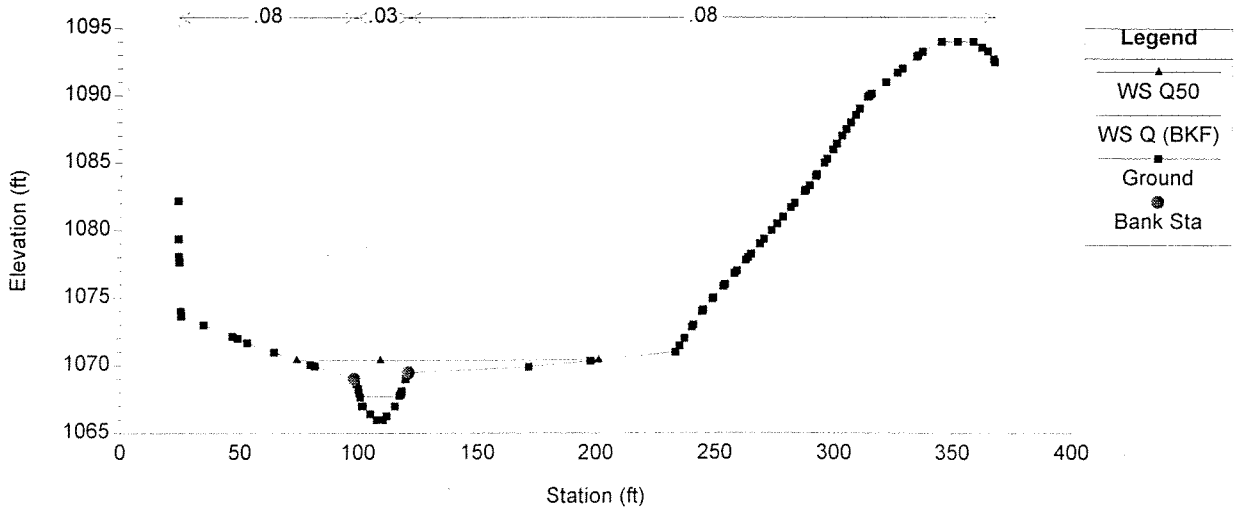## Up All Run   Plan 02   3/2/00
64
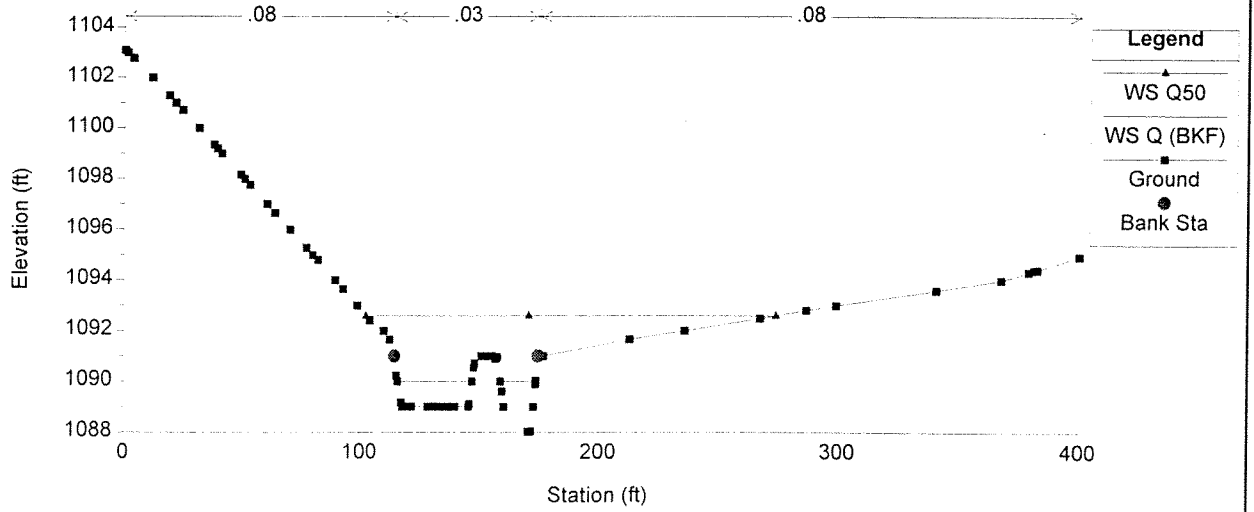
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63
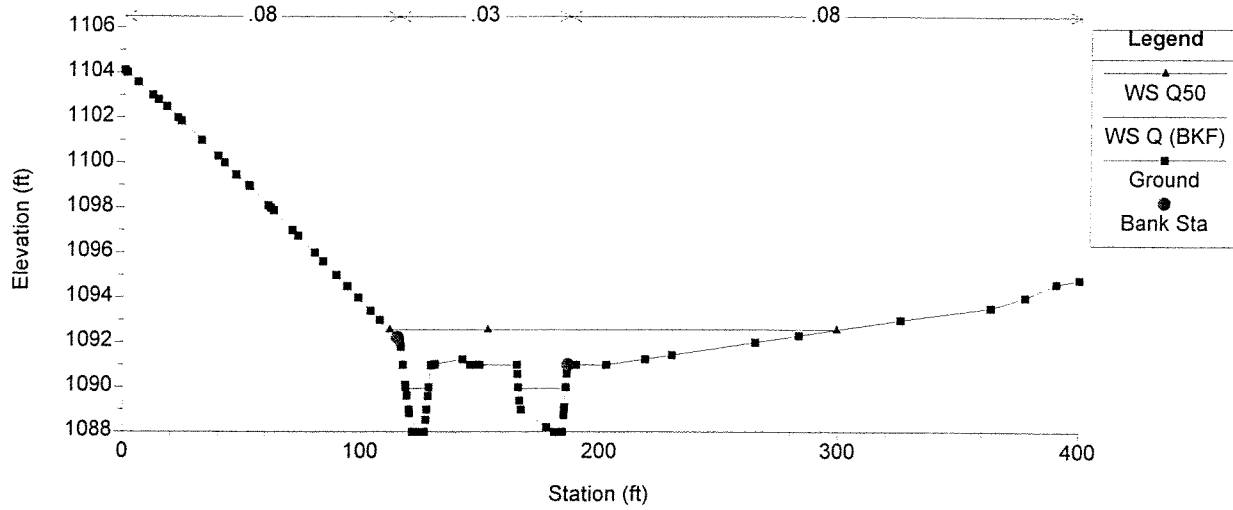
Up All Run   Plan 02   3/2/00
62

Up All Run   Plan 02   3/2/00
61

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta
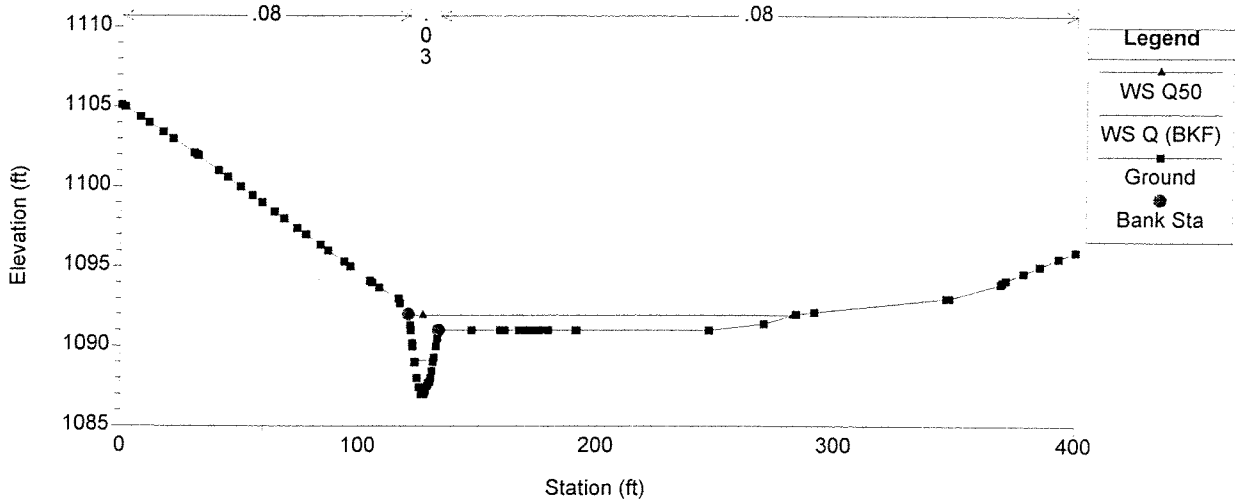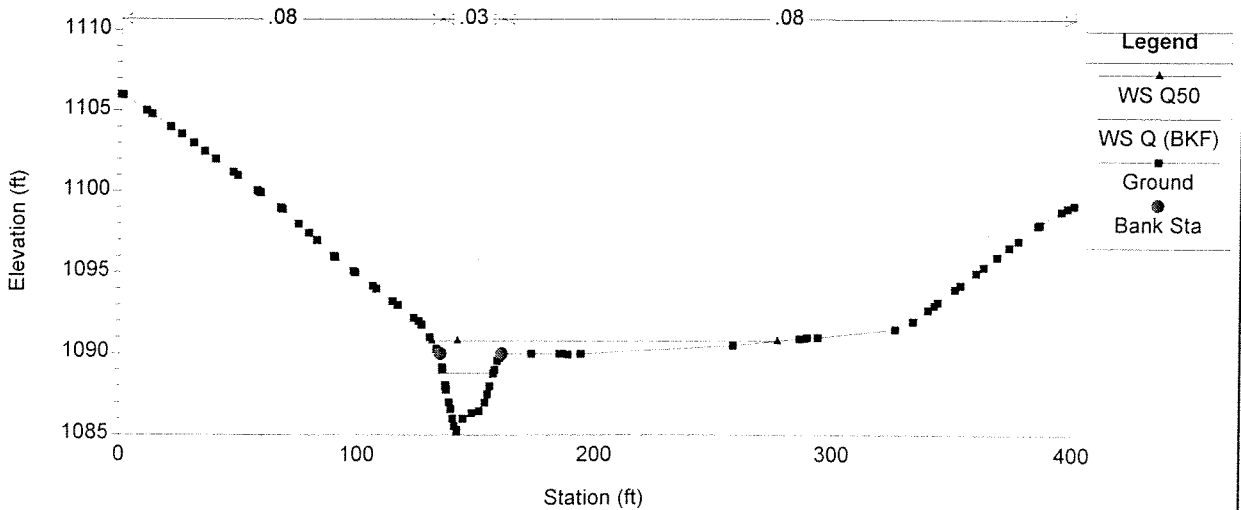
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60
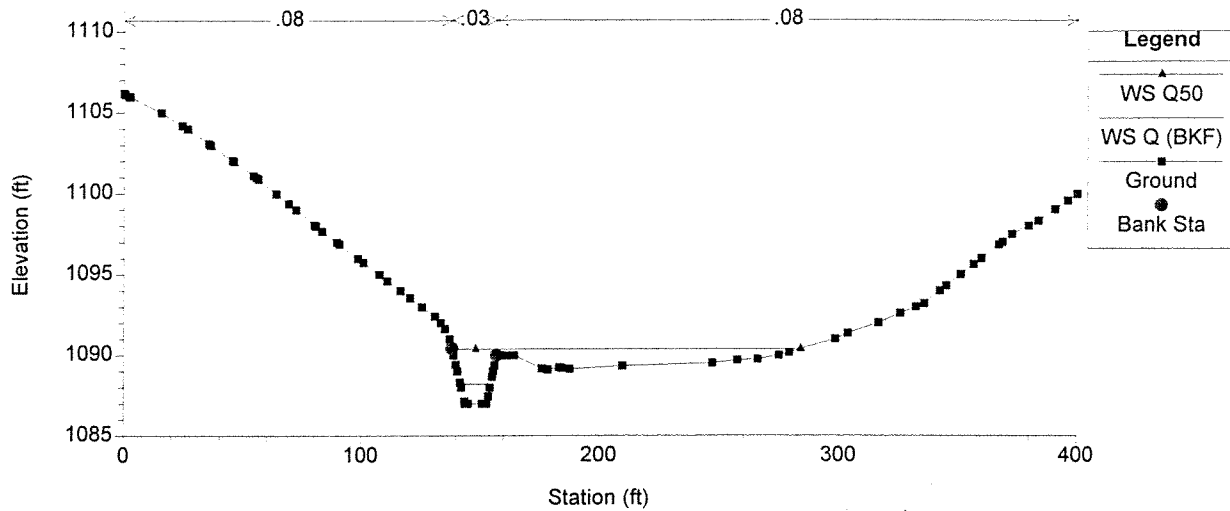
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59
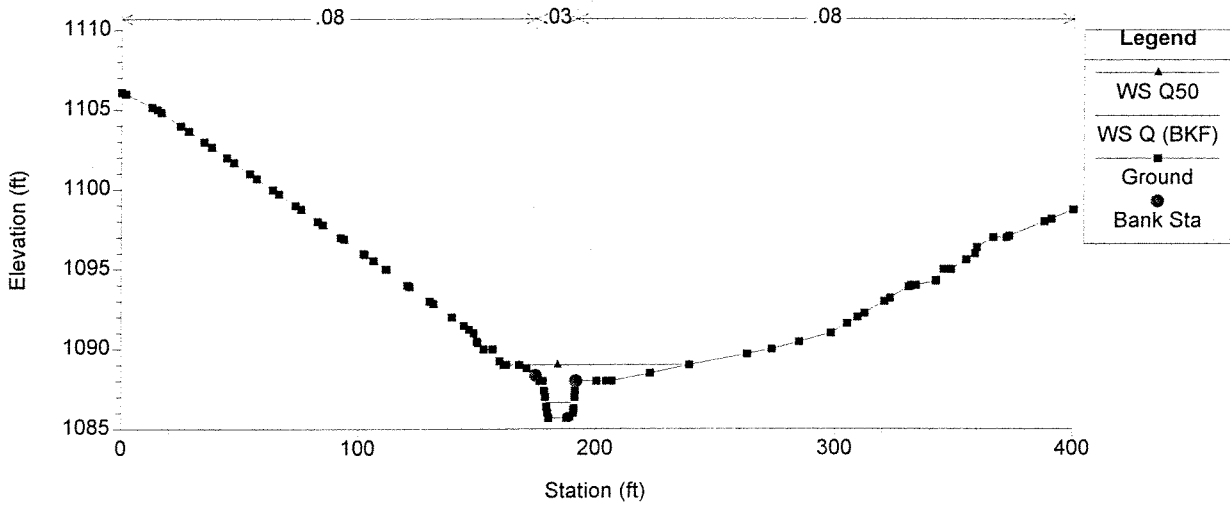
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58
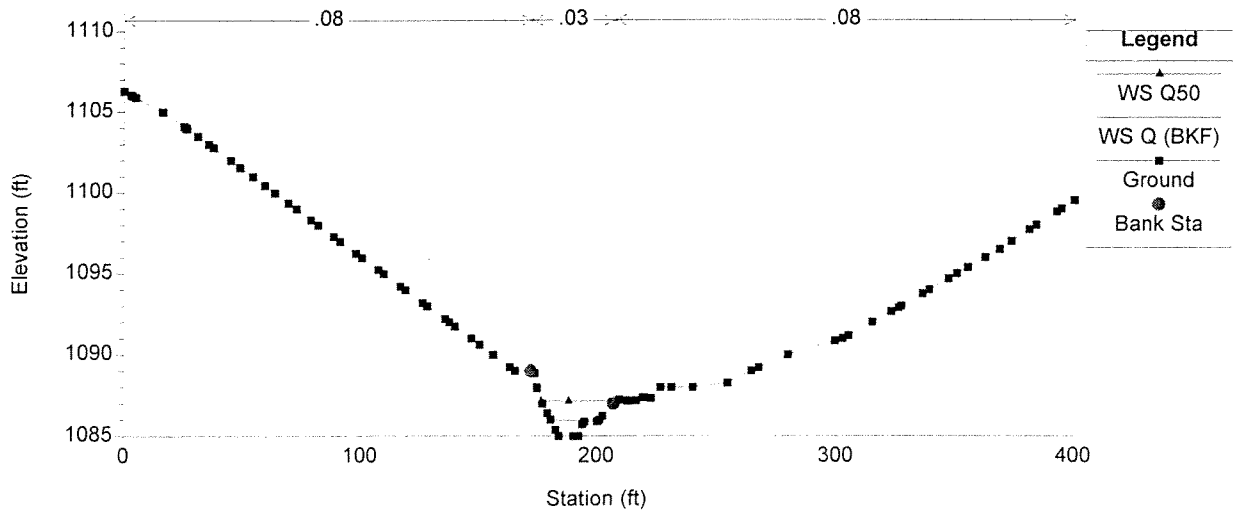
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57
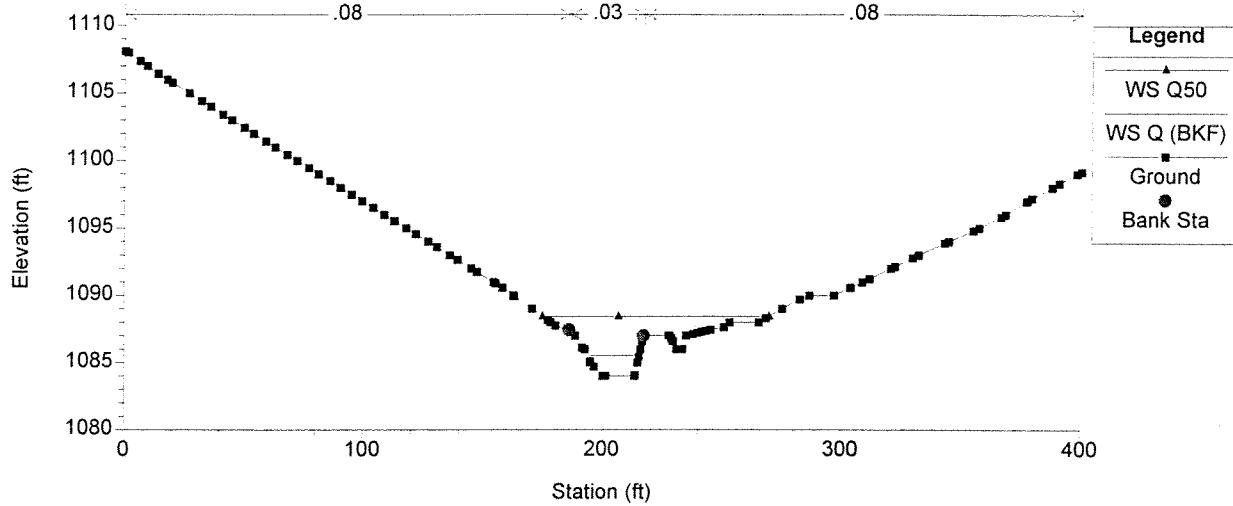
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56
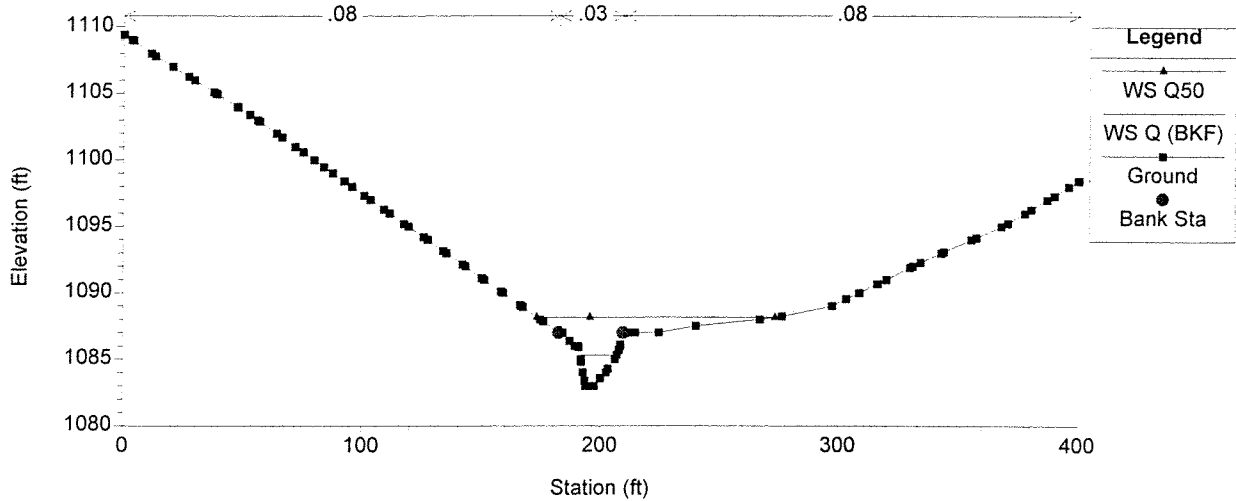
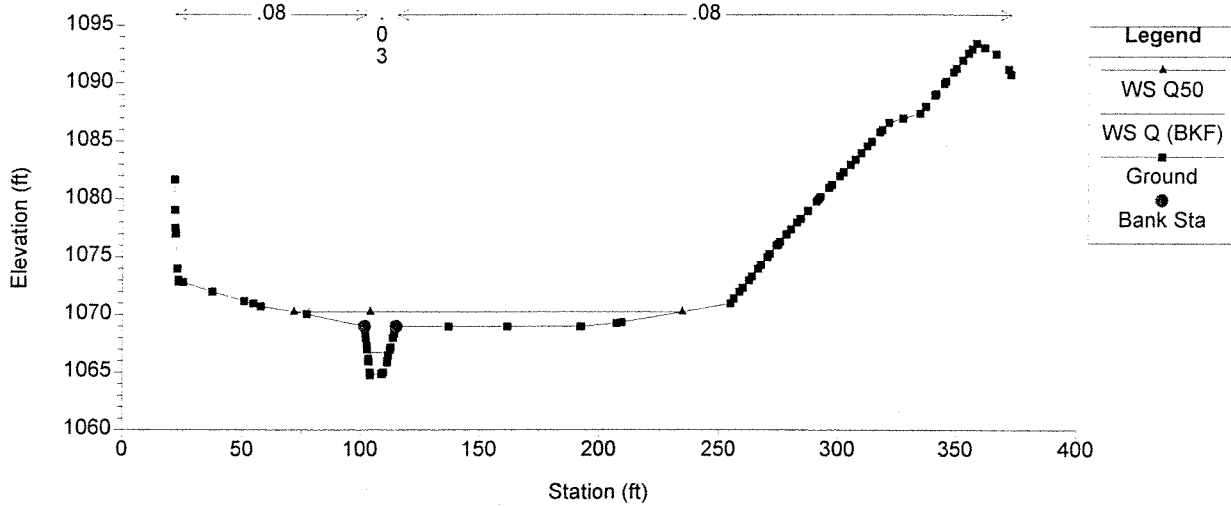## Up All Run   Plan 02   3/2/00
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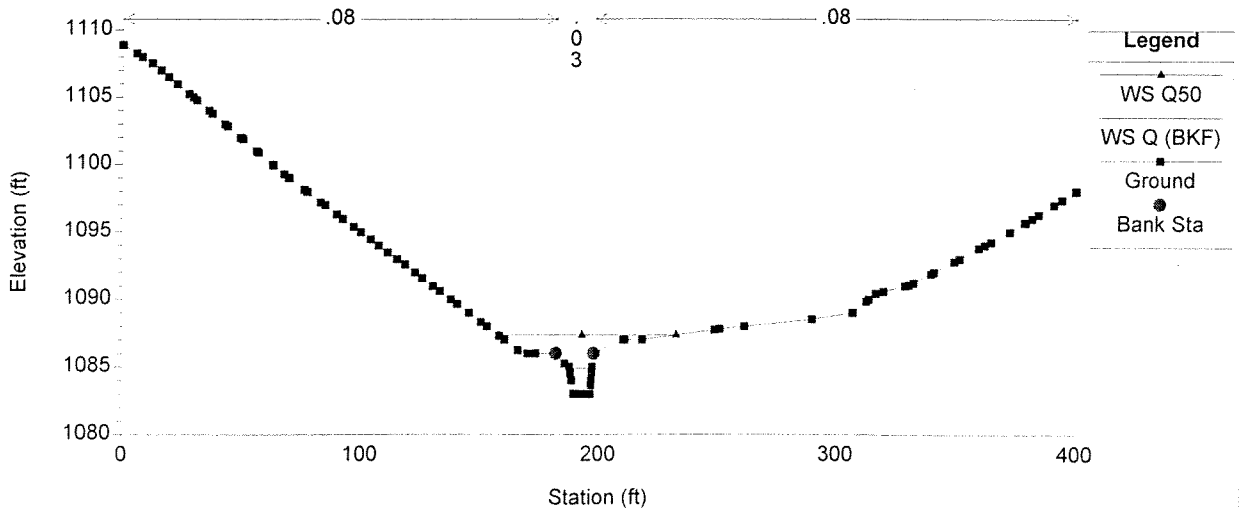
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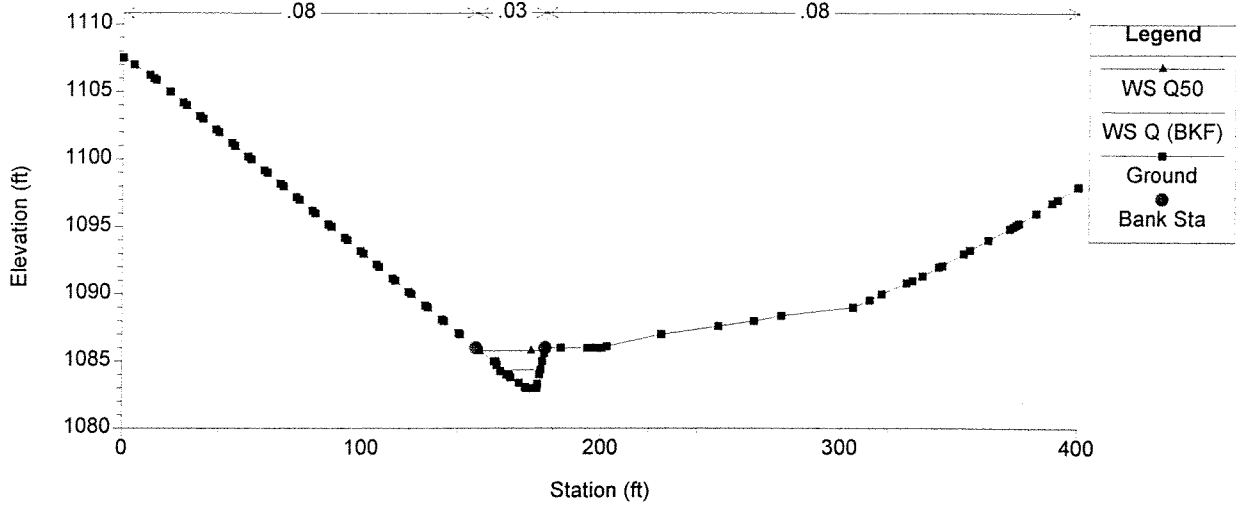
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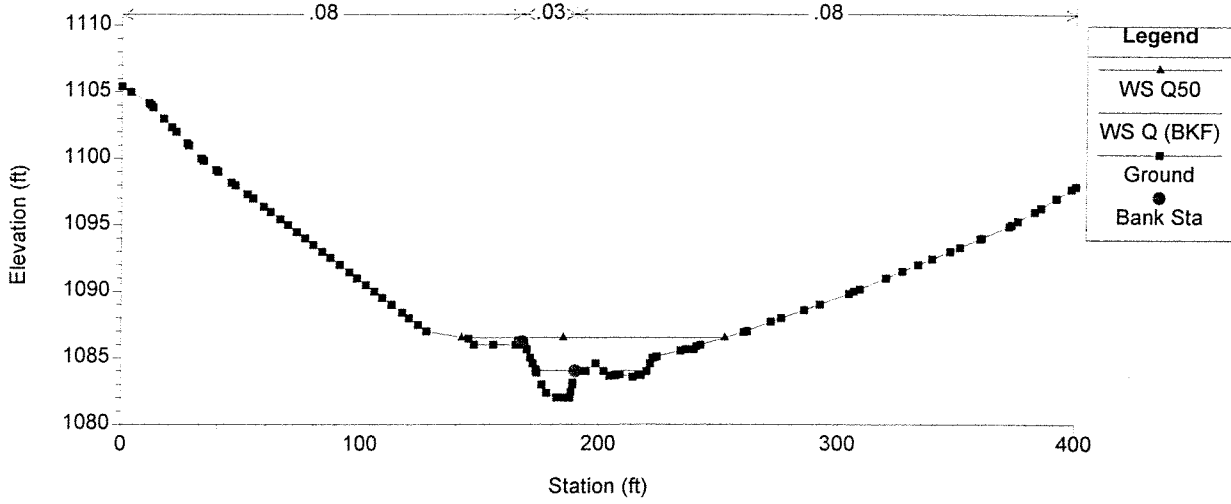
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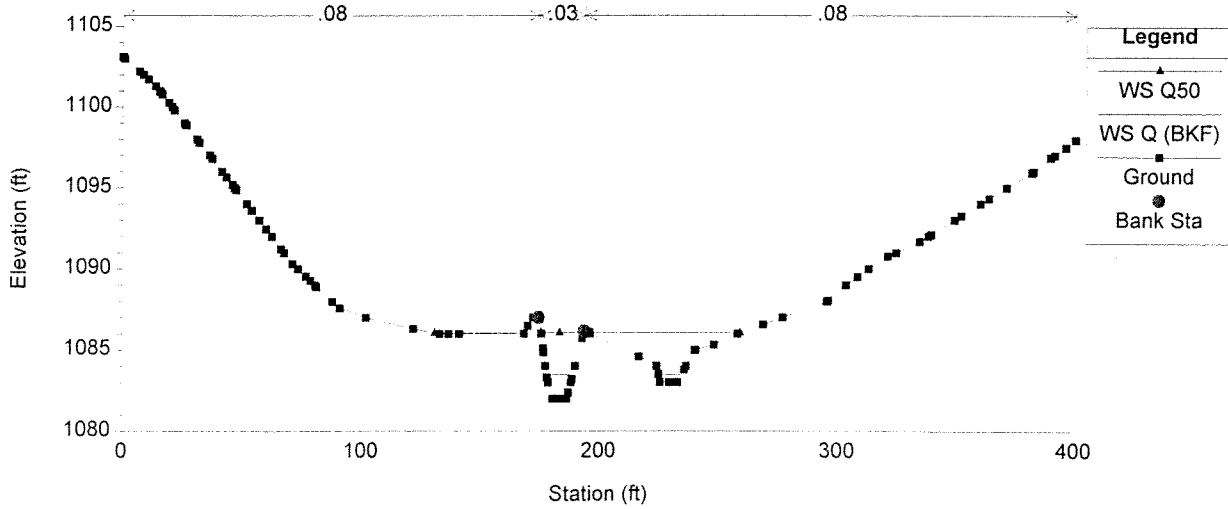
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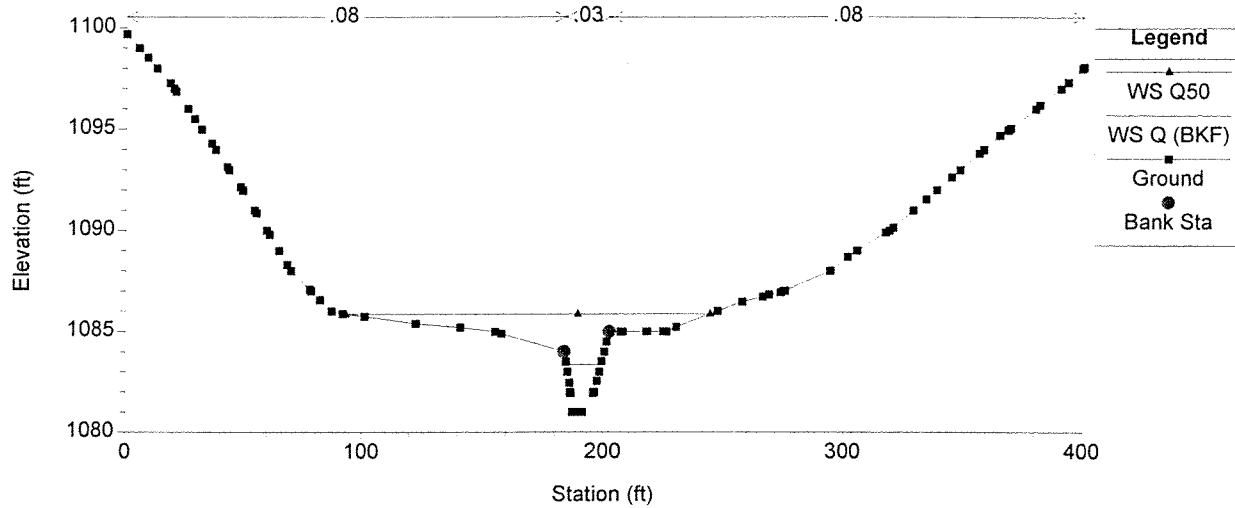
Legend
- ▲ WS Q50
- ■ WS Q (BKF)
- Ground
- ● Bank Sta

Up All Run   Plan 02   3/2/00
50

Legend
- ▲ WS Q50
- ■ WS Q (BKF)
- Ground
- ● Bank Sta

Up All Run   Plan 02   3/2/00
49

Legend
- ▲ WS Q50
- ■ WS Q (BKF)
- Ground
- ● Bank Sta

Up All Run   Plan 02   3/2/00
48

Legend

▲ WS Q50
■ WS Q (BKF)
Ground
● Bank Sta

Up All Run   Plan 02   3/2/00
47

Legend

▲ WS Q50
■ WS Q (BKF)
Ground
● Bank Sta

Up All Run   Plan 02   3/2/00
46

Legend

▲ WS Q50
■ WS Q (BKF)
Ground
● Bank Sta

Up All Run   Plan 02   3/2/00
45

Legend

▲ WS Q50

■ WS Q (BKF)

Ground

● Bank Sta

Up All Run   Plan 02   3/2/00
44

Legend

▲ WS Q50

■ WS Q (BKF)

Ground

● Bank Sta

Up All Run   Plan 02   3/2/00
43

Legend

▲ WS Q50

■ WS Q (BKF)

Ground

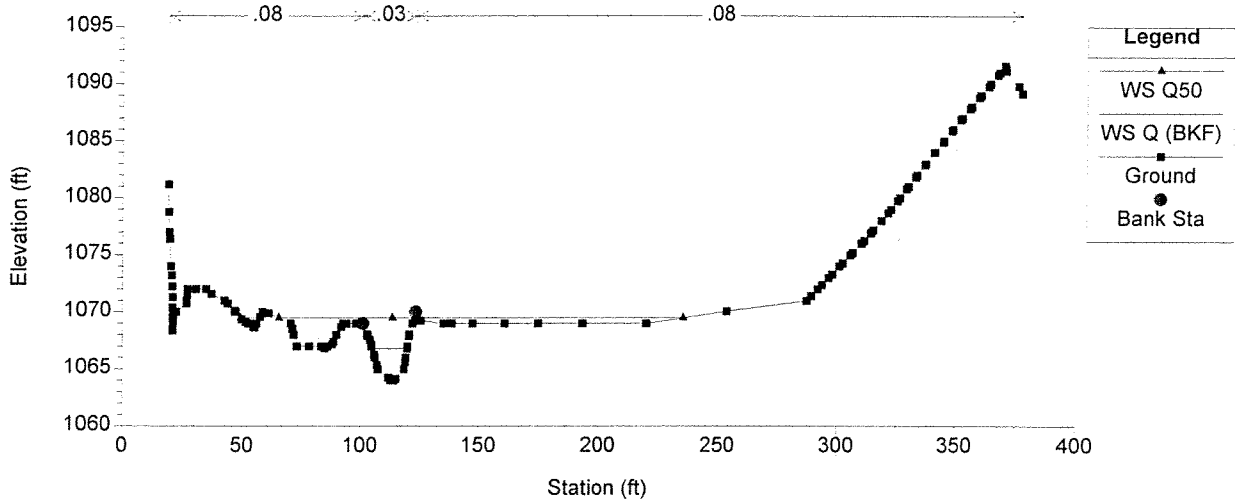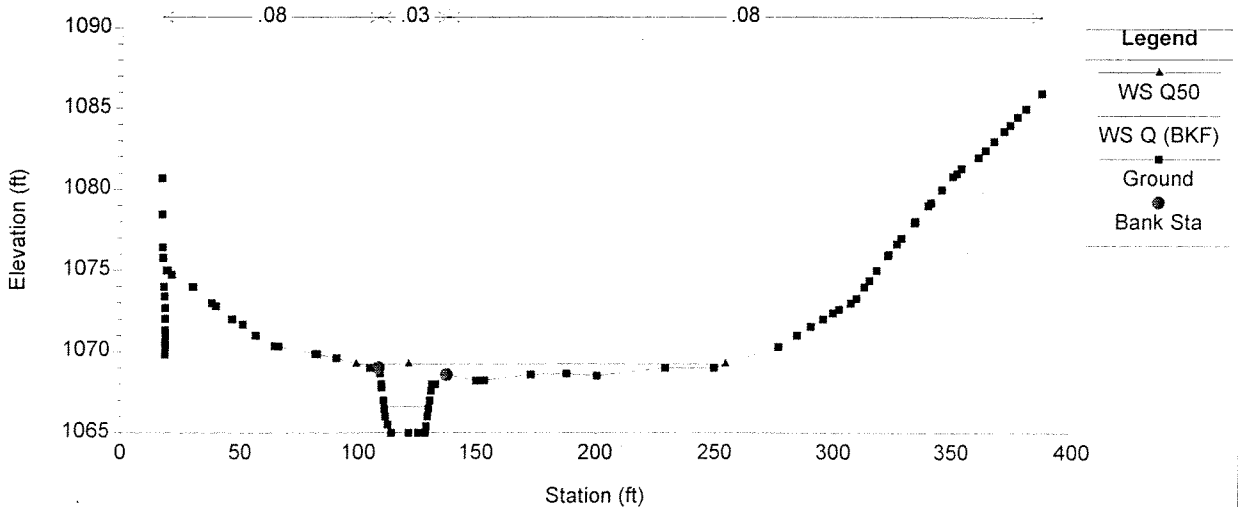● Bank Sta

Up All Run   Plan 02   3/2/00
42

Up All Run   Plan 02   3/2/00
41

Up All Run   Plan 02   3/2/00
40

Up All Run   Plan 02   3/2/00
39

Up All Run   Plan 02   3/2/00
38

Up All Run   Plan 02   3/2/00
37

Up All Run   Plan 02   3/2/00
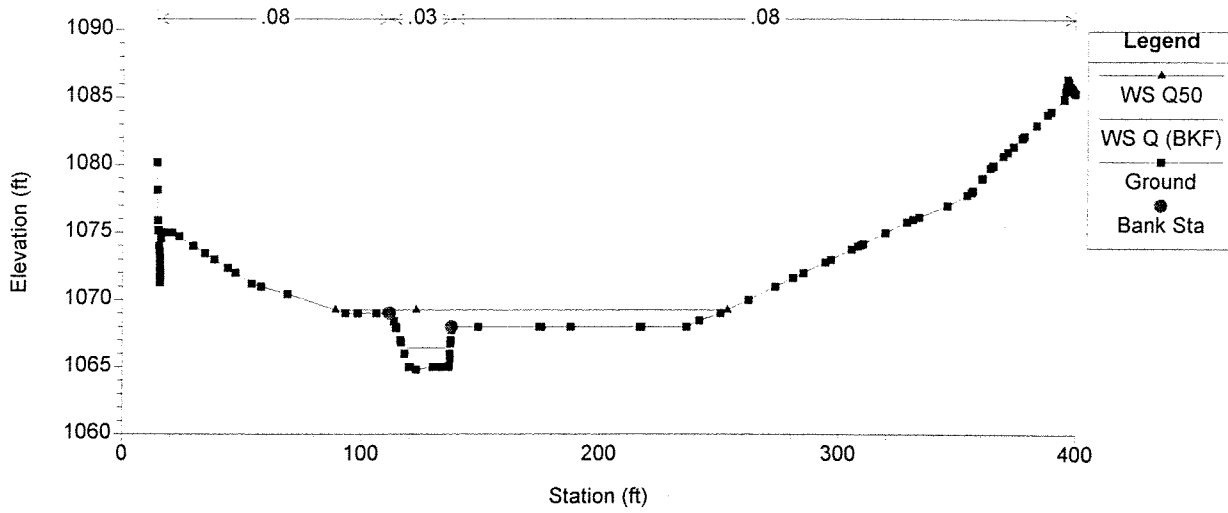36

Up All Run   Plan 02   3/2/00
35

Up All Run   Plan 02   3/2/00
34

Up All Run   Plan 02   3/2/00
33

Up All Run   Plan 02   3/2/00
32
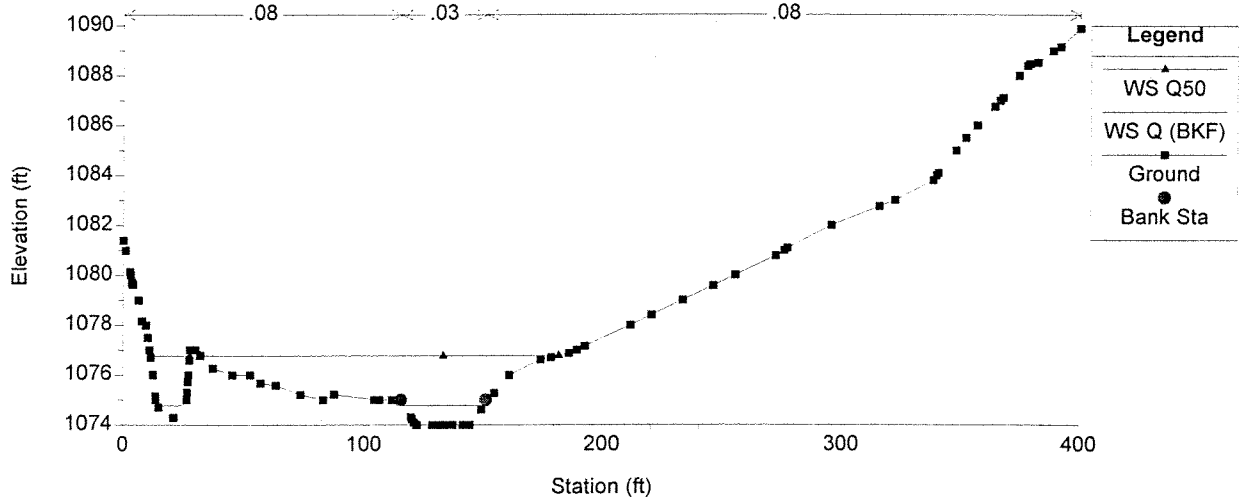
Up All Run   Plan 02   3/2/00
31

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Up All Run   Plan 02   3/2/00
30

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Up All Run   Plan 02   3/2/00
29

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Up All Run   Plan 02   3/2/00
28

Legend

WS Q50

WS Q (BKF)

Ground

Bank Sta

Up All Run Plan 02 3/2/00
27

Up All Run Plan 02 3/2/00
26

Up All Run Plan 02 3/2/00
25
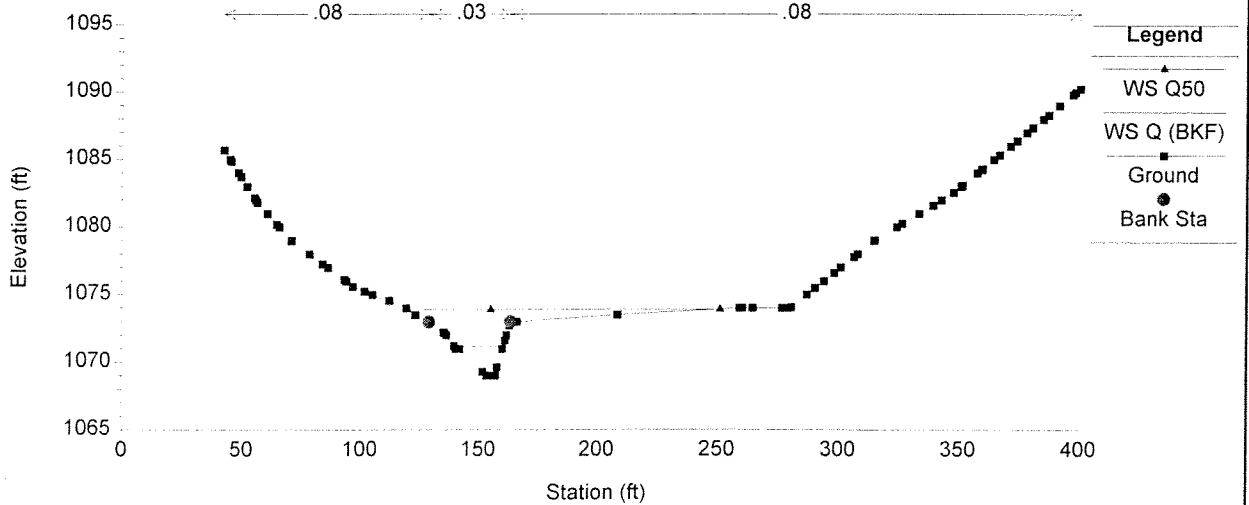
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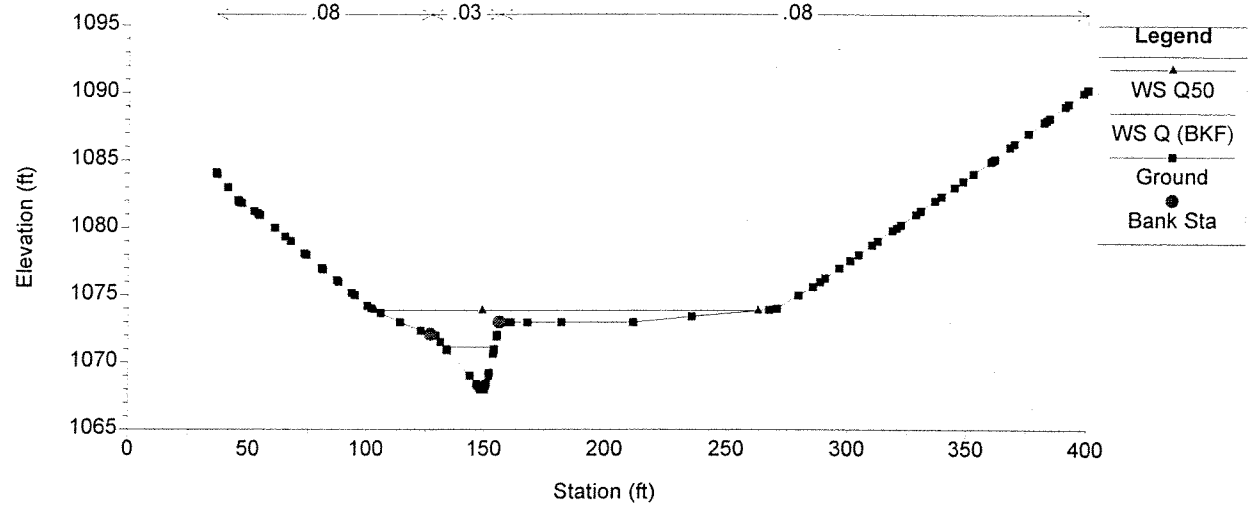
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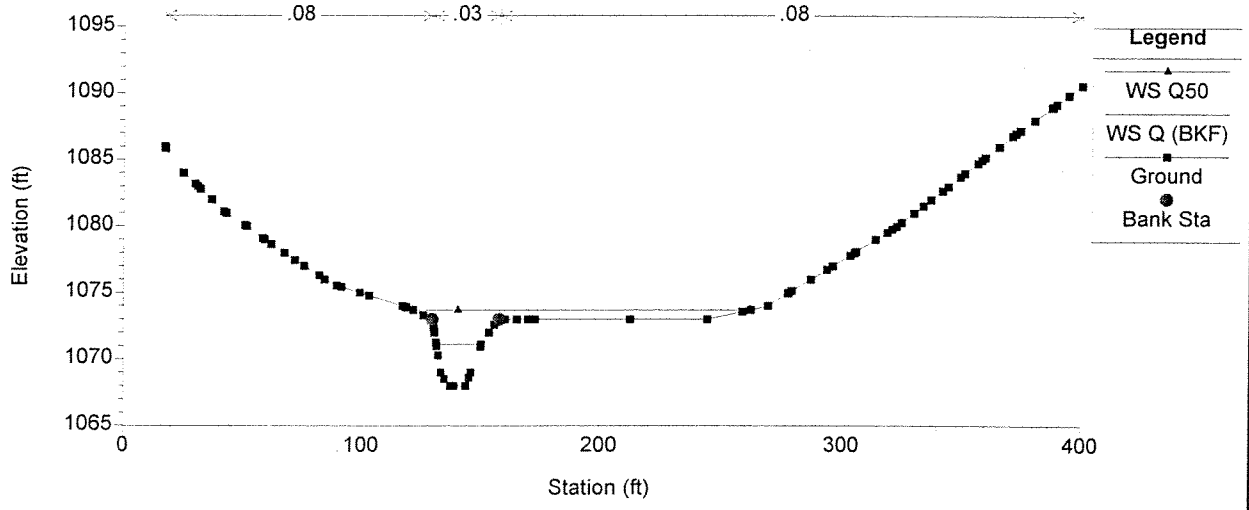
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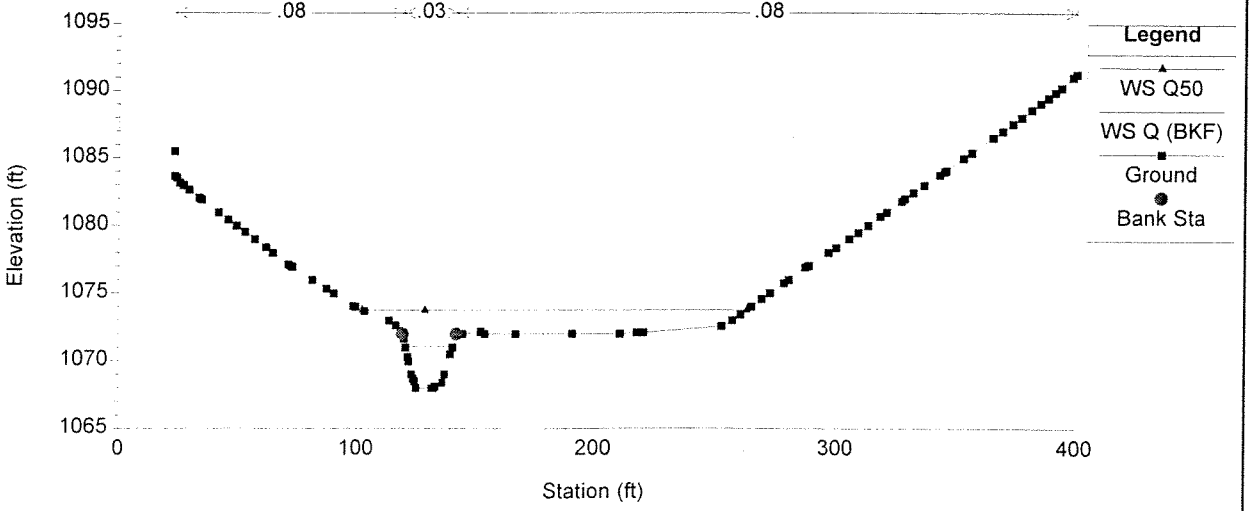
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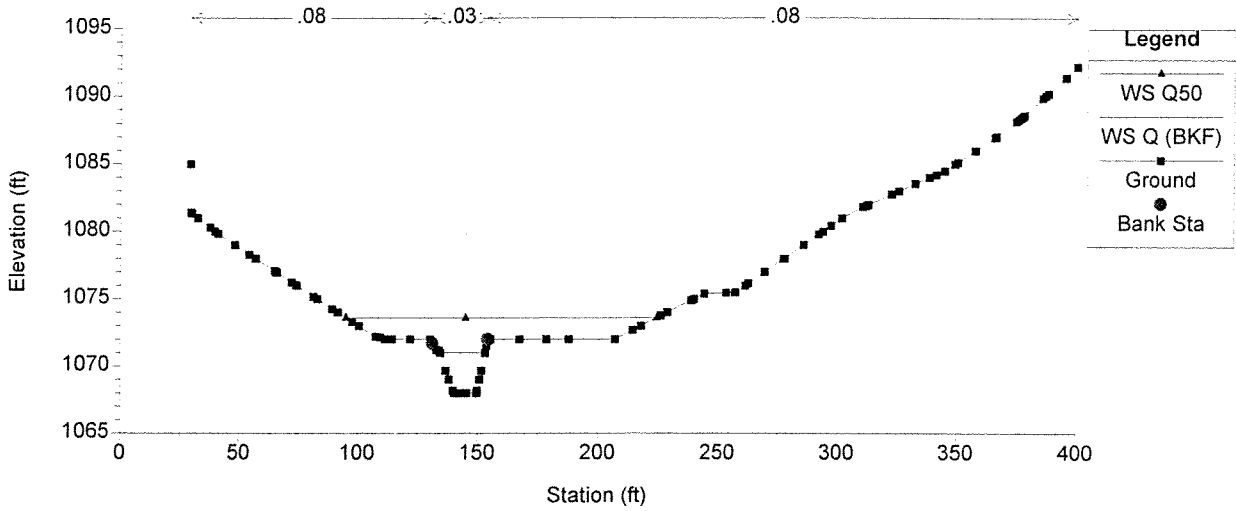
Up All Run   Plan 02   3/2/00
20

Up All Run   Plan 02   3/2/00
19

Up All Run   Plan 02   3/2/00
18

Legend

WS Q50
WS Q (BKF)
Ground
Bank Sta

Up All Run   Plan 02   3/2/00
17

Legend

WS Q50
WS Q (BKF)
Ground
Bank Sta

Up All Run   Plan 02   3/2/00
16
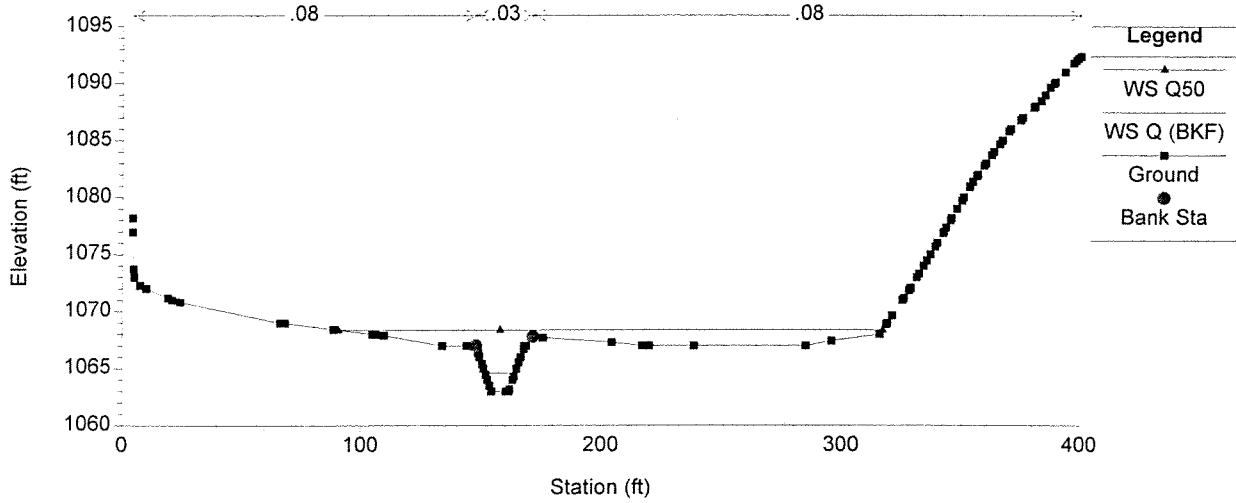
Legend

WS Q50
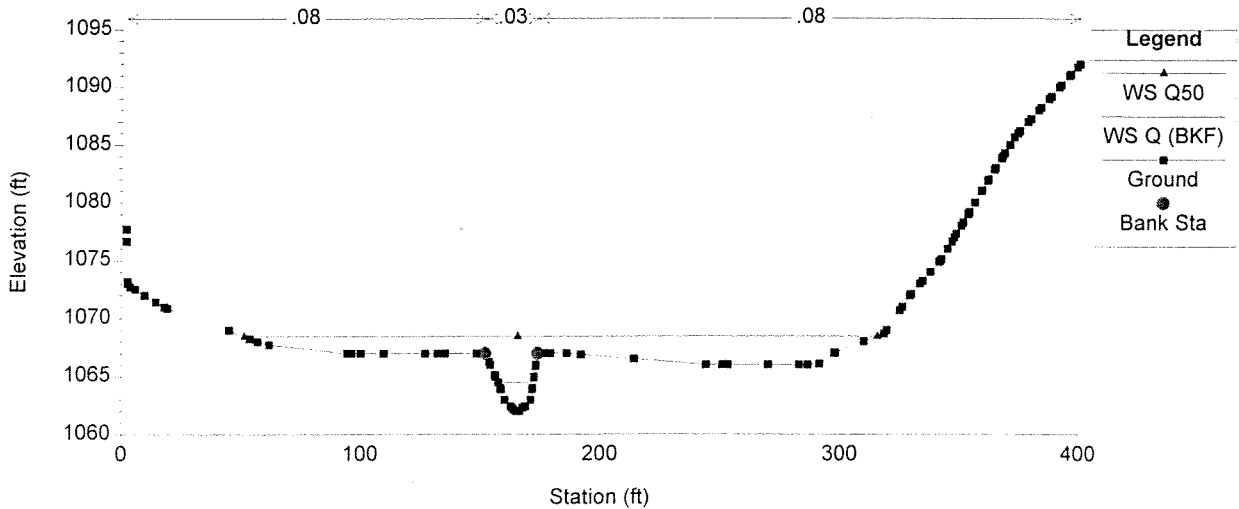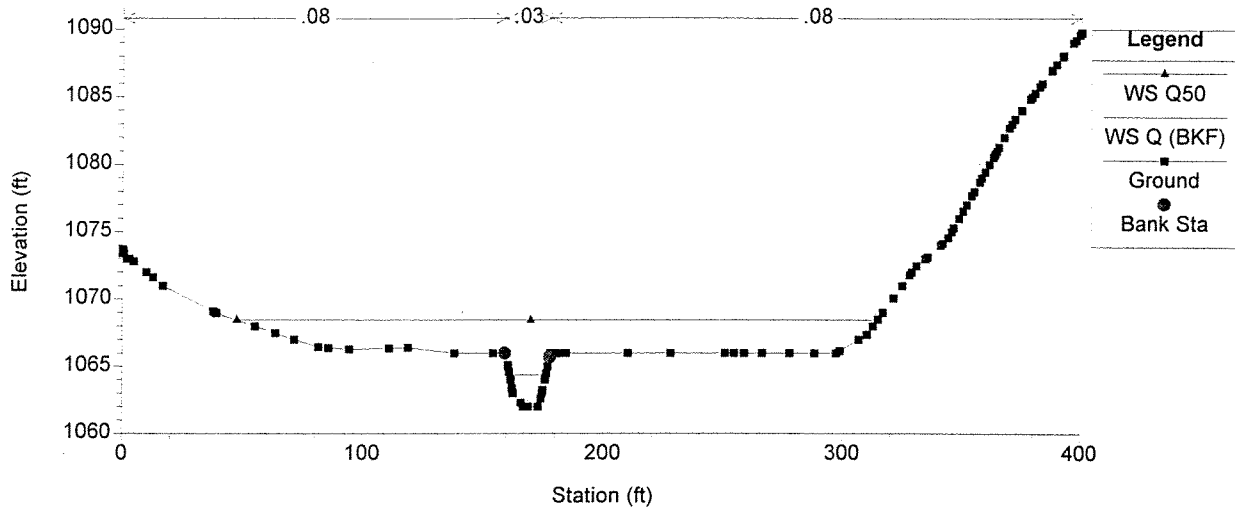WS Q (BKF)
Ground
Bank Sta

Up All Run   Plan 02   3/2/00
15

Up All Run   Plan 02   3/2/00
14

Up All Run   Plan 02   3/2/00
13

Up All Run   Plan 02   3/2/00
12

Up All Run   Plan 02   3/2/00
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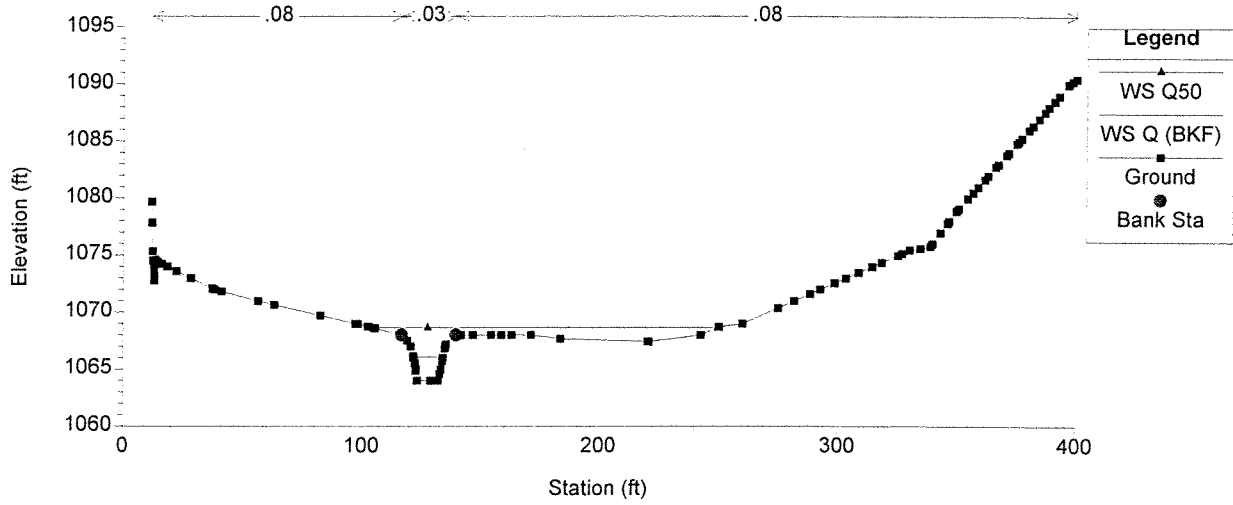
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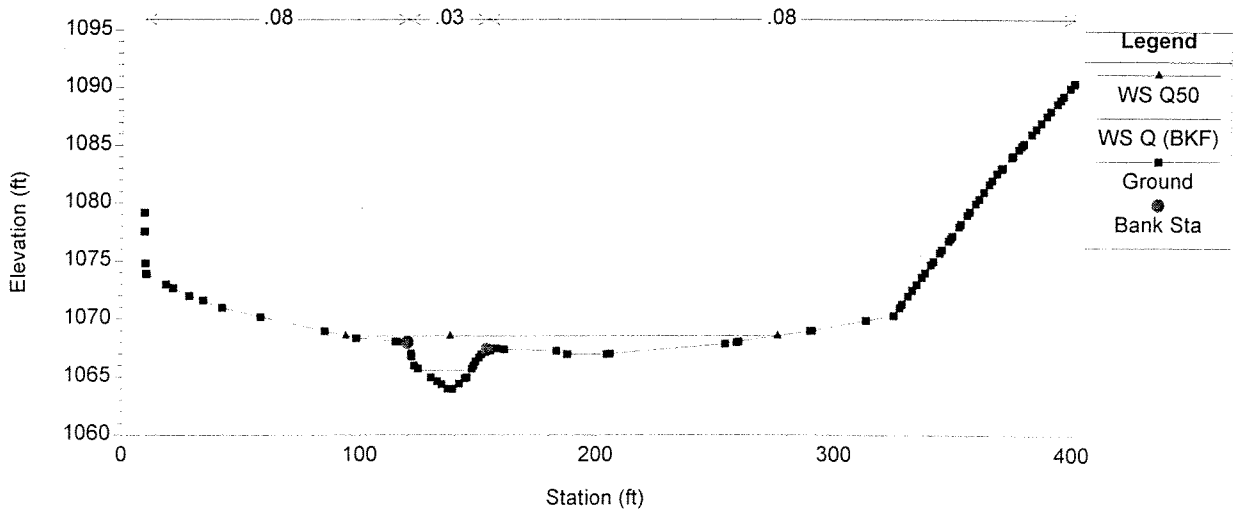
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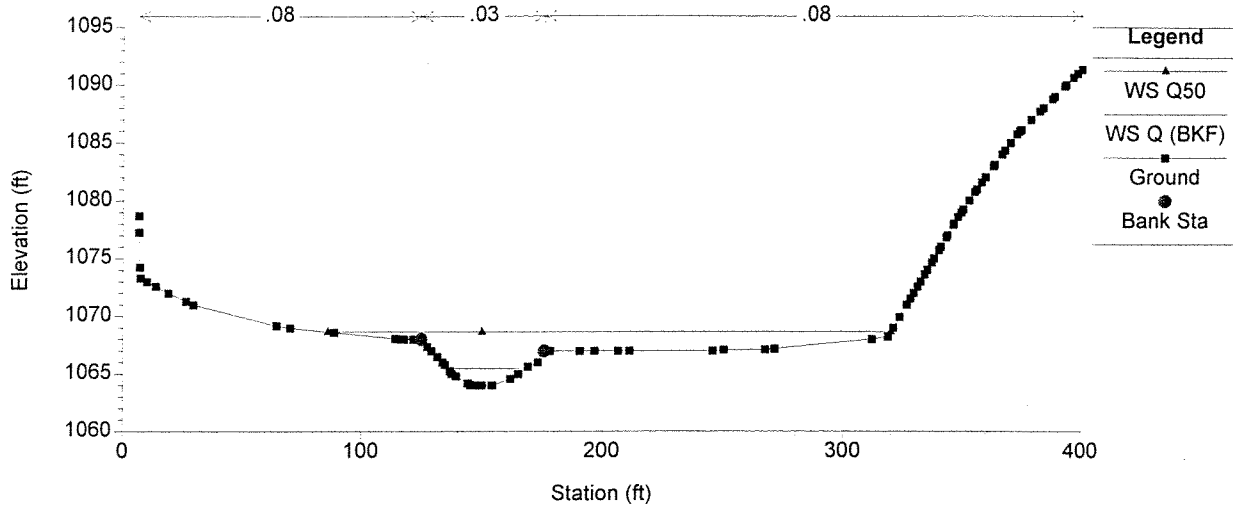
Up All Run   Plan 02   3/2/00
8

Up All Run   Plan 02   3/2/00
7

Up All Run   Plan 02   3/2/00
6

Up All Run   Plan 02   3/2/00
5
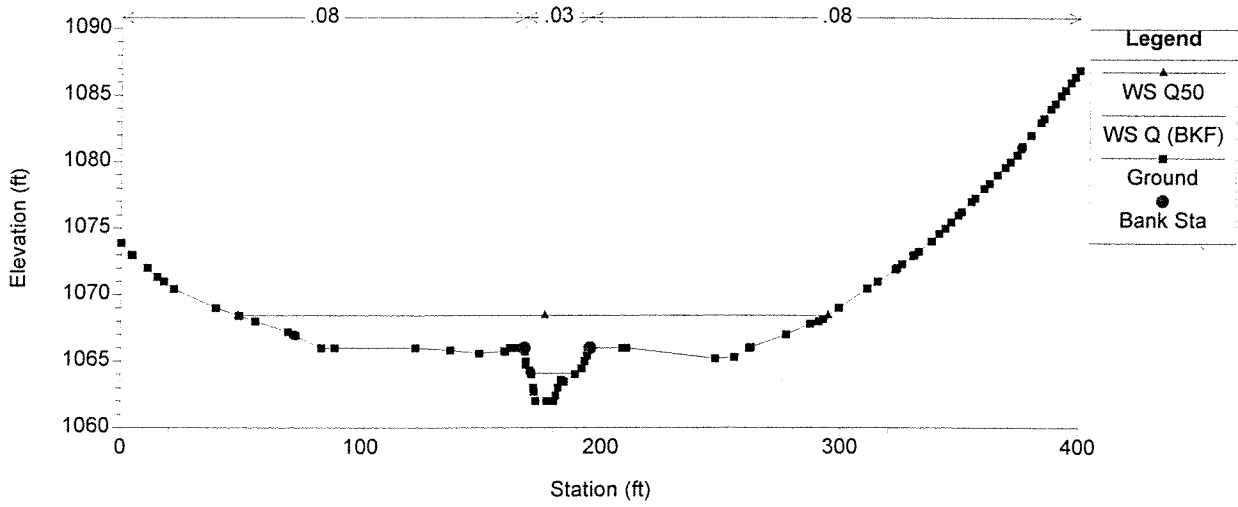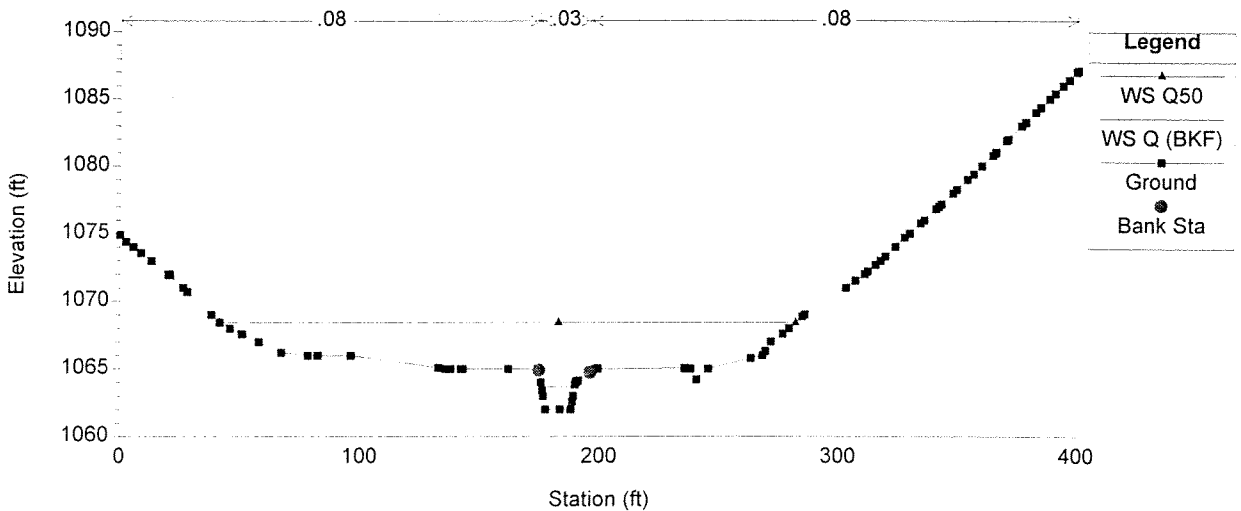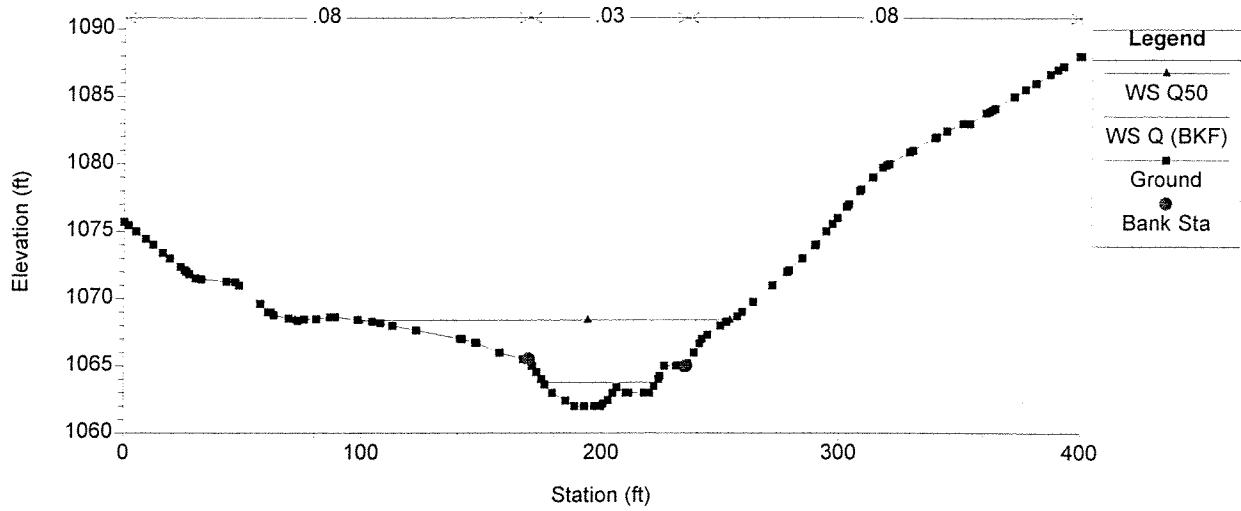

Up All Run   Plan 02   3/2/00
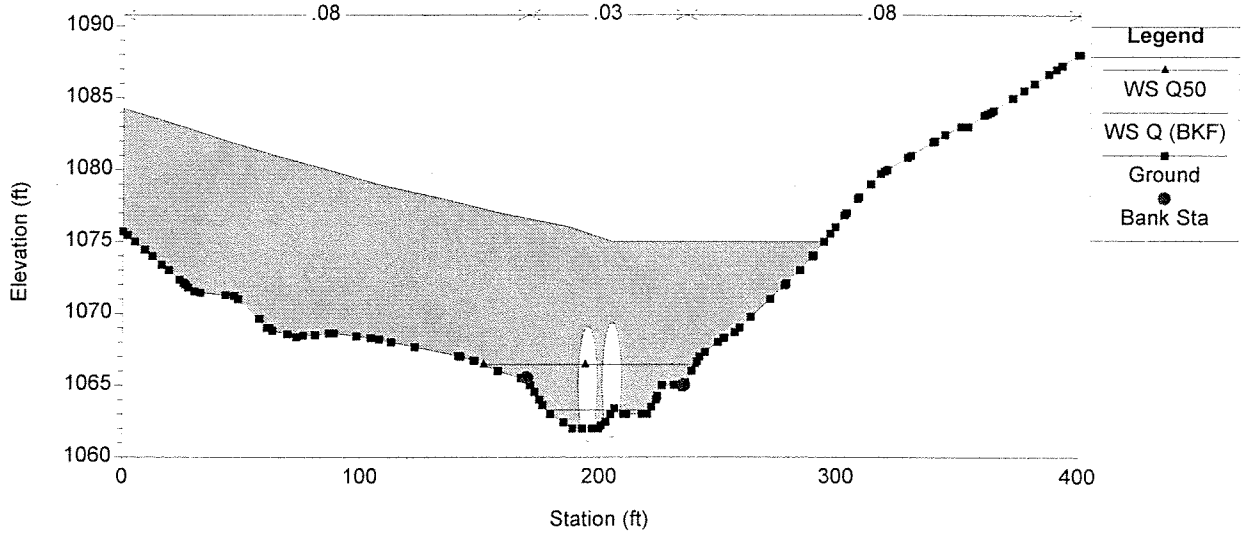### 4

Up All Run   Plan 02   3/2/00
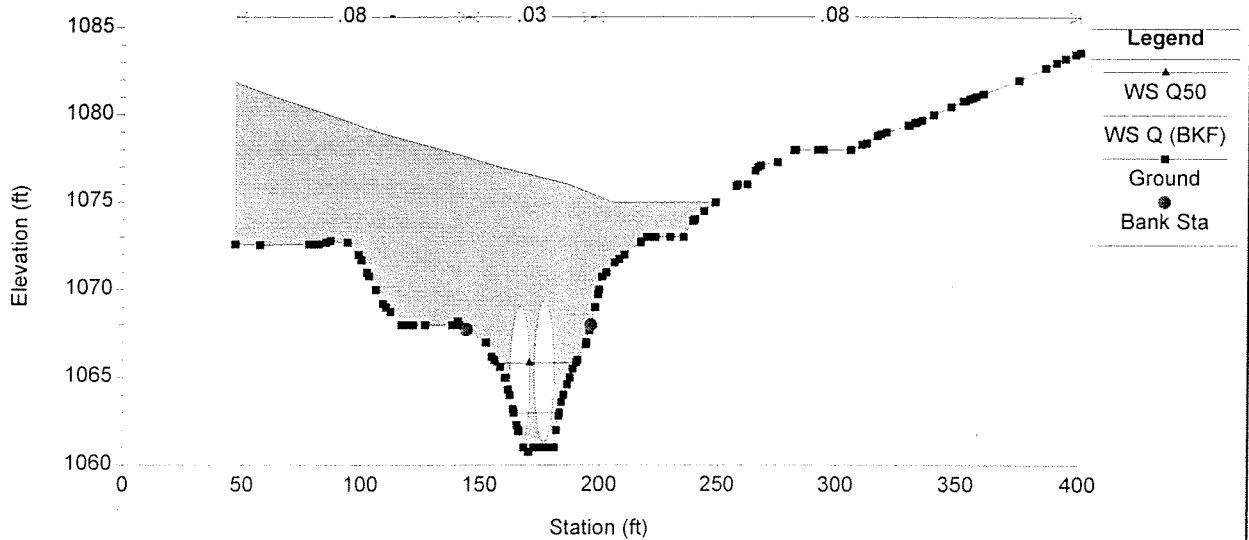

Up All Run   Plan 02   3/2/00

Up All Run   Plan 02   3/2/00

Up All Run   Plan 02   3/2/00

Downstream Segment
Jumping Run
East of SR 1605

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB	Shear Total
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
DownAll	2400.	160.00	1046.00	1049.01		1049.24	0.002472	3.78	42.29	21.05	0.47	0.29			0.29
DownAll	2400.	248.30	1048.00	1049.54		1049.87	0.002983	4.60	54.02	22.94	0.53	0.41			0.41
DownAll	2400.	564.23	1048.00	1050.52		1051.34	0.005218	7.28	79.80	37.93	0.72	0.95	0.06		0.65
DownAll	2400.	782.72	1046.00	1050.84	1050.54	1052.14	0.007382	9.15	92.72	42.13	0.87	1.45	0.19		0.96
DownAll	2400.	973.78	1046.00	1051.11	1051.04	1052.83	0.008991	10.54	104.52	45.13	0.97	1.89	0.34		1.23
DownAll	2400.	1193.73	1048.00	1051.58	1051.58	1053.60	0.009207	11.42	127.79	57.62	0.99	2.14	0.42		1.22
DownAll	2350.	160.00	1046.00	1048.32	1048.32	1048.95	0.013079	6.39	25.06	20.31	1.01	0.98			0.98
DownAll	2350.	248.30	1048.00	1048.78	1048.78	1049.58	0.012415	7.08	35.06	23.28	1.02	1.13			1.13
DownAll	2350.	564.23	1046.00	1049.90	1049.90	1050.95	0.011253	8.22	68.61	33.50	1.01	1.38			1.38
DownAll	2350.	782.72	1046.00	1050.44	1050.44	1051.68	0.010547	8.94	87.54	35.56	1.00	1.53			1.53
DownAll	2350.	973.78	1046.00	1050.86	1050.86	1052.26	0.010181	9.50	102.53	36.79	1.00	1.67			1.67
DownAll	2350.	1193.73	1046.00	1051.29	1051.29	1052.86	0.009876	10.04	118.86	38.08	1.00	1.80			1.80
DownAll	2300.	160.00	1045.00	1048.10		1048.15	0.000418	1.70	94.29	42.55	0.20	0.06			0.06
DownAll	2300.	248.30	1045.00	1048.66		1048.73	0.000539	2.07	119.71	48.27	0.23	0.08			0.08
DownAll	2300.	564.23	1045.00	1050.05		1050.18	0.000695	2.93	192.28	56.02	0.28	0.15			0.14
DownAll	2300.	782.72	1045.00	1050.75		1050.93	0.000740	3.38	236.74	71.16	0.29	0.18	0.02		0.15
DownAll	2900.	973.78	1045.00	1051.30		1051.51	0.000769	3.71	279.67	86.12	0.30	0.21	0.03		0.15
DownAll	2300.	1193.73	1045.00	1051.88		1052.13	0.000792	4.03	338.78	119.28	0.31	0.24	0.03		0.14
DownAll	2250.	160.00	1045.00	1047.98		1048.11	0.001457	2.89	55.30	27.98	0.36	0.17			0.17
DownAll	2250.	248.30	1045.00	1048.48		1048.67	0.001954	3.51	70.65	33.31	0.43	0.25			0.25
DownAll	2250.	564.23	1045.00	1049.72		1050.10	0.002301	4.91	124.44	57.59	0.49	0.43	0.07		0.30
DownAll	2250.	782.72	1045.00	1050.34		1050.84	0.002454	5.68	180.24	114.69	0.52	0.54	0.09	0.02	0.24
DownAll	2250.	973.78	1045.00	1050.81		1051.41	0.002522	6.23	239.29	132.93	0.54	0.62	0.14	0.05	0.28
DownAll	2250.	1193.73	1045.00	1051.32		1052.02	0.002568	6.79	310.11	148.97	0.55	0.71	0.20	0.08	0.33
DownAll	2200.	160.00	1046.00	1047.79		1047.98	0.004113	3.51	45.55	38.58	0.57	0.30			0.30
DownAll	2200.	248.30	1046.00	1048.34		1048.55	0.002934	3.66	67.80	41.70	0.51	0.29			0.29
DownAll	2200.	564.23	1046.00	1049.66		1049.96	0.002255	4.42	179.28	132.71	0.48	0.36	0.09		0.19
DownAll	2200.	782.72	1046.00	1050.32		1050.68	0.002082	4.84	271.92	147.79	0.48	0.41	0.15	0.02	0.24
DownAll	2200.	973.78	1046.00	1050.84		1051.24	0.001943	5.16	351.00	159.84	0.47	0.44	0.19	0.05	0.26
DownAll	2200.	1193.73	1046.00	1051.38		1051.84	0.001832	5.49	442.25	175.87	0.47	0.48	0.22	0.07	0.29
DownAll	2150.	160.00	1046.00	1047.60		1047.79	0.003566	3.51	45.60	34.88	0.54	0.29			0.29
DownAll	2150.	248.30	1046.00	1048.21		1048.41	0.002643	3.66	67.92	38.89	0.49	0.28			0.28
DownAll	2150.	564.23	1046.00	1049.54		1049.85	0.002163	4.49	192.91	142.86	0.47	0.37	0.09		0.18
DownAll	2150.	782.72	1046.00	1050.20		1050.58	0.002051	4.97	291.81	159.33	0.48	0.42	0.16	0.01	0.23
DownAll	2150.	973.78	1046.00	1050.71		1051.14	0.001961	5.34	377.33	175.82	0.48	0.47	0.20	0.05	0.26
DownAll	2150.	1193.73	1046.00	1051.25		1051.74	0.001887	5.71	477.01	192.79	0.48	0.51	0.24	0.08	0.29
DownAll	2100.	160.00	1045.00	1047.55		1047.66	0.001442	2.71	58.97	32.84	0.36	0.16			0.16
DownAll	2100.	248.30	1045.00	1048.15		1048.30	0.001440	3.11	87.26	94.27	0.37	0.19	0.01		0.08
DownAll	2100.	564.23	1045.00	1049.48		1049.75	0.001569	4.24	251.61	146.18	0.41	0.31	0.12	0.02	0.17
DownAll	2100.	782.72	1045.00	1050.12		1050.48	0.001636	4.87	353.48	168.38	0.43	0.39	0.17	0.06	0.21
DownAll	2100.	973.78	1045.00	1050.62		1051.05	0.001678	5.34	441.23	182.27	0.45	0.45	0.21	0.10	0.25
DownAll	2100.	1193.73	1045.00	1051.14		1051.65	0.001720	5.83	540.18	196.76	0.46	0.51	0.25	0.14	0.29
DownAll	2050.	160.00	1045.00	1047.32		1047.55	0.003178	3.85	41.59	24.56	0.52	0.32			0.32
DownAll	2050.	248.30	1045.00	1047.88		1048.18	0.003457	4.36	56.99	29.75	0.55	0.39			0.39
DownAll	2050.	564.23	1045.00	1049.08		1049.61	0.003615	5.87	178.88	150.80	0.61	0.62	0.17	0.12	0.26
DownAll	2050.	782.72	1045.00	1049.63		1050.33	0.003812	6.76	266.31	168.54	0.64	0.78	0.28	0.22	0.38
DownAll	2050.	973.78	1045.00	1050.06		1050.89	0.003934	7.42	340.05	178.75	0.66	0.91	0.37	0.29	0.46
DownAll	2050.	1193.73	1045.00	1050.49		1051.48	0.004089	8.12	420.25	191.06	0.69	1.05	0.47	0.37	0.56
DownAll	2000.	160.00	1044.49	1047.35		1047.44	0.000720	2.31	69.32	28.01	0.26	0.10			0.10
DownAll	2000.	248.30	1044.49	1047.92		1048.05	0.000941	2.90	85.70	29.91	0.30	0.15			0.15
DownAll	2000.	564.23	1044.49	1049.12		1049.43	0.001560	4.53	242.98	165.37	0.41	0.34	0.09	0.08	0.14
DownAll	2000.	782.72	1044.49	1049.68		1050.12	0.001878	5.44	340.48	185.58	0.46	0.47	0.15	0.14	0.21
DownAll	2000.	973.78	1044.49	1050.11		1050.67	0.002096	6.11	424.17	202.36	0.49	0.58	0.21	0.19	0.27
DownAll	2000.	1193.73	1044.49	1050.55		1051.24	0.002323	6.82	516.74	219.33	0.52	0.70	0.27	0.25	0.34
DownAll	1950.	160.00	1045.00	1047.32		1047.39	0.000835	2.16	74.21	38.59	0.27	0.10			0.10
DownAll	1950.	248.30	1045.00	1047.89		1047.99	0.000948	2.53	98.16	45.27	0.30	0.13		0.00	0.12
DownAll	1950.	564.23	1045.00	1049.13		1049.33	0.001083	3.63	295.38	197.02	0.34	0.22	0.07	0.04	0.10
DownAll	1950.	782.72	1045.00	1049.72		1050.00	0.001208	4.26	419.21	223.20	0.37	0.29	0.11	0.07	0.14
DownAll	1950.	973.78	1045.00	1050.18		1050.52	0.001281	4.71	527.03	240.20	0.39	0.35	0.14	0.10	0.17
DownAll	1950.	1193.73	1045.00	1050.66		1051.06	0.001354	5.18	645.08	254.39	0.41	0.41	0.18	0.13	0.21
DownAll	1900.	160.00	1045.00	1047.24		1047.34	0.001299	2.50	64.07	38.02	0.34	0.13			0.13
DownAll	1900.	248.30	1045.00	1047.81		1047.93	0.001412	2.83	87.63	45.83	0.36	0.17			0.17
DownAll	1900.	564.23	1045.00	1049.06		1049.27	0.001326	3.74	290.19	210.15	0.38	0.25	0.08	0.05	0.11
DownAll	1900.	782.72	1045.00	1049.65		1049.93	0.001379	4.30	422.93	237.19	0.40	0.31	0.12	0.08	0.15
DownAll	1900.	973.78	1045.00	1050.12		1050.45	0.001402	4.70	538.70	255.84	0.41	0.35	0.15	0.10	0.18
DownAll	1900.	1193.73	1045.00	1050.60		1050.99	0.001431	5.11	664.45	266.03	0.42	0.40	0.20	0.13	0.22
DownAll	1850.	160.00	1045.00	1047.18		1047.28	0.001239	2.52	63.44	35.59	0.33	0.13			0.13
DownAll	1850.	248.30	1045.00	1047.73		1047.86	0.001265	2.97	85.71	44.97	0.35	0.17		0.02	0.15
DownAll	1850.	564.23	1045.00	1048.90		1049.19	0.001568	4.35	263.99	205.18	0.42	0.32	0.08	0.08	0.13
DownAll	1850.	782.72	1045.00	1049.44		1049.84	0.001812	5.15	380.58	229.84	0.46	0.43	0.14	0.12	0.19
DownAll	1850.	973.78	1045.00	1049.86		1050.35	0.001967	5.74	480.76	248.27	0.49	0.52	0.19	0.16	0.24
DownAll	1850.	1193.73	1045.00	1050.28		1050.88	0.002125	6.35	589.11	258.21	0.51	0.62	0.26	0.21	0.30
DownAll	1800.	160.00	1045.00	1046.80		1047.14	0.005076	4.65	34.38	21.52	0.65	0.48			0.48
DownAll	1800.	248.30	1045.00	1047.18		1047.70	0.007326	5.79	42.89	25.55	0.79	0.73			0.73
DownAll	1800.	564.23	1045.00	1048.09	1048.09	1048.97	0.010917	7.56	118.76	138.28	0.99	1.20	0.31		0.58
DownAll	1800.	782.72	1045.00	1048.54	1048.54	1049.60	0.009951	8.35	183.82	153.84	0.98	1.36	0.52	0.17	0.74
DownAll	1800.	973.78	1045.00	1048.86	1048.86	1050.09	0.009722	9.02	235.68	164.18	0.99	1.52	0.67	0.26	0.86
DownAll	1800.	1193.73	1045.00	1049.28	1049.24	1050.62	0.008723	9.44	307.85	179.39	0.96	1.59	0.78	0.30	0.93
DownAll	1750.	160.00	1044.52	1046.20	1046.20	1046.73	0.013154	5.88	30.81	54.22	1.00	0.86	0.10		0.46
DownAll	1750.	248.30	1044.52	1046.63	1046.63	1047.22	0.012335	6.24	62.59	89.76	0.99	0.93	0.31		0.53
DownAll	1750.	564.23	1044.52	1047.50	1047.50	1048.38	0.010941	7.65	165.81	134.73	0.99	1.23	0.67		0.83
DownAll	1750.	782.72	1044.52	1047.96	1047.96	1049.00	0.010159	8.37	229.94	142.98	0.99	1.38	0.87		1.01
DownAll	1750.	973.78	1044.52	1048.28	1048.28	1049.48	0.010238	9.03	276.90	151.99	1.01	1.55	1.03	0.09	1.16
DownAll	1750.	1193.73	1044.52	1049.27		1050.17	0.004891	7.82	440.47	175.72	0.74	1.03	0.73	0.19	0.76

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Chan (lb/sq ft)	Shear LOB (lb/sq ft)	Shear ROB (lb/sq ft)	Shear Total (lb/sq ft)
DownAll	1700.	160.00	1043.00	1044.81	1044.69	1045.31	0.009831	5.65	28.31	22.43	0.89	0.76			0.76
DownAll	1700.	248.30	1043.00	1045.26	1045.19	1045.84	0.010972	6.16	45.75	58.27	0.94	0.89	0.13		0.53
DownAll	1700.	564.23	1043.00	1046.88		1047.37	0.003767	5.68	221.05	140.05	0.62	0.60	0.28		0.37
DownAll	1700.	782.72	1043.00	1047.78		1048.28	0.002659	5.80	353.81	157.76	0.54	0.57	0.32	0.07	0.37
DownAll	1700.	973.78	1043.00	1048.54		1049.05	0.002101	5.87	481.52	177.35	0.50	0.55	0.32	0.08	0.35
DownAll	1700.	1193.73	1043.00	1049.40		1049.92	0.001677	5.93	644.71	197.21	0.46	0.52	0.32	0.11	0.34
DownAll	1650.	160.00	1043.00	1044.27	1044.22	1044.77	0.011571	5.68	28.19	25.08	0.94	0.79			0.79
DownAll	1650.	248.30	1043.00	1044.92		1045.39	0.006721	5.49	45.20	27.88	0.76	0.68			0.66
DownAll	1650.	564.23	1043.00	1046.77		1047.20	0.002685	5.33	240.89	156.35	0.53	0.50	0.19	0.03	0.26
DownAll	1650.	782.72	1043.00	1047.68		1048.15	0.002120	5.62	397.13	184.48	0.49	0.51	0.24	0.05	0.28
DownAll	1650.	973.78	1043.00	1048.46		1048.94	0.001775	5.78	548.02	204.58	0.46	0.51	0.28	0.08	0.29
DownAll	1650.	1193.73	1043.00	1049.33		1049.83	0.001486	5.91	739.11	234.92	0.44	0.51	0.31	0.09	0.29
DownAll	1600.	180.00	1042.00	1043.96		1044.36	0.005614	5.11	35.20	19.99	0.68	0.57			0.57
DownAll	1600.	276.46	1042.00	1044.55		1045.08	0.005450	5.84	47.37	21.42	0.69	0.69			0.68
DownAll	1600.	625.68	1042.00	1046.27		1046.99	0.004423	6.90	231.69	189.99	0.66	0.84	0.22	0.28	0.33
DownAll	1600.	866.60	1042.00	1047.19		1047.98	0.003609	7.31	418.93	210.77	0.62	0.87	0.35	0.41	0.43
DownAll	1600.	1078.16	1042.00	1047.98		1048.80	0.003058	7.52	588.47	219.75	0.59	0.87	0.45	0.43	0.49
DownAll	1600.	1319.22	1042.00	1048.87		1049.70	0.002581	7.69	803.76	246.27	0.55	0.86	0.51	0.38	0.51
DownAll	1550.	180.00	1042.00	1043.74		1044.08	0.005049	4.65	38.73	24.20	0.65	0.48			0.48
DownAll	1550.	276.46	1042.00	1044.42		1044.80	0.003934	4.97	55.68	25.73	0.59	0.50			0.50
DownAll	1550.	625.68	1042.00	1046.25		1046.76	0.002783	5.78	223.05	168.79	0.53	0.57	0.15	0.09	0.22
DownAll	1550.	866.60	1042.00	1047.19		1047.77	0.002363	6.22	390.03	186.88	0.51	0.61	0.26	0.13	0.30
DownAll	1550.	1078.16	1042.00	1048.00		1048.61	0.002066	6.47	548.85	209.30	0.49	0.63	0.33	0.14	0.33
DownAll	1550.	1319.22	1042.00	1048.90		1049.54	0.001781	6.67	756.32	239.70	0.47	0.63	0.38	0.17	0.34
DownAll	1500.	180.00	1041.00	1043.52		1043.85	0.003937	4.87	38.55	19.29	0.58	0.45			0.45
DownAll	1500.	276.46	1041.00	1044.14		1044.59	0.004090	5.43	50.89	20.44	0.61	0.57			0.57
DownAll	1500.	625.68	1041.00	1045.76		1046.55	0.004482	7.20	137.61	105.67	0.66	0.89	0.17		0.35
DownAll	1500.	866.60	1041.00	1046.63		1047.58	0.004210	7.92	255.02	152.82	0.66	1.02	0.33	0.08	0.42
DownAll	1500.	1078.16	1041.00	1047.44		1048.44	0.003623	8.20	387.35	172.86	0.63	1.03	0.46	0.17	0.49
DownAll	1500.	1319.22	1041.00	1048.36		1049.38	0.003065	8.39	555.36	191.45	0.59	1.02	0.56	0.24	0.54
DownAll	1450.	180.00	1041.00	1042.96		1043.55	0.008641	6.16	29.22	17.57	0.84	0.83			0.83
DownAll	1450.	276.46	1041.00	1043.47		1044.27	0.009135	7.18	38.49	18.95	0.89	1.07			1.07
DownAll	1450.	625.68	1041.00	1045.07	1044.74	1046.23	0.007709	8.65	78.79	117.63	0.86	1.35	0.03	0.02	0.31
DownAll	1450.	866.60	1041.00	1046.19		1047.33	0.005104	8.64	226.16	143.40	0.74	1.21	0.38	0.20	0.49
DownAll	1450.	1078.16	1041.00	1047.13		1048.24	0.003910	8.63	367.47	158.66	0.67	1.14	0.51	0.28	0.55
DownAll	1450.	1319.22	1041.00	1048.12		1049.22	0.003154	8.70	531.90	174.64	0.62	1.09	0.59	0.33	0.58
DownAll	1400.	180.00	1041.00	1042.84		1043.16	0.004529	4.53	39.73	22.97	0.61	0.45			0.45
DownAll	1400.	276.46	1041.00	1043.43		1043.84	0.004575	5.12	54.03	26.23	0.63	0.54			0.54
DownAll	1400.	625.68	1041.00	1045.31		1045.82	0.002783	5.77	183.84	115.73	0.53	0.57	0.18	0.05	0.27
DownAll	1400.	866.60	1041.00	1046.45		1046.99	0.002081	5.98	326.80	135.85	0.48	0.56	0.28	0.12	0.30
DownAll	1400.	1078.16	1041.00	1047.38		1047.95	0.001742	6.16	462.64	155.96	0.45	0.56	0.33	0.15	0.31
DownAll	1400.	1319.22	1041.00	1048.37		1048.96	0.001500	6.35	623.53	168.77	0.43	0.56	0.36	0.19	0.33
DownAll	1350.	180.00	1041.00	1042.57		1042.90	0.006035	4.59	39.22	29.55	0.70	0.49			0.49
DownAll	1350.	276.46	1041.00	1043.29		1043.59	0.003929	4.48	62.47	38.57	0.59	0.42	0.03		0.39
DownAll	1350.	625.68	1041.00	1045.40		1045.64	0.001408	3.96	226.68	112.92	0.39	0.27	0.10	0.03	0.17
DownAll	1350.	866.60	1041.00	1046.60		1046.84	0.000919	3.96	369.04	124.47	0.33	0.25	0.13	0.06	0.17
DownAll	1350.	1078.16	1041.00	1047.55		1047.80	0.000730	4.03	492.60	133.74	0.31	0.24	0.14	0.07	0.16
DownAll	1350.	1319.22	1041.00	1048.56		1048.82	0.000610	4.13	632.08	143.81	0.29	0.24	0.15	0.08	0.16
DownAll	1300.	180.00	1040.00	1041.74		1042.46	0.011326	6.78	26.54	16.19	0.93	1.03			1.03
DownAll	1300.	276.46	1040.00	1042.36		1043.24	0.010005	7.53	36.71	16.86	0.90	1.17			1.17
DownAll	1300.	625.68	1040.00	1043.86	1043.70	1045.37	0.009527	9.85	67.56	26.53	0.93	1.73	0.37	0.21	1.30
DownAll	1300.	866.60	1040.00	1044.52	1044.52	1046.55	0.010201	11.44	87.13	32.96	0.99	2.20	0.58	0.41	1.46
DownAll	1300.	1078.16	1040.00	1045.15	1045.15	1047.50	0.009777	12.32	110.02	40.51	1.00	2.44	0.68	0.55	1.45
DownAll	1300.	1319.22	1040.00	1045.85	1045.85	1048.50	0.009209	13.10	141.86	50.60	0.99	2.63	0.73	0.67	1.43
DownAll	1250.	180.00	1039.00	1041.51		1042.00	0.005707	5.61	32.10	15.54	0.69	0.65			0.65
DownAll	1250.	276.46	1039.00	1042.10		1042.79	0.006415	6.64	41.66	16.85	0.74	0.87			0.87
DownAll	1250.	625.68	1039.00	1043.60		1044.85	0.008220	8.95	69.93	21.34	0.87	1.44			1.44
DownAll	1250.	866.60	1039.00	1044.42		1045.92	0.008189	9.81	88.70	24.88	0.88	1.65		0.09	1.55
DownAll	1250.	1078.16	1039.00	1045.10	1044.64	1046.77	0.007624	10.37	107.42	33.33	0.86	1.77		0.16	1.33
DownAll	1250.	1319.22	1039.00	1045.84	1045.28	1047.69	0.007149	10.91	134.97	42.61	0.84	1.88		0.32	1.24
DownAll	1200.	180.00	1039.00	1041.02		1041.64	0.008826	6.31	28.51	16.52	0.85	0.87			0.86
DownAll	1200.	276.46	1039.00	1041.55		1042.39	0.009325	7.35	37.68	18.03	0.89	1.11	0.03		1.04
DownAll	1200.	625.68	1039.00	1043.24		1044.44	0.007526	8.78	73.27	28.03	0.85	1.37	0.09	0.06	0.98
DownAll	1200.	866.60	1039.00	1044.06		1045.54	0.006931	9.76	98.05	32.41	0.84	1.58	0.27	0.22	1.05
DownAll	1200.	1078.16	1039.00	1044.72		1046.42	0.006517	10.45	120.72	35.76	0.84	1.72	0.37	0.34	1.10
DownAll	1200.	1319.22	1039.00	1045.45		1047.36	0.006076	11.09	150.72	48.40	0.83	1.85	0.46	0.31	0.99
DownAll	1150.	180.00	1038.78	1040.77		1041.20	0.006652	5.30	33.97	20.82	0.73	0.62			0.62
DownAll	1150.	276.46	1038.78	1041.43		1041.94	0.005437	5.74	48.20	22.06	0.68	0.67			0.67
DownAll	1150.	625.68	1038.78	1043.38		1044.01	0.003773	6.49	99.53	31.62	0.61	0.73	0.13		0.64
DownAll	1150.	866.60	1038.78	1044.31		1045.09	0.003425	7.07	130.41	35.55	0.59	0.81	0.24	0.03	0.67
DownAll	1150.	1078.16	1038.78	1045.08		1045.95	0.003094	7.48	161.18	44.32	0.58	0.86	0.29	0.10	0.61
DownAll	1150.	1319.22	1038.78	1045.91		1046.87	0.002816	7.88	201.88	54.21	0.57	0.91	0.32	0.16	0.57
DownAll	1100.	180.00	1038.00	1040.55		1040.92	0.004214	4.92	36.60	17.33	0.60	0.50			0.50
DownAll	1100.	276.46	1038.00	1041.17		1041.69	0.004582	5.78	47.83	18.59	0.64	0.65			0.65
DownAll	1100.	625.68	1038.00	1042.93		1043.78	0.004997	7.37	84.93	24.04	0.69	0.95			0.95
DownAll	1100.	866.60	1038.00	1043.89		1044.87	0.004664	7.93	109.50	26.21	0.68	1.04		0.06	1.02
DownAll	1100.	1078.16	1038.00	1044.66		1045.75	0.004289	8.35	130.97	30.10	0.66	1.11		0.11	0.97
DownAll	1100.	1319.22	1038.00	1045.49		1046.68	0.004015	8.78	160.92	43.96	0.64	1.17		0.14	0.79
DownAll	1050.	180.00	1038.00	1040.24		1040.67	0.005560	5.27	34.13	18.67	0.69	0.59			0.59
DownAll	1050.	276.46	1038.00	1040.92		1041.45	0.005084	5.82	47.53	20.76	0.68	0.67			0.67
DownAll	1050.	625.68	1038.00	1042.79		1043.52	0.004104	6.84	91.52	26.12	0.64	0.81			0.81
DownAll	1050.	866.60	1038.00	1043.79		1044.63	0.003463	7.36	123.47	42.21	0.61	0.87	0.08	0.07	0.58
DownAll	1050.	1078.16	1038.00	1044.59		1045.52	0.003083	7.75	164.26	58.70	0.59	0.91	0.08	0.15	0.50

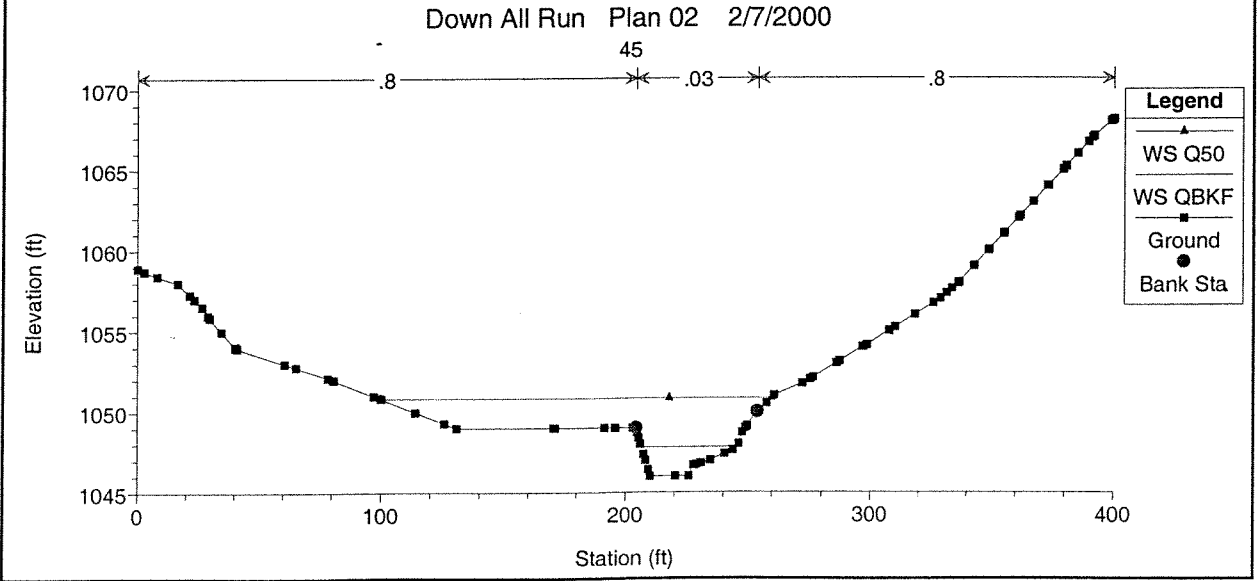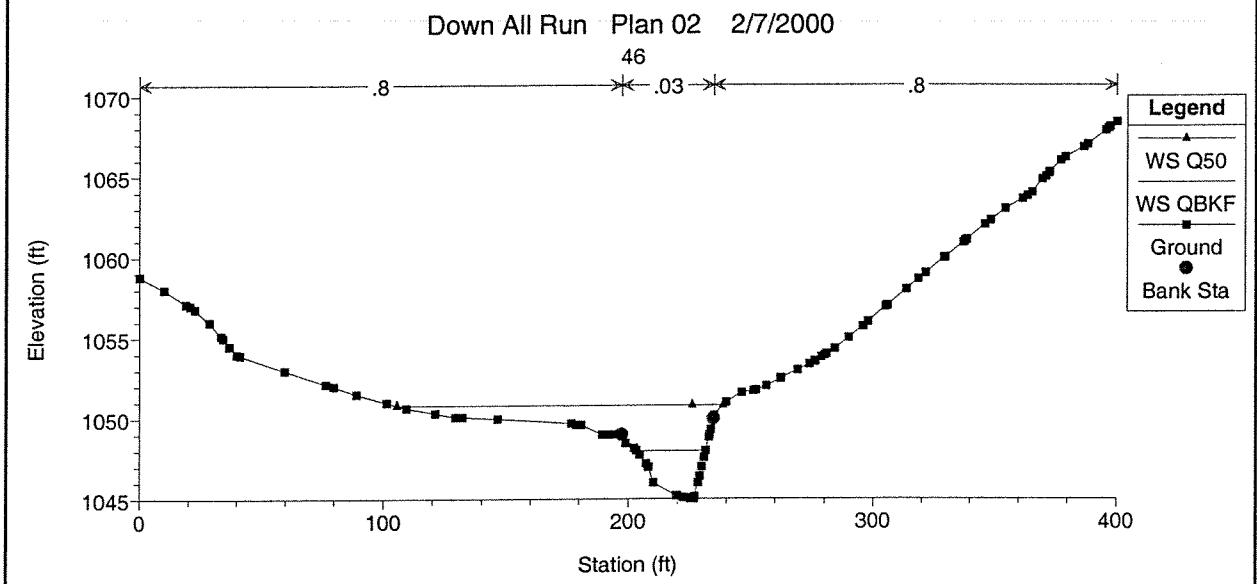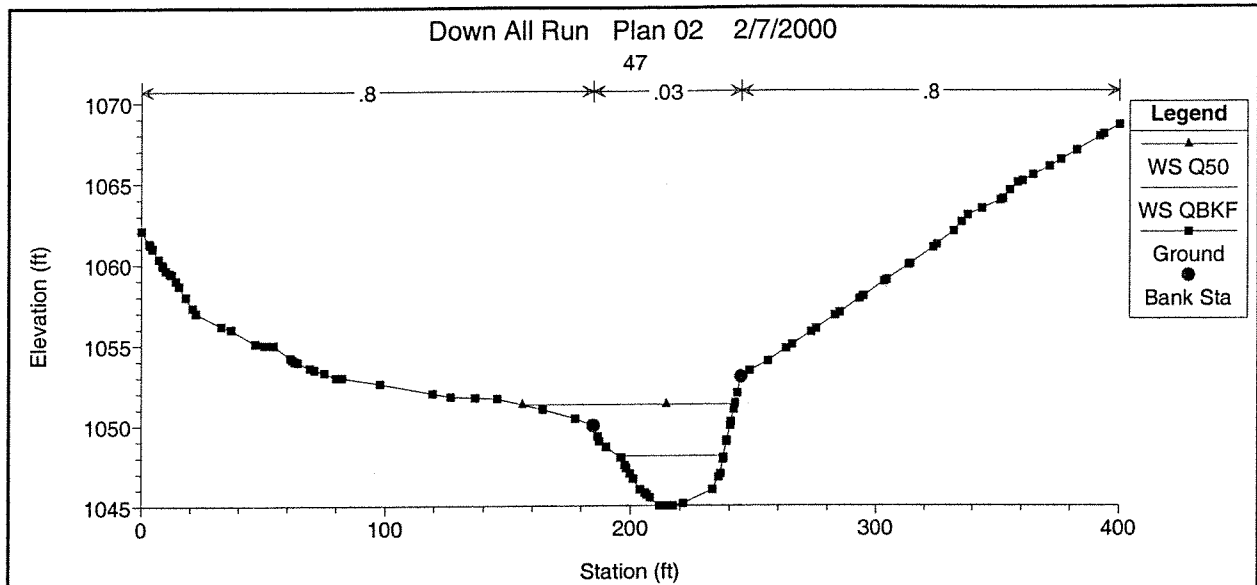| Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl	Shear Chan (lb/sq ft)	Shear LOB (lb/sq ft)	Shear ROB (lb/sq ft)	Shear Total (lb/sq ft)
DownAll	1050.	1319.22	1038.00	1045.44		1046.46	0.002789	8.15	220.82	74.25	0.58	0.96	0.08	0.21	0.48
DownAll	1000.	180.00	1037.50	1039.89		1040.37	0.006399	5.55	32.41	17.89	0.73	0.66			0.66
DownAll	1000.	276.46	1037.50	1040.62		1041.18	0.005403	6.02	45.92	19.35	0.69	0.72			0.72
DownAll	1000.	625.68	1037.50	1042.53		1043.30	0.004436	7.02	91.05	33.50	0.66	0.86	0.07	0.06	0.68
DownAll	1000.	866.60	1037.50	1043.59		1044.45	0.003517	7.45	140.53	58.81	0.61	0.89	0.09	0.16	0.49
DownAll	1000.	1078.16	1037.50	1044.42		1045.36	0.003088	7.81	196.92	76.59	0.59	0.92	0.09	0.22	0.48
DownAll	1000.	1319.22	1037.50	1045.30		1046.32	0.002778	8.18	272.02	96.28	0.58	0.96	0.08	0.27	0.46
DownAll	950.	180.00	1037.00	1039.88		1040.12	0.002355	3.91	46.06	20.65	0.46	0.30			0.30
DownAll	950.	276.46	1037.00	1040.63		1040.93	0.002341	4.44	62.24	22.58	0.47	0.37			0.37
DownAll	950.	625.68	1037.00	1042.58		1043.06	0.002210	5.58	118.30	40.00	0.48	0.51		0.04	0.37
DownAll	950.	866.60	1037.00	1043.65		1044.23	0.002074	6.14	175.29	70.29	0.47	0.58		0.10	0.30
DownAll	950.	1078.16	1037.00	1044.49		1045.16	0.002010	6.56	244.97	94.96	0.47	0.64		0.15	0.31
DownAll	950.	1319.22	1037.00	1045.38		1046.12	0.001964	6.96	340.01	118.58	0.46	0.69		0.20	0.33
DownAll	900.	180.00	1036.77	1039.72		1039.99	0.002553	4.15	43.42	17.75	0.47	0.34			0.34
DownAll	900.	276.46	1036.77	1040.42		1040.80	0.002861	4.91	57.74	23.23	0.50	0.45	0.06		0.39
DownAll	900.	625.68	1036.77	1042.18		1042.90	0.003269	6.83	106.64	32.32	0.57	0.76	0.29	0.02	0.57
DownAll	900.	866.60	1036.77	1043.13		1044.07	0.003294	7.79	148.12	68.10	0.59	0.93	0.42	0.07	0.41
DownAll	900.	1078.16	1036.77	1043.88		1044.98	0.003290	8.49	208.28	95.54	0.60	1.06	0.50	0.16	0.41
DownAll	900.	1319.22	1036.77	1044.66		1045.94	0.003255	9.14	294.27	121.15	0.61	1.18	0.57	0.25	0.46
DownAll	850.	180.00	1037.00	1038.88	1038.88	1039.69	0.012720	7.24	24.87	15.45	1.00	1.17			1.17
DownAll	850.	276.46	1037.00	1039.45	1039.45	1040.47	0.012094	8.13	34.00	16.80	1.01	1.38			1.38
DownAll	850.	625.68	1037.00	1040.94	1040.94	1042.55	0.0106294	10.17	68.84	27.09	1.00	1.87	0.56		1.49
DownAll	850.	866.60	1037.00	1041.71	1041.71	1043.70	0.009966	11.34	90.85	30.59	1.00	2.16	0.87	0.22	1.61
DownAll	850.	1078.16	1037.00	1042.39	1042.39	1044.62	0.009061	12.02	123.62	64.42	0.98	2.30	1.04	0.24	1.00
DownAll	850.	1319.22	1037.00	1043.05	1043.05	1045.57	0.008581	12.79	170.72	77.09	0.96	2.49	1.18	0.48	1.10
DownAll	800.	180.00	1036.00	1038.75		1039.13	0.003981	4.91	36.65	16.83	0.59	0.49			0.49
DownAll	800.	276.46	1036.00	1039.40		1039.92	0.004359	5.76	48.04	18.29	0.63	0.64			0.64
DownAll	800.	625.68	1036.00	1040.86		1041.89	0.005328	8.17	96.02	49.21	0.73	1.13	0.27	0.14	0.60
DownAll	800.	866.60	1036.00	1041.41		1042.91	0.006504	9.87	125.16	55.94	0.83	1.58	0.53	0.30	0.85
DownAll	800.	1078.16	1036.00	1041.81		1043.75	0.007518	11.24	148.36	61.07	0.90	1.99	0.76	0.44	1.06
DownAll	800.	1319.22	1036.00	1042.32	1042.17	1044.67	0.007969	12.38	181.44	67.64	0.94	2.33	1.01	0.60	1.24
DownAll	750.	180.00	1036.00	1037.95	1037.95	1038.76	0.012579	7.21	24.95	15.61	1.01	1.16			1.16
DownAll	750.	276.46	1036.00	1038.52	1038.52	1039.53	0.011913	8.05	34.32	17.26	1.01	1.35			1.35
DownAll	750.	625.68	1036.00	1040.05	1040.05	1041.49	0.010204	9.63	75.58	63.74	0.99	1.70	0.38	0.03	0.72
DownAll	750.	866.60	1036.00	1040.84	1040.78	1042.52	0.008742	10.44	131.86	78.39	0.95	1.85	0.70	0.38	0.87
DownAll	750.	1078.16	1036.00	1041.49		1043.33	0.007827	10.99	185.97	88.04	0.93	1.94	0.88	0.58	0.98
DownAll	750.	1319.22	1036.00	1042.16		1044.19	0.007182	11.58	248.00	96.94	0.91	2.05	1.03	0.72	1.09
DownAll	700.	180.00	1035.00	1037.70		1038.08	0.004460	4.92	36.57	18.40	0.62	0.51			0.51
DownAll	700.	276.46	1035.00	1038.46		1038.91	0.003959	5.40	51.23	20.13	0.60	0.56			0.56
DownAll	700.	625.68	1035.00	1040.26		1040.93	0.004112	6.58	121.17	82.95	0.64	0.77	0.08	0.14	0.35
DownAll	700.	866.60	1035.00	1041.24		1041.99	0.003297	6.99	208.23	99.01	0.59	0.79	0.23	0.24	0.41
DownAll	700.	1078.16	1035.00	1041.97		1042.80	0.002980	7.38	285.72	111.71	0.58	0.84	0.30	0.31	0.45
DownAll	700.	1319.22	1035.00	1042.73		1043.65	0.002762	7.80	375.50	125.00	0.57	0.89	0.37	0.36	0.49
DownAll	650.	180.00	1033.39	1037.69	1036.01	1037.90	0.001597	3.68	49.13	16.49	0.37	0.25			0.25
DownAll	650.	276.46	1033.39	1038.42	1036.63	1038.73	0.002180	4.45	62.10	20.07	0.44	0.36			0.36
DownAll	650.	625.68	1033.39	1040.11		1040.76	0.002688	6.48	143.01	100.45	0.52	0.67	0.11	0.09	0.23
DownAll	650.	866.60	1033.39	1040.95		1041.82	0.002939	7.55	238.18	120.48	0.56	0.88	0.26	0.21	0.34
DownAll	650.	1078.16	1033.39	1041.56		1042.62	0.003157	8.38	313.95	126.86	0.59	1.03	0.37	0.33	0.46
DownAll	650.	1319.22	1033.39	1042.18	1040.58	1043.46	0.003383	9.24	394.36	134.10	0.62	1.21	0.50	0.45	0.59
DownAll	600.	180.00	1035.00	1036.85	1036.85	1037.67	0.012872	7.24	24.86	15.44	1.01	1.18			1.18
DownAll	600.	276.46	1035.00	1037.43	1037.43	1038.44	0.012154	8.08	34.20	17.06	1.01	1.37			1.37
DownAll	600.	625.68	1035.00	1039.24	1038.96	1040.49	0.008127	8.97	77.48	64.12	0.88	1.44	0.12	0.07	0.58
DownAll	600.	866.60	1035.00	1039.94	1039.74	1041.52	0.008007	10.14	144.03	129.67	0.90	1.73	0.45	0.23	0.54
DownAll	600.	1078.16	1035.00	1040.44		1042.31	0.008108	11.06	214.40	145.89	0.93	1.98	0.68	0.43	0.72
DownAll	600.	1319.22	1035.00	1040.99	1040.99	1043.12	0.008057	11.91	297.18	158.49	0.94	2.21	0.91	0.64	0.91
DownAll	550.	180.00	1034.00	1036.53		1037.05	0.006137	5.81	30.98	14.97	0.71	0.70			0.70
DownAll	550.	276.46	1034.00	1037.19		1037.88	0.006359	6.69	41.30	16.20	0.74	0.88			0.88
DownAll	550.	625.68	1034.00	1038.95	1038.34	1040.06	0.007256	8.47	74.16	32.18	0.82	1.29		0.01	0.94
DownAll	550.	866.60	1034.00	1039.70	1039.30	1041.08	0.006991	9.47	153.05	128.35	0.83	1.51	0.30	0.25	0.50
DownAll	550.	1078.16	1034.00	1040.26		1041.86	0.006888	10.25	231.31	150.05	0.84	1.69	0.51	0.41	0.64
DownAll	550.	1319.22	1034.00	1040.86		1042.66	0.006641	10.93	329.35	170.51	0.84	1.85	0.71	0.57	0.78
DownAll	500.	180.00	1034.00	1036.12		1036.70	0.007674	6.12	29.41	15.02	0.77	0.80			0.80
DownAll	500.	276.46	1034.00	1036.69		1037.51	0.008407	7.25	38.14	15.60	0.82	1.06			1.06
DownAll	500.	625.68	1034.00	1038.49	1038.14	1039.67	0.008193	8.76	98.21	85.19	0.85	1.40		0.22	0.56
DownAll	500.	866.60	1034.00	1039.20		1040.69	0.008257	9.87	173.95	140.22	0.87	1.67	0.10	0.44	0.62
DownAll	500.	1078.16	1034.00	1039.70		1041.46	0.008457	10.80	248.74	160.72	0.90	1.93	0.36	0.61	0.79
DownAll	500.	1319.22	1034.00	1040.19	1040.19	1042.26	0.008748	11.77	333.57	181.02	0.93	2.21	0.61	0.79	0.97
DownAll	450.	180.00	1033.00	1036.08		1036.34	0.004011	4.08	44.07	27.52	0.57	0.37			0.37
DownAll	450.	276.46	1033.00	1036.85		1037.12	0.002743	4.20	65.83	28.99	0.49	0.35			0.35
DownAll	450.	625.68	1033.00	1038.90		1039.27	0.001684	4.89	199.94	149.35	0.42	0.39	0.08	0.06	0.14
DownAll	450.	866.60	1033.00	1039.75		1040.22	0.001697	5.55	365.24	206.24	0.43	0.48	0.15	0.13	0.18
DownAll	450.	1078.16	1033.00	1040.38		1040.93	0.001737	6.07	496.68	211.77	0.45	0.55	0.20	0.19	0.25
DownAll	450.	1319.22	1033.00	1040.98		1041.63	0.001823	6.64	623.80	214.88	0.47	0.63	0.24	0.26	0.32
DownAll	400.	180.00	1033.00	1035.33		1036.01	0.009096	6.59	27.32	14.94	0.86	0.94			0.94
DownAll	400.	276.46	1033.00	1035.74	1035.71	1036.80	0.011662	8.24	33.57	15.48	0.99	1.39			1.39
DownAll	400.	625.68	1033.00	1037.51	1037.51	1038.98	0.011229	9.74	64.22	21.88	1.00	1.77			1.77
DownAll	400.	866.60	1033.00	1038.39	1038.39	1039.94	0.009917	10.04	124.17	141.56	0.97	1.80	0.23	0.20	0.53
DownAll	400.	1078.16	1033.00	1038.96	1038.96	1040.65	0.008772	10.51	223.17	206.90	0.94	1.87	0.50	0.36	0.58
DownAll	400.	1319.22	1033.00	1039.77		1041.38	0.006674	10.39	395.39	216.70	0.85	1.72	0.67	0.59	0.74
DownAll	350.	180.00	1033.00	1034.73	1034.73	1035.45	0.013224	6.84	26.30	18.41	1.01	1.09			1.09
DownAll	350.	276.46	1033.00	1035.21	1035.21	1036.16	0.012481	7.82	35.36	18.88	1.01	1.31			1.31
DownAll	350.	625.68	1033.00	1036.97		1038.21	0.008223	8.94	70.02	20.47	0.85	1.44			1.44
DownAll	350.	866.60	1033.00	1037.80		1039.33	0.008321	9.94	87.16	21.00	0.86	1.70			1.70

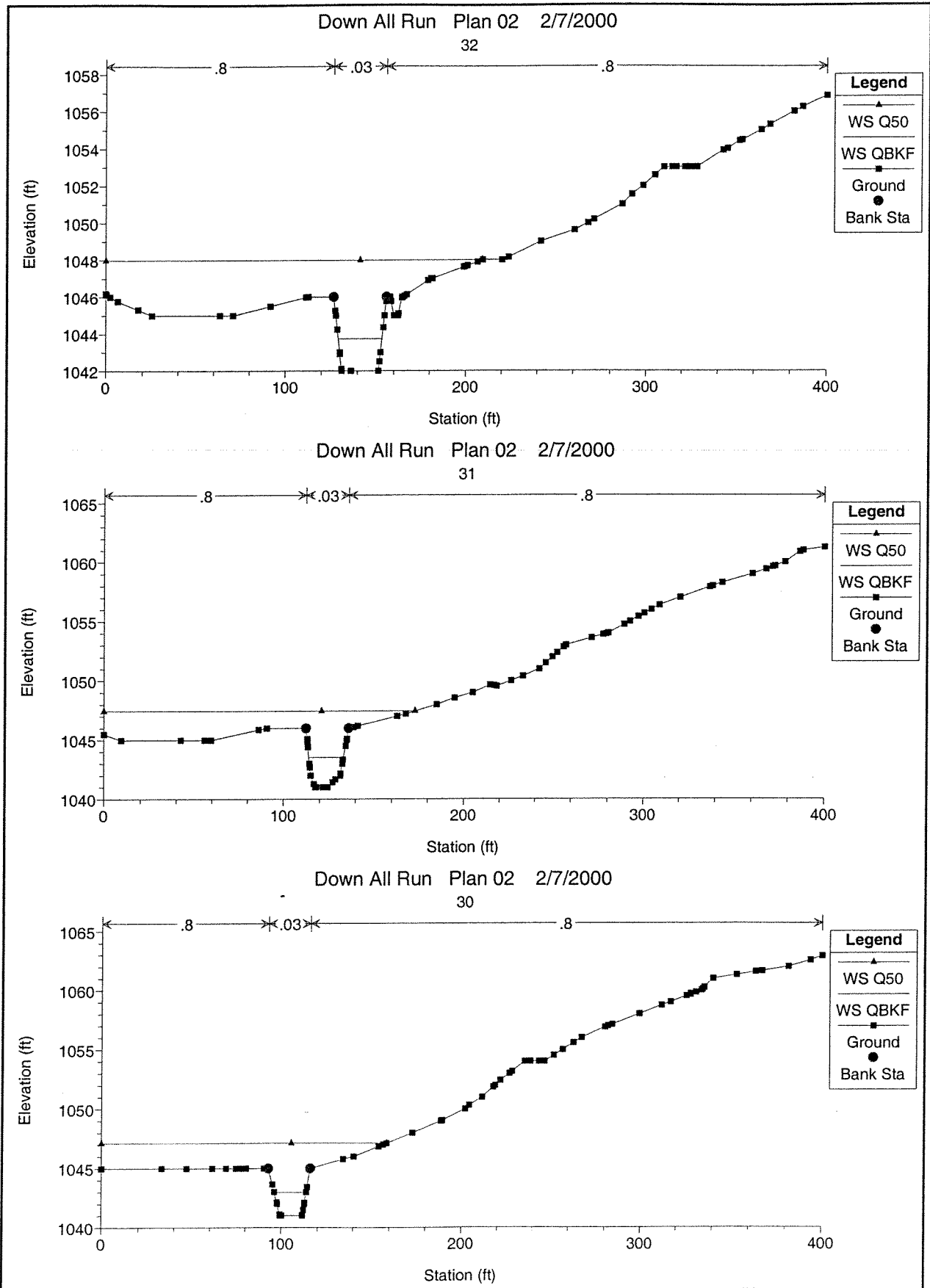| Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan	Shear LOB	Shear ROB	Shear Total
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)	(lb/sq ft)	(lb/sq ft)	(lb/sq ft)
DownAll	350.	1078.16	1033.00	1038.44	1038.12	1040.18	0.007998	10.63	181.62	201.32	0.86	1.86	0.22	0.22	0.44
DownAll	350.	1319.22	1033.00	1039.24		1041.03	0.006859	10.90	344.57	209.06	0.81	1.85	0.49	0.52	0.68
DownAll	300.	180.00	1031.00	1034.71		1034.97	0.002754	4.12	43.71	19.61	0.49	0.34			0.34
DownAll	300.	276.46	1031.00	1035.33		1035.71	0.003069	4.91	56.28	20.52	0.52	0.46			0.46
DownAll	300.	625.68	1031.00	1037.12		1037.79	0.003413	6.57	95.21	23.76	0.57	0.73			0.71
DownAll	300.	866.60	1031.00	1038.02	1036.44	1038.88	0.003376	7.46	166.28	206.94	0.59	0.88	0.06	0.06	0.16
DownAll	300.	1078.16	1031.00	1038.74	1037.04	1039.71	0.003239	7.99	317.23	210.81	0.59	0.96	0.18	0.20	0.30
DownAll	300.	1319.22	1031.00	1039.53		1040.59	0.003038	8.43	484.87	214.87	0.58	1.03	0.29	0.33	0.41
DownAll	250.	180.00	1032.00	1034.57		1034.83	0.002758	4.14	48.34	25.73	0.48	0.35	0.11		0.28
DownAll	250.	276.46	1032.00	1035.16		1035.55	0.003229	5.02	64.92	31.24	0.53	0.48	0.19	0.02	0.36
DownAll	250.	625.68	1032.00	1036.91		1037.60	0.003793	6.74	130.94	44.46	0.59	0.78	0.40	0.26	0.56
DownAll	250.	866.60	1032.00	1037.85		1038.69	0.003897	7.39	245.03	164.20	0.62	0.90	0.44	0.18	0.34
DownAll	250.	1078.16	1032.00	1038.64		1039.52	0.003405	7.66	408.55	216.59	0.59	0.92	0.49	0.27	0.38
DownAll	250.	1319.22	1032.00	1039.48		1040.39	0.002947	7.88	591.88	217.92	0.57	0.92	0.52	0.38	0.47
DownAll	200.	180.00	1032.00	1034.40		1034.68	0.003139	4.26	42.26	19.91	0.52	0.37			0.37
DownAll	200.	276.46	1032.00	1034.97		1035.38	0.003652	5.14	53.76	20.93	0.57	0.51			0.51
DownAll	200.	625.68	1032.00	1036.71		1037.41	0.003871	6.72	93.13	24.27	0.60	0.78			0.78
DownAll	200.	866.60	1032.00	1037.66		1038.50	0.003687	7.36	205.62	185.01	0.60	0.88	0.15	0.12	0.25
DownAll	200.	1078.16	1032.00	1038.46		1039.35	0.003274	7.66	376.48	224.83	0.58	0.91	0.27	0.24	0.33
DownAll	200.	1319.22	1032.00	1039.33		1040.25	0.002848	7.88	572.83	228.30	0.55	0.92	0.36	0.36	0.43
DownAll	150.	180.00	1032.00	1033.66	1033.66	1034.36	0.012772	6.70	26.85	19.45	1.01	1.04			1.04
DownAll	150.	276.46	1032.00	1034.21	1034.13	1035.05	0.010532	7.32	37.76	20.19	0.94	1.14			1.11
DownAll	150.	625.68	1032.00	1036.34	1035.50	1037.18	0.005073	7.33	88.51	71.22	0.70	0.95		0.02	0.35
DownAll	150.	866.60	1032.00	1037.46		1038.31	0.003720	7.47	286.90	240.23	0.62	0.90	0.14	0.18	0.27
DownAll	150.	1078.16	1032.00	1038.34		1039.18	0.002999	7.56	500.75	248.53	0.58	0.87	0.25	0.30	0.36
DownAll	150.	1319.22	1032.00	1039.24		1040.10	0.002527	7.70	729.03	256.50	0.54	0.86	0.32	0.38	0.43
DownAll	100.	180.00	1031.00	1033.29		1033.77	0.006049	5.56	32.37	16.91	0.71	0.65			0.65
DownAll	100.	276.46	1031.00	1034.03		1034.61	0.005264	6.08	45.45	18.14	0.68	0.72			0.72
DownAll	100.	625.68	1031.00	1036.14	1034.89	1036.94	0.004123	7.21	96.93	108.75	0.62	0.88	0.03	0.03	0.22
DownAll	100.	866.60	1031.00	1037.20		1038.12	0.003544	7.78	286.11	218.81	0.60	0.95	0.23	0.19	0.28
DownAll	100.	1078.16	1031.00	1038.04		1039.01	0.003167	8.13	474.76	232.83	0.58	0.98	0.34	0.32	0.39
DownAll	100.	1319.22	1031.00	1038.92		1039.94	0.002856	8.45	686.11	246.71	0.57	1.02	0.42	0.42	0.48
DownAll	50.	180.00	1031.00	1033.12		1033.47	0.004544	4.73	38.03	20.75	0.62	0.48			0.48
DownAll	50.	276.46	1031.00	1033.97		1034.33	0.003472	4.81	57.49	24.80	0.56	0.48			0.46
DownAll	50.	625.68	1031.00	1036.30		1036.69	0.001766	4.98	169.86	119.05	0.43	0.41	0.05	0.06	0.15
DownAll	50.	866.60	1031.00	1037.43		1037.87	0.001465	5.33	320.31	145.88	0.41	0.43	0.06	0.13	0.19
DownAll	50.	1078.16	1031.00	1038.28		1038.77	0.001345	5.65	459.88	180.29	0.40	0.46	0.06	0.15	0.21
DownAll	50.	1319.22	1031.00	1039.17		1039.70	0.001249	5.96	634.20	211.26	0.40	0.49	0.06	0.18	0.23
DownAll	0.	180.00	1030.00	1032.51	1032.15	1033.14	0.008002	6.40	28.13	13.46	0.78	0.87			0.87
DownAll	0.	276.46	1030.00	1033.21	1032.78	1034.03	0.008009	7.27	38.04	14.55	0.79	1.05			1.05
DownAll	0.	625.68	1030.00	1035.19	1034.53	1038.44	0.008006	8.96	69.80	18.60	0.82	1.44			1.44
DownAll	0.	866.60	1030.00	1036.08	1035.56	1037.61	0.008002	9.94	91.48	56.18	0.84	1.68	0.22	0.04	0.73
DownAll	0.	1078.16	1030.00	1036.68	1036.24	1038.50	0.008009	10.84	130.64	75.07	0.86	1.91	0.44	0.27	0.80
DownAll	0.	1319.22	1030.00	1037.30	1036.90	1039.42	0.008007	11.72	184.87	103.01	0.87	2.15	0.62	0.42	0.84

Down All Run   Plan 02   2/7/2000
DownAll

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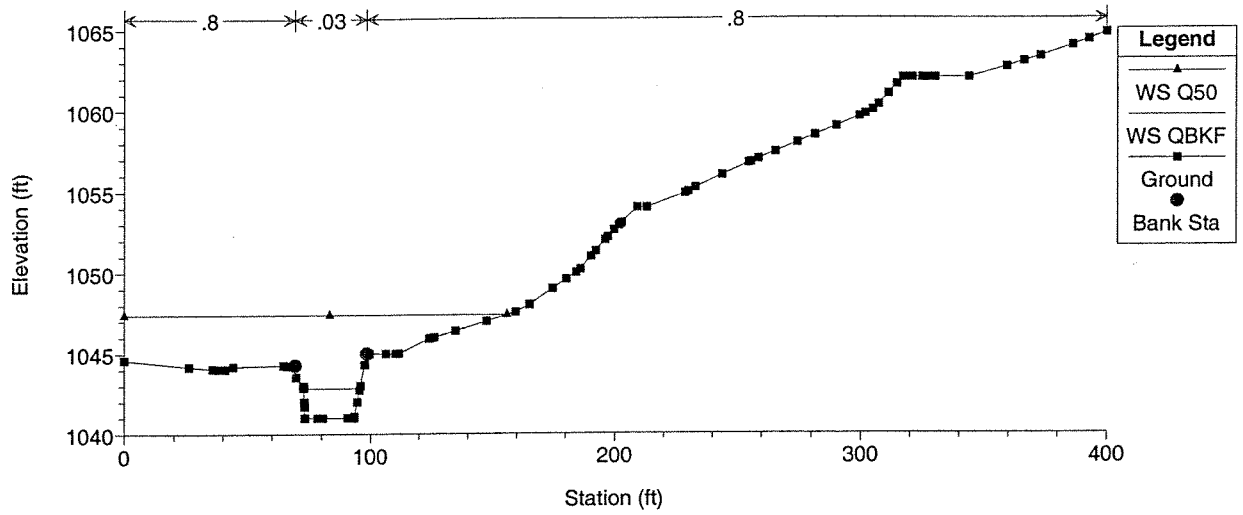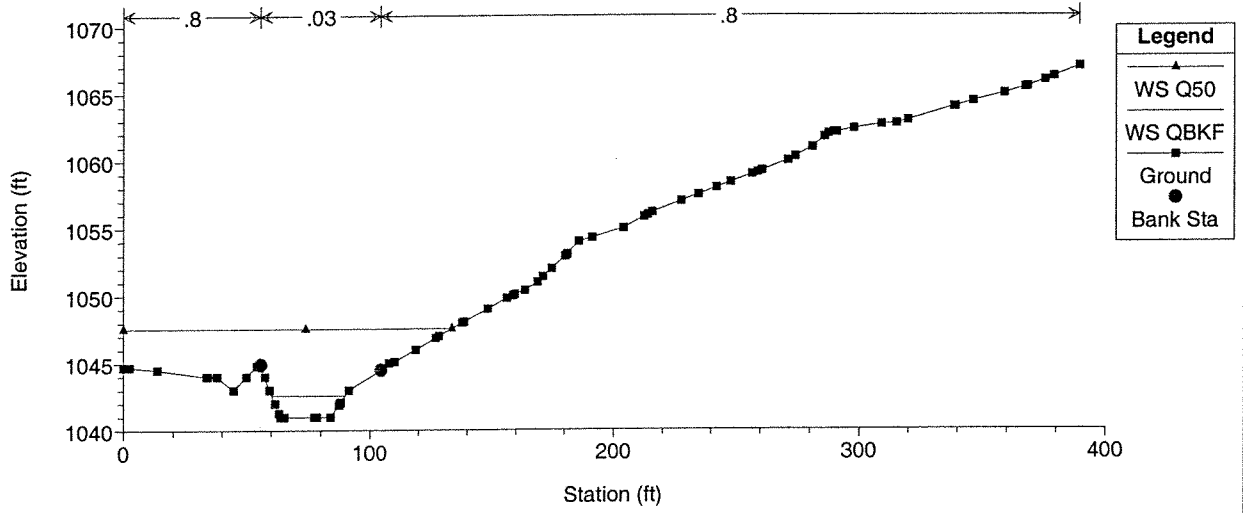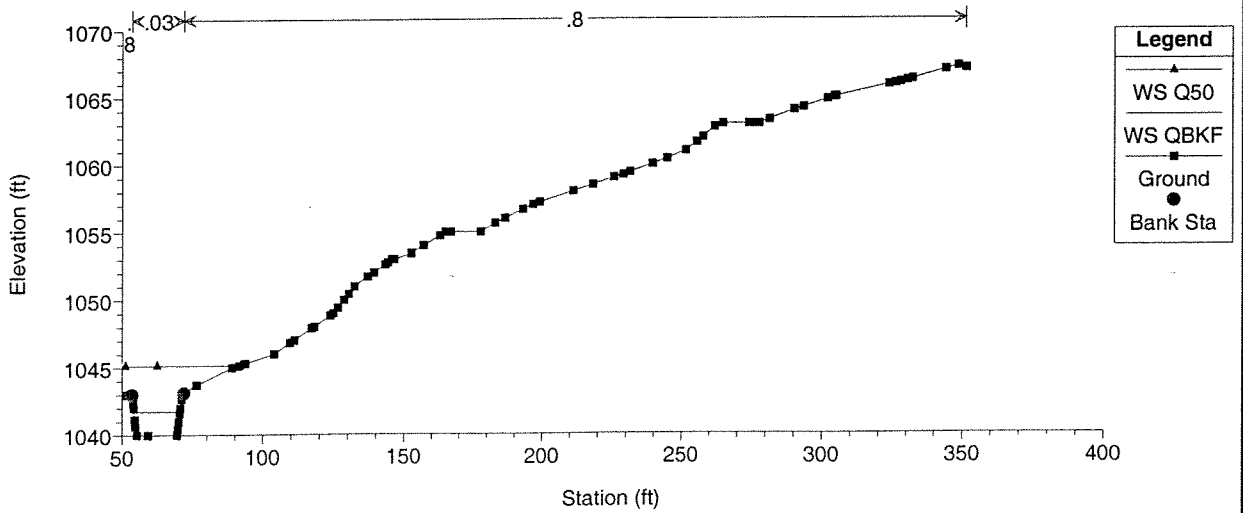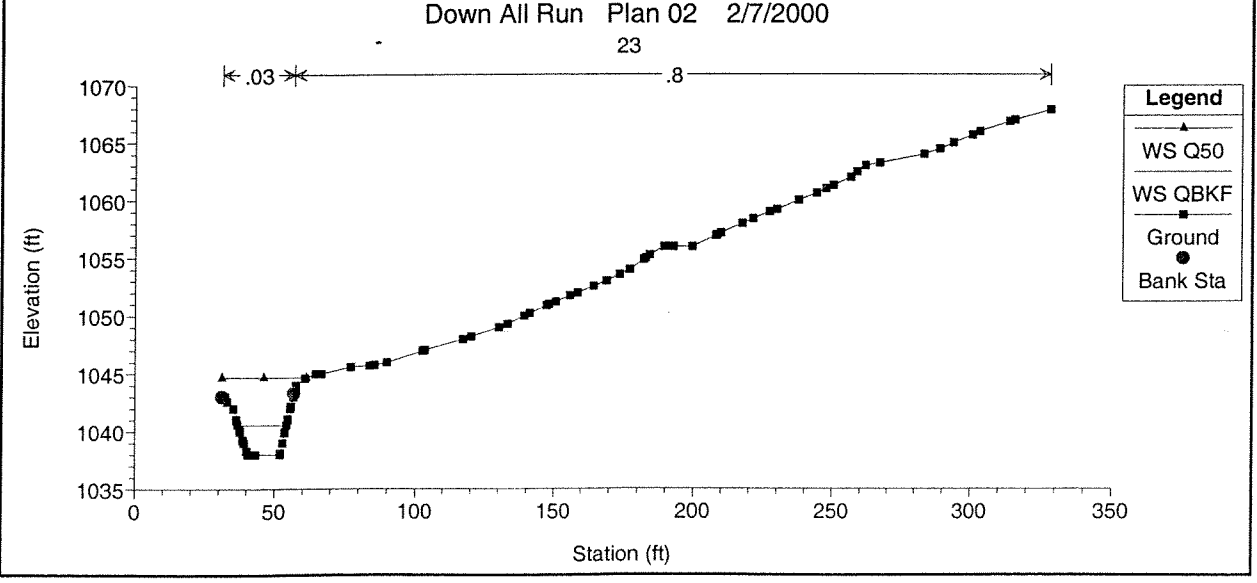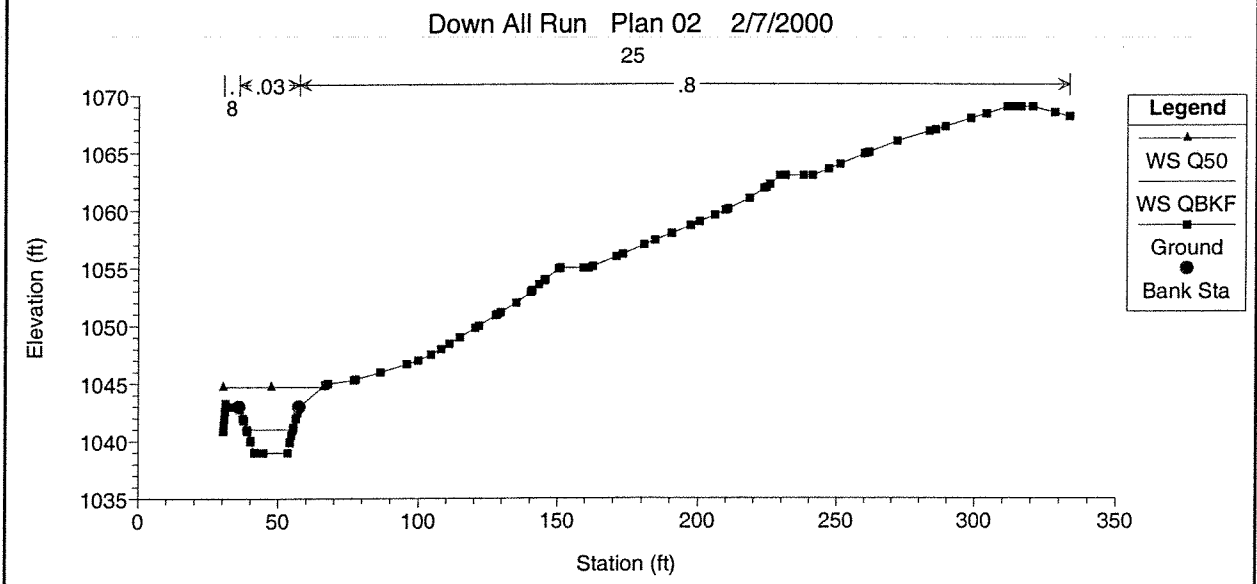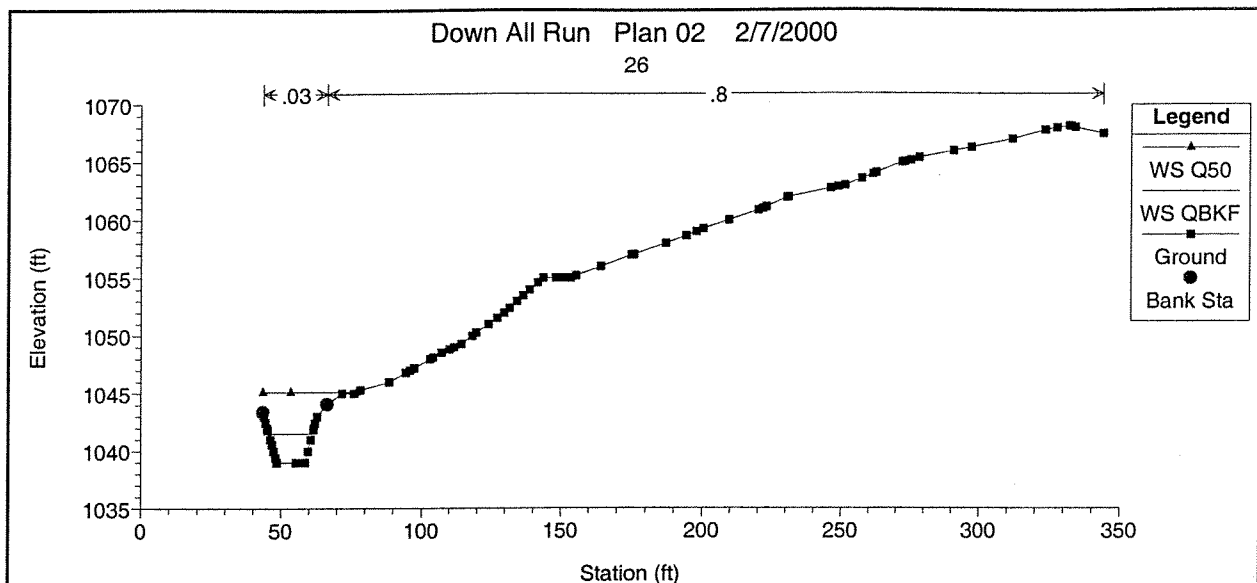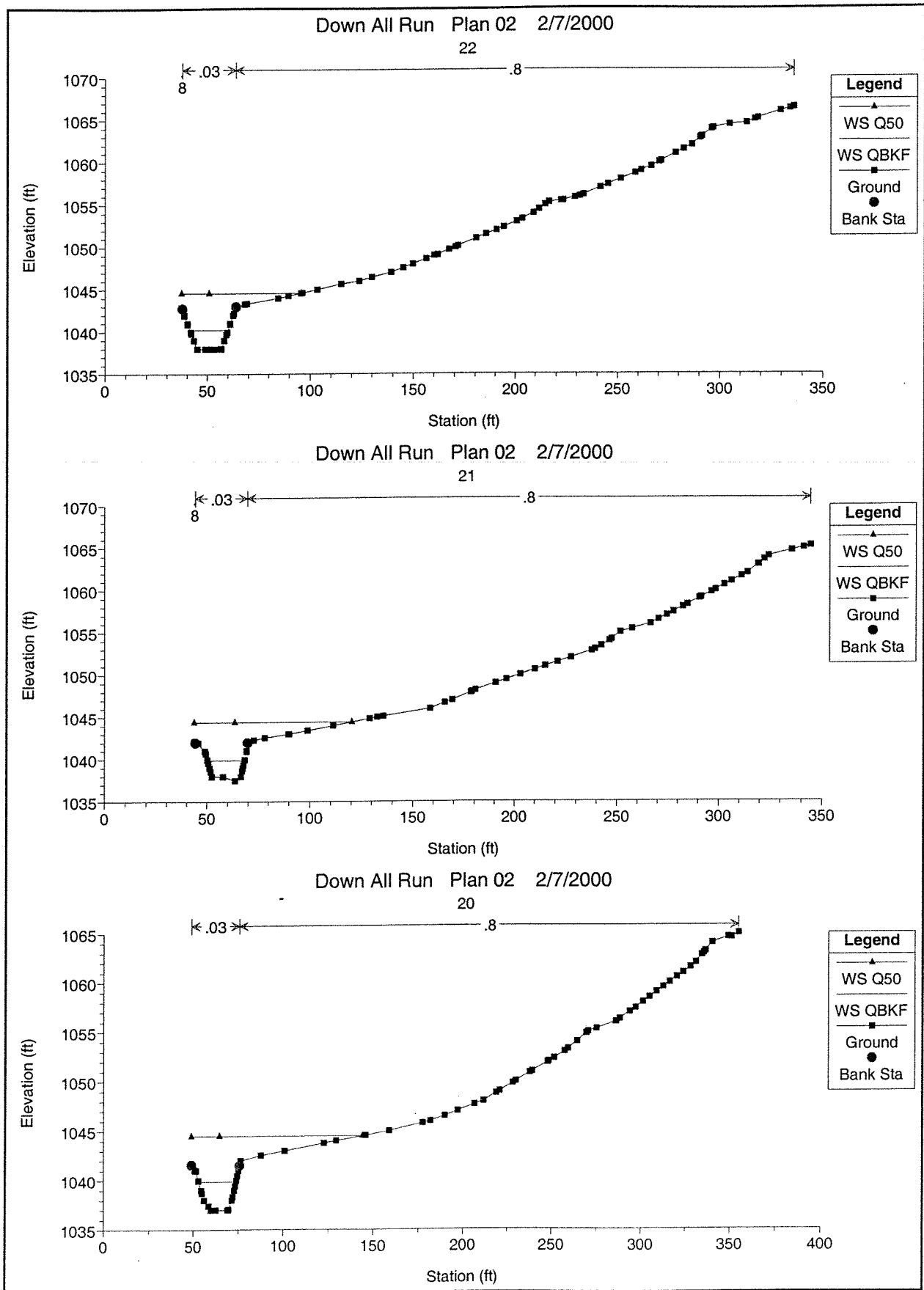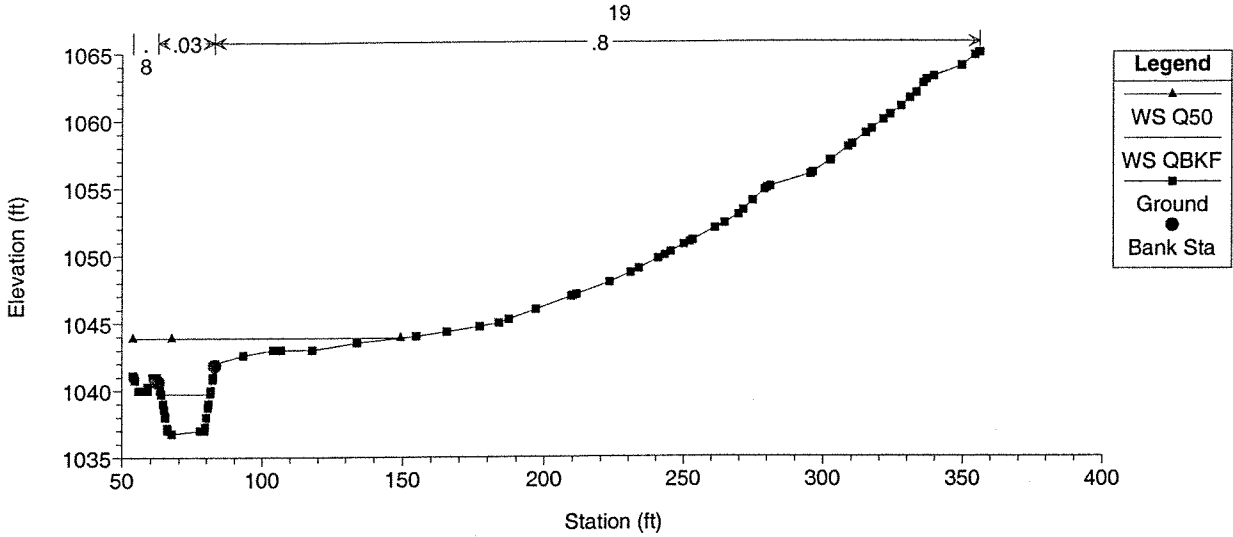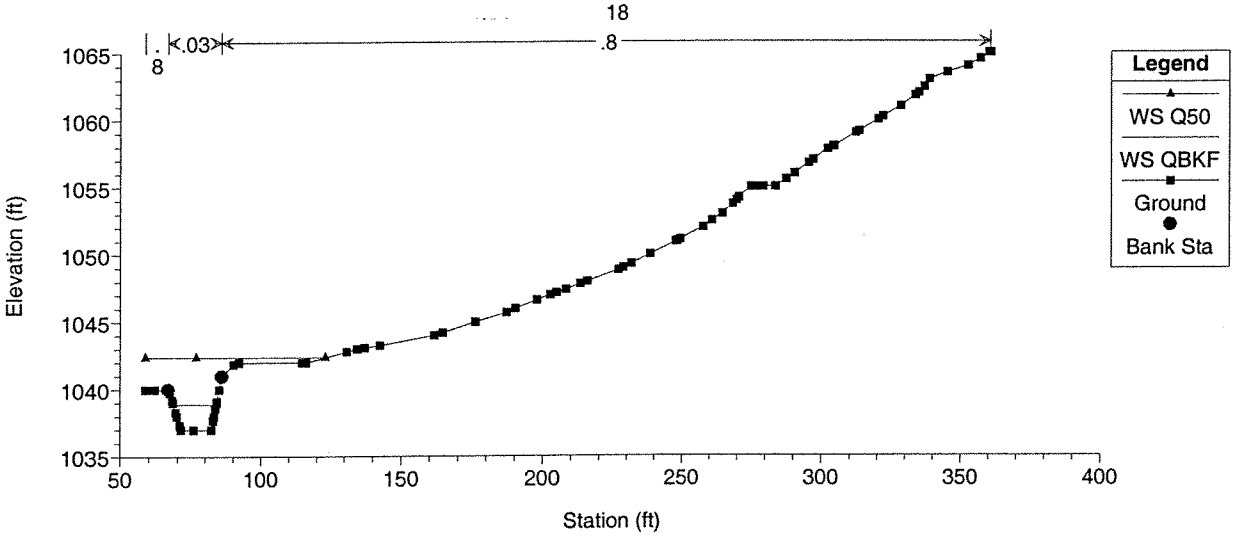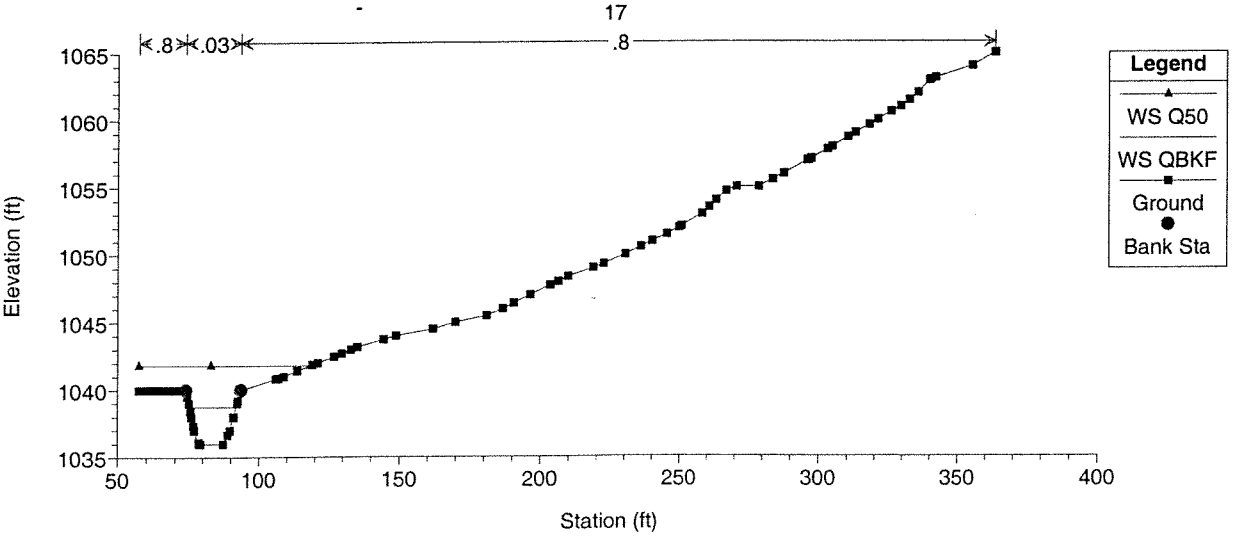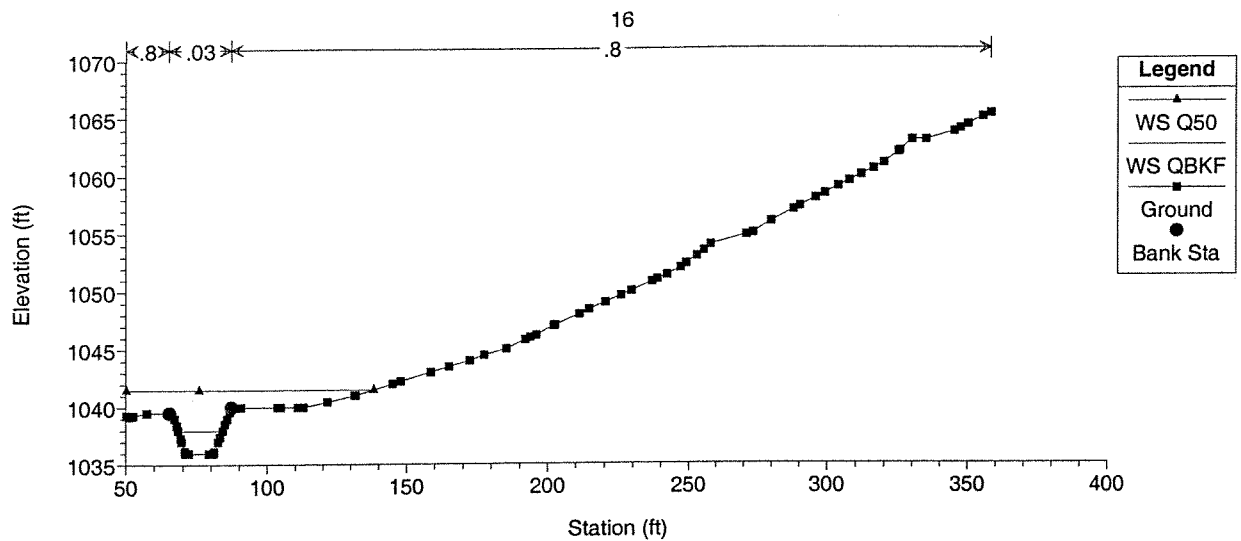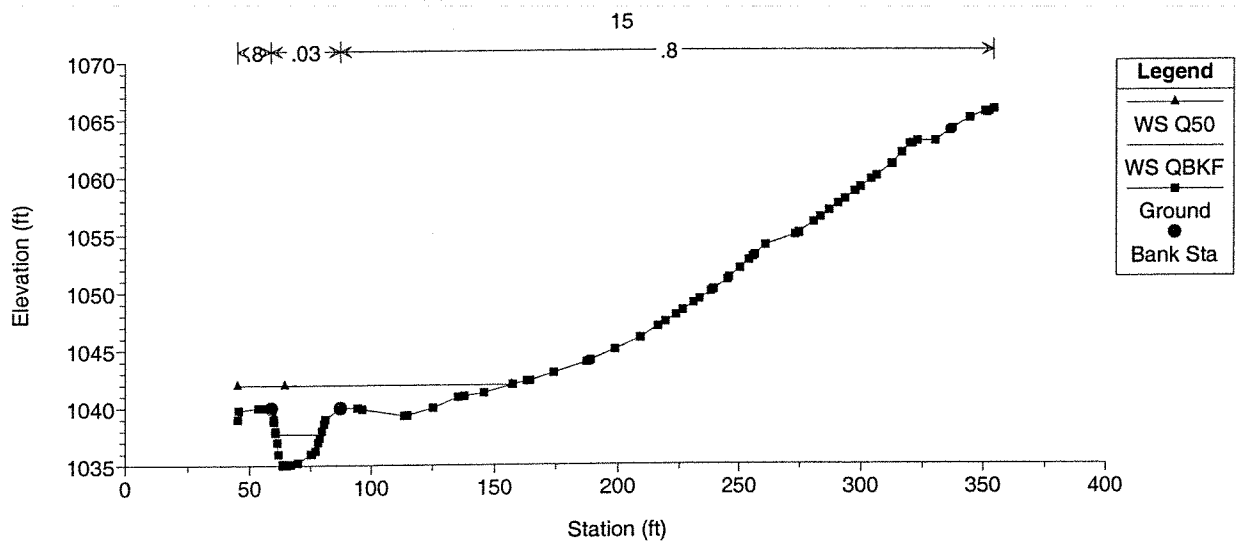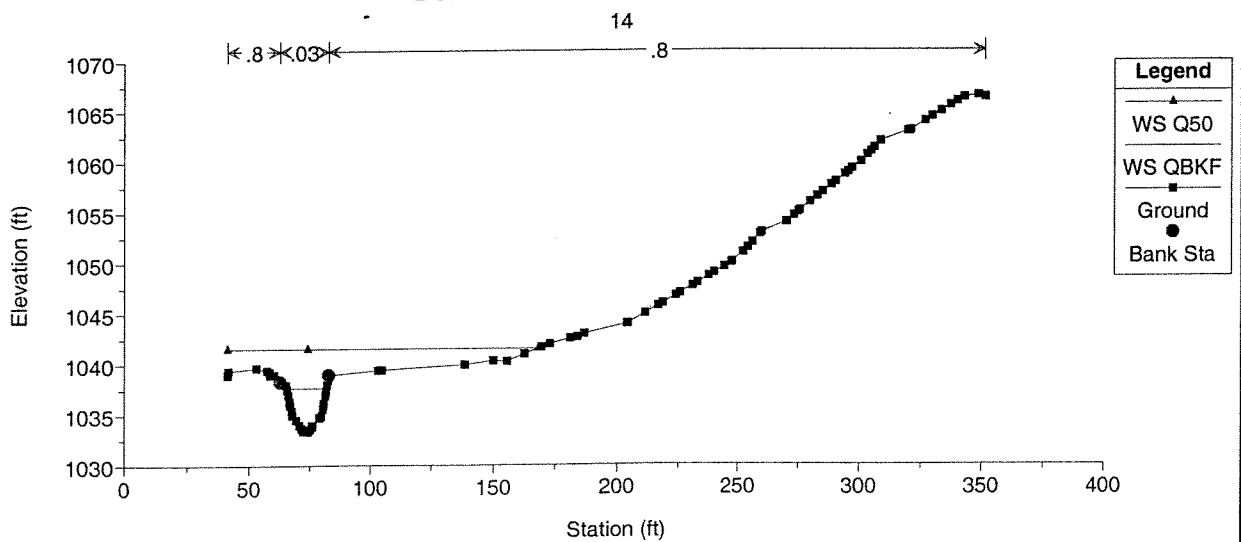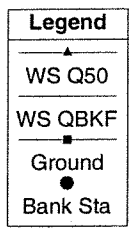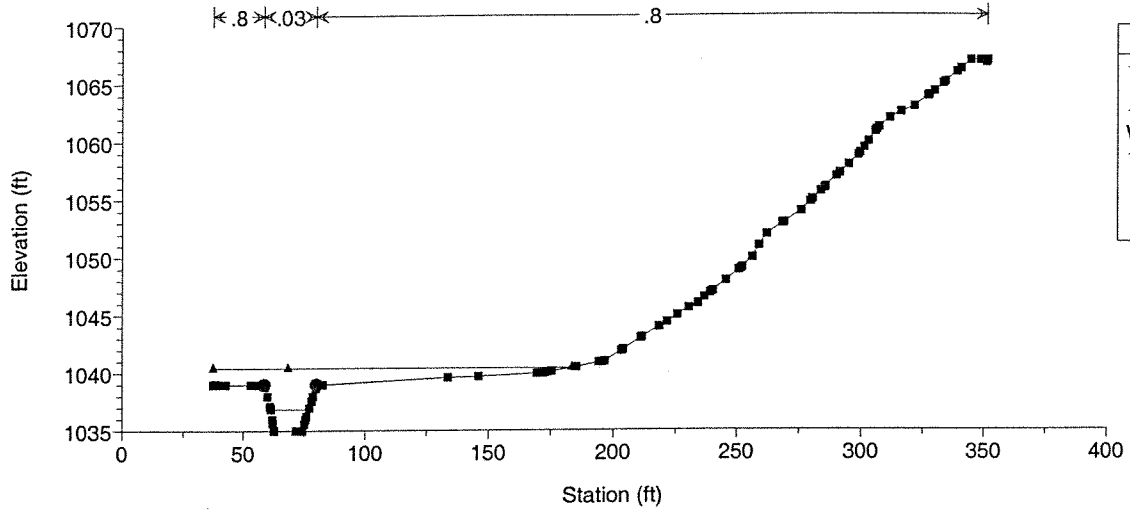Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
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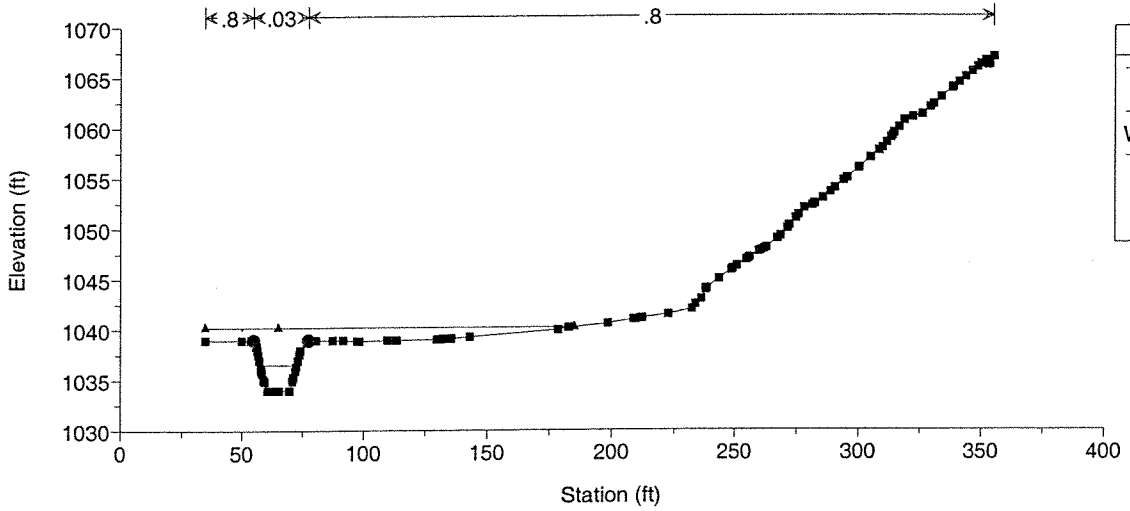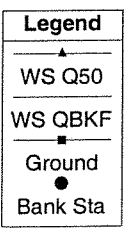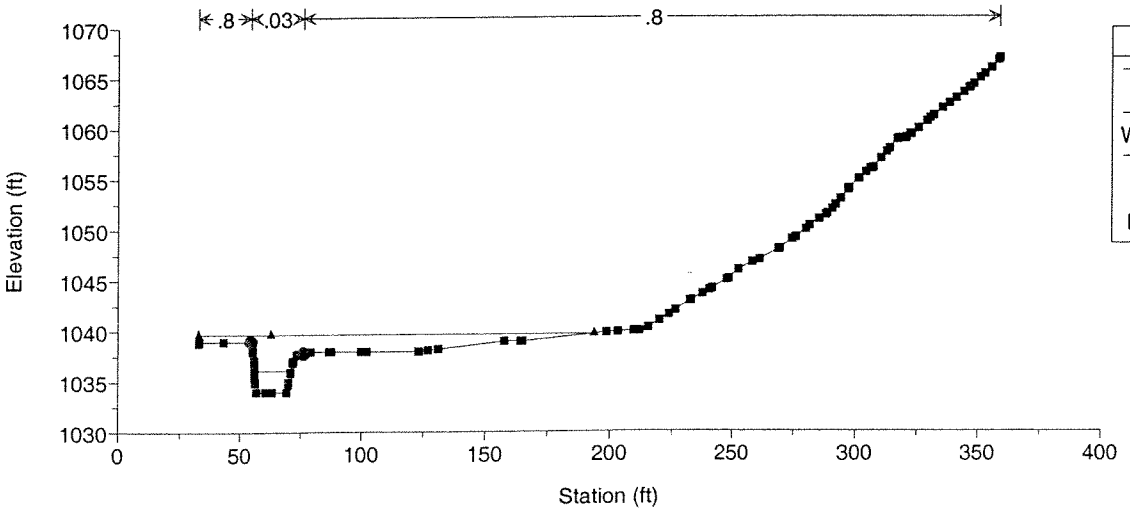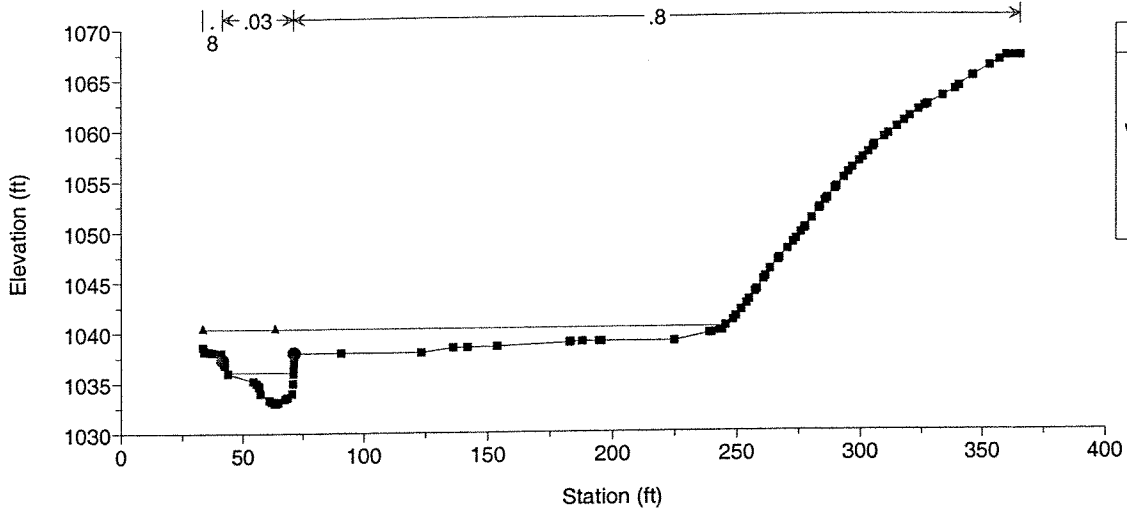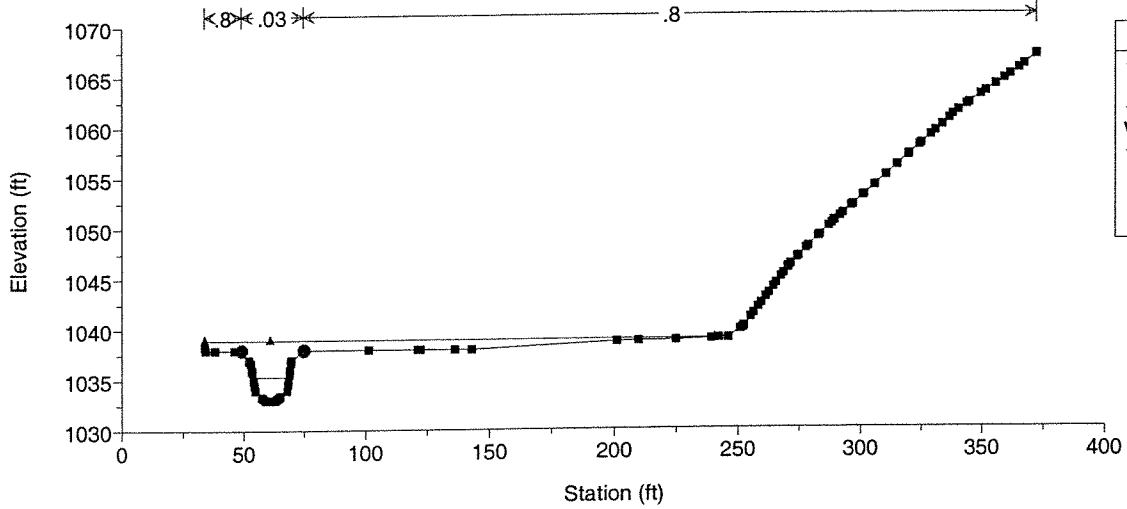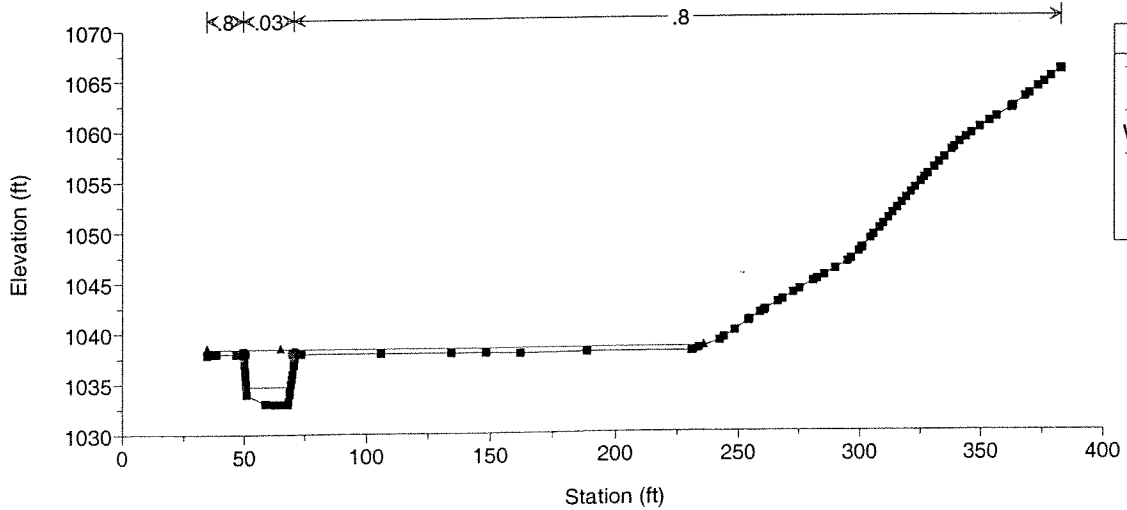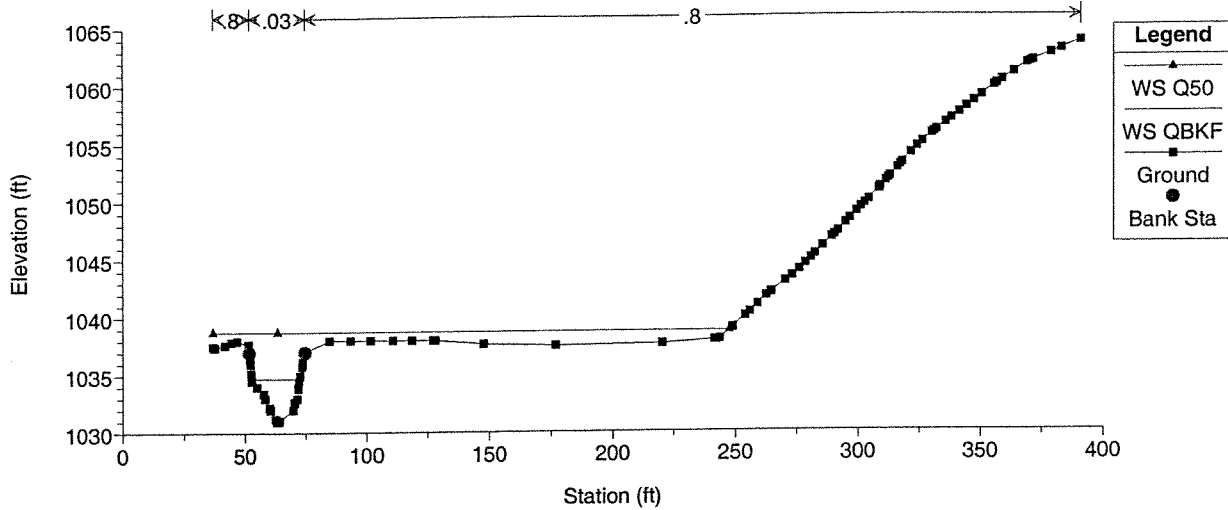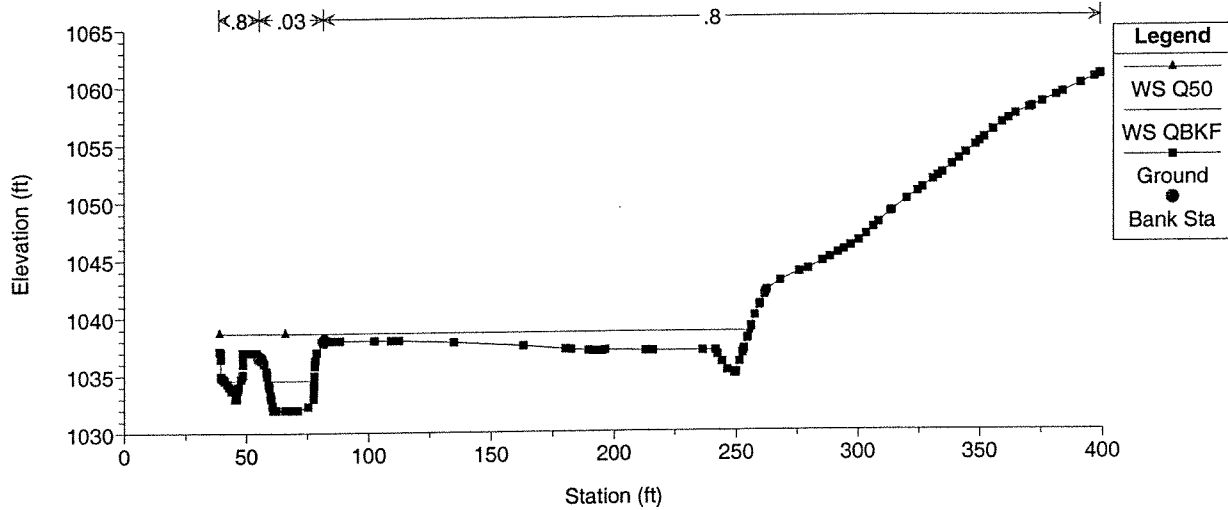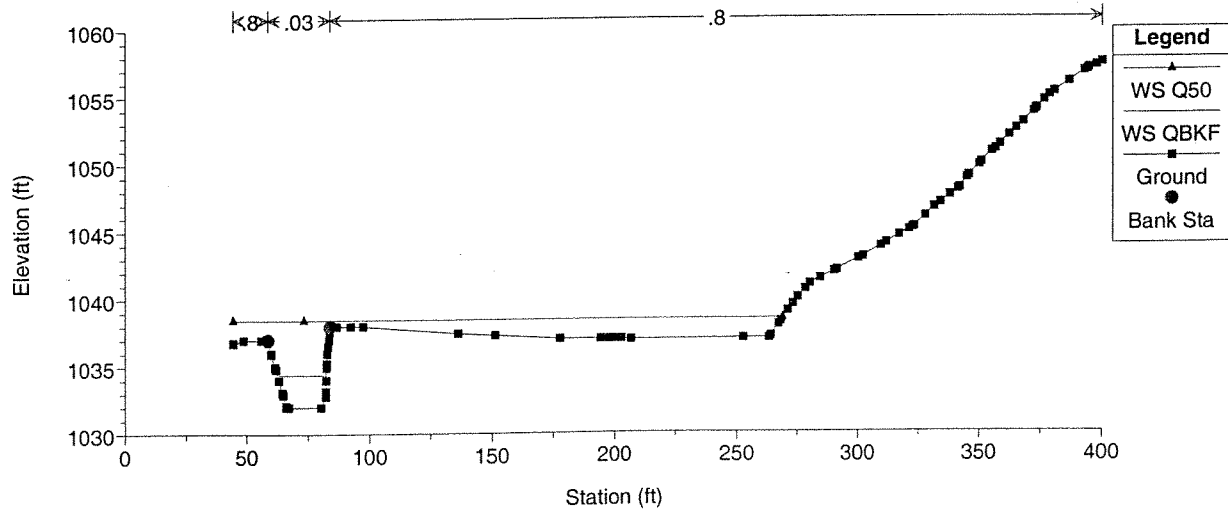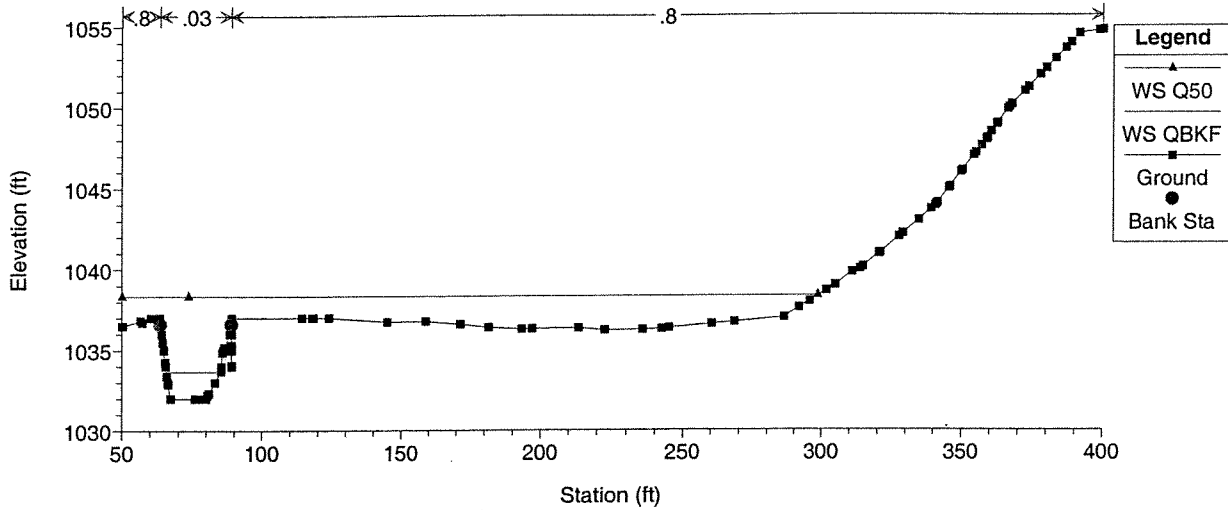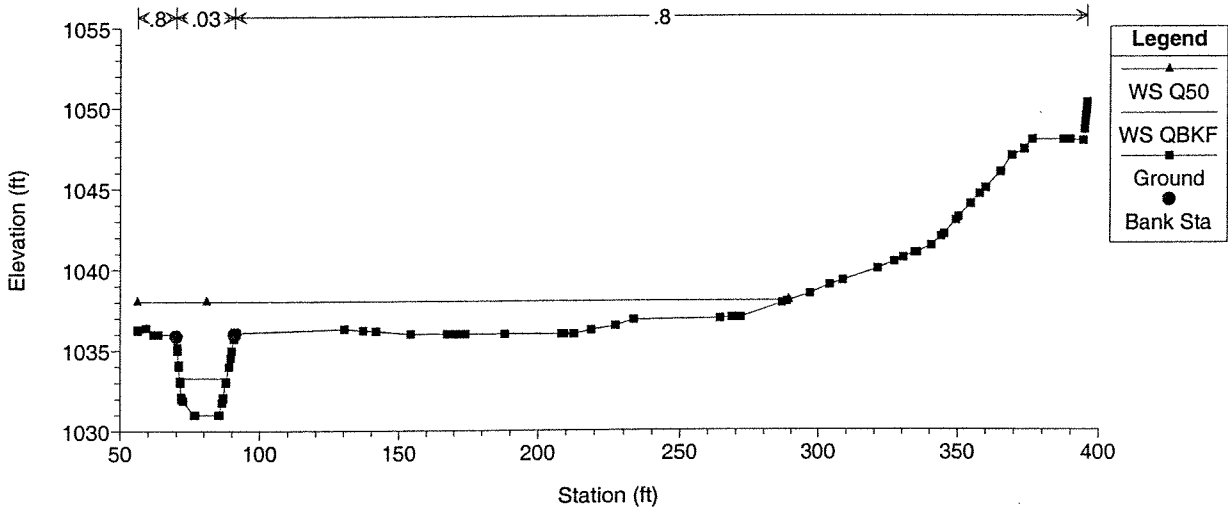Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
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Down All Run   Plan 02   2/7/2000
11

Legend

WS Q50

WS QBKF

Ground

Bank Sta

Down All Run   Plan 02   2/7/2000

10

Legend

WS Q50
WS QBKF
Ground
Bank Sta

Down All Run   Plan 02   2/7/2000

9

Legend

WS Q50
WS QBKF
Ground
Bank Sta

Down All Run   Plan 02   2/7/2000

8

Legend

WS Q50
WS QBKF
Ground
Bank Sta

Down All Run   Plan 02   2/7/2000
7

Down All Run   Plan 02   2/7/2000
6

Down All Run   Plan 02   2/7/2000
5

Down All Run   Plan 02   2/7/2000
4

Down All Run   Plan 02   2/7/2000
3

Down All Run   Plan 02   2/7/2000
2
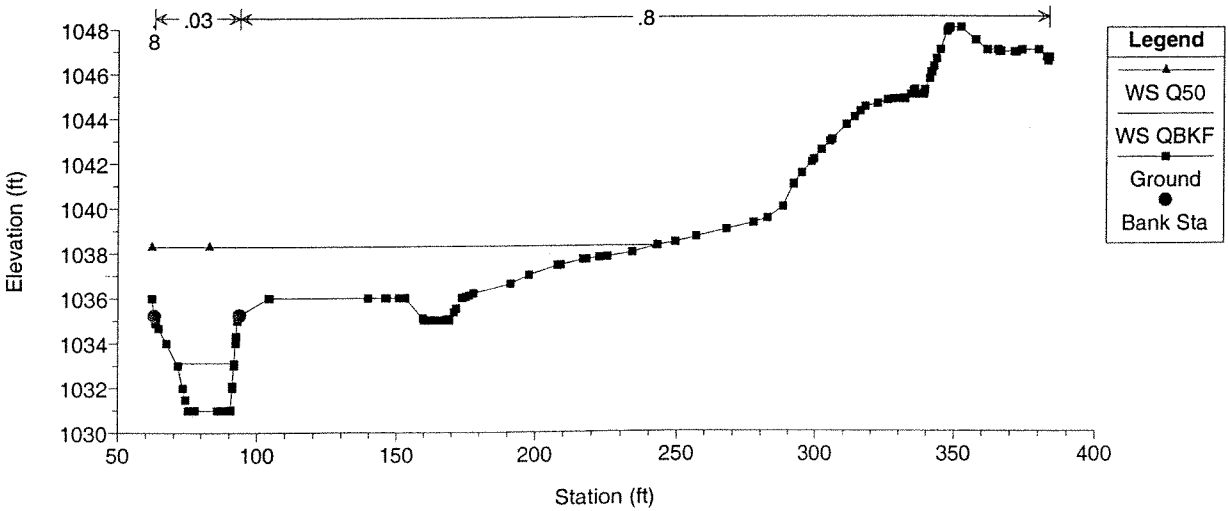
Down All Run   Plan 02   2/7/2000
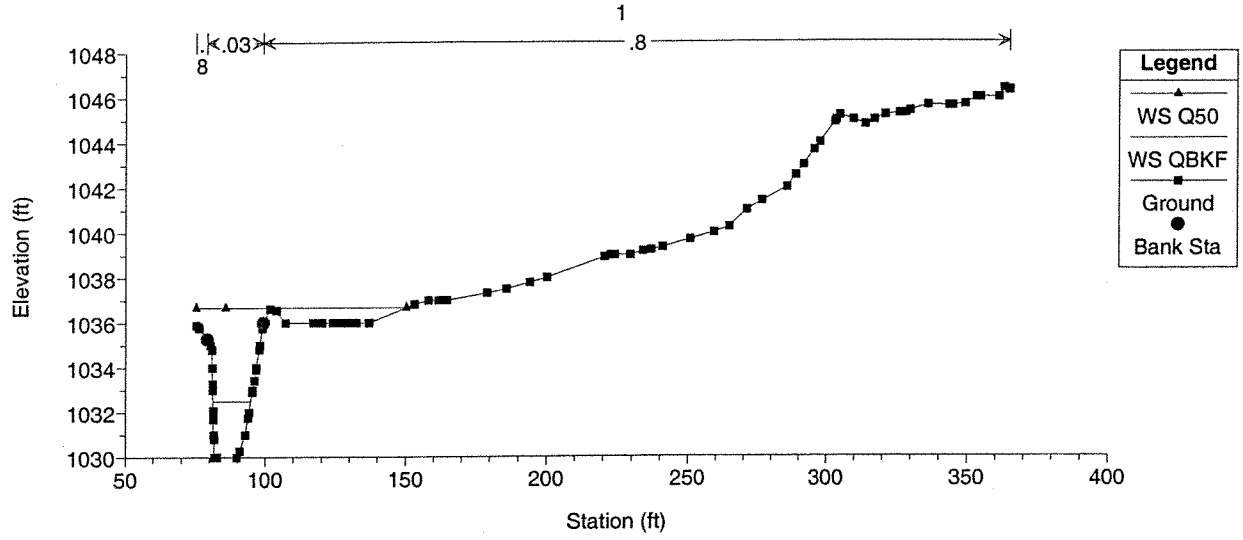
Appendix F

Site Photos

Reference Reach
Glade Creek

#1 –Looking downstream at STA 0+00

#2 – Looking upstream at STA 2+25

#3 – Looking downstream at STA 1+30

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Project: Payne Dairy Farm

Title: Reference Reach Glade Creek

Prepared by: Wil Welhelm.

Job Number: 011795000

Sheet 4 of 4

#4 – Looking upstream at STA 1+30

Upstream Segment
Jumping Run
North of SR 1614

#1 – Cattle have unlimited access to stream

#2 – Cattle in stream with vertical banks and no riparian vegetation.

#3 – Typical banks with cattle disturbance (foreground) and vertical undermined banks (background)
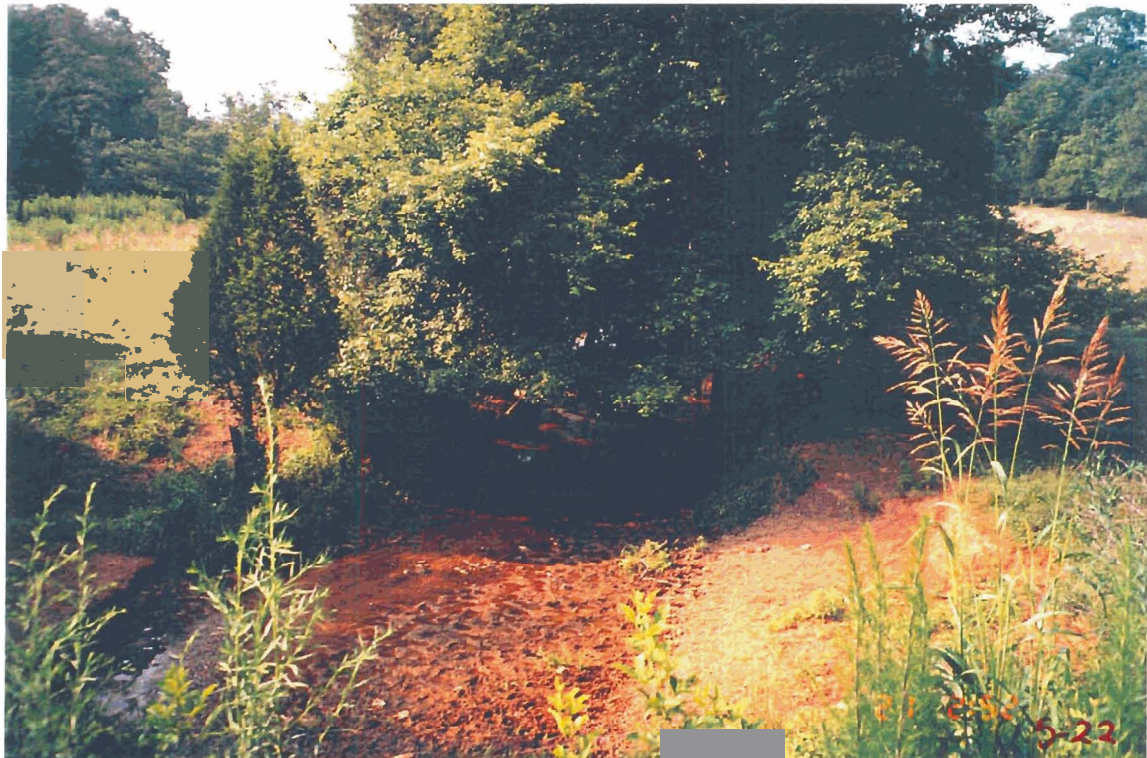
#4 – Cattle crossing upstream of SR1614 – looking upstream

Kimley-Horn and Associates, Inc.

Project: Payne Dairy Farm
Title: Upstream Segment - Jumping Run

Prepared by: Will Wilhelm.
Job Number: 011795000
Sheet 3 of 4

#5 – Chanalized section of stream. Relic channel background.

#6 – Bank disturbance from cattle (typical).

#7 – Single row of trees upstream of SR1614.

Downstream Segment
Jumping Run
East of SR 1605

#1 – Looking upstream at SR 1605

#2 – Looking upstream – bedrock present.

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and Associates, Inc.

Project: Payne Dairy Farm

Title: Downstream Segment - Jumping Run

Prepared by: Will Wilhelm.

Job Number: 011795000

Sheet   2   of 3

#3 – Cattle crossing just downstream of SR 1605. Looking downstream through culvert under SR 1605.

#4 – Bank erosion (typical)

#5 – Jumping Run downstream of proposed restoration (view 1).

#6 – Jumping Run downstream of proposed restoration (view 2).